Critical Study of Al-Nino Effect, Monsson Phenomenon and Environmental Damages in The Context of Climate Change in Pakistan

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Abstract:

Pakistan, ranked as the eighth most vulnerable country to climate change, faces significant ecological and meteorological challenges despite contributing minimally to global greenhouse gas emissions. The nation experiences extreme weather patterns, including severe flooding, erratic rainfall, and high summer temperatures, impacting its agricultural sector, which constitutes 21% of the GDP. Climate change-related disasters, like the 2022 floods, have resulted in immense economic losses, pushing millions below the poverty line. Pakistan's climate response includes a National Climate Change Policy (NCCP 2012), yet its implementation remains inadequate, especially concerning mitigation and adaptation strategies. Despite opportunities from international climate financing mechanisms like the Paris Accord and the $100 billion Green Climate Fund, Pakistan struggles to leverage these resources effectively due to institutional and policy gaps. This study explores Pakistan's climate change policies, institutional frameworks post-18th Constitutional Amendment, and disaster management strategies, emphasizing the need for robust action to integrate climate change into national development and financial planning.

Key words:

Climate Change, Pakistan, Greenhouse Gas Emissions, Climate Finance, Agricultural Impact

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Introduction

Pakistan's vulnerability to climate change impacts is well documented and acknowledged. The Intergovernmental Panel on Climate Change Synthesis Report of 2014 pointed to an increase in global temperatures of 4°C, contrary to initial estimates of about 3.5°C until 2100, entailing serious consequences for the survival of both humans and other species. Pakistan is the eighth most vulnerable country to climate change, and its contribution to Greenhouse Gases (GHG) accounts for 0.5-0.8 percent, according to various reports such as the Intergovernmental Panel for Climate Change (IPCC) Report 2004-05. Despite low carbon emissions, Pakistan's ecological and meteorological diversity directly exposes it to climate-driven threats in the form of floods, erratic rainfall, and extreme temperatures rising to 50°C in summer. The total loss in terms of GDP was seven percent, which is slightly less than the country's total tax revenues between 1998-2012. Similarly, the flood in 2022 caused a loss of almost $30 billion, requiring about $16 billion for rehabilitation and resettlement. According to a World Bank report, in the wake of the post-flood scenario, around 9 million people have fallen below the poverty line (Bank, 2022). In Pakistan, agriculture contributes almost 21% to the state GDP, employs half of the country's labor force, and relies on river waters for 80% of irrigated land. More than half of the rural population depends on agriculture for their livelihood and survival. Agriculture-dependent countries like Pakistan are the most affected by climate change. Climate change poses a serious threat to sustainable economic growth, for which Pakistan requires long-term commitment and strategies for integrating climate change into mainstream policy frameworks. Given Pakistan's economic vulnerabilities and financial constraints, climate financing is a risky business and requires financial resources to implement mitigation and adaptation measures to control environmental degradation without affecting economic growth. The Paris Accord of 2015 presents a unique opportunity for Pakistan to tap into much-needed climate-related financing from the $100 billion commitment made by the developed world to developing countries, which is conditioned upon submitting quantifiable and measurable actions in the form of INDCs every five years to qualify for international grants. Pakistan's performance on this account has been patchy and lukewarm, given the policy and institutional challenges that evolved for climate change at both federal and provincial levels after the 18th Amendment of 2010, which shifted the balance of power towards provinces in the domain of climate change (Change, 2004).

Statement of the Problem

Pakistan's contribution to global carbon emissions is arguably low compared to other developing countries in the region; however, its ecological diversity makes it the 8th most vulnerable state to face the vagaries of climate change with serious socio-economic implications.

Pakistan has developed an elaborate climate change regime and was among the first few states to enact the National Climate Change Policy (NCCP 2012) with a full-fledged Ministry of Climate Change in 2013. However, its performance is far from satisfactory in the context of mitigation and adaptation measures. Therefore, it is crucial to understand that despite the global opportunities and initiatives available in the form of the $100 billion "Green Climate Fund," Pakistan has not been able to capitalize on such avenues. This necessitates a deeper understanding of the climate change discourse from normative, operational, and structural levels.

Scope and Significance of the Study

This paper aims to highlight the policy and institutional framework at both the federal and provincial levels related to climate change in the context of the 18th Constitutional Amendment of 2010 and its impact on environmental issues between the federation and provincial units. Moreover, it will also reflect on the existing operational apparatus related to climate-induced disaster management, such as floods, at both the federal and provincial levels. In addition, it will examine the prospects of various initiatives by the Khyber Pakhtunkhwa Government in the context of climate change mitigation and adaptation measures.

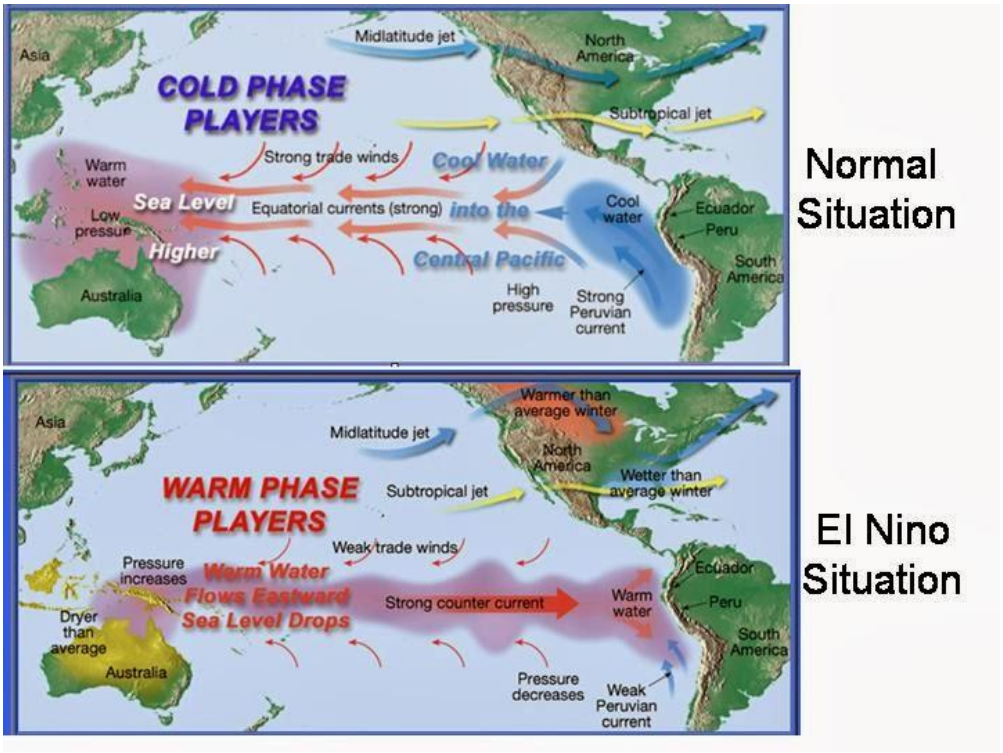
Methodology

The study employs both quantitative and qualitative methods. Secondary data has been obtained from published reports of the UNDP, ADB, Government of Khyber Pakhtunkhwa, research papers, and internet sources. Furthermore, quantitative data has been obtained using purposive sampling through structured questionnaires to elicit public perceptions about climate change.

El-Nino & La Nina

The terms El Niño and La Niña refer to Pacific Ocean weather phenomena that oscillate temperatures back and forth from warm to cooler and vice versa. El Niño refers to the warming of the central and eastern tropical Pacific, whereas La Niña is the reverse phenomenon, where the trade winds pick up speed and warm water in the eastern Pacific moves towards the western side of the Pacific. El Niño and La Niña events last nine to twelve months, but at times can extend for years. However, on average, El Niño and La Niña events occur every two to seven years. The combined effect of both El Niño and La Niña generates weather changes all across the globe, also known as ENSO (http://www.vagaries.in/2014/02/el-nino-la-nina.html, n.d.).

Figure-1
El Nino Situation



ENSO in Pakistan

Monsoon enters Pakistan from two different sides. The first is the southeastern wind that travels from the Bay of Bengal, entering Pakistan through India along the foothills of the Himalayas, resulting in the northeastern parts of the country receiving the monsoon. The second pathway is through the Arabian Sea, where moist, rain-carrying south-western winds enter Pakistan. The southeastern region of Pakistan receives rainfall from these wind currents.

Pakistan's precipitation and temperature changes are very complex. It experiences some unique and diversified climatic patterns throughout the year. In the extreme north, the minimum temperature can drop as low as -25°C, while in the southern sandy desert areas, summer temperatures can rise as high as 55°C. Seasonal forecasts suggest that Pakistan is expected to experience an extended winter season, with most parts of the country facing low temperatures until spring. Due to the low intensity of cyclogenesis over the Bay of Bengal during ENSO, the monsoon system is weak, dissipating before reaching Pakistan, resulting in the country receiving less-than-normal monsoon rainfall during the year. On the other hand, La Niña causes higher-than-normal rainfall due to stronger cyclogenesis activity in the Bay of Bengal as sea surface temperatures rise.

In 1998, Pakistan recorded heavy snowfall in mountainous areas and rainfall in Punjab, followed by four years of drought in the lower parts of the country. Another minor El Niño event occurred in 2009, which resulted in droughts followed by the devastating flood in the country during 2010 (Zuhaib Anwar).

Situational Analysis of Climate Change on Various Sectors

The following is the situational analysis of the effects of climate change on various thematic groups, as well as strategies for translating the National Climate Change Policy (NCCP) into Provincial Climate Change Policy (PCCP). The proposed actions are based on the Climate Change Policy, the competency of relevant government institutions, and the resources available for their implementation (Environmental Protection Agency, 2022).

Water Sector

Water is one of the most crucial sectors affected by climate change. The Indus Basin is among the largest irrigation systems in the world and is largely dependent on precipitation, glaciers, and snowmelt. Groundwater contributes around 48% of the surface water available at the canal head of the irrigation system. In Pakistan, current water utilization is as follows: agriculture - 92%, industry - 3%, and domestic & infrastructure - 5%. In the future, water demand will increase due to socioeconomic development and population growth. River flows are heavily dependent on seasonal and annual variability, where the highest flows are almost double the lowest flows, and total flows during the kharif season are five times greater than rabi season flows.

Analyses of river flows show a decreasing trend in annual water flow. The annual variability of river flows is more pronounced in the downstream Kotri Barrage, where in a normal year, the annual flow decreases from 77.3 MAF to 39.2 MAF. This decline in flow has serious implications for the Indus Delta regions, such as Hyderabad, Thatta, and Badin, where seawater intrudes into agricultural lands, destroying both the agricultural system and the groundwater drinking quality (Bank A. D., 2015).

