

International Climate Agreements and Pakistan's National Climate Policies:

Implementation, Gaps and Coping Strategies

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Abstract

This study examines Pakistan's alignment with international climate agreements, especially the Paris Agreement and UNFCCC, and evaluates the effectiveness of its national climate policies. The study is guided by the following research questions: (1) a) What are the specific institutional, socio-cultural, and governance barriers affecting the implementation of international climate agreements in Pakistan? b) How do Pakistan's national climate policies align with its commitments under agreements such as the Paris Agreement and UNFCCC? c) What policy and strategic reforms can bridge the gap between Pakistan's climate commitments and ground-level action? The objective is to critically evaluate the effectiveness of national climate policies in aligning with international climate agreements. Despite active participation in global climate frameworks, Pakistan faces significant challenges in implementing climate commitments owing to institutional inefficiencies, fragmented governance, financial constraints, and technical limitations.

The research employs a qualitative case study design. Primary data were collected through semi-structured interviews and focused group discussions with 10 policymakers and experts, while secondary data included national reports, peer-reviewed literature, and global climate

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databases. The study focuses on four main themes: (1) alignment with international commitments, (2) institutional and legislative challenges, (3) financial limitations, and (4) coping strategies (adaptation and mitigation).

The study reveals that while Pakistan has been able to work on few weather-related projects, such as climate-smart agriculture and the Indus River Initiative, such programs are poorly financed, both in terms of technical expertise and funds. Various forms of inefficiency, governance fragmentation and financial hardship act as barriers in the scaling up of climate actions. Some of the critical factors include lack of proper policy formulation, retrograde industrial techniques and deficient infrastructural development, which in turn, affect the capacity of Pakistan to achieve the set targets for reduction of greenhouse gases as well as combating climate change effects. This research uniquely triangulates expert interviews, focus group data, and policy analysis to offer an integrated view of the institutional, financial, and policy misalignments obstructing climate action in Pakistan.

Additionally, it emphasizes the need to strengthen inter-institutional linkages and increase the climate financing pool, improve legislative instruments, and raise the level of necessary information in society. It calls for greater use of diplomacy and private sector involvement to deal with climate change. It also emphasizes the role of international cooperation and calls on the developed countries to honor their funding commitments. The study encourages regional cooperation for technology transfer and capacity building for developing countries, particularly the V20 and CVF. The findings indicate the deficits that Pakistan faces in areas such as structural reform and strategic management, further compounded by poor international cooperation. Concisely, the study offers targeted policy recommendations, such as strengthening inter-agency coordination, expanding domestic climate financing, enhanced focus for policy alignment and leveraging international diplomacy to secure green technology and funds tailored to Pakistan's needs.

Keywords: *climate, policies, gaps, coping strategies, UNFCCC.*

1. Introduction

1.1. Overview

Climate change is viewed as one of the biggest threats to mankind in the modern epoch. It causes severe concern to ecosystems, biodiversity, human life, and economies around the globe. Nations and societies need to join hands in fighting this global threat, which is caused primarily by overconsumption of planet's resources by the humans. This is imperative as global temperatures

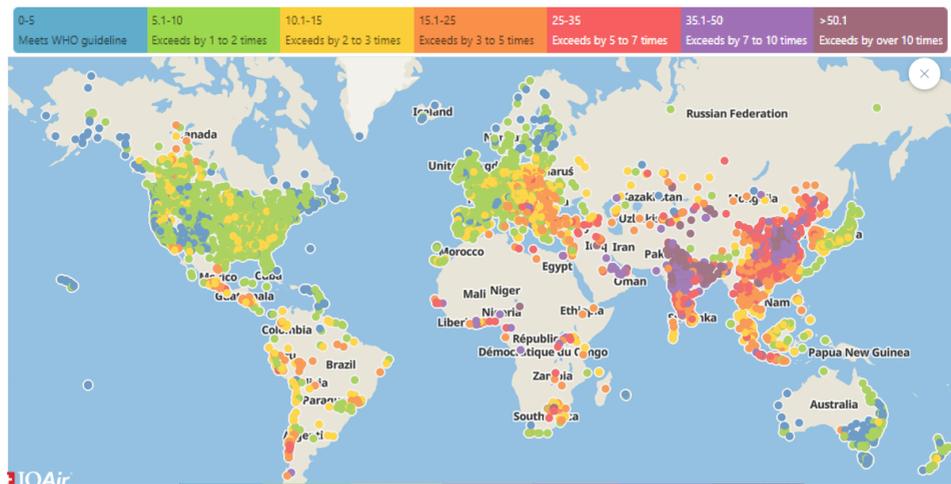


continue to rise and extreme weather patterns become more commonplace. Realizing it, the international community has established the UN Framework Convention on Climate Change (UNFCCC) (1992), the Kyoto Protocol (1997), and the Paris Agreement (2015). These agreements prioritize emission reductions, building climate resilience, and mobilizing climate finance, acknowledging that such objectives require integrated global and national strategies. Further, Intergovernmental Panel on Climate Change (IPCC), founded in 1988, an organization that offers assessments on the scientific basis, determines actions made at the international level, and so enables countries like Pakistan to align their climate policies in conformity with the international commitments. Combination of moderate climate vulnerability and significant ecological degradation is exacerbated by rapid urbanization, which amplifies the nation's exposure to climate-related risks. Urban areas, as centers of energy production, contribute to global atmospheric emissions while also being the most affected by climate disasters. Major urban centers face challenges like inadequate waste management, urban sprawl, air pollution, poor access to water and sanitation, and congestion, which hinder productivity and service efficiency. According to the 2024 Environmental Performance Index (EPI), Pakistan ranked 178th out of 180 countries, with an overall score of 19.7, highlighting severe deficiencies in air quality, ecosystem vitality, and climate change mitigation (Yale University, 2024). The World Air Quality Report (2023) ranks Pakistan as the second-most polluted country globally, with Lahore listed as the most polluted city, where annual PM_{2.5} concentrations exceed 10 times the WHO safe limit (IQAir, 2024). Despite a growing number of national policies and international commitments, a major policy-practice gap persists. Pakistan's climate vulnerability is not only rooted in financial and technical constraints, but is also deeply embedded in weak institutional structures, fragmented governance systems, and insufficient public engagement. This study aims to investigate how these multidimensional challenges hinder the implementation of international climate agreements at the national level.

Effective climate action depends on aligning national policies with international commitments which encourages countries to submit Nationally Determined Contributions (NDCs) aimed at reducing emissions and limiting global warming to 1.5°C. Pakistan is very susceptible to the effects of climate change so the fulfillment of international climate commitments is both crucial and challenging. Pakistan, owing to its geographical spread of population and socio-economic factors, is among the top ten countries that are most vulnerable to climate change. Rising temperatures, increased frequency of extreme weather events such as droughts, floods, heat waves, perennial smog, and accelerated glacial retreat, need attention as they impact the economy and health of the people (Zemp et al., 2023).

Figure 1

World Map of 2024 PM2.5 concentrations by city
PM2.5 legend



Source: (World Air Quality Report, 2021)

Climate-dependent factors such as agriculture, high levels of poverty, rapid growth of population, and dependence on climate-sensitive sectors make adaptation and mitigation more challenging. Pakistan has one of the highest indices of climate vulnerability, even though it contributes very little to global GHGs emissions, thus requiring a sustainable climate policy and pragmatic action plans. Many issues including, institutional weaknesses; and lack of fiscal space, technical proficiency, and public awareness have arrested progress, leaving huge gaps between policy intent and implementation. This study aims to evaluate alignment of national climate policies of Pakistan with its international obligations, identifies gaps and recommends measures / coping strategies to strengthen climate resilience.

1.2. Statement of the Problem

As a signatory to major international climate agreements, including the Paris Agreement 2015, Pakistan is committed to reducing emissions and enhancing climate resilience. However, the country faces significant challenges in translation of its global commitments into practical realities. Pakistan's ability to carry out effective climate actions is tremendously impaired by lack of institutional capacity, inadequate financial resources, and limited access to climate-friendly technologies. Additionally, Pakistan's extremely high vulnerability to climate impacts exacerbates the challenges in espousing effective adaptation and mitigation measures. This requires a comprehensive and context-specific strategy to bridge the gap between global commitments and local actions.

