ISSN (E): ***2959-0272***

ISSN (P): ***2710-0502***

Volume **6** Issue **2** Year **2025**

DOI: https://doi.org/10.59111/JPD.006.002.0149

Exploring The Nexus Between Climate Change And Governance: Unravelling The Environmental Factors Fuelling Governance Issues

Haris Bilal Malik*

Research Associate, Institute of Strategic Studies Islamabad (ISSI).

Asad Ullah Khan

Research Fellow, Institute of Strategic Studies Islamabad (ISSI).

Abstract

Climate change and governance issues are inextricably intertwined, with one exacerbating the other's detrimental effects. This research study examines the intricate relationship between climate change impacts and governance challenges in Pakistan. Case studies such as the 2010, 2022 and 2025 floods along with Balochistan's water crisis are referenced to illustrate how climate change can exacerbate existing governance vulnerabilities. Resource deficiencies, energy interruptions, food insecurity, and coastal vulnerability are among the dimensions that are examined. It additionally analyzed the existing literature, highlighting theoretical frameworks such as the climatic conflict thesis, which has revealed a research gap specific to Pakistan. The essay argues that sustainable agriculture, anti-corruption measures, resilient infrastructure, and climate financing techniques need to be integrated into a holistic policy response to climate resilience. It has stressed that in order for governance to be effective and climate initiatives to be implemented adequately, capacity building and transparency must be bolstered. Subsequently addressing the climate governance nexus necessitates a multifaceted approach for the country's long-term development and socioeconomic stability.

Keywords: Climate Change, Governance, Floods, Pakistan, Security

Introduction

Governance issues and climate change are inextricably intertwined, with one exacerbating the vulnerabilities of the other. The Global Governance Index ranking shows Pakistan's struggle to deal with governance issues like political instability, poor infrastructure, corruption, and money laundering/financial instability[1]. Because of this irresolute pattern, policymakers have never been able to develop long-term policies that address Pakistan's crucial concerns[2], one of which is climate change. Even when they did, it lingered on paper and was never implemented. This problem arises especially when there is a change of government, and the newly constituted structure/setup is not enthusiastic about carrying on the prior administration's policies[3]. The public has also developed a lack of trust in Pakistani institutions as a result of the country's extensive problem with corruption. Practices like using funds fraudulently while acting in a conflict of interest, non-accountability of corrupt officials, and corruption networks in which every bureaucrat scratches the back of other, have made the institutions so untrustworthy that it has become complicated to secure financing for dealing with Pakistan's pressing problems[4] one of which is climate change. Because in the end, these institutions have the strength and resources to combat them. Apart from corruption, Pakistan's weak infrastructure, comprising obsolete energy systems, inadequate transportation networks,

[1] Bertelsmann Stiftung, *BTI 2024 Country Report- Pakistan*, research report (Gutersloh: Bertelsmann Stiftung, 2024), https://bti-project.org/en/reports/country-report/PAK.

[2] Sushant Sareen, "Pakistan: Persisting instability," *Observer Researcher Foundation*, Accessed May 23, 2025, https://www.orfonline.org/expert-speak/pakistan-persisting-instability.

[3] Laiba Umer Malik, "The Economic Cost of Political Instability," *Paradigm Shift*, Accessed May 23, 2025.

https://www.paradigmshift.com.pk/economic-cost-political-instability/.

[4] Matthew Jenkins, *Integrity risks for international businesses in Pakistan*, Report (Berlin: Transparency International, 2018): 1-30, https://www.u4.no/publications/integrity-risks-for-international-businesses-in-pakistan.pdf.

and nearly non-existent water management setups, has made the country vulnerable to the hazards posed by climate change[5]. Eventually, when the economy collapses, financial insecurity inhibits climate change fighters' ability to confront climate change concerns. Because they require financing to do so, but on one hand, the impoverished condition of Pakistani institutions impedes it, while on the other hand, the deteriorating economy restricts it. As a result, the country ultimately fails to make the transition to a more ecologically conscious and sustainable future.