Water Distribution

River	% of Indus Flow		Summer	Winter	Summer Source	Winter Source
Indus	44		86	14	Snow, glacial melt & monsoon	Rainfall
Chenab	19		83	17	Snow, glacial melt & monsoon	Rainfall
Jehlum	16		78	22	Mainly snow melt & monsoon	Rainfall
Kabul	16		82	18	Snow or glacial melt	Rainfall
Others	5		-	-	-	-

Water stress has a disproportionate impact on food security and agriculture in Khyber Pakhtunkhwa (KP). The province of KP contains around 7.67 percent of Pakistan's total cultivable area, and more than half of this land depends on rain-fed agriculture. As a result, a decline in water supplies could have a severe spillover effect, not just in KP but also in adjacent provinces.

Agriculture Sector

Agriculture is a vital sector of economic growth and contributes almost 21% to the country's GDP. The majority of the population is directly or indirectly dependent on this sector. It contributes about 24 percent of GDP and accounts for half of the employed labor force, being the largest source of foreign exchange earnings. Crops are categorized into two seasons: Rabi and Kharif. Wheat is the major Rabi crop, and cotton is the major Kharif crop. Crops are highly sensitive to the amount of water available and temperature variability. It is estimated that with a rise in temperature (+0.5°C–2°C), agricultural productivity will decrease by around 8%–10% by 2040 (Bank A. D., 2015).

Length of Growing Season (Days)

Region	**Northern Pakistan**	**Southern Pakistan**
	Mountainous (Humid)	Plains (Semiarid)
Baseline	246	161
Temperature Increase 1	232	155
Temperature Increase 2	221	149
Temperature Increase 3	211	144
Temperature Increase 4	202	138
Temperature Increase 5	194	133

The agriculture sector in KP is plagued by various issues. The strain on natural resources is increasing due to urbanization, the scarcity of uncultivated land, and the ineffectiveness of the existing irrigation system. Approximately 20% of cultivable land is uncultivated, and a large portion of this uncultivated land is prone to land degradation (waterlogging and salinity), urbanization, and inefficient water usage. The use of fertilizers and pesticides should not be excessive in order to increase agricultural productivity.

Livestock

In Pakistan, the livestock sector contributes 56.3% of agricultural sector output and 11.8% to the national GDP, supporting more than 8 million rural families directly involved in raising livestock.

The emissions from this sector make up a large part of the total emissions from the agricultural sector of Pakistan. A general assumption is that due to increases in temperature, droughts, and floods, meadows and cropping lands will decrease, ultimately reducing land productivity and decreasing the quality and quantity of fodder. However, very little evidence is available in the literature on how climate change affects the world's dairy and livestock systems.

Rangelands and livestock in KP complement each other and play an important role in the rural economy. The provision of veterinary services is a challenge, hampered by a lack of staff, equipment, drugs, and farmer awareness, as well as the seasonal relocation of animals to inaccessible locations (Environmental Protection Agency, 2022).

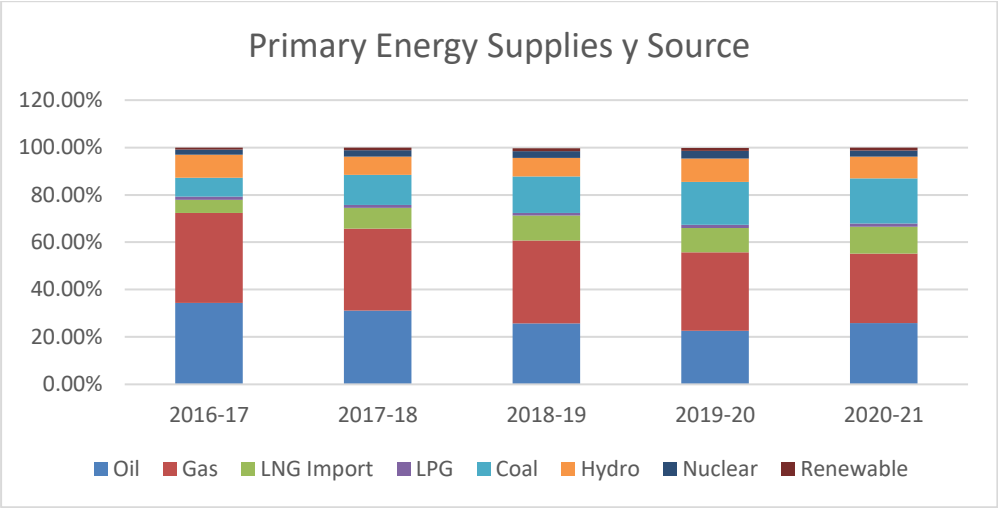
The majority of fish are found in rivers, natural ponds, and lakes. Climate change causes variations in the flow of water in rivers and other bodies of water, which directly impacts the fisheries sector.

Energy

The energy sector is a major contributor to climate change through its high GHG emissions in Pakistan and is also sensitive to its impacts. It is predicted that economic growth and changing consumption patterns, including rising demand for air conditioning in the summer months, will likely increase energy demand and consequently GHG emissions. With climate change in the future, the energy sector will largely be affected by extreme weather events such as flooding, storm surges, and drought, which will affect energy sources and the supply and distribution infrastructure. Pakistan's water resources are at severe risk due to climate change. Currently, hydropower resources supply about 30% of the country's electricity.

The most likely impact of global warming is the recession of Himalayan glaciers, which are the largest source of freshwater supply in the country. Uncertain water resources will reduce the reliability of the hydroelectric supply, which is a key provider of the country's power sector, leading to reduced reliability of the whole electricity generation system. Variations in water supply will be further aggravated by increased sedimentation of major reservoirs.

The primary sources of energy in the country are gas (29.3%), oil (25.9%), hydropower (9.2%), coal (19%), and nuclear energy (2.6%) as of 2020-21 (Figure-I). Pakistan is the largest consumer of gas in the region and has the sixth-largest coal reserves in the world. However, energy dependency on gas and oil is high compared to coal (Pakistan, 2021).


Primary Energy Supplies y Source
120.00%
100.00%
80.00%
60.00%
40.00%
20.00%
0.00%
2016-17
2017-18
2018-19
2019-20
2020-21
Oil
Gas
LNG Import
LPG
Coal
Hydro
Nuclear
Renewable

Urban Infrastructure Services

The impact of climate change on urban infrastructure is considered to be due to changes in parameters related to weather or climate, either in magnitude or duration, as a result of climate change. These include changes in temperature (either maximum or minimum), precipitation causing heavy floods, frequency and intensity of storms, and sea level rise. In Pakistan, past experiences show that infrastructure located in areas exposed to such events or near climate-sensitive features such as rivers, coastal areas, storm tracks, or arid areas is at risk from extreme weather events. Normally, urban infrastructure services are interdependent, and the failure of services in one infrastructure often results in disruptions to other connected urban services. Climate change may increase the frequency of such disruptions in the coming decades (Environmental Protection Agency, 2022).

Forestry

Forests are an important natural resource, specifically in the context of rural livelihoods. They provide timber, fuelwood, food, habitat for wildlife, and various important ecosystem services, such as mitigating carbon dioxide. The forest area in Pakistan is 4.19 million hectares, representing 5% of the total land area. The Indus Delta alone supports 97% of the total mangrove forests. It is predicted that most of the anticipated impacts of climate change, such as changes in temperature and precipitation, and the increasing frequency and intensity of extreme events, will affect the forest severely, threatening biodiversity status and soil quality.

Climate change has an impact on forests both directly and indirectly. Climate change affects not just forest production and growth, but it is also associated with an increase in the number of forest disturbances. Carbon dioxide levels in the atmosphere, precipitation, and temperature are all important factors influencing forest productivity. Storms, droughts, and decreased tree health are some of the forest disturbances that influence forest productivity and tree species distribution.

Transport

The transport industry is responsible for the country's economic development because it accounts for 10% of the total national GDP and 11% of economic activity in KP. The transportation sector, in addition to contributing to the economy, is a major generator of GHG emissions. There is an urgent need for the Government of KP to investigate

alternative modes of transportation and ways to improve the existing transportation sector, such as the Peshawar BRT project and the introduction of electric vehicles.

Global Dimension of Climate Change Discourse

The year 2015 was marked by two landslide global initiatives on climate change, which culminated in the Paris Agreement, signed by 196 states, as well as the signing of the Sustainable Development Goals for 2030. The agreement came after the shocking increase in global temperature, making 2015 the warmest year recorded in human history since the dawn of the industrial revolution, touching the 1°C milestone with serious implications for developing countries, including Pakistan. In the Paris Accord, the developed world promised to allocate $100 billion to the Green Climate Fund for developing countries to reduce greenhouse gas emissions by 60% by 2050 through mitigation and adaptation measures, reflected in their INDCs. An INDC is a document that sets out a country's non-binding intentions to reduce greenhouse gas (GHG) emissions and the steps or financing needed to take such mitigation or adaptation measures (UNDP, 2015).

The Development of Pakistan's INDC

COP21

The Paris Accord of 2015 came as a great diplomatic success for global action to save the world from the catastrophic effects of climate change by limiting global warming to 1.5%. However, there has been a disconnect between the Paris Agreement and Pakistan's first Intended Nationally Determined Contributions (INDC) at COP21 in 2015. It came as a shocking surprise when Pakistan submitted a much-delayed, only one-page long, 350-word "Zero Draft" prepared by the Ministry of Climate Change (MoCC) and a confidential draft by technical experts. However, both drafts were utter disappointments and failed to make any quantitative or qualitative commitments to mitigate and/or adapt to climate change. Secondly, there was no multi-sectoral and stakeholder consensus, except for a few officials from the MoCC and technical experts funded by international donors (UNDP, 2015). In contrast, Vietnam and Kenya submitted their INDCs after attaining a broad-based multi-sectoral and stakeholder consensus across the national and subnational levels. Thirdly, Zimbabwe and Afghanistan were able to submit quantitative mitigation measures, even if they were conditional. Fourthly, Pakistan failed to spell out its investment requirements for mitigation and adaptation, and its assumptions were

based on other countries' forecasting of macro-level investments, such as in LSM and transport, even though it could have been done easily by the Finance Division if it had coordinated with the MoCC, thus squandering a fair chance to plead its case for tapping this crucial investment to fight climate threats.

The government has cited two reasons for this failure: first, that any intention for mitigation might not be legally binding, and second, that data reliability of mitigation measures is another issue. However, both arguments are logically wanting. If they had submitted the zero draft as the final draft after fine-tuning it on the pattern of other states like Sri Lanka, Bangladesh, and Afghanistan—states that also faced similar issues—they could have submitted coherent stances, citing their own reasons for failure due to data issues and domestic priorities that would determine their climate change commitments. The unfortunate reality is that the world does not wait for laggards: you snooze, you lose. And Pakistan had done just that (Bank A. D., 2015).