1.3. Research Questions

The statement of the problem entails two basic research questions. Viz.

1. What are the challenges in Pakistan's effective execution of its international climate commitments?
2. How Pakistan can bridge the gaps in its domestic climate actions to fulfill its international climate commitments?

The dissection of above research question entails many specific enquiries. For example, what are the specific institutional, socio-cultural, and governance barriers affecting the implementation of international climate agreements in Pakistan? How do Pakistan's national climate policies align with its commitments under agreements such as the Paris Agreement and UNFCCC? What policy and strategic reforms can bridge the gap between Pakistan's climate commitments and ground-level action. These questions guide the research inquiry and shape the data collection and analytical framework used throughout the study.

1.4. Review of Literature

While numerous studies highlight Pakistan's climate vulnerability, fewer critically assess the disconnect between global climate diplomacy and national-level implementation in developing countries. This review aims to analyze existing research through a critical lens, evaluating institutional readiness, financing barriers, and the socio-political landscape influencing climate governance. Studies often remain sector-specific and do not explore how overlapping constraints interact to inhibit climate action. This gap underscores the need for integrated policy approaches and strategic reforms.

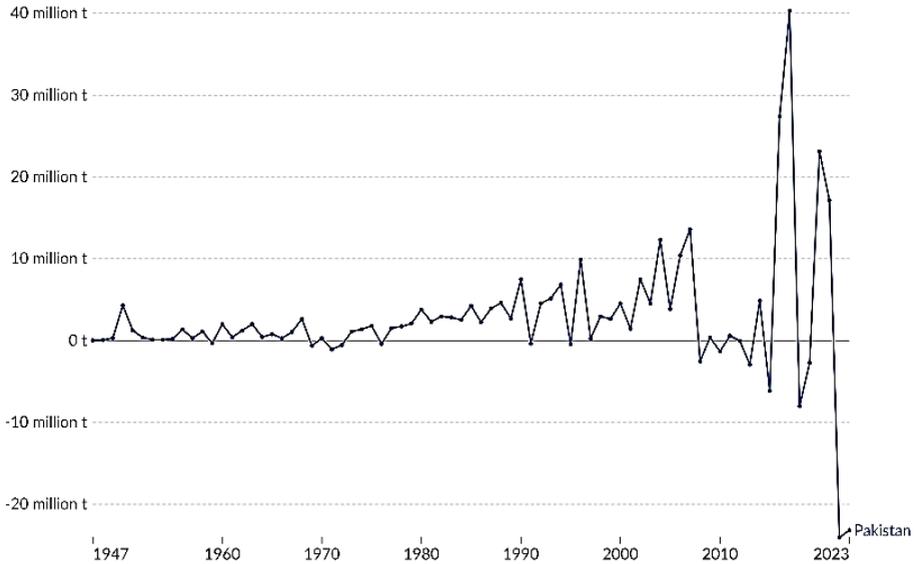
1.4.1. International Climate Agreements

International agreements set legally binding and voluntary targets for emission reductions, adaptation, and financing, but the translation of these frameworks into actionable national policies remains uneven, particularly in developing nations like Pakistan. International agreements define targets for emission reduction, adaptation, and climate finance. Greenhouse gases (GHG), particularly CO₂, emissions below 750 ppm, is required. The discussion, in this regard, nowadays, focuses on how the technology can be implied, and what institutions and policies are needed to put it into practice. Research indicates that in order to keep CO₂ at 500 ppm global emissions required to be cut into half within the next 50 years and will have to continue this in the years following that. This encompasses the integration of renewable sources such as solar and wind power, as well as carbon sequestration technologies (Pattberg et al., 2022).

Figure 2

Pakistan's Year-On-Year Percentage Change in CO₂ Emissions

Absolute annual change in carbon dioxide (CO₂) emissions, measured in tonnes.



Source: (Global Carbon Budget, 2024)

Pakistan has committed to reduce greenhouse gas emissions, increase energy efficiency and participate in international efforts to address climate change through several international agreements. These arrangements are the backbone of the government's climate policy for the nation but there is still much work needed domestically, as most projects are still to be undertaken. Following are some of the important climate agreements that Pakistan has signed and actions taken to implement these agreements:

Table 1

Timeline of Pakistan's Major Climate Commitments

Year	Commitment/Event	Goals
1976	Environmental Protection Ordinance	Establish initial framework for environmental protection in Pakistan.



1992	Signed UNFCCC	Commit to addressing climate change under the international framework.
1997	Ratified the Kyoto Protocol	Support global efforts to reduce greenhouse gas emissions as a non-Annex I country.
2005	Established the Ministry of Environment	Create a dedicated institution for managing environmental and climate-related issues.
2010	18th Amendment to the Constitution	Devolve environmental policymaking to provinces for localized climate action.
2012	Launched the National Climate Change Policy (NCCP)	Provide a framework for adaptation and mitigation strategies across sectors.
2013	Framework for Implementation of NCCP	Translate NCCP into actionable strategies and programs.
2015	Signed the Paris Agreement	Commit to global temperature goals and enhance resilience to climate impacts.
2016	Submitted Initial NDCs	Reduce emissions by 20% by 2030 (conditional on international support).
2018	Initiated the Plant for Pakistan Initiative	Increase forest cover by planting 10 billion trees by 2023.
2019	Operationalized the Pakistan Climate Change Act (2017)	Establish the Pakistan Climate Change Council and Climate Change Authority.

2021	Updated NDCs	Target 50% emission reductions by 2030 (15% unconditional, 35% conditional on funding).
2022	Developed the National Adaptation Plan (NAP)	Enhance resilience to climate impacts across key sectors like water, agriculture, and energy.
2023	Collaborated on the Indus Basin Adaptation Initiative	Strengthen water security and climate resilience in the Indus River Basin.

Source: (Ministry of Climate Change, Government of Pakistan, 2021)

The Doha Amendment (2016) is intended to eliminate hydrofluorocarbons (HFCs) in order to preserve the ozone layer. As a signatory to the Montreal Protocol (1987) Pakistan has made a commitment to phase out HFCs and contribute to the global efforts to protect the ozone layer and address climate change. Indeed, the Glasgow Climate Pact (2021) also stresses the importance of increased rate of climate action, that is, emissions reductions, improved climate finance rates and strengthened adaptation measures. Pakistan has reasserted its commitment to this Pact and is striving to enhance its climate resilience and to raise climate finance, although there is much left to do (Cohen et al., 2022).

1.4.2. Pakistan's Climate Issues

- a) Climate Change Impact on Pakistan: Pakistan is uniquely affected by the consequences of climate change, which is also dealing with an array of environmental problems, that include an increasing occurrence and severity of extreme weather events, such as flood, drought and heatwave (ESCAP, 2023). Glacial Melting of over 7,000 glaciers in northern Pakistan is altering river flows, causing erratic flooding patterns and posing a significant threat to water resources. Deglaciation in the Himalayas and Karakoram, at an increasingly rapid rate, affects the rivers, especially the Indus River. It creates significant risks to the irrigation system (agriculture and water security). As the glaciers melt, water storage in the form of glaciers is depleting, which impinges on the flow of water during dry seasons, hampering agriculture and irrigation systems, especially in the agricultural heartlands of Punjab and Sindh. Reports from the World Glacier Monitoring Service (WGMS) and the Pakistan Meteorological Department highlight these growing concerns. Frequent flooding in the



Indus River Basin is largely due to glacial melt and the effects of monsoon rains, which have become more intense owing to climate change. Prolonged droughts, particularly in the provinces of Sindh and Balochistan, have been exacerbated by rising temperatures, which affect water availability and agricultural productivity. Cities like Lahore and Karachi are facing severe air pollution, leading to a rise in respiratory and cardiovascular diseases. Smog is largely driven by industrial emissions and vehicular pollution. Before 2016 there was no smog in Pakistan and fog was mostly observed in the months of December and January. However, owing to climate change the fog period got shifted to November and October which coincided with the burning of the paddy crop, resulting in the formulation of smog, which has affected adversely to most parts of the Punjab, more severely the provincial capital, Lahore (Nasim, 2024). In addition to technical and fiscal bottlenecks, policy implementation is obstructed by deep-rooted governance limitations. Coordination across ministries and provinces is weak, particularly after the 18th Constitutional Amendment, which devolved environmental responsibilities without adequate capacity-building. The Federal climate governance infrastructure is also marred with inefficiencies and misplaced priorities. Socio-cultural inertia and low public awareness further limit community-level adaptation. Climate discourse often remains elite-centered, excluding vulnerable rural populations and women. These institutional and socio-cultural blind spots create friction between top-down planning and grassroots realities.