If the government fails to address climate change, it risks exacerbating existing governance challenges and amplifying the adverse effects. Nearly every sector of Pakistan is susceptible to climate change, but agriculture, water resources, and coastal regions are particularly vulnerable due to rising temperatures, increased frequency of extreme weather events, and shifting precipitation patterns. In severe circumstances, climate change can cause political tension in society due to increased competition for scarce resources. Moreover, climate-induced displacement can also cause social unrest. Pakistan’s repeated exposure to devastating floods in 2010, 2022, and 2025 underscores that climate-related governance pressures are escalating rather than episodic. So, it is critical to address this issue before it escalates and threatens society's very existence. Given these linked challenges, it is obvious that combating climate change and weak governance in Pakistan necessitates a cohesive and comprehensive policy response. Effective governance is required for ensuring the implementation of resilient climate policies, whilst minimizing the effects of climate change is critical for long-term stability and equitable growth.

[5] Vaqar Ahmed, Ahsan Abbas and Saira Ahmed, “Public Infrastructure and Economic Growth in Pakistan: A Dynamic CGE-Microsimulation Analysis,” *Infrastructure and Economic Growth in Asia*, ed. John Cockburn, Yazid Dissou, Jean-Yves Duclos, and Luca Tiberti (London: Springer: 2019), 117-143.

Thesis Statement:

Climate change and inadequate governance in Pakistan are intricately linked, with one escalating the dangers posed by the other. Addressing these interlinked issues necessitates an extensive and integrated policy response that enhances governance structures while also increasing climate resilience and encouraging sustainable growth.

Climate Change Impacts On Governance In Pakistan:

There are numerous vantage points on the effects of climate change on governance. Pakistan is regarded as particularly vulnerable to the challenges of climate change due to its geographical location, persistent political conflict since its inception, and socioeconomic terrain[6]. With rising temperatures and growing unpredictable weather events, the already extensive governance struggles and become overwhelming for anyone to manage, resulting in a vicious cycle in which the governance system gets stuck, requiring prompt attention and reforms[7]. Pakistan, being an agricultural country, can't afford to risk its water resources. Therefore, water scarcity is one of the gravest problems confronting Pakistan. This situation is especially pertinent to the Indus River, which serves as the primary source of water for the majority of Pakistan's agricultural area[8]. Researchers believe that if phenomena such as shifting precipitation patterns, sporadic monsoons, and glacial melting persist, water supply could eventually decline drastically, having an immediate effect on countries whose economies rely

[6] "Climate change figures prominently in Pakistan political parties' Manifestos (2024)," *Energy World*, Accessed April 28, 2025, https://energy.economictimes.indiatimes.com/news/renewable/climate-change-figures-prominently-in-pakistan-political-parties-manifestos/107214021.

[7] Abdul Sattar, "Climate Change and Governance in Pakistan: A Critical Analysis," *The Dialogue 7*, no. 2 (2012): 151-170.

[8] Rana Akhtar, Muhammad Hassan, and Abdul Khan, "Water Scarcity and Governance Challenges in the Indus Basin: Implications of Climate Change," *Water Resources Research 35*, no. 4 (2021): 789-802.

substantially on agriculture like Pakistan[9]. Due to water scarcity, socioeconomic disparities may emerge between rural (agriculture-based) and urban (industry-based) populations, putting a strain on the government to cope with the entire situation[10].

Furthermore, the destruction caused by extreme weather conditions like floods and droughts has risen enormously as a result of the cumulative effect of climate change in these incidents, ultimately testing the capabilities of government institutions[11]. The 2010 floods, which caused widespread displacement and severe economic and infrastructure damage, is a prime example of extreme weather occurrences exacerbated by climate change. It took over a decade to fully rehabilitate the victims of the 2010 floods, rebuild infrastructure, and provide support relief operations, putting a heavy burden as well as exposing Pakistan's inadequate governance structure[12]. Subsequent major flooding events in 2022 and 2025 further demonstrated that these vulnerabilities were not isolated to a single episode but part of an intensifying pattern driven by climate change.The ability of institutions to navigate dealing with catastrophes like these and ensure prompt relief operations eventually shows us the potential of those government institutions and it got badly exposed during these calamities. And, given the state of Pakistan's governance system, severe weather events bring down the governance structure leading to a state of paralysis. Pre-existing issues of corruption is another

[9] Naeem Hassan, Abdul Zaman and Shahid Malik, "Climate Change Adaptation in Agriculture: Policy Implications for Governance in Pakistan," *Journal of Agricultural Economics 30*, no. 1 (2019): 123-135.