COMPARISON OF INDC								
GDP/capital ($)	Country	Base Level	Reduction Target	Target Year	Sectors	Sector-wise measures	Vulnerab-ility	International financing needs
1,596	India	2005	33% - 35% (contingent on Article 3.1 & 4.7)	2030	Not Specified	Specified without GHG or USD amounts	Detailed mention, justifies development	International finance needs to be finalized later, preliminary estimates equal $2.5 trillion
1,443	Ghana	2010	15% (BAU) (unconditional), additional 30% (conditional on international support)	2025-2030	Energy, industrial processes and product use, agriculture, waste	Specified with USD amounts but without GHG	Passing reference	$16 billion
1,358	Kenya	N/A	30% (BAU)	2030	Same as above	Specified without GHG or USD amounts	Passing reference	$40 billion for mitigation and adaptation across sectors
1,334	Pakistan - Submitted draft	None	None	None	Potentially all sectors	Not specified	None mentioned	None mentioned
1,334	Pakistan - Zero draft	N/A	37% on energy supply, 22% energy demand, 8% transportation, 5.5% agri and forestry (BAU)	2030	Energy demand/supply, agriculture and forestry, transport	Specified without GHG or USD amounts	Detailed mention	None mentioned. No explicit mention of conditionality but implicitly based on Article 4.1
1,334	Pakistan - Confidential draft	2012	Option 1: 10% (5% unconditional, 5% conditional) Option 2: 18% (5% unconditional, 13% conditional) Option 3: 18% (conditional)	2030	Energy (including transportation) and agriculture	Specified without GHG or USD amounts	Detailed mention	USD amount not mentioned but conditional reductions are subject to external financial support, technology transfer and capacity building

After having lost this opportunity in COP21, Pakistan sought assistance from multilateral institutions for Climate Public Expenditures and Institutional Review (CPEIR), and the first such review was conducted by the KP government in collaboration with UNDP. They formulated the Climate Change Financial Framework (CCFF) in 2018 with the sole purpose of revamping the State's Public Financial Management while mainstreaming climate change in budgetary allocations, both at the federal and provincial levels across various departments. This was done to reflect mitigation and adaptation measures in quantifiable numbers, which would determine the provision of international grants. After much delay, Pakistan was finally able to submit its INDCs for COP27 in 2021.

Analysis of COP27 (Egypt)

As per the INDCs submitted to COP21, Pakistan made a voluntary commitment to reduce 50% of carbon emissions by 2030. This means delinking economic growth from hydrocarbon-dependent industries and

sectors to renewable sources of energy. For this, Pakistan requires almost $15 billion for mitigation and $11 billion for adaptation every year, excluding GHG mitigation from the agriculture sector (Tribune, 2021).

Given Pakistan's economic indicators, raising such revenues annually is impractical for two obvious reasons:

1. Binding agreements with IPPs without renegotiation force Pakistan to pay despite surplus power, leading to the issue of circular debt.
2. The second phase of CPEC focuses on investment in agriculture and industrialization through specialized economic zones.

The Paris Accord 2015 was a unique opportunity for climate financing in Pakistan; however, given the lukewarm and patchy understanding of the climate change discourse in the context of COP21 and COP27 at the national level, it compels us to understand the climate change institutional framework in Pakistan, particularly in the context of the 18th Amendment of 2010, which fundamentally altered the power relationship between the federation and provinces after the devolution of 47 subjects, especially environment and ecology in the context of climate change and entering into Multilateral Environmental Agreements (MEAs).

Climate Governance after the 18th Amendment in Pakistan

Pakistan is a signatory to a number of MEAs, including the Rio Declaration, UNFCCC, Kyoto Protocol, and the Paris Agreement. It has passed a National Climate Change Policy in 2012 and enacted the Pakistan Climate Change Act in 2017. Provincial governments are considered key actors in national adaptation and mitigation measures, and the lack of coordination between the Federation and the Provinces seriously challenges these measures. A brief constitutional history will help us understand the evolution of environmental law and the impact of the 18th Amendment of 2010 on the climate change regime between the federation and provinces (Bank A. D., 2015).

Brief Constitutional History - Pakistan

The first Constitution, promulgated in 1956, proposed a federal form of government and the distribution of powers and functions between the federal and provincial governments into three lists: Federal, Concurrent, and Provincial. Article 108 provides that the Federal Government can exercise full powers on any matter related to MEAs, whether or not provided in the Federal or Concurrent list. However, the 1973 Constitution, as it was before the 18th Amendment, abolished the provincial list and retained the federal and concurrent lists, where the federation could legislate on subjects enumerated in both lists, and provincial governments were vested with residuary powers to legislate on matters pertaining to the concurrent list and any matter not mentioned in both lists. Moreover, the 1973 Constitution, unlike Article 108 of the 1956 Constitution, did not give the Federal

Government specific powers to implement provisions of MEAs in the provincial domain, except as provided in the Rules of Business of 1973, where the federation could legislate on MEAs only with the approval of the Prime Minister (WWF - ILO, 2018).

The 18th Amendment devolved considerable powers to the provinces by abolishing the Concurrent Legislative List. Under the present Constitution, Parliament can make laws only on subjects enumerated in the Federal Legislative List, or with extra-territorial jurisdiction, or if requested to do so by a resolution passed by any Provincial Assembly. Neither environmental pollution, ecology, nor climate change is enumerated in the Federal Legislative List. However, they remain subject to a number of MEAs. Entries 3 and 32 of the Federal Legislative List allow Parliament to make laws regarding the implementation of treaties and agreements with other countries and "international treaties, conventions, and agreements." But the 18th Amendment leaves unclear how far the Federation's power to implement an MEA allows it to enact legislation where the subject matter of the MEA is in the provincial domain—that is, where the subject matter of the MEA is not enumerated in the Federal Legislative List. This lack of clarity can be illustrated in the way provinces have exercised their newly expanded powers of legislation concerning devolved subjects like environmental pollution and ecology. Each province has passed its own environmental protection laws and conferred powers to implement the specified MEAs in their respective domains. The resulting situation is that the Federal Government and three of the four provincial governments have the power to implement the same MEAs. In 2014, the Government of Punjab made the Punjab Biosafety Rules, 2014, leading to parallel regimes for regulating GMOs, such as the Biosafety Committee at the federal level (UNDP, 2015).

Review of the Present Climate Governance Framework

The 18th Amendment of 2010 led to the abolition of the Ministry of Environment in 2011 and the devolution or reallocation of its responsibilities to the provinces or various federal institutions. It is notable that the National Climate Change Policy was passed at the time of the 18th Amendment when many of the Federation's responsibilities for climate governance were being devolved to the provinces. Post-18th Amendment, the Climate Change Division was established in 2011, and then it was elevated to a full-fledged Ministry of Climate Change in 2013. However, it was again downgraded to a division in 2014, which was elevated to a ministry again in 2015. It enacted its first Climate Change Act in 2017. The current responsibilities and mandate of the Ministry of Climate Change, as assigned by the Rules of Business, are given below:

1. Pakistan Environmental Protection Council;
2. Pakistan Environmental Protection Agency;
3. Pakistan Environmental Planning and Architectural Consultants Limited (PEPAC);

4. Global Environmental Impact Study Centre, Islamabad;
5. National policy, plans, strategies, and programs regarding disaster management, environmental protection, preservation, pollution, ecology, forestry, wildlife, biodiversity, climate change, and desertification;
6. Coordination, monitoring, and implementation of environmental agreements with other countries, international agencies, and forums;
7. Policy formulation, coordination, and reporting of human settlements, including urban water supply, sewerage, and drainage.

It can be observed that the Ministry of Climate Change's responsibility with respect to climate change is limited to national policies and disaster management, while crucial operational arms of national disaster, such as NDMA, operate independently and provide no policy coordination with provinces. This is particularly glaring as many of the legislative subjects within the domain of climate change have been devolved to the provinces in light of the 18th Amendment. In 2013, it is interesting to note that while Pakistan was ratifying the Paris Accord in 2016, there was no Climate Change Act, which was only enacted in 2017 (Alam, 2019).

Pakistan Climate Change Act, 2017

The Act envisages a Pakistan Climate Change Council for coordination between the federation and provinces and the Pakistan Climate Change Authority, which has yet to be established or notified, with no rules of business. This has created a coordination vacuum between the federation and provinces on developing a unified approach to climate change, thus inhibiting mitigation and adaptation measures where the main focus is on immediate disaster management, relief, and rehabilitation, rather than addressing the long-term challenges posed by climate change.

Interestingly, the provisions of this Act are deemed to override "anything inconsistent in any other law for the time being in force" and also empower the Federal Government to make rules for implementing the provisions of MEAs related to climate change specified in its Schedule. This Schedule mentions the UNFCCC, Kyoto Protocol, Paris Agreement, and "any other agreement relating to climate change to which Pakistan is a party." However, to date, no rules to implement any of the listed MEAs have been notified (Pakistan G. o., 2017).

Sub-National Climate Governance

As in the case of the Federal Government, provincial Rules of Business allocate the business of government at the sub-national, provincial level. The abolition of the Concurrent Legislative List pursuant to the 18th Amendment expanded the legislative responsibilities of provincial governments to include, among other things, environmental pollution and ecology. Since the subject of "climate change" is not mentioned in the Federal Legislative List, provinces have executive and legislative competence to take action on these subjects, make policies, and enact legislation. All the provinces have enacted

their own provincial environmental legislation after the 18th Amendment (Alam, 2019).

GAPS in Constitutional Provisions

As can be seen, these Rules of Business do not explicitly allocate any responsibility over climate change to the Environment Protection Department. However, responsibility over the administration of the Punjab Environmental Protection Act, 1997, does include the power to propose rules for the implementation of the MEAs listed in the Schedule to the Act, which includes the Kyoto Protocol as one of the MEAs that the Government of Punjab can frame rules to implement.

It is also pointed out that a number of energy, food, water, and biodiversity issues are mentioned in the responsibilities of various departments, illustrating the point that climate change is perhaps not a discrete subject to be confined to one department, but an issue that must be embedded in and responded to by all departments at the sub-national level.

In *Asghar Leghari vs. Federation of Pakistan*, the Lahore High Court recognized "climate change [as] a defining challenge of our time," which was a "clarion call for the protection of the fundamental rights of the citizens of Pakistan." In doing so, the Court also recognized that "existing environmental jurisprudence has to be fashioned to meet the needs of something more urgent and overpowering, i.e., climate change." The Court constituted a Climate Change Commission with the objective of effectively implementing the National Climate Change Policy, 2012, and the Framework for Implementation of the Climate Change Policy. It is pointed out that the mandate of the Commission was in relation to the Province of Punjab, and the Commission was able to force the Punjab Government to draft the Climate Change Act in 2017. Additionally, it oversaw ADP projects, where out of 734 initiatives, progress was shown in 144 priority areas due to Judicial Activism (*Asghar Leghari vs. Federation of Pakistan*, 2015).