- b) **Pakistan's Energy Mix:** The energy mix is becoming inefficient owing to increased reliance on fossil fuels and delayed work on hydel projects. This might affect our exports, once carbon border adjustment mechanism (CBAM) of European Union gets fully implemented after 2025. Hence Pakistan needs to reshape its energy mix, with more focus on renewable energy, particularly when the country has imported more than ten thousand megawatts capacity of solar panels in last two years (PECCA, 2024). The renewable energy is projected worldwide as potential remedy for rising energy consumption and global warming related to fossil fuel use (Lu et al., 2023; Su et al., 2023; Umar et al., 2022, 2021; Yang et al., 2021).
- c) **Industrial Sector Challenges in Transitioning to Green Energy:** Textiles, leather, cement, and steel industries are considered key polluters. These sectors face high costs of transitioning to renewable energy and limited availability of green technologies. The socio-economic impacts of climate change are particularly exacting in Pakistan's rural areas, where agriculture remains the primary source of income. For instance, problems related to food insecurity, poverty, and disruption of livelihoods are increasing in number due to climate-related alterations in water availability, crop production, and livelihoods (Mavromatidi et al., 2018).

1.4.3. Analytical Insights

Transportation, industrial, and energy sector emissions play a major role in exacerbating Pakistan's climate sensitivity and risk of extreme weather events. To effectively mitigate climate risks, it is essential to implement comprehensive policies and targeted reduction strategies aimed at addressing these emissions.

a) Sectoral Emissions and Their Impact

Concentration of Pollutants (Tons) from various sectors: As reported by the Urban Unit, Government of Punjab, here is a summary of the emissions data:

Figure 3

Percentage of Pollutants from Different Sectors



Source: (Urban Unit Govt. of Punjab, 2023)

- **Transport Sector Emissions in Lahore:** Two-stroke motor vehicles, especially motorcycles and scooters, are major contributors to air pollution by emitting a considerable amount of Carbon Monoxide (CO), Non-Methane Volatile Organic Compounds (NMVOC) and nitrogen oxides (NO_x). These and fine particulate matter (PM_{2.5} and PM₁₀) pollutants all aggravate smog in the winter and cause severe respiratory and cardiovascular disease. The amounts of emissions from motorcycles also and scooters reach a very large value (104.76 Gg) compared to emissions from motorcars and jeeps (16.34 Gg). Replacing with cleaner energy and promoting driving an electric vehicle seem to be able to mitigate these negative impacts.
- **Industrial Sector Emissions:** The industry releases pollutants (i.e., NO_x, NMVOC, and particulate matter) caused by fossil fuel combustion and outdated technology. These emissions lead to unhealthy air grades and environmental pollution. Mitigation strategies are the use of cleaner technologies, more rigorous emission controls and the incorporation of renewable generation into industrial processes.
- **Agricultural Sector Emissions:** Agricultural emissions of methane and nitrous oxide from rice cultivation, animal husbandry and fertilizers

increase atmospheric temperatures.

- **Energy Sector Emissions:** Energy supply is mainly based on fossil fuels, coal-fueled power plants, leading to CO₂, SO₂ and particulate matter emissions, and thus cause increase in climate vulnerability.
- **Health Impacts:** These emissions have a profound impact on health, and cause an increased number of cases of respiratory and cardiovascular diseases, and premature mortality, especially affecting children and the elderly.

Table 2

Pakistan's Vulnerability to Climate Change by Sector

Sector	Climate Impacts	Consequences
Agriculture	Droughts, heatwaves, changing rainfall	Reduced crop yields, food insecurity
Water Resources	Glacial melt, altered river flows	Water scarcity reduced hydroelectricity
Energy	Increased energy demand, hydropower shortages	Blackouts, increased fossil fuel usage
Health	Rising temperatures, waterborne diseases	Increased mortality, disease outbreaks

Source: (Eckstein, Künzel, & Schäfer, 2021)

1.4.4. Pakistan's National Climate Policies

In Pakistan, different policies and frameworks have been developed and implemented to adapt, to limit, and to construct resilience to climate change. This section outlines some of the key efforts:

a) **Twenty-sixth Constitutional Amendment:** Pakistan has shown its dedication to the issue of climate change by enacting the right to a clean and healthy environment in its constitution under Article 9A of the 26th Constitutional Amendment. As revealed in this constitutional article, governments demonstrate their commitment to combatting climate change and towards sustainable development.

b) **National Climate Change Policy (2012):** The National Climate Change Policy (NCCP), introduced in 2012, marked Pakistan's first comprehensive approach to addressing climate change. It aimed to integrate climate resilience into key sectors such as forestry, energy, water resources, and agriculture. Policy highlighted the need for adaptation and mitigation measures, public education, and strengthening of institutional capacity.

c) Pakistan Climate Change Act (2017): The Climate Change Act was introduced, which outlined the establishment of a Climate Change Council, a Climate Change Authority and Climate Change Fund. These institutions are critical to the integration of climate change issues into the national development framework and processes dealing with the premature effects of climate change on various sectors (Jamal, 2018).

- a) Nationally Determined Contributions: Pakistan submitted its NDCs in 2016, committing to reduce its emissions by 50% by 2030. Of this reduction, 15% is guaranteed, while 35% is contingent upon foreign assistance.
- b) Other initiatives
 1. Ten Billion Tree Tsunami (2018): A major effort focused on climate adaptation and mitigation through large-scale biodiversity preservation and forest restoration.
 2. Baseline Emissions: Pakistan's GHG emissions were 492 Mt CO₂ e in 2018, primarily from energy (46%), agriculture (41%), and industry (7%). Plans focus on renewable energy (20% by 2030) and reforestation through the Billion Tree Tsunami Project. Experts suggest that initiatives have resulted in decline in figures.
 3. Recharge Pakistan (2021): This initiative aims to enhance climate resilience by focusing on water conservation, flood control, and the restoration of wetlands.
 4. Green Pakistan Initiative (2019): Focused on reforestation, waste management, and improving sanitation to combat environmental degradation.

1.4.5. Assessment of Pakistan's Policies in International Context

Prima facie, Pakistan's national climate policies are in line with international commitments as part of the Paris Agreement and the UNFCCC on adaptation and resilience, in key sectors like agriculture, water management, and disaster risk reduction. However, full implementation of these policies continues to face challenges owing to financial and technological constraints. Pakistan has been an active participant in the international climate negotiations, especially within the Group of 77 where it has raised issues relating to climate finance, technology transfer, and capacity building. Pakistan highlighted the necessity of international support in the wake of devastating floods in COP27 (2022) and strongly advocated for setting up of a 'Loss and Damage Fund' to address the impacts of climate-induced disasters. Pakistan played important role in COP 28 and COP 29 in respect of advocating viewpoint of global south regarding issues of climate finance, adaptation, mitigation, and carbon markets.



1.4.6. Case Studies of Climate Policy Implementation in Developing Countries

Perusal of case studies including World Bank's reality check Report on policies of 25 countries, Grantham Research Institute of Climate Change and Environment's study of South Africa's climate governance and UNDP's Risk-informed strategy tool including case studies of seven countries, viz Bangladesh, Fiji, Ecuador, Lebanon, Cambodia and Moldova reflect governance challenges, resource constraints and socio-cultural barriers.