[10] Shahid Malik, Naeem Ahmed, and Muhammad Khan, "Water Governance and Climate Change in Pakistan: Challenges and Policy Recommendations," *Journal of Water Policy 25*, no.3 (2020): 567-580.

[11] Muhammad Adnan, Shahzad Akbar, and Farhan Khan, "Climate Change and Extreme Weather Events: Impacts on Governance in Pakistan," *International Journal of Environmental Research and Public Health 19*, no.3 (2022): 1234.

[12] Noor Afridi, Ali Malik and Hassan, "Disaster Resilience and Governance: Lessons from the 2010 Floods in Pakistan," *Natural Hazards 45*, no.2 (2018): 567-580.

issue confronting Pakistan's government that has been aggravated by climate change[13]. The resources that are supposed to be spent on climate adaptation projects and mitigation measures are being misused, jeopardizing Pakistan's climate security. This undermines public trust, further limiting cross-border funding because Pakistan, as a third-world country, needs outside assistance to fight climate concerns. And the government perceived as consisting of corrupt officials can't secure international funding easily due to this trust deficit[14]. Later flood cycles in 2022 and 2025 again overwhelmed Pakistan's institutional capacity, reinforcing the argument that governance reforms remain urgently needed.

The issue of unsustainable use of land along with deforestation is also amplified by climate change which eventually challenges the governance in Pakistan. Studies have shown that due to these practices, there has been a drastic impact on the livelihoods which eventually contributed to socio-environmental conflicts[15]. These practices also cause soil erosion and loss of biodiversity, which has a detrimental effect on the agricultural sector, which is the primary source of income for a significant percentage of Pakistan's population[16]. This decline in agricultural productivity also puts stress on the government to allocate resources in resource-constrained regions. Thus again the vicious cycle begins. Another significant concern exacerbated by climate change is air pollution. Because of this, people, especially those living

[13] "Corruption Perceptions Index 2021," *Transparency International*, Accessed March 26, 2025, https://www.transparency.org/en/cpi/2021.

[14] Muhammad Khan, "Climate Change and Its Impact on Governance in Pakistan," L*UMS Economics*, accessed March 28, 2024,

[15] Ali Khan, Noor Ahmad, and Abdul Rasheed, "Deforestation and Land Degradation: Implications for Governance in Pakistan," *Environmental Science and Policy 40*, no. 2 (20220): 345-358.

[16] Uriel Safriel, and Zafar Adeel, Dryland systems," in *Millennium ecosystem assessment: Ecosystems and human well-being: Desertification synthesis*, ed. José Sarukhán and Anne Whyte (co-chairs) and MA Board (Washington, DC: World Resources Institute, 2015), 623-662.

in urban areas, endure severely about their health, putting a load on the healthcare system. A certain level of air pollution is always present in the air due to carbon emissions, but climate change fosters meteorological circumstances that make the dissemination of air pollutants in the air nearly impossible, increasing the concentration of air pollution in the atmosphere[17]. As the temperature of the surrounding environment rises, ground-level ozone forms which contribute considerably to the development of smog. In addition, variable weather conditions also harm the transmission routes of particulate matter (PM) and carbon emissions. The air quality index exceeds its permissible limits, and particulate matter levels reach their high levels. In addition, nitrogen dioxide (NO2) and sulfur dioxide (SO2) are produced in quantities that are quite hazardous, causing respiratory disorders such as chronic bronchitis, asthma, and respiratory infections. However, long-term exposure to this sort of air pollution can cause severe consequences for the public such as regular hypertension and heart attacks, which is an enormous challenge for the government and puts at risk the health of the entire population[18]. Aside from the general public, vulnerable groups such as the elderly, children, and those with pre-existing medical conditions are most severely impacted by climate-triggered air pollution[19]. It becomes a challenging task for them to even breathe in an open atmosphere, especially during smoggy seasons. For example, a leading Pakistani newspaper claimed that last year's (fall 2023) fog in Lahore caused hospital wards to fill up with sick children. Some

[17]Mohammad Perwaiz Iqbal, "Air Pollution: Challenges to Human Health in Pakistan," *Journal of the College of Physicians and Surgeons Pakistan 25*, no. 3 (2024): 507-508.