CURRENT STATUS	GAPS
Article 143 of the Constitution gives the Federal Government the authority to act as the focal point for fulfilling international obligations on global environmental protocols and agreements.	In the absence of proper coordination and oversight, it is unlikely that these policies and acts will be successfully implemented due to the devolution of environment and ecology to the provinces after the 18th Amendment in 2010.
Entries 3 and 32 of the Federal Legislative List allow Parliament to make laws regarding the implementation of treaties and agreements with other countries and "international treaties, conventions, and agreements."	But the 18th Amendment leaves unclear just how far the Federation's power to implement an MEA allows it to enact legislation when the subject matter of the MEA has not been enumerated in the Federal Legislative List.

Except Sindh, the provinces have conferred onto their respective provincial governments the power to implement the specified MEAs. The resulting position is that the Federal Government and three of the four provincial governments have the power to implement the same MEAs.	In 2014, the Government of Punjab made the Punjab Biosafety Rules, 2014, resulting in parallel regimes for the regulation of genetically modified organisms (GMOs) in Pakistan.
In Sui Southern Gas Company Limited vs. Federation of Pakistan, the Supreme Court of Pakistan ruled in favor of upholding the legislative powers of the Federal Government to the extent of MEAs while interpreting entries No. 3 and 32 of the Federal Legislative List.	In Asghar Leghari vs. Federation of Pakistan, the Lahore High Court recognized "climate change [as] a defining challenge of our time," which was a "clarion call for the protection of fundamental rights of the citizens of Pakistan."
The 18th Amendment of 2010 resulted in the abolition of the Ministry of Environment in 2011 and the devolution or reallocation of its responsibilities, as set out in the Federal Government Rules of Business, to the provinces or various federal institutions.	It is notable that the National Climate Change Policy was passed at the time of the 18th Amendment when many of the Federation's responsibilities for climate governance were being devolved to the provinces.
The provisions of the Pakistan Climate Change Act, 2017 are deemed to override "anything inconsistent in any other law for the time being in force" and also empower the Federal Government to make rules for implementing the provisions of MEAs relating to climate change specified in its Schedule. This Schedule mentions the UNFCCC, Kyoto Protocol, Paris Agreement, and "any other agreement relating to climate change to which Pakistan is a party."	However, to date, no rules to implement any of the listed MEAs have been notified.
Article 270AA(6) of the Constitution states that notwithstanding the omission of the Concurrent List by the 18th Amendment, all laws with respect to any of the matters enumerated in the said List and in force immediately before the commencement of the 18th	The Supreme Court of Pakistan named Shehla Zia against WAPDA. The decision by the Court pointed out that the right to life of a citizen is to provide citizens with a healthy environment free from pollution. This case was a foundational stone

Amendment shall continue to remain in force until altered, repealed, or amended by the competent authority.	for environmental jurisprudence in the country (Shehla Zia vs WAPDA, 1994).

GAPS at Inter-Provincial Level

Punjab	KP	Sindh	Balochistan
The Punjab Government Rules of Business were updated in 2011 at the time of the 18th Amendment and have remained unchanged and unamended. However, responsibility over the administration of the Punjab Environmental Protection Act, 1997, does include the power to propose rules for the implementation of the MEAs such as the Kyoto Protocol.	The Khyber Pakhtunkhwa Assembly passed the Khyber Pakhtunkhwa Environmental Protection Act in 2014. Under this Act, the Government of Khyber Pakhtunkhwa has the power to make laws to implement the MEAs listed in its Schedule. The Schedule to the Act lists 19 MEAs, including the UNFCCC and Kyoto Protocol. However, to date, no rules to implement any of the MEAs provided for in the Schedule have been made.	The Sindh Assembly passed the Sindh Environmental Protection Act in 2014. The Act does not give the Government of Sindh the power to implement any MEAs, except for providing inter-provincial and fed-provincial coordination.	The Balochistan Assembly passed the Balochistan Environmental Protection Act in 2014. Under this Act, the Government of Balochistan may make rules to implement MEAs listed in its Schedule. The Schedule contains 30 MEAs, including the Rio Declaration, UNFCCC, and Kyoto Protocol. However, to date, no rules to implement any of the MEAs have been made by the Government of Balochistan.

SWOT Analysis of NCCP in Respect of Floods

Strengths	Weaknesses
- Stormwater catchment to reduce flood risk	- Lacks realistic and comprehensive backing for establishing goals and objectives.
- Glacier Lake Outburst Floods (GLOF) risk reduction project study	- The policy is not based on empirical research (such as protection of glaciers in view of military conflict).

- The policy provides clear guideline direction to provincial governments	- There is no financial allocation for adaptation.
- Provides mechanisms for implementation strategies for action plans	- Absence of formulation and enforcement of river floodplain regulations and laws.
- Integration of sectoral policies with climate change policy	- No statistical background or achievable measures indicated.
- Provides mechanisms to enhance human & institutional capacity	- Stakeholders' identification is opportunistic rather than systematic in terms of the scope of various interest groups that need to be consulted.
- Provides initiatives for aquifer recharge mechanisms	- There is no clarity as to who the real stakeholders are.
- GIS mapping of flood embankments for flood management	- The document does not address the concerns of any stakeholder or provide appropriate measures for such concerns.
- Establishes local flash flood forecasting & warning systems	- Policy has yet to trigger substantial climate-related finance due to policy and institutional disconnect.
- Provides for real-time exchange of hydrological data in the region	
- Provisions for policy implementation committee	
Opportunities	**Threats**
- MEAs have played a major role in shaping climate change policy and legislation in Pakistan	- The overall institutional landscape on climate change is highly fragmented with involvement from the federal, provincial, private sector, and civil society.
- As a co-chair of the Conference of Parties (COP27), Pakistan may invite donors to assist in flood response and mitigation	- NCCP provides a framework, but there seems to be difficulty in prioritizing it into action.
- Given that the climate change ministry has not fully devolved to the provinces, there remains an opportunity to optimize the capitalization on the skills and competences of multi-level institutions	- Pakistan is experiencing constituency politics, which means that projects are being shaped under the influence of these dynamics.

- The implementation of international agreements and treaties related to environment and climate change	- Allocation of the climate budget is dominated by mitigation at the federal level.
- Collaboration areas in developing more effective systems for forecasting and warning	
- Learning from the best practices in the world	

EETH Analysis in Respect of Floods

Enhancement of Strengths	**Elimination of Weaknesses**
(i) Stormwater can be turned into an opportunity to mitigate water shortage. (ii) Glacier Lake Outburst Floods (GLOF) risk reduction project study may be employed. (iii) In consonance with the policy guidelines, climate change/flood issues may be addressed at the provincial level with the help of the federal government. (iv) An action plan may be devised in light of the implementation strategies. (v) Implementation plan for the integration of sectoral policies with climate change policy. (vi) The policy implementation committee may ensure the following: • Provides mechanisms to enhance human & institutional capacity • Provides initiatives for aquifer recharge mechanisms • GIS mapping of flood embankments for flood management • Establishes local flash flood forecasting & warning systems • Through exchange of real-time hydrological data in the region	(vii) Research-based policy measures may be devised for establishing goals and objectives, as well as for protecting glaciers. (viii) Financial allocation may also be made for adaptation measures. (ix) River floodplain regulations and laws may be formulated. (x) Stakeholders' identification is opportunistic rather than systematic. Various interest groups need to be consulted. (xi) The real stakeholders may be identified.
Taking Advantage of Opportunities	**Hedge Against Threats**
i. MEAs have played a major role in shaping climate change policy and legislation in Pakistan. Funds and technology may also be obtained from international donors.	i. The overall institutional landscape on climate change is highly fragmented with involvement from the federal, provincial, private sector, and civil society.
ii. As a co-chair of the Conference of Parties (COP27), Pakistan may invite donors to assist in flood response and mitigation.	ii. NCCP provides a framework, but there seems to be difficulty in prioritizing it into action.

iii. Given that the climate change ministry has not fully devolved to the provinces, there remains an opportunity to optimize the capitalization on the skills and competences of multi-level institutions.	iii. Pakistan is experiencing constituency politics, which means that projects are being shaped under the influence of these dynamics.
iv. The implementation of international agreements and treaties related to environment and climate change.	iv. Allocation of the climate budget is dominated by mitigation at the federal level.
v. Collaboration areas in developing more effective systems for forecasting and warning.	
vi. Learning from the best practices in the world.	

Climate Change (Situational Analysis)

Anthropogenic emissions of Greenhouse Gases (GHG) have increased since the industrial era, resulting in global warming and large-scale changes in weather patterns, collectively known as "Climate Change." Globally, scientific evidence suggests that Climate Change is responsible for changes in precipitation, increased occurrences of droughts and heat waves, increased intensity and frequency of hurricanes, sea-level rise, and the melting of glaciers and Arctic ice.

Recognizing the risks and vulnerabilities, the UN General Assembly established the 17 Sustainable Development Goals (SDGs) in 2015 to achieve a brighter and more sustainable future for all. Pakistan was the first country to accept the SDGs-2030 agenda through a unanimous resolution of the Pakistani Parliament, which produced Vision 2025, aligned with the SDGs. In addition, to address Climate Change concerns, a legally binding international treaty was signed at the Conference of Parties (COP21) in Paris, known as the Paris Agreement 2015. The treaty's goal is to keep global warming well below 2°C, preferably 1.5°C, compared to pre-industrial levels. Pakistan became a signatory to the Paris Agreement in 2016 and submitted its first Nationally Determined Contributions (NDCs) with the goal of reducing emissions by 20% and taking actions to adapt to the changing climate by 2030.

Greenhouse Gas Emission Profile of Pakistan

Pakistan ranks comparatively low among countries in terms of per capita GHG emissions due to its lower level of development. According to a preliminary projection, the GHG emission levels for Pakistan are expected to increase many times in the coming decades. This is based on the assumption that the GHG emissions intensity for the five main sectors mentioned will

remain essentially the same as during the period from 2020 to 2050. Thus, the projected total GHG emissions of Pakistan, in line with the government's economic growth strategy, will increase by around 7 times by 2050.

Sector	**1994**	**2008**	**2012**	**2020**	**2050**
Energy	86	157	169	358	2685
Agriculture	72	120	165	245	1395
Industrial Processes	13	18	14	26	67
Land Use Change and Forestry	7	9	10	14	38
Wastes	4	6	10	7	15
Total Emissions	**182**	**310**	**368**	**650**	**4200**

According to the national GHG inventory of Pakistan (2011–2012), total GHG emissions were 369 million tons of CO2, with 55% from the energy sector, 38.71% from agriculture and livestock, 4% from industrial processes, and 2.15% from land use change and forestry sectors. The energy and agriculture-livestock sectors alone account for around 90% of the total emissions pool and have thus far remained the biggest emitters of GHGs in 2020 (Bank A. D., 2015).