Table 3

Case Studies of Climate Policy Implementation in Developing Countries

Country	Key Strategies	Challenges
Bangladesh	Coastal defenses, early warning systems, climate finance	Limited access to global funds
Kenya	Renewable energy focus (geothermal), forest restoration	Inadequate local capacity for policy execution
Pakistan	Disaster risk management, adaptation in agriculture	Lack of financial resources, weak governance

Source: (Desai, 2020)

2. Research Methodology

2.1. Data Collection

The study adopts a mixed-methods approach, integrating both quantitative and qualitative techniques to comprehensively evaluate the alignment and implementation of Pakistan's climate policies with its international obligations.

- a) **Quantitative data Collection:** Quantitative data were gathered through a structured questionnaire survey composed of 15 Likert-scale and multiple-choice questions. The survey aimed to assess the perceptions of climate policy implementation, familiarity with global agreements, and barriers to climate action.
 - The survey targeted 100 participants, including climate experts, policymakers, government officials, and academics with relevant subject knowledge. The purposive sampling ensured that only

respondents with direct experience or involvement in climate policy, governance, or implementation were included.

- The survey was administered via Google Forms and distributed through email and WhatsApp platforms. The response window remained open for three weeks, with reminders sent biweekly.
- A total of 100 responses were received out of 132 invitations, yielding a response rate of approximately 76%. This reasonably high response rate enhances the representativeness of the sample, though some degree of non-response bias cannot be ruled out.
- Although the sample size is modest, it aligns with the exploratory nature of this study. However, future studies may benefit from increasing the sample size and incorporating stratified sampling techniques to ensure wider sectoral and regional coverage.

b) **Qualitative Data Collection: Interviews and FGDs:** Semi-structured key informant interviews were conducted with experts from both governmental and non-governmental organizations. These interviews explored institutional readiness, climate finance, legislative gaps, and coordination mechanisms. The interview guide included open-ended questions grouped under four thematic areas: (1) institutional and legislative challenges, (2) financial and technical constraints, (3) stakeholder engagement, and (4) international cooperation and climate diplomacy.

Table 4

Interview Forum

Individuals	Designation	Type of Data Collected	Method
Mr. Abu Akif	Former secretary MOCC- Climate expert	Insights into Pakistan's institutional climate governance, policy alignment challenges	Semi-structured Interview involving open-ended questions
Prof. Dr. Aleem Ahmad Khan	Climate Specialist, Former VC Baha Uddin Zakariya University Multan	Insights into Pakistan's institutional climate governance, policy alignment challenges, and academic contributions to climate resilience.	



Mr. Muhammad Idrees Mahsud)	Member DRR, (NDMA), Pakistan	Discussion on gaps in Pakistan's implementation of International Climate Commitments	
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Additionally, a focused group discussion (FGD) was conducted with environmental practitioners, policy advisors, and EPA officials to explore collective experiences regarding policy gaps and implementation challenges.

Table 5

FGD Panelists

Mr. Naseem Shah	Chairman, Integrated Consultant Management / Ex- Ex-Secretary Environment Commission Pakistan	Overview of climate-related reports and national climate change policy draft. Special emphasis on environmental impacts of climate change, including Smog.	
Dr. Ahtisham Raza (Dr. Shahid Raza)	CEO, Integrated Consultant Management Consultant EPA SR Consultancy (PVT-LTD) (FAO)		Focused Group Discussion
Noman Younas	DD-CC-EPA-90345-4738696		
Dr. Asim (Dr. Arslan)	(DD-E PA-0300-8492084) SP & IU DD, EPA (SP and IU)		

3. Data Analysis

The survey data was analyzed quantitatively using Microsoft Excel for descriptive statistics (e.g., frequency, percentage distributions) and cross-tabulations to explore associations between climate agreement familiarity and perception of policy implementation. Pearson correlation analysis was performed to assess the relationship between familiarity with climate agreements and perceived quality of national climate policy execution.

For qualitative data, the study employed thematic analysis following Braun and Clarke's (2006) six-phase method.

- Thematic analysis involved systematic coding of interview transcripts and FGD notes. A deductive coding approach was initially adopted using pre-

defined categories based on the study's research questions.

- This was followed by an inductive refinement, where emergent themes were grouped and classified using NVivo software.
- Key themes identified included: (i) Coordination and Institutional Overlap, (ii) Financial Disbursement Bottlenecks, (iii) Capacity Gaps at Provincial Level, and (iv) Perceptions of Global North Accountability, with specific focus on Pakistan's role in this behalf.
- To ensure reliability, a second coder independently reviewed a subset (25%) of transcripts to confirm theme consistency.

Participation was voluntary, anonymous, and all data were collected with informed consent. Ethical compliance was maintained in accordance with institutional review protocols. Sensitive or identifying data were excluded from reporting to protect respondent confidentiality.

3.1. Research Scope and Significance

This study evaluates the alignment of Pakistan's climate policies with its international commitments, focusing on the challenges faced by developing countries. It aims to identify gaps between policy formulation and implementation to enhance climate resilience and sustainability in Pakistan.

The findings will aid policymakers, NGOs, and international organizations in strengthening Pakistan's climate policy, improving institutional capacity, and ensuring better alignment with global climate goals.

4. Analysis and Discussion

4.1. Analysis of Results

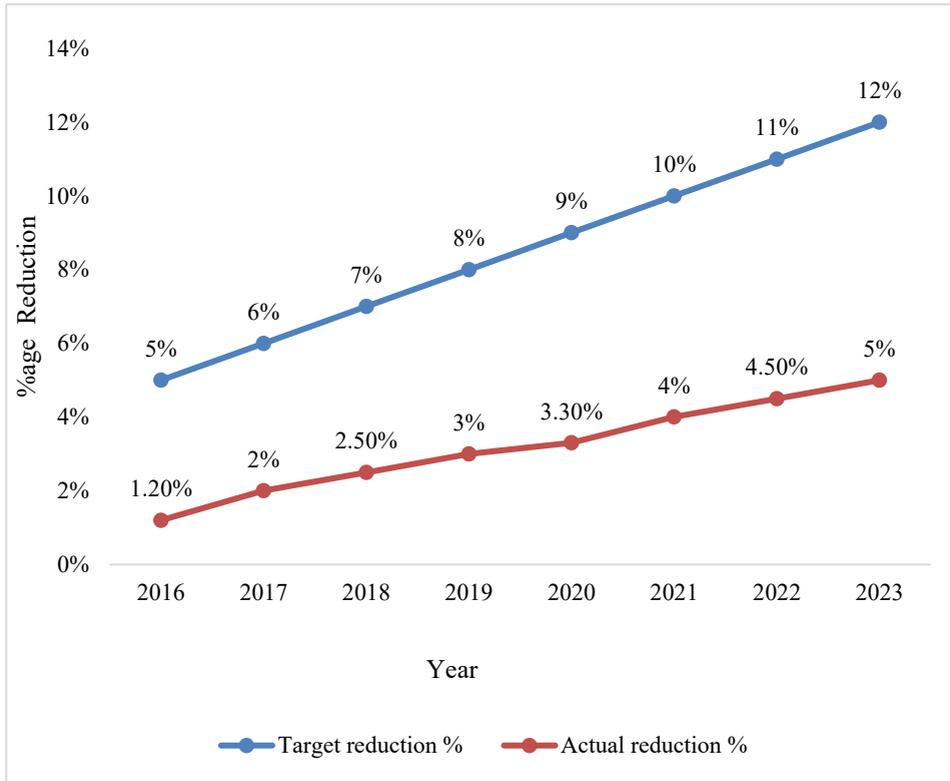
4.1.1. Qualitative Results

- a) **Alignment with International Commitments:** Pakistan is struggling to meet its targets under international commitments. As per the latest UNFCCC reports, Pakistan's efforts to reduce GHG emissions have been slower than anticipated, with only a 5% reduction in GHG emissions by 2023—well below the 12% target for that period. Looking ahead, the country aims to reduce its emissions by 50% by 2030, contingent upon international support, but with the current pace of progress, achieving this ambitious goal seems increasingly unlikely.