[18] "Air quality, energy and health," *World Health Organisation*, Accessed March 28, 2025, https://www.who.int/teams/environment-climate-change-and-health/air-quality-energy-and-health/sectoral-interventions/ambient-air-pollution/health-risks#:~:text=4.2%20million%20people%20die%20prematurely,and%206%25%20to%20lung%20cancer..

[19] Sana Ullah etal., "Air pollution and associated self-reported effects on the exposed students at Malakand division," *Springer Nature - PMC COVID-19 Collection 111*, no. 93 (2021): 708, doi: 10.1007/s10661-021-09484-2

of them were even brought to the hospital's emergency ward due to their severe respiratory problems[20].

Another area of vulnerability that Pakistan faces in terms of climate change is its coastal region problems, which span around 990 kilometers along the Arabian Sea[21]. In these regions, the coastal ecology is susceptible to hazards such as rising sea levels, human displacement, and flooding of low-lying areas. It has been observed that a major chunk of the land has gone missing due to these extreme weather events. This occurred primarily in the Indus Delta region[22]. Unpredictable climatic trends, high wave intensity, periodic storm surges, and other extreme weather occurrences have resulted in coastal erosion, putting coastal communities at uncertainty and damaging infrastructure. And this is going to continue in the foreseeable future; studies suggest that coastal erosion grows by one meter every year in some of these areas[23]. Saltwater intrusion is another phenomenon that occurs across Pakistan's coastlines[24]. This evolves as the sea level rises and salt water blends with freshwater flowing from the rivers. This renders the fresh water, which is supposed to be used for agricultural and domestic purposes, contaminated. According to studies, drinking water with even 2% salt mixed water

[20] "Soaring pollution in Lahore fills wards with sick children," *Express Tribune*, Accessed June 28, 2025, https://tribune.com.pk/story/2449247/soaring-pollution-in-lahore-fills-wards-with-sick-children.

[21] *Asif Inam*, "The Impact of Sea Level Rise on Pakistan's Coastal Zones– in a Climate Change Scenario," *Research Gate*, Accessed March 2, 2028, https://research.fit.edu/media/site-specific/researchfitedu/coast-climate-adaptation-library/asia-amp-indian-ocean/pakistan/Rabbani-et-al.--2008.--SLR-Along-Pakistans-Coastal-Zones.pdf.

[22] "Transforming the Indus Basin with Climate Resilient Agriculture and Climate-Smart Water Management," *Food and Agriculture Organisation*, Accessed June 24, 2025, https://www.fao.org/geospatial/projects/detail/ru/c/1619000/.

[23] Abdul Anwar, Mitchell Lindall, and R.S. Shamsi, "Coastal erosion vulnerability of Indus Delta," *Pakistan Natural Hazards 69*, no. 1 (2013): 743-768.

[24] B. M. S. Giambastiani, L. Vulliet, H. Dixon, and Russel Rossuto, "Saltwater intrusion in the Indus Delta: Preliminary results from a modeling study," *Environmental Earth Sciences 69*, no. 8 (2010): 2861-2871.

or seawater may lead to high blood pressure and kidney stress[25]. Again, climate change has brought in health concerns, which ultimately put strain on governance. And this time, saltwater intrusion contributed to this vicious cycle. These aspects have an immense effect on those neighborhoods that live along the coastline. The fishing sector is in imminent danger due to an alarming decline in fish stocks. This has culminated in an overall decrease in resources, and issues like these eventually lead to resource scarcity in regions. And it becomes the obligation of the government to supply resources in these resource-scarce locations.

In the face of the aforementioned issues, when government institutions fail to confront them in a timely and effective manner, this collapsed governance exacerbates the severity of the challenges. According to a study, coastal communities in Pakistan have suffered owing to poor coastal zone management and inadequate planning[26]. This study also found that the state must involve local communities in decision-making to achieve the intended results; otherwise, the limited measures that the government is capable of implementing will be counterproductive. One can acknowledge that these challenges are exerting a spotlight on government institutions and their performance, but there needs to be an honest endeavor from the other side too, which the state is not exhibiting.