Impacts of Climate Change in KP

Khyber Pakhtunkhwa Province is located in the northwest of the country and hosts a variety of topographical features. The foothills of the Karakoram, Himalayan, and Hindukush mountain ranges are found primarily in the north of the province, while the southern side is mostly comprised of valley plains, which consist of agricultural land and rangelands. Severe climate conditions exist in the province's northern region, which experiences extremely snowy and cold winters, with high-intensity rainfall, whereas the province's southern region experiences relatively less severe winters, with reasonable rainfall and warmer summers. KP is divided into nine agro-ecological zones based on climate, rainfall, temperature, altitude, soil, and topography (Pakhtunkhwa, 2021). Figure-1 shows the map of the agro-ecological zones of KP.

Climate Change has influenced KP like other regions of Pakistan. Climate Change has caused progressive changes in weather and food production patterns, as well as abrupt and disastrous weather catastrophes such as severe floods caused by high rainfall (2010, 2022), droughts caused by water scarcity and stress, and extended heatwaves. In KP, all of these disastrous events have resulted in the following changes:

- Temperature Changes

- Precipitation Changes
- Changes in Food Production
- Shifting Weather Patterns
- Glacial Melting
- Loss of Biodiversity
- People and Society

The above changes have severely impacted various sectors, including Water Resources, Agriculture, Livestock, Fisheries, Forestry, Wildlife & Biodiversity, Vulnerable Ecosystems, Disaster Preparedness, Public Health, and Energy.

SWOT Analysis of Provincial Departments

The Environment and Forestry, Agriculture, Water & Irrigation, Energy & Power, Relief, Rehabilitation & Settlement, and Communication & Works (Roads & Infrastructure) Departments score highly in climate relevance.

Strengths	**Weaknesses**
• Government ownership • Existence of institutional mechanism • Vibrant regulatory framework • Human resources	• Governance issues • Political influence • Lack of implementation regime • Missing sectoral linkages • Inconsistencies in climate change policies • Climate change literacy/awareness
Opportunities	**Threats**
• Availability of foreign funding for implementation of policies • Adoption of international best practices • Equipping human resources with modern tools • - Tourism potential	• Anthropogenic issues • Recurring natural disasters • Geographic vulnerability • Extreme weather conditions • Population growth • - Increase in sediment flow due to floods and high-intensity rains

Climate-Related Expenditures

KP, like the other three provinces, obtains a major portion of its resources from the Federal Divisible Pool under the paradigm of fiscal federalism followed in Pakistan. The KP budgetary profile is based on the KP Finance Department's publication, the "Annual Budget Statement." A majority of the current expenditure falls under the label of "general public service," which is mainly related to salaries and pensions of provincial employees. It is useful to examine provincial budget financing, as nearly 30 percent of it is spent on development or investment activities.

The geophysical location of KP near three mountain ranges makes it particularly vulnerable to gradually rising temperatures, creating the need for fiscal space for an effective climate response.

The government has also designated a high-level champion for steering the provincial Green Growth Strategy and plans that include attention to climate change response. The methodology and steps involved in selecting climate-related programs and projects in the development budget of KP are similar to those adopted by the Federal Government. Projects in the Environment and Forestry Department, Agriculture, Water & Irrigation, Energy & Power, and Relief & Rehabilitation Department score highly in climate relevance.

The study of development projects executed found that around 15-25% of KP's total provincial development budget is allocated for climate-vulnerable departments. Total climate-related spending in KP has increased from PKR 9.74 billion to PKR 147.189 billion between 2013-14 and 2022-23. Based on the aforementioned profile of the number of climate-related projects and their associated investments, a summary trend analysis of climate-relevant budget allocation in the development budget is presented in Table-1.

Out of a total of 34 departments, the share of climate change budget allocation of expenditures for climate-related tasks was broad for the overall ADP of 2022-23, with water resources at 5.5%, energy & power at 7.6%, agriculture at 3.8%, roads & infrastructure at 16.12%, and urban town planning at 4.09%. The government is executing more projects in water, energy & power, roads, and agriculture (Graph-1). However, with regards to climate budgeting, there is a need to link multi-sectoral planning and budgeting with climate change policy needs, thus making way for clearer tracking of climate change-related budgetary and development implementation investments. Year-wise sectoral projects executed by each department are depicted in Graph-2 (Pakhtunkhwa, Annual Development Plan, 2022).

Table-1 Year-wise Expenditure Allocation

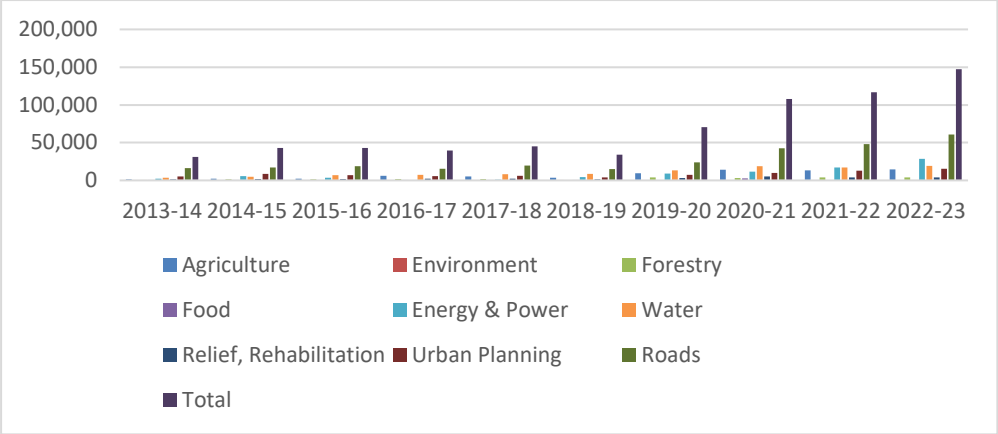
(Rupees in Million)
Project in No.
Share in %

Department	2013-14			2014-15			2015-16			2016-17			2017-18		
	Amount	Projects	Share	Amount	Projects	Share	Amount	Projects	Share	Amount	Projects	Share	Amount	Projects	Share
Agriculture	1,532	51	1.7	2,455	46	1.8	2,468	47	1.4	6217	45	3.9	5,290	39	2.5
Environment	57	11	-	57	10	-	57	8	-	57	7	-	57	4	-
Forestry	569	46	0.6	1,366	47	1.0	1,242	56	0.7	2,007	100	1.29	2,007	41	1.0
Food	500	8	0.4	501	11	0.4	501	11	0.3	732	11	0.5	732	21	0.4
Energy & Power	2,223	28	1.9	5,657	36	4.0	3,749	39	2.1	299	35	0.2	830	45	0.4
Water	3,415	93	2.9	4,737	132	3.4	6,870	203	3.9	7,150	209	4.4	8,352	212	4.0
Relief, Rehabilitation	1,447	6	1.2	2,053	11	1.5	2,053	18	1.2	2,215	23	1.4	2,215	30	1.1
Urban Planning	5,229	20	4.4	8,760	21	6.3	6,985	19	4.91	5587	28	3.5	6,243	30	3.0
Roads	16,176	103	13.7	17,267	231	12.4	19,006	343	10.9	15319	333	9.5	19577	358	9.4
Total	**31,148**	**366**		**42,853**	**545**		**42,931**	**744**		**39,583**	**791**		**45,303**	**780**	

Table-1 Year-wise Expenditure Allocation

(Rupees in Million)
Project in No.
Share in %

Department	2018-19			2019-20			2020-21			2021-22			2022-23		
	Amount	**Projects**	**Share**	**Amount**	**Projects**	**Share**	**Amount**	**Projects**	**Share**	**Amount**	**Projects**	**Share**	**Amount**	**Projects**	**Share**
Agriculture	**3,445**	**40**	**1.9**	**9,510**	**43**	**4.0**	**14,315**	**133**	**4.5**	**13,242**	**135**	**4.18**	**14,645**	**94**	**3.89**
Environment	**446**	**5**	**0.2**	**40**	**3**	**-**	**40**	**4**	**-**	**50**	**3**	**0.02**	**47**	**4**	**0.01**
Forestry	**2,8 66**	**29**	**1.6**	**4,086**	**25**	**1.7**	**3,226**	**51**	**1.0**	**4,017**	**38**	**1.27**	**3,956**	**54**	**1.05**
Food	**472**	**18**	**0.3**	**404**	**10**	**0.2**	**2,706**	**14**	**0.9**	**403**	**11**	**0.13**	**393**	**11**	**0.10**
Energy & Power	**4,222**	**46**	**2.3**	**9,016**	**41**	**3.8**	**11,437**	**75**	**3.6**	**16,897**	**65**	**5.34**	**28,646**	**68**	**7.61**
Water	**8,825**	**176**	**4.9**	**13,261**	**164**	**5.6**	**18,659**	**243**	**5.9**	**17,081**	**223**	**5.4**	**19,386**	**194**	**5.15**
Relief, Rehabilitation	**1,428**	**28**	**0.8**	**2,982**	**30**	**1.3**	**5,042**	**40**	**1.6**	**3,955**	**39**	**1.25**	**4,087**	**43**	**1.09**
Urban Planning	**4,054**	**33**	**2.2**	**7,419**	**35**	**3.10**	**10,021**	**76**	**3.2**	**12,748**	**77**	**4.03**	**15,389**	**81**	**4.09**
Roads	**14,961**	**308**	**8.30**	**23,699**	**313**	**10.0**	**42,341**	**507**	**13.3**	**48,229**	**525**	**15.24**	**60,640**	**515**	**16.12**
Total	**33,962**	**683**		**70,417**	**664**		**107,787**	**1143**		**116,622**	**1116**		**147,189**	**1064**	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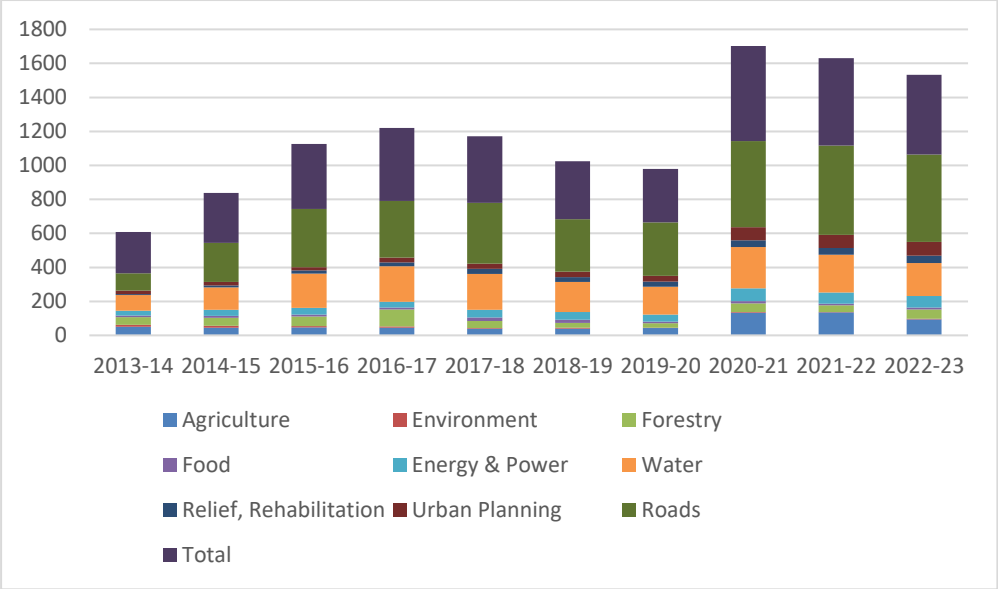
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Agriculture
Environment
Forestry
Food
Energy & Power
Water
Relief, Rehabilitation
Urban Planning
Roads
Total