Figure 4

Pakistan's Emission Reduction Targets vs. Actual Reductions (2016-2023)



Source: (UNFCCC, 2023)

- b) Institutional and Legislative Challenges: Institutional weaknesses and poor inter-governmental coordination present serious barriers to effective climate policy implementation in Pakistan. Although the Climate Change Act (2017) aimed to centralize governance mechanisms, its enforcement remains weak. This is primarily due to overlapping mandates among federal and provincial institutions. In particular, coordination between the Ministry of Climate Change (MOCC) and provincial Environmental Protection Agencies (EPAs) is fragmented, hindering the consistent formulation and execution of climate strategies across regions.
- c) Federal-Provincial Coordination: Misalignment between federal climate goals and provincial priorities has delayed initiatives like the Indus River Initiative.

Table 6

Institutional and Legislative Gaps in Climate Policy Execution

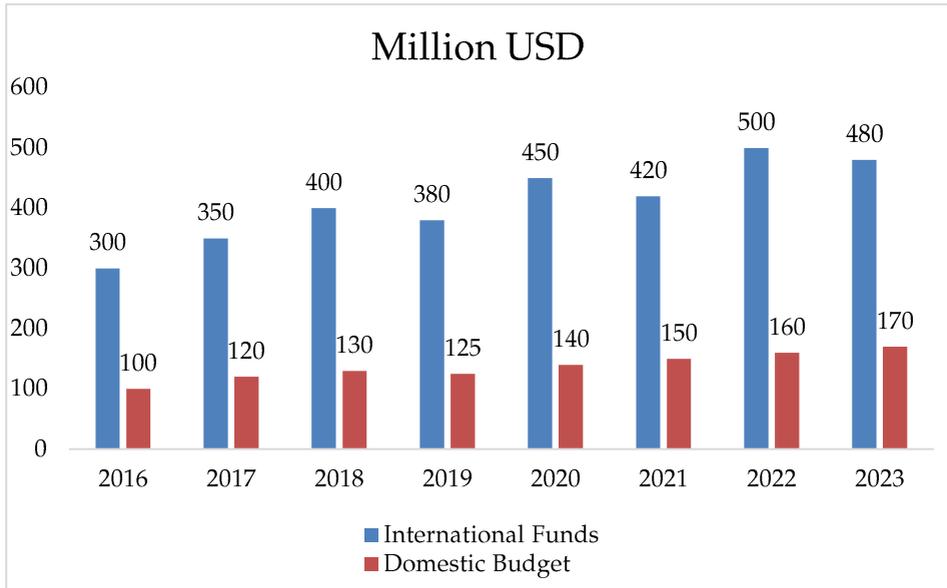
Gaps Identified	Impact on Policy Implementation
Poor coordination among ministries	Delayed policy execution and lack of comprehensive strategy
Weak enforcement mechanisms	Inconsistent application of laws at the provincial level
Lack of accountability	Few penalties for non-compliance with national climate policies

- d) **Financial Constraints and Resource Allocation:** Financial constraints are among the most critical barriers to implementing climate policies in Pakistan. As per the Green Climate Fund (2023), the country has received just 50% of the funds required for its climate projects. On the domestic front, only 0.9% of the national GDP was allocated to climate-related initiatives in 2023. This limited financial commitment significantly affects Pakistan's ability to execute large-scale mitigation and adaptation strategies.
- e) **Climate Finance:** The international funds have been very important to the progress of Pakistan. However, poor disbursement timelines and inefficiencies have generally caused delays in progress. Domestic budget allocation of Pakistan for climate projects is grossly inadequate.
- f) **Adaptation and Mitigation Strategies:** Although Pakistan has developed several adaptation strategies to address climate vulnerabilities particularly in water management and agriculture, their implementation remains limited. A key example is the Indus River Initiative, which was designed to enhance water security. However, the project has faced repeated delays owing to resource constraints and fragmented coordination between involved agencies. In mitigation, Pakistan's renewable energy transition is slow, with renewables making up only 7% of the energy mix by 2023, far below the 15% target. Barriers include financial risks, regulatory issues, and low private sector investment. Efforts to reduce smog and promote cleaner energy sources like solar and wind, along with water management projects to address glacial melt, are underway (Ahmad et al., n.d.).



Figure 5

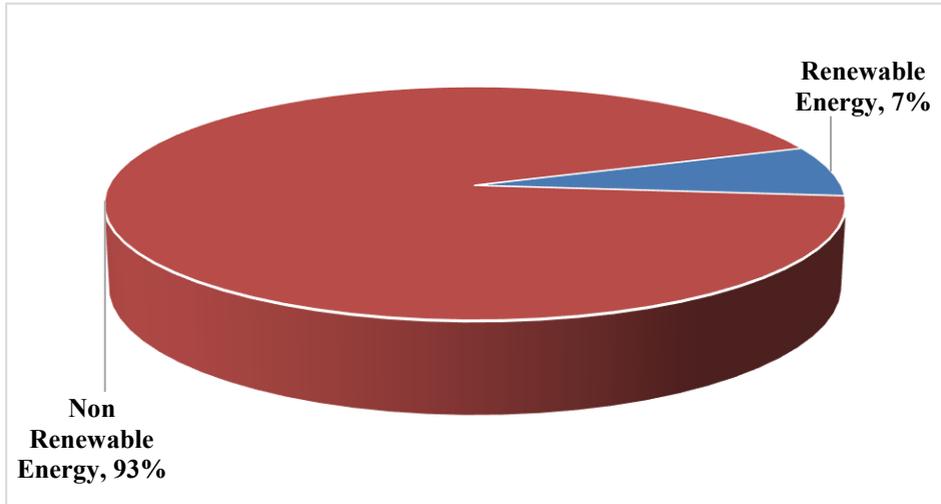
Pakistan's Climate Finance Sources (2016-2023)



Sources: (Khan et al., 2024)

Figure 6

Renewable Energy Contribution to Pakistan's Energy Mix (2023)



Source: (Asia Society, 2024)

Table 7

Adaptation and Mitigation Strategy Gaps

Sector	Planned Strategies	Challenges
Agriculture	Climate-smart agriculture	Limited financial and technical support
Water Resources	Efficient water management	Delays in implementation of Indus River Initiative
Energy	Renewable energy expansion	Slow private sector investment owing to low incentives

4.1.2. Quantitative Results

- a) Awareness of International Climate Agreements: Most of the respondents (60 percent) have heard of Pakistan's obligations pertaining to the international climate treaties, the average degree of acquaintance being 3 (out of 5) This reflects adequate percent idea of awareness among the respondents that participated in the study.

Table 8

Awareness of International Climate Agreements

Familiarity Level	Frequency	Percentage
Very Familiar	25	25%
Somewhat Familiar	35	35%
Neutral	20	20%
Not Familiar	20	20%

- b) Perceptions of Policy Implementation: 45% of the respondents stated that Pakistan's obligations concerning climate have been poorly translated into action, while only 5% rated the compliance as complete.



Table 9

Perceptions of Policy Implementation

Implementation Level	Frequency	Percentage
Fully Implemented	5	5%
Partially Implemented	35	35%
Poorly Implemented	45	45%
Not Implemented	15	15%

c) Frequency Distributions

Barriers to Effective Implementation: When asked about the main barriers to climate policy implementation, 50% of respondents pointed out a lack of financial resources, while 30% indicated political instability as a major obstacle.

Table 10

Barriers to Effective Implementation

Barrier	Frequency	Percentage
Insufficient Financial Resources	50	50%
Political Instability	30	30%
Institutional Weaknesses	10	10%
Lack of Public Awareness	10	10%

- Cross-Tabulation Analysis

Cross-Tabulation of Familiarity and Policy Implementation: A cross-tabulation between experience of climate agreements and perception of policy implementation indicated that the policy perception as a result of its execution was rated higher by those who had more experience with the agreements.