Climate Change projects executed under the annual development programme of Khyber Pakhtunkhwa during the last 10 years are tabulated as follows:

Financial Year	Project	Cost (Million Rs.)
2013-14	Feasibility Study for Drainage, Sewerage, and Solid Waste Management Plan for DI Khan City	20
	Rehabilitation of Waste Lands through vegetative Treatment in Haripur Forest Division	15
	Establishment of Climate Change Cell for Multilateral Environmental Agreements (MEAs) in EPA, Environment Department, Khyber Pakhtunkhwa.	18
2014-15	Drainage, Sewerage, and Solid Waste Management Plan for D.I.Khan City	13.69
	Hazardous Waste Management through Public-Private Partnership in Khyber Pakhtunkhwa.	20
	Establishment and Strengthening of Climate Change Centre at the University of Agriculture, Peshawar.	17
	Conservation and Improvement of Forest Ecosystems in Hazara	450
	Rehabilitation and Improvement of Natural Resources in Malakand	450
2015-16	Hazardous Waste Management through Public-Private Partnership in Khyber Pakhtunkhwa.	23
	Enhancement of Forest Resource Base in Southern Forest Circle.	416
	Enhancement of Resilience and Livelihood Improvement through Forestry Interventions in Central and Southern Districts of Khyber Pakhtunkhwa.	58.58
	Institute of Climate Change Studies in Khyber Pakhtunkhwa	10
2016-17	Afforestation of Drylands through Rainwater Harvesting in Southern Districts of Khyber Pakhtunkhwa	61

	Remote-Sensing Solution for Forest Change Detection in Khyber Pakhtunkhwa	70
	Establishment of Climate Change Cell for Multilateral Environmental Agreements (MEAs) in EPA, Environment Department, Khyber Pakhtunkhwa.	34
	Billion Trees Afforestation Project in Khyber Pakhtunkhwa (Phase-II)	9,826
2017-18	Development of Sewerage System and Rehabilitation/Construction of Waste Water Treatment Plants in Peshawar.	18,543
	Billion Tree Afforestation Project in Khyber Pakhtunkhwa Phase-III	8,400
2018-19	Rehabilitation of Sewerage / Solid Waste Treatment Plants in Peshawar & Divisional Headquarters	1,000
	Conversion of Waste to Energy Project through WSSP / WSSCs on PPP basis	6,000
2019-20	Introduction of Zigzag Technology in Construction and Operation of Brick Kilns in Khyber Pakhtunkhwa.	20
	10-BTTP Up-Scaling Green Pakistan Program, Revival of Forestry Resources in Khyber Pakhtunkhwa	13,670
	Mitigation of Climate Change effects through raising of plantation in District South Waziristan.	80
2020-21	Safe Disposal of Hospital Infectious Waste in Khyber Pakhtunkhwa.	1,000
	Diversion of Municipal Effluents and Solid Waste Polluting the Major Canals of Peshawar City.	474
	Rehabilitation of Sewerage / Solid Waste Treatment Plants in Peshawar & Divisional Headquarters.	5,000
	Waste Disposal Projects in Major Towns of Khyber Pakhtunkhwa	500
2021-22	Reclamation of Culturable Waste Land and Solarization of Agriculture Tube Wells.	1,000

	Culturable Waste Land Development & Solarization of Existing Agriculture Tube/Open Wells in newly Merged Districts of Khyber Pakhtunkhwa	1,657
	Climate resilience through Horticulture Transactions.	200
2022-23	Diversion of Municipal Effluents and Solid Waste Polluting the Major Canals of Peshawar City.	2,554
	Diversion of Municipal Effluents and Solid Waste Polluting Canals in various Districts of Khyber Pakhtunkhwa	3,000
	Solid Waste Management Plant (Integrated Resource Recovery Centre) at Bahrain, Babuzai, and Mingora District Swat on a Pilot Basis.	100
	Sustainable Productivity Enhancement through Promotion of Climate-Smart and Efficient Mechanized Farming Practices in Khyber Pakhtunkhwa	1,000

Impact Analysis

There has been growing policy attention to climate change issues in KP, as evidenced by the development of a provincial Climate Change Policy, the establishment of the Climate Change Cell, and the launching of the KP Green Growth Initiative. Among the climate adaptation projects, two projects have been analyzed in view of the larger portfolio.

Billion Tree Tsunami Project

The Billion Tree Tsunami Project was launched by the provincial government during FY 2014-15 with initial cost estimates of Rs 1,000 million. Given its importance, social and economic impacts in the surrounding areas, the scope and cost were expanded to Rs 1,912 million. The campaign helped the government fulfill its 348,400-hectare commitment to the Bonn Challenge – a global effort to restore 150 million hectares of deforested and degraded land by 2020, and 350 million hectares by 2030.

The project is naturally restoring a previously deforested landscape, which has assisted in meeting present and future needs and offers multiple benefits for climate adaptation and mitigation. The project has achieved its restoration target through a combination of protected natural regeneration (60%) and planned afforestation (40%). Additionally, it has established 13,000 private tree nurseries, which have already boosted local incomes, generated thousands of green jobs, and empowered unemployed youth and women in the province (source).

Promotion of Climate-Smart and Efficient Mechanized Farming

Khyber Pakhtunkhwa is vulnerable to a range of slow and rapid-onset hazards, including floods, droughts, heat stress, pest and disease outbreaks, avalanches, landslides, glacial lake outbursts, and earthquakes. Projected climatic changes are expected to increase the incidence and severity of many of these hazards, through greater variability in rainfall and higher temperatures. The introduction of improved crop and livestock varieties, integrated pest management, fertility management, and updated agroecological zoning for improved crop suitability have been considered promising interventions to support the agricultural sector. With this motive, the government of Khyber Pakhtunkhwa has launched the project **Sustainable Productivity Enhancement through Promotion of Climate-Smart and Efficient Mechanized Farming Practices**, with an estimated cost of Rs 1,000 million during the current financial year.

International Funding Projects

Scope	**Amount**	**Sponsor**	**Status**
Sustainable Management of Biodiversity in Malakand (Districts Swat and Chitral) (GiZ Assisted)	Rs520	GiZ	Completed
Financing to support upgrading rural roads to provide safe and reliable access in the most vulnerable districts of KP	$300 million	World Bank	Approved on June 9, 2022
Building of 250 engineering structures including dams, ponds, spillways, tree plantation, and drainage to reduce the risk of GLOF in KP and GB	$36.96 million	UNDP	Under GCF

Rich natural resources are seriously threatened by the impacts of climate change and other human interventions, and their loss would severely curtail people's livelihoods. A series of workshops has been held to sensitize stakeholders about agro-biodiversity, ecosystem-based adaptation measures, and a number of the adaptation measures identified, besides establishing value chains for non-timber forest products.

The World Bank has recently approved $300 million in financing to support upgrading rural roads to provide safe and reliable access to schools, health facilities, and markets in the most vulnerable districts of KP province. This will provide safe and affordable transportation to primary and middle schools in remote areas, which have the lowest enrolment and attendance rates.

The project will also improve connectivity to markets and provincial centres to support income generation for rural farmers by reducing transportation costs and travel times.

The melting of the Hindu Kush, Karakoram, and Himalayan glaciers due to rising temperatures has created 3,044 glacial lakes in Gilgit-Baltistan and Khyber Pakhtunkhwa. It is estimated that 33 of these glacial lakes are hazardous and likely to result in glacial lake outburst floods. Such flooding can release millions of cubic metres of water and debris in just a few hours, resulting in the loss of lives, destruction of property and infrastructure, and severe damage to livelihoods. UNDP and the Government of Pakistan are working on a project for early warning systems, engineering structures, and disaster management policies that will reduce the risk, protecting local communities and providing early warning of devastating flood events.

Seeking Financial Assistance: Gap Analysis

Combatting climate change requires consistent policy, planning, and structured systems for budget management and well-developed financing strategies that can leverage existing public spending. At the landmark Paris Climate Conference under the United Nations Framework Convention on Climate Change (UNFCCC) in December 2015, developed countries committed to mobilizing $100 billion per year of additional climate finance. All countries are increasingly compelled to account for how effective their use of international funding available for climate change would be, including through a transparent PFM system that ensures the efficient and transparent use of resources. In the wake of a fragile accounting system and capacity, Pakistan is not capable of seeking financial sponsorship from international donor agencies.

Climate change is not a thematic consideration in planning, and most sectoral policies and strategic action plans remain silent on the issue in the country. Budgeting processes in KP do not allow for systematically tracking and monitoring climate-relevant spending. However, climate change can be better addressed by incorporating it into the province's development plans and budget.

Mostly, expenditures by institutions on different climate change projects show that the volume and pattern of public spending are disintegrated and accounted for in different nomenclatures.

The integration of climate actions and policies in the PFM system can ensure it is adequately addressed through a firm commitment of resources and associated mechanisms to ensure these are used as planned. It may include the development of new processes, tools, and systems to generate data and analysis that can assist policymakers in making more informed decisions to better align climate policy goals with the provincial budget. It will promote measures for increased transparency and accountability in climate spending (Bank A. D., 2015).

In order to integrate and reflect climate change in budgetary control and public finance management, the following key reform measures are proposed:

MTBF Integration	Responsible
- Amend Budget Call Circular and ancillary guidelines to include climate change - Identify one pilot department for integrating climate change in its MTBF and defining relevant outputs - Develop KPIs to reflect climate change responses applicable to selected line departments, and subsequently measure performance against them. FD to facilitate with line departments. Adaptation and mitigation plans when developed, and sector policies, when aligned with climate change, will guide the KPIs.	Finance Department
Institutional Co-ordination	
- Establishment of a Climate Change Finance Unit - Amend the Rules of Business to ensure that implementation of national and provincial climate change policy objectives becomes a function of the line departments	Environment, Finance and P&D Departments
Capacity Building	
- Designate focal persons in each relevant department to steer the climate finance integration process, preferably personnel representing the budget sections - Capacity development of planning and budget officers and climate change focal persons to comply with Budget Call Circular, and guidelines on making project development and appraisal more climate change sensitive.	Environment and Finance departments, with relevant sector departments
Adaptation and Mitigation plans	
- Provincial adaptation and mitigation plans will be developed to incorporate a climate lens in the provincial planning process to ensure that the climate-	Relevant line department

relevant projects are prioritized in line with the objectives as described in both the National Climate Change Policy (NCCP) and the draft provincial climate change policy. - Revise sector policies, strategies and action plans to mainstream and align them with the provincial climate policy and provincial adaptation and mitigation plans	
Project Appraisal & Selection	
Review and/or revise Pro forma (PC-1, PC-II, PC-III & P- IV) and Project Development Manual guidelines to incorporate climate change risk and response measures, and climate finance, to align them with CCFF parameters	Planning & Development Department
Monitoring and Accountability	
- Operationalize a climate budget coding and tracking system within GFMIS - Develop new platforms for engaging with civil society organizations including media to support project formulation, selection, and monitoring	Finance Dept., CGA, AG, P&D

Action Plan to be Employed by the Provincial Government

The province of KP is in the process of formulating policy and legal tools needed to link itself to the global paradigm of SDGs. The 18th amendment empowers the federating units to chalk out their policies and enact legislative tools to assist the province in developing and executing Disaster Risk Reduction (DRR) and climate change mitigation strategies. The policy in hand is an endeavor on the part of the provincial government to overcome the disaster caused by climate change through adaptation and mitigation strategies in line with the National Climate Change Policy 2021. These legislative tools and policies will ensure that climate action is mainstreamed into developmental planning and management, particularly for socially and economically vulnerable communities (Environmental Protection Agency, 2022).

This action plan, exhibited with the Policy, outlines the strategies and measures that will be implemented for the designated sectors in order to incorporate the NCCP 2021 into the PCCP 2022.

The actions are grouped into categories based on the NCCP Framework's objectives as:

- Priority Actions: within 2 years
- Short-term Actions: within 5 years
- Medium-term Actions: within 10 years
- Long-term Actions: within 20 years

Adapting technologies for development or the use of crop varieties with greater heat and drought tolerance, modernizing irrigation infrastructure, employing water-saving technologies, integrated watershed management, reforestation of catchment areas, and construction of additional water storage, diversification of the energy mix (including investment in renewable and small hydropower projects), improved weather forecasting and warning systems, and construction of embankments or river sides are some of the proposed strategies.

The climate change adaptation experience of KP is still in the nascent stage. The PCCP prioritizes adaptation over mitigation efforts for the country with a suggested set of sector-level adaptation measures, which are further prioritized and categorized for short-, medium-, and long-term implementation. These efforts, however, fail to plan out a transition from the current phase of increased climate change awareness and outreach to the development and implementation of adaptation plans, strategies, legislation, and projects at the national, subnational, and local levels. International development partners and donors act as a major force in the country for building momentum for sustainable and climate-resilient development.

Selected adaptation technologies and measures are suggested against the types of risks faced by Pakistan's agriculture, water, energy, and urban infrastructure services sectors. It is worthwhile to note that the success of agricultural adaptation technologies has been found to be heterogeneous across the farming community. What may work in one location, or for one type of crop, may not work for others.

Agriculture

Climate Change Risk	Suggested Adaptation Technologies
Reduced crop production due to heat stress and higher temperatures	Development or use of crop varieties with greater heat and drought tolerance.
Water shortages due to low rainfall and increased evapotranspiration-	Promote the use of efficient irrigation techniques (sprinkler and drip irrigation, etc.); improve the irrigation

induced crop water requirements, particularly in rain-fed dry areas	distribution system and reduce distribution losses; and implement laser land leveling to reduce water wastage.
Erratic, uncertain, and sometimes unseasonal rainfall patterns badly affecting crop production	Promote the use of efficient irrigation techniques (sprinkler and drip irrigation, etc.); improve the irrigation distribution system and reduce distribution losses; and implement laser land leveling to reduce water wastage.
Reduction in available irrigation water due to changing rainfall patterns and increased demand	Improve integrated water management systems, along with required legislation and awareness-raising support.
Decreasing quality and quantity of underground water due to excessive pumping, which is negatively affecting crop productivity and soil fertility	Improve integrated water management systems, along with required legislation and awareness-raising support.
Increased frequency and intensity of extreme climatic events such as flooding, drought, and heat waves, causing extensive damage to agriculture and livestock sectors	Develop an improved multi-hazard early warning system.

Water Sector

Climate Change Risk	**Suggested Adaptation Technologies**
Increasing water shortages due to changing climatic patterns, particularly precipitation and warmer temperatures causing higher evaporation, in addition to increasing demand from the rising population and additional industrial usage	Promote efficient irrigation techniques such as sprinkler and drip irrigation systems; recycle wastewater in urban areas; promote rainwater harvesting; and encourage desalination techniques, particularly in coastal and hyper-arid areas with saline underground water.
Higher water losses in conventional irrigation systems	Promote efficient irrigation techniques such as sprinkler and drip irrigation systems; improve the irrigation distribution system and reduce distribution losses.
Reduction in water storage capacities due to sedimentation	Initiate efforts on integrated watershed management; reforestation of catchment areas; and construction of additional water storage areas.
Increased frequency of extreme climatic events such as floods, droughts, and storms due to the changing climate	Improve the multi-hazard early warning system.
Lack of understanding of how climate change is affecting water availability in the country	Carry out awareness-raising campaigns for both the public and policymakers to create a better understanding of water

	issues and the need to conserve this precious resource.
Increased frequency of flash floods generating huge damage from hill torrents, particularly in hilly areas	Construction of slow-action dams and small storage containers in hilly areas.
Increased saltwater intrusion, particularly in the Indus delta due to reduced freshwater supplies to the area	Improve water management to ensure the required freshwater supplies to the delta area to maintain a healthy ecosystem.

Energy Sector

Climate Change Risk	Suggested Adaptation Technologies
Reduction in water availability for hydropower generation	Diversify the energy mix and make further investments in renewable and small hydropower projects.
Extreme climate events damaging oil, gas, and power infrastructure	Improve weather forecasting and warning systems; retrofit critical energy infrastructure.
Hotter temperatures increase energy demand	Invest in additional energy capacity, preferably in renewable resources.
Warmer air and hotter water temperatures may affect the efficiency of thermal plants	Invest in technology to improve the efficiency of thermal plants in warmer conditions.

Urban Infrastructure Services

Climate Change Risk	Suggested Adaptation Technologies
Heavy rainfall impact on urban drainage systems	Enhance the capacity of urban storm drain channels; develop and promote rain gardens, roof gardens, and bioswales; and make efficient use of water to offset the impacts of severe drought spells in urban areas, particularly in arid regions.
Extreme hydrological events impacting urban potable water supply systems	Improve water supply infrastructure to handle extreme events.
Heavy rainfall-induced landslides in mountain urban centers	Adopt both hard and soft preventive measures to offset the impact of landslides and sea level rise, such as constructing dikes or sea walls, and increasing vegetation cover to minimize landslide threats.

Conclusion

The National Climate Change Policy 2012 mentions Federal and Provincial Climate Change Policy Implementation Committees. However, no such committees have been established at either the Federal or Provincial level. The Pakistan Climate Change Act, 2017 envisions a National Climate Change Authority comprising members from the Provinces. However, the Authority has not yet been notified, nor has its staff or management been appointed. Limited references to Federal/Provincial coordination and interaction on climate governance remain confined to the paper on which it is printed.

The National Climate Change Policy 2012 mentions Federal and Provincial Climate Change Policy Implementation Committees. However, no such committees have been established at either the Federal or Provincial level. The Pakistan Climate Change Act, 2017 envisions a National Climate Change Authority comprising members from the Provinces. However, the Authority has not yet been notified, nor has its staff or management been appointed. Rules as provided under Sec. 17 have also not been notified to date, despite the lapse of five years, nor has the Climate Change Fund been established. Furthermore, the Council, as stipulated in the Act, has recently been notified, apparently to showcase at COP27.

The Provincial Government is empowered to implement MEAs by notifying rules in the official Gazette. However, there is no evidence of this to date from either forum. Despite the differing capacities of the Provinces to roll out climate change-related initiatives, no Province has yet exercised its Constitutional right to request Parliament to pass a Federal law related to this aspect of climate change. Since the regulatory framework remained silent on the environment, it was the Judiciary that intervened and defined a clean environment and water as basic human rights. Pakistan is not the only federation to experience this issue. A case study of Canada implementing international agreements in coordination with its provinces is a referral case to be emulated by Pakistan—an example of cooperative federalism.

Coordination on climate change among the Federation and the Provinces has not materialized despite provisions in the Policy. Primary data, obtained through purposive sampling, indicates that the most vulnerable economic sector is agriculture, and the most affected class is the one involved in the agriculture sector.