Table 11

Cross-Tabulation of Familiarity and Policy Implementation

Awareness Level	Fully Implemented	Partially Implemented	Poorly Implemented	Not Implemented at All	Total (%)
Very Familiar	3	15	5	2	25%
Somewhat Familiar	2	14	15	4	35%
Neutral	0	4	10	6	20%
Not Familiar	0	2	15	3	20%
Total (%)	5%	35%	45%	15%	100%

- **Correlation Analysis**

Correlation between Familiarity and Policy Implementation: The association between the perception of climate policy execution and acquaintance with international climate agreements was examined using a Pearson correlation calculation. A moderately positive association was indicated by the analysis, which yielded a 0.40 correlation coefficient, P-value: 0.00003. According to this, individuals who are more knowledgeable about global climate agreements are likely to have a more positive opinion of Pakistan's implementation of its climate policies.



Figure 7

Bar Chart for Distribution of Responses

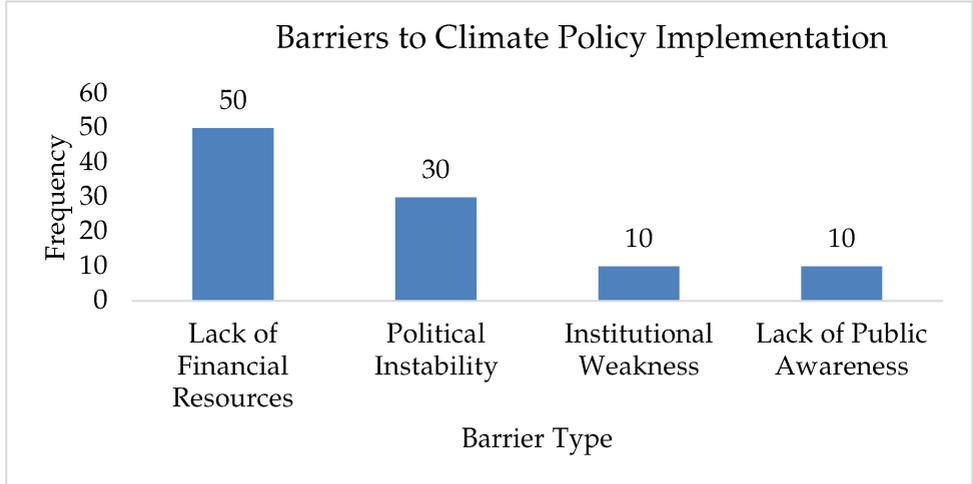


Figure 8

Pie Chart for the Proportion of Specific Responses (e.g., Barriers to Implementation)

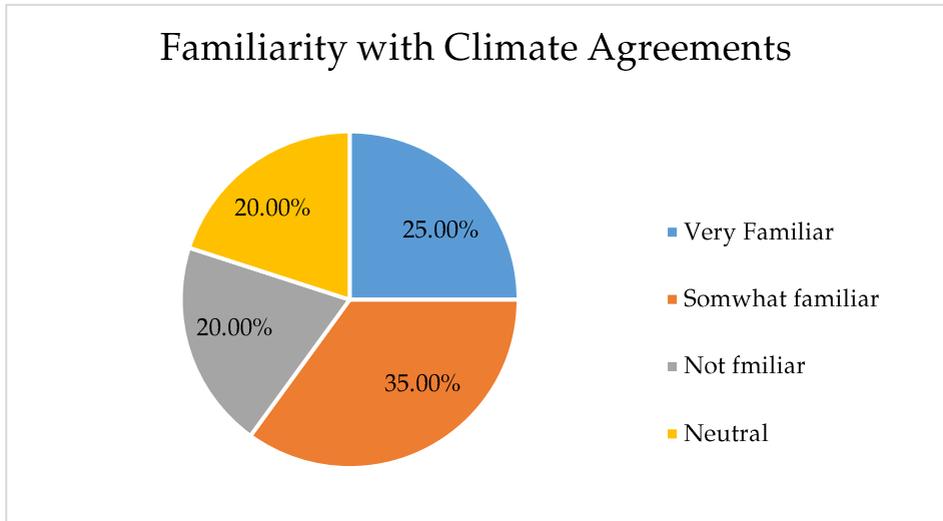
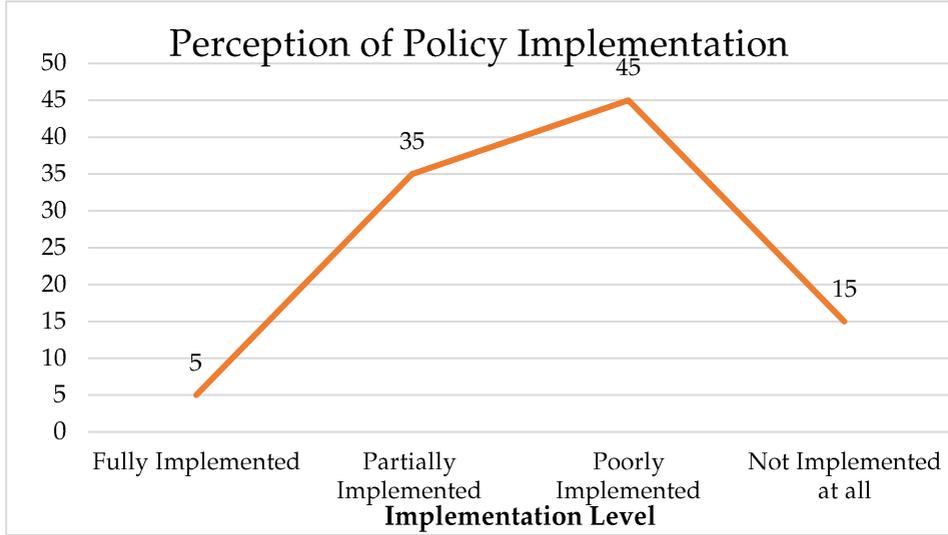


Figure 9

Line Graph for Correlations between Variables



4.2. Interviews and Focused Group Discussion

The interviews and stakeholder inputs provide critical insights into the gaps and opportunities in Pakistan's climate change response. Key results are summarized below:

- a) **Local and Global Determinants of Climate Change:** Pakistan faces a dual challenge of addressing domestic and regional contributors to climate change. Locally, deforestation, fossil fuel reliance, and industrial emissions are primary drivers of GHG emissions. The energy sector, with its growing demand and dependency on non-renewable sources, significantly contributes to the national carbon footprint. Stakeholders highlighted deforestation as a major concern. It not only releases stored carbon into the atmosphere but also prevents further carbon sequestration. Participants also criticized Pakistan's increasing reliance on fossil fuel-based energy, which contradicts its climate goals. Additionally, transboundary emissions from neighboring countries including India, China, and Bangladesh were identified as external contributors to Pakistan's climate challenges. The transboundary impacts highlight the fact that climate challenges in South Asia are closely interlinked, hence making regional cooperation necessary for the success of mitigation strategies.
- b) **Governance and Institutional Gaps:** Weak institutional frameworks and governance inefficiencies were major obstacles to effective climate action



in Pakistan. Climate change is classified as a provincial subject after the 18th Amendment, which suffers from inadequate coordination between the federal and provincial governments. This was evident in the delay in operationalizing the 2017 Climate Change Act because of resistance from the provinces. The financial constraints also make the situation worse by assigning minimal resources to climate action. The MOCC had an alarmingly low budget for development, so it was unable to do anything for issues like methane emissions from unmanaged landfill sites. This is just a manifestation of a larger issue of weak governance that undermines climate policies. The participants also pointed out issues of poor governance, corruption, inertia and inherent bureaucratic inefficiencies in the MOCC.

- c) **Progress in Policy Implementation:** NCCP has led to many successful projects undertaken across the country, including solar panel installations, "Billion Tree Tsunami", and other green energy projects. All these projects have resulted in ecological sustainability through increase in forests, promotion of clean energies, and agricultural water savings. Changes in farming culture, such as adjustments in crop cycles, are helping farmers improve resistance towards floods and droughts and help stabilize vulnerable farm communities. Despite these successes, most of the policies are donor-driven and lack local ownership. In addition, the policies have little actionable outcome. The absence of proper monitoring and evaluation mechanisms further weaken the implantation.
- d) **Climate Finance and Public Awareness:** Lack of International climate finance is a major hindrance to large-scale mitigation and adaptation projects. Limited engagement with mechanisms such as GCF restricts Pakistan's capacity to fund sustainable development. Public awareness and behavioral change are essential for fostering a culture of climate resilience. Stakeholders stressed targeted campaigns to educate communities about climate change impacts, encourage sustainable practices, necessary documentation for obtaining carbon credits and effecting case for climate resilient finances.
- e) **Holistic Approach Needed:** The findings suggest that Pakistan's climate challenges are interlinked with broader governance issues. Fragmented responsibilities, lack of technical expertise, and inter-agency conflicts weaken the overall system. A unified, holistic approach, focusing on improved governance, inter-provincial coordination, and targeted investments in renewable energy and public awareness, is critical to strengthening Pakistan's climate resilience.
- f) **Smog was caused by climate change,** owing to seasonal shifts matching rice crop burning time in Punjab provinces of India and Pakistan across international borders. The experts were of the view that management of

this issue by the Indian government was more tactical, though Indian side implied unethical tactics like maneuvering restrictions on paddy crop burning timings aligned with change in wind direction etc.

5. FINDINGS AND CONCLUSION

5.1. Literature Review Findings

Based on an examination of climate policy documents and literature, many shortcomings in the institutional arrangement, funding, and technological access were deciphered. Chronic issues for Pakistan include weak institutional execution, reliance on foreign assistance, and poor inter-agency coordination.

5.2. Document Analysis Finding

The Paris Agreement's NDCs set up hasty targets for emission reduction and adaptation efforts. However, as the document review reveals, national policies and means for their implementation do not fit in the same framework. Even though the comprehensive framework was provided by the Pakistan Climate Change Act enacted in 2017, barriers in institutions and the absence of provincial participation limit functional implementation.

5.3. Expert Consultations and Interviews

Interview and FGD participants identified four core gaps: weak public engagement, underfunded initiatives, fragmented governance, and the absence of locally-led climate resilience programs. The necessity of building adaptation plans at the level of communities and actively engaging local authorities have also been outlined as key but insufficiently explored areas for further enhancement. Pakistan's increasing reliance on fossil fuel-based energy is debatable, especially when it has great potential for renewable energy viz, abundant sunlight and high solar irradiance levels of 5.5–6.0 kWh/m²/day with a potential to generate 2.9 million megawatts (World Bank, 2020), capacity for wind energy in coastal areas and innate potential of hydel electricity, which is much more than demand. Pakistan's knee jerk reactions, like fossil fuel based IPPs, addition of two coal-based power plants under CPEC, correspond with worsening of energy crisis, resulting, inter alia, in rising electricity costs, which contributed in de-industrialization. The experts criticized policies of various governments in this regard and even pointed towards kickbacks and corruption in mega projects. They specifically observed that delay in construction of dams / hydel resources was unexplainable. The experts, however, stressed the need for proper international diplomacy, observing that Pakistan could provide leadership to global south more effectively by proactive approach. The COP 29 outcomes were found encouraging with \$300 US billion commitment of developed nations to developing nations under New Collective Quantified Goal on Climate Finance (NCQG), but it was felt that Pakistan needed to be precise and proactive to get its due share for climate resilience.



5.3.1. Case Studies Findings

Examples of Bangladesh, India, and Kenya validate integration of climate change adaptation and mitigation and development planning, particularly the nexus between energy and agriculture in the case of Pakistan. These countries could provide valuable lessons in developing renewable energy initiatives and attracting climate funding.

5.3.2. Data Collection Findings

According to data sourced from emissions database systems such as the Emissions Database for Global Atmospheric Research (EDGAR), Pakistan's emissions have been on the rise (199,300 ktCO₂e in 2022 to 200,510 ktCO₂e in 2023) (EDGAR,2023) owing to the energy and agriculture sectors. Pakistan suffers a lot from climate change and is almost completely unable to adapt in the most critical sectors such as water and health, as shown by vulnerability indices such as the Notre Dame Global Adaptation Index.

5.3.3. Fishbone (Ishikawa) Diagram

- a) **Main Problem:** Gaps in the Implementation of International Climate Agreements in Pakistan:
- b) **Policy Framework:** Fragmented policies, weak enforcement of the 2017 Climate Change Act, and poor federal-provincial alignment.
- c) **Governance:** Weak coordination among ministries, limited local government involvement, and political instability.
- d) **Financial Constraints:** Over-reliance on international climate funds, insufficient domestic budgets, and high upfront capital costs of renewable energy.
- e) **Technology and Infrastructure:** Lack of green technologies, outdated fossil fuel infrastructure, and inadequate disaster management systems.
- f) **Public Awareness:** Limited awareness of climate issues like smog and glacier melt; poor private sector and civil society engagement.
- g) **International Cooperation:** Delays in technology transfer and capacity-building, and insufficient global representation.

5.4. PESTEL Analysis

- a) Political: Instability and changes in leadership disrupt climate policy, while

tensions between federal and provincial governments hinder progress. Corruption and mismanagement are also significant issues.

- b) Economic: Limited funding for green technologies, a heavy reliance on fossil fuels, and competing national priorities restrict investment in climate initiatives.
- c) Social: Vulnerable rural communities are at risk of displacement due to climate-related disasters, and there is a low level of public awareness and participation.
- d) Technological: The adoption of renewable energy is slow, there is a dependence on foreign technologies, and monitoring infrastructure is inadequate.
- e) Environmental: There is an increasing frequency of disasters such as floods and droughts, along with ecosystem degradation caused by deforestation and urbanization.
- f) Legal: The enforcement of the 2017 Climate Change Act is ineffective, there are legislative gaps, and federal-provincial frameworks are inconsistent.

This analysis underscores systemic weaknesses in governance, finance, and technology, coupled with external pressures, as key gaps impeding alignment of Pakistan's climate actions with international climate commitments. Further analysis reflects presence of auxiliary gaps in the system, which add up in making the situation worse.

5.5. Auxiliary Gaps

5.5.1. Legislative and Regulatory Gaps

Delays in putting the Climate Change Act 2021 into effect and weak implementation of standards, such as the emission regulations, point to a weakness in governance capacity. For example, Lahore's composting project and Orange Line carbon credits have faced systemic failures.

5.5.2. Industrial Emissions and Fuels

Eco-friendly technologies, such as zig-zag brick kilns, are yet to be adopted and industries are still using fuels that are high in emission, thus causing significant pollution.

5.5.3. Environmental Degradation

Pakistan has only 5% forest cover as compared to India's 25%. Its carbon absorption capacity is very low. Projects like the Billion Tree Tsunami have been unevenly successful and call for more holistic reforestation.

5.5.4. Infrastructure and Monitoring Gaps

Poor air quality monitoring and insufficient infrastructure in dealing with



some urban concerns, including dust pollution and traffic congestion, hinder effective responses to climate hazards.

5.5.5. Global vs. National Target Misalignment

Pakistan's NDCs do not provide clear pathways for implementation in order to achieve emission reductions. Coal fired power projects under CPEC widen the gap further.

5.5.6. Institutional and Data Gaps

Fragmented governance, limited institutional capacity, and inadequate climate data weakens policy implementation and decision-making processes.

5.5.7. Funding and Financial Gaps

Heavy reliance on international funding (GCF), fund disbursement delays and little investment within the country further impairs country's capability in handling climate issues.

5.5.8. Public Awareness and Policy Inconsistencies

Public understanding of climate change impacts is low, while support for national initiatives is reduced and grassroots mobilization is limited.