Recommendations

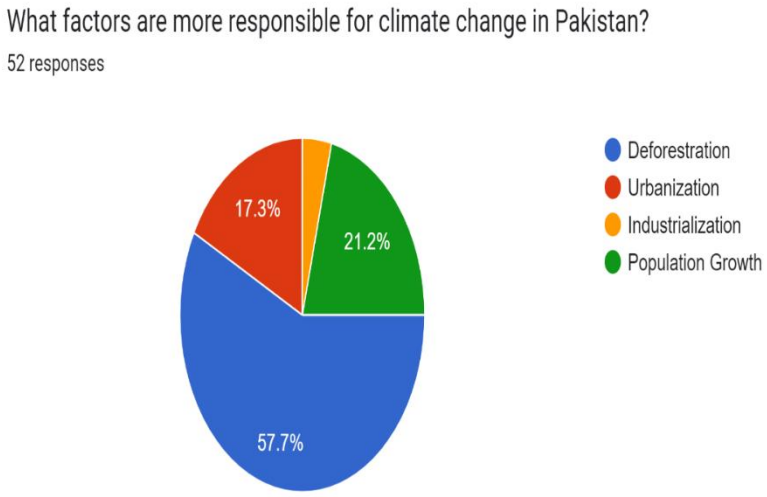
The measures taken by Pakistan regarding mitigation and adaptation for climate change need significant improvement to become a success story. There are numerous factors associated with their non-implementation. Firstly, the government has not been able to mainstream the concept of climate change (CC) and educate the public that the threat is real. Secondly, the government has not been able to fund the mitigation and adaptation measures due to financial constraints. Thirdly, the departments do not have the capacity to implement these measures. Fourthly, the provinces have not accorded due priority to these measures, resulting in the absence of ownership and, ultimately, ineffective implementation. Fifth, the provincial departments have not been able to deliver due to the socio-economic conditions of the masses and political interference. Keeping in view Alfred Pareto's 80/20 rule, the following areas have been identified while making recommendations. These are essentially the 20% of the whole picture but would result in achieving the remaining 80% if acted upon properly. These recommendations are as follows:

1. The subject of climate change may be assigned to a specific department and agency, as the existing Rules of Business, Government of Khyber Pakhtunkhwa, do not clearly allocate it to a specific department or agency. Relief, Rehabilitation & Settlement or Environment departments are more relevant to the subject and may be considered for the purpose. Suitable amendments in the RoB may be enacted.
2. The mandate of the EPA and PDMA may be reviewed in the Secretaries Committee Meeting held under the Chairmanship of the Chief Secretary, Khyber Pakhtunkhwa, to include the subject of climate change, or another specialized agency may be created for the purpose.
3. Climate change is a cross-cutting issue and needs integrated efforts from different government departments at both federal and provincial levels. It is, therefore, necessary to establish a high-level platform under the KP Chief Secretary or Chief Minister to steer the response to climate challenges.
4. Separate technical working committees, including DRM specialists, meteorologists, and relevant experts on climate change, may be notified to work on three key areas: climate-resilient infrastructure, climate-resilient agriculture, and climate-resilient development, to provide recommendations. The recommendations of the technical working committees will be presented to the high-level forum for approval.
5. Monitoring of decisions made by the high-level forum may be assigned to the PMRU under the Chief Secretary's Office, Government of Khyber Pakhtunkhwa.

6. Awareness programs for communities, corporate, and public sector organizations on climate change via media, academia, and Corporate Social Responsibility (CSRs).
7. Specialized training and seminars for government functionaries may be arranged to develop their capacity on climate resilience and other relevant aspects of climate change.
8. Climate-resilient design standards for public and private sector infrastructure may be prepared to mitigate the effects of threats posed by climate vulnerability.
9. The current laws governing the control of unauthorized construction of buildings in river basins need to be reviewed for an integrated response to the challenges.
10. Arrangements should be made to establish a sufficient number of weather stations and gauges to measure discharge in streams and rivers.
11. An Early Warning System (EWS) should be installed at suitable places to assist in early responses to floods or heavy rainfall.
12. Glacier management is another neglected area that has not been assigned to any department in the Rules of Business. Hence, deliberations and workable decisions on this matter are required in the Secretaries Committee meeting.
13. Efficient use of water should be promoted through on-farm water management initiatives.
14. P&DD should develop a checklist for feasibility studies and designs that are climate-inclusive and make it a mandatory part of PC-I.
15. The Forestry, Wildlife, and Environment Department should initiate public awareness and mobilization efforts on climate change challenges, adaptation, and mitigation measures.
16. Establishing departmental climate change cells with research centers and strengthening bilateral coordination between line departments is the need of the hour.

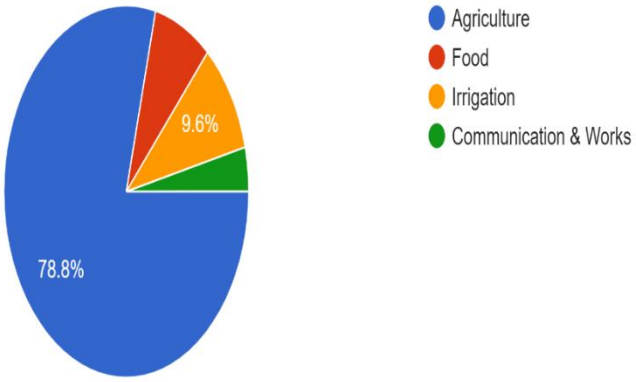
Survey Report

A questionnaire to seek public opinion on climate change was conducted using information technology via Google Forms. The results of the survey are depicted in the following graphs.



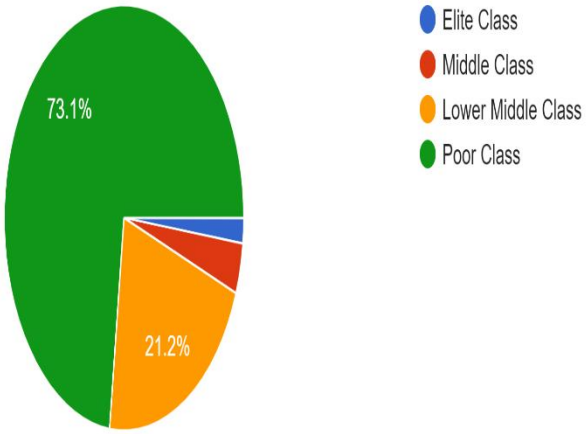
Which sector is the most vulnerable in the context of climate change?

52 responses



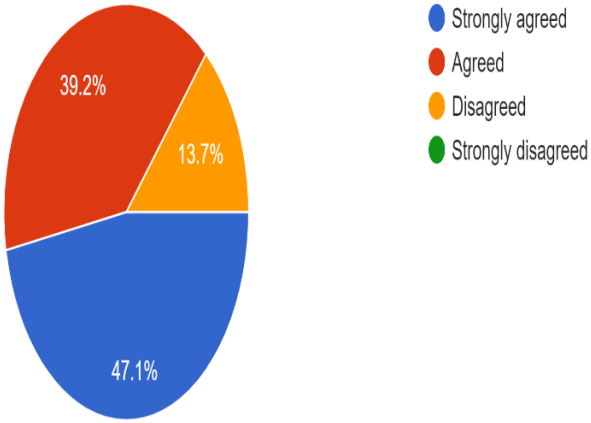
Which Group of individuals is most likely to be affected by climate change

52 responses



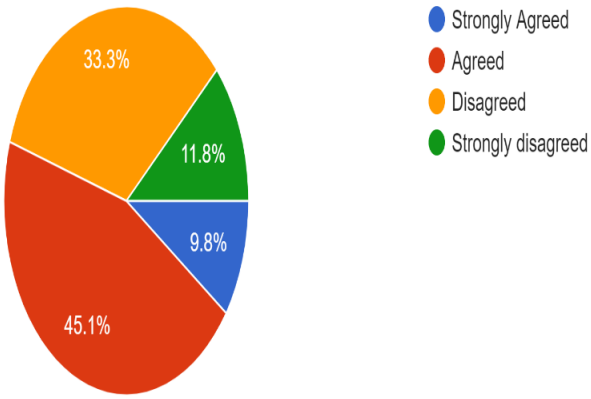
How far is the coordination gap between NGOs and Government responsible for failure to mitigate the hazardous impacts of climate change?

51 responses



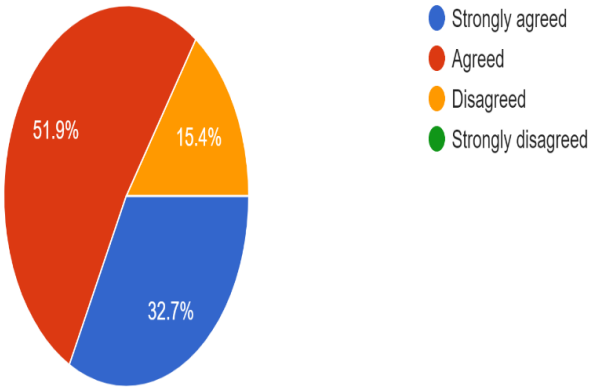
Is the contingency plan by the KP Government adequate to forecast and mitigate the hazardous impacts of climate change?

51 responses



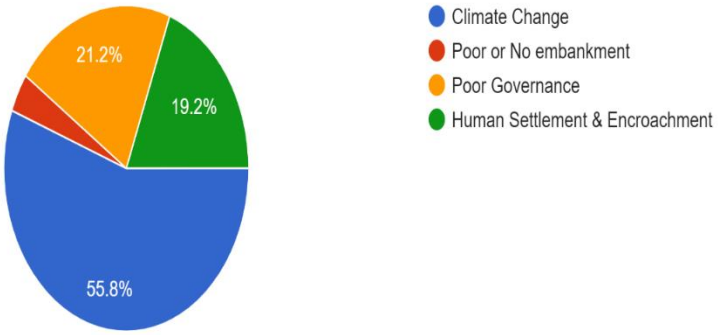
Should the responsibility of the devastating impacts of climate change be attributed to ineffective policies of government?

52 responses



Which one is the most direct cause of floods in Pakistan?

52 responses



	Description	Verifiable/Measurable Indicator	Means of Verification	Important Assumptions
Goal	1. To have a climate resilient Infrastructure, Agriculture and development.	1. Allocation of budgetary resources/ allocation in the Annual Development Plan for Climate Change initiatives	Budget document/ ADP of the government	Will of the government to alleviate the existing plight of Climate change initiatives to make an impact on various sectors
	2. A resilient and healthy environment in KP by absorbing climate change threats through adaptive & imitative measures	2. Clean and green province	2. Improvement in the general health and life expectancy of the public and agriculture growth	2. It is assumed that no extra-ordinary natural calamity hit the province.
Purpose	1.To guard against environmental hazards	1. Better Climate friendly infrastructure Development	1. Public opinion and third-party validation	1. Socio-economic stability and priorities of the political government.
	2. A strong regulatory and institutional framework at provincial level in agreement with the international & national commitments	2. A department with legal and financial mandate having a sound human resource	2. Achievement of measurable and quantifiable imitative and adaptation measures	2. A proactive CSOs, Climate literacy and Political constituency
Outputs	1.To develop a uniform coordination mechanism at Federal & Provincial levels	1.To have a uniform body for enforcement of Climate Change policy	1.Uniform implementation of regulatory regime	1.Uniformity of policy mechanism leads to better realization of Climate change policies
	2. A dedicated department is constituted in KP to deal with the subject of climate change.	2. Service delivery	2. Deliverables are achieved	2. Timely availability of sufficient funds and will
Activities	1. Agreement on ToRs for improving legal/ policy framework of Climate Change	1.Allocation from the Provincial budget for realization, donors funded project and share in the NFC awards	1. Reflection of funds in the ADP	1. Priority of the government to improve Climate change initiatives
	2. Necessary amendments in the provincial rules of business	2. Approved Rules of business	2. Reflection of funds in the ADP	2. Uninterrupted availability of sufficient funds

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