5.5.9. Sector Sensitivity and Health Risks

Climate-health impacts, such as respiratory and heat-related illnesses, are underrepresented in policy discussions, despite their significance in vulnerable populations.

5.5.10. Foreign Aid for NDC Commitments

Only 25–30% of committed aid has been disbursed so far, while institutional weaknesses have restricted access to key climate funds.

5.5.11. Federal vs. Provincial Roles

Overlapping responsibilities and resource conflicts between federal and provincial governments undermine effective policy implementation, with provinces often lacking technical capacity and sufficient funding.

5.6. Analytical Implications

The analysis has identified several key challenges that are hindering Pakistan's ability to effectively tackle climate change:

- a) **Financial and Economic Constraints:** Pakistan's heavy dependence on international financial aid has not been sufficient to achieve its climate objectives. The current financial systems lack integration, and ineffective coordination among stakeholders has obstructed the country's capacity to implement strong climate policies. Additionally, the absence of domestic funding for climate initiatives limits the effectiveness of both mitigation

and adaptation efforts.

- b) **Legal and Regulatory Gaps:** Although Pakistan has made commitments under international agreements, there are still significant deficiencies in its legal and regulatory frameworks. The slow pace of policy implementation and the inconsistency of programs across various regions have stalled progress.
- c) **Infrastructure Gaps:** The absence of critical infrastructure, especially in areas like air quality monitoring and traffic management, along with a failure to adopt green technologies, has contributed to increasing pollution levels, particularly in urban areas.
- d) **Limited Private Sector Participation:** The private sector has had a minimal impact on addressing climate change, largely due to insufficient incentives and a lack of coherent strategic planning to encourage investment in green technologies. The limited involvement of private enterprises in climate solutions further obstructs advancement.

5.7. Conclusion

Pakistan has been able to improve the climate policy and legislation frameworks; however, institutional gap closure and mobilization of resources for finance are necessary in order to transform these policies into actual, workable policies. The country faces several overlapping challenges in addressing climate change, including fiscal constraints, institutional weaknesses, and infrastructure deficiencies. While Pakistan has made commitments under international agreements, its ability to meet climate targets is severely constrained by poor governance, reliance on external finance and minimal involvement of the private sector in climate solutions. The absence of a clear roadmap to implement NDCs and tap international funds through proper documentation further exacerbates the situation. In short, while Pakistan has made strides in climate legislation and awareness, implementation remains hindered by financial dependency, fragmented institutional arrangements, and lack of long-term planning. Nationally Determined Contributions (NDCs), although ambitious, lack actionable roadmaps and measurable targets for sector-wise reductions. A revised approach, grounded in existing climate frameworks like the Climate Change Act (2017) and the NCCP (2021), is essential for bridging the gap between international commitments and domestic realities.

6. Way Forward

6.1. Policy and Legal Reforms (Short-Term: 1–2 Years)

- a) Amend the Climate Change Act (2017) to incorporate a compliance monitoring mechanism at the provincial level.



- b) Update NDC implementation plans with detailed sectoral action points and annual review benchmarks.
- c) Launch a National Climate Compliance Unit within MOCC to track federal-provincial alignment and penalize non-compliance.

6.2. Technology and Infrastructure (Short to medium-Term: 1–5 Years)

- a) Scale up renewable energy transition by introducing feed-in tariffs and financing incentives for rooftop solar projects under the Renewable Energy Policy 2019. Shifting to E-model as explained below (4.6) would be crucial.
- b) Strengthen Pakistan's Air Quality Monitoring Network by partnering with academic institutions and city governments.
- c) Accelerate the shift to electric vehicles (EVs) by subsidizing charging infrastructure in urban zones (aligned with EV Policy 2020).
- d) Promote the widespread use of zigzag kiln technology in brick kilns throughout the country. This technology improves fuel efficiency, reduces emissions, and minimizes air pollution, contributing significantly to environmental protection.
- e) Create green belts and buffer zones in key regions, particularly urban areas, to mitigate air pollution. These zones can absorb pollutants, improve air quality, and enhance public health. Roadsides in urban areas may either be developed as green areas or paved roads to reduce dust.

6.3. Capacity and Awareness (Short–Medium Term: 2–4 Years)

- a) Train 1,000 federal and provincial officials in climate-smart budgeting and green procurement practices annually.
- b) Integrate climate education modules into high school and undergraduate curricula, with support from the Ministry of Education and MOCC.
- c) Launch a “Climate Resilience Champions” campaign to build local community engagement.

6.4. Finance and Governance (Long-Term: 5–10 Years)

- a) Operationalize the Loss and Damage Fund with at least 20 climate-resilient infrastructure projects in vulnerable districts by 2030.
- b) Institutionalize climate budgeting within the Ministry of Finance by earmarking 2% of GDP for adaptation and mitigation.
- c) Leverage Article 9A of the Constitution and public-private partnerships (PPPs) to mobilize investment in sustainable infrastructure.

6.5. Regional Cooperation (Permanent):

Strengthen regional cooperation with neighboring countries, particularly in managing the Indus River. Establish a partnership for water security and climate action that focuses on shared resources and collaborative climate adaptation strategies. Regional cooperation for technology transfer and capacity building for developing countries, particularly the V20 and CVF is recommended.

6.6. International Advocacy (Permanent):

- a) Use Pakistan's vulnerability to climate change as a platform for international advocacy. Encourage global commitment to climate security, especially in sectors like agriculture and infrastructure, by highlighting the urgent need for international support and policy coordination.
- b) Access to Affordable Climate Technology: Engage in diplomatic efforts to secure access to affordable climate technologies through international partnerships. Pakistan should leverage its position to gain access to financial resources and technological advancements, particularly in clean energy and climate adaptation.

6.7. Shift to E Model (Short to medium-Term: 1–5 Years):

- a) Electric-based systems, powered by solar energy, should replace traditional gas-based appliances to reduce fossil fuel reliance. Gradual phasing out of natural gas in domestic use can ensure a cleaner energy transition (IEA, 2024). To achieve this end, the government may gradually discontinue natural gas supply to domestic consumers, initially of posh areas, and alongside it needs to promote
 - clean cooking- use of electric appliances, (for example induction stove)
 - use of electric home appliances including geysers
- b) Promote formulation of integrated plan for new energy vehicles and their indigenization. EVs powered by rooftop solar systems can reduce carbon emissions and dependency on fossil fuels. (World Bank, 2020).
 - Convert to E Model (E Cars, E bikes, E stoves, E geysers)
 - **Facilitate the Transition to Electric Vehicles (EVs):** Promote private sector investment in EV infrastructure, such as charging stations, to encourage the widespread use of clean transportation options.
 - The Federal Government may consider application of some levy on old fuel-based vehicles to generate domestic funds, which can be utilized to promote E-vehicles.
 - Convert Public Transport to Electric Vehicles.



This will not only help in achievement of renewable energy goals under the Paris agreement, but also aid in resolving national energy crisis marred by increased production vis-à-vis demand of electricity.

6.8. Engaging the Private Sector in Climate Actions

- a) **Learning from Success Stories:** Kenya's renewable energy initiative engaged private investors in wind and solar projects, achieving 80% energy from renewables by 2020 (Sharma et al., 2024). Encouraging private sector participation through incentives and strategic planning that align with national and international climate goals would go a long way to improve national climate actions.
- a) **Improved Coordination and Policy Implementation:** Strengthening intergovernmental coordination and ensuring the effective execution of climate policies at both the federal and provincial levels.
- b) **New Financial Mechanisms:** Developing innovative financial systems to boost domestic investment in climate change mitigation and adaptation.

6.9. Final Recommendation Alignment

All proposed actions are aligned with existing national policies, including:

- a) The National Climate Change Policy (2021)
- b) Pakistan's Updated NDCs (2021)
- c) Pakistan's 10 billion Tree Tsunami Project
- d) The National Adaptation Plan (NAP, 2022)

These recommendations aim to create realistic, phased pathways for meeting climate goals while addressing ground-level challenges in governance, financing, and implementation.

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