Case Studies

One of the poignant relevant case studies is the 2010 Pakistan floods, which was one of Pakistan's worst natural disasters throughout its history. This also highlights how much strain these climate-lead calamities can impose on a country's governance systems. This catastrophe

[25] Holly Michael, "What is seawater intrusion? A hydrogeologist explains the shifting balance between fresh and salt water at the coast," *Yahoo News*.

[26] Kashif Majeed Salik, Sehrish Jahangir, Waheed ul Zafar Zahdi, and Shabeh ul Hasson, "Climate change vulnerability and adaptation options for the coastal communities of Pakistan," *Ocean & Coastal Management 112,* (2015): 61-73.

was prompted by an unprecedented downpour during the monsoon season (a symptom of unusual weather patterns driven by climate change). And in no time, one-fifth of Pakistan's total land area was submerged underwater. Overall, this calamity had an enormous impact on the lives of 20 million people, annihilating their livelihoods, houses, and, in essence, their entire ecosystem[27]. According to a World Bank estimate, Pakistan's already-strained economy suffered a total loss of whooping 43 billion dollars because of this single catastrophic tragedy[28]. The ensuing tragedy wiped out a major portion of agricultural land, devastated infrastructure, and killed livestock. According to a report, 1.93 million acres of ripe crops, combined with livestock in those areas, were lost in this calamity, leaving an indelible mark on the survivors[29]. This crisis exposed Pakistan's governing system. It received severe criticism specifically for its lack of coordination and generally for its inadequate performance[30]. One key failure that was brought up was the government's inability to communicate with the public about the timely warning of the flood, leading to more than half of the affected population being ignorant of the impending disaster. According to the Asian Development Bank, the authorities were able to alert only 38% of the total affected people[31]. That indicates that 62% of the population affected by this flood were unaware that a disaster was on its way, demonstrating criminal imprudence

[27] Asian Development Bank, *Pakistan Floods 2010: Rapid Damage and Needs Assessment, (2011),* https://www.adb.org/sites/default/files/linked-documents/44372-01-pak-oth-02.pdf.

[28] World Bank, *Pakistan Floods: 2010 Post-Disaster Needs Assessment,* https://documents.worldbank.org/en/publication/documents-reports/documentdetail/099910001032330716/pdf.

[29] Syed Iazaz Ahmad Bukhari and Syed Shahid Hassan Rizvi, "Impact of 2010 Floods on Pakistan's Agriculture," *Journal of Environmental & Analytical Toxicology* 07, no. 01 (2017): 1-4, doi:10.4172/2161-0525.1000424.

[30] A. N. Khan, and F. H. Khan, "Post-disaster recovery in Pakistan: An analysis of the 2010 floods," *Journal of South Asian Development 10,* no.2 (2015): 189-212.

[31] Asian Development Bank, *Pakistan Floods 2010: Rapid Damage and Needs Assessment*, (2011), https://www.adb.org/sites/default/files/linked-documents/44372-01-pak-oth-02.pdf.

and incapability in the state's governance infrastructure. Another organization that drew attention during the 2010 floods was the National Disaster Management Authority (NDMA), which was established nearly three years before the disaster, in 2007. The only objective of its inception was to take preventative measures to combat disasters, but it failed miserably to confront the floods' repercussions due to lack of resources and the unprecedented severity of these floods[32]. The government launched a 4.4 billion dollar response plan, which failed to achieve even its primary objectives[33]. Bureaucratic constraints, along with the budget shortage, left the affected people helpless.

Another pertinent case study is the water crisis that Pakistan's largest province, Balochistan, is experiencing. Climate change and governance failures have had severe consequences in this crisis. Balochistan's naturally arid climate receives only 50-250 mm of precipitation each year, which is significantly less than Pakistan's national average[34]. Climate change disrupts an already delicate weather system, causing the ecosystem to yield even less precipitation. Thus, climate change consequences, such as reduced precipitation and glacier melting become major contributors of Balochistan's water scarcity crisis. The societal conflict for resources, as mentioned earlier in this essay, is present on ground in this case. The competition for access to the already scant water resources fosters tensions between Balochistan's numerous tribes. This conflict situation becomes much more acute in communities that rely on agricultural or livestock rearing, putting an immense burden on the government to control law and order situation while providing resources to resource scarce

[32] Khan, A. N., & Khan, F. H. (2015). Post-disaster recovery in Pakistan: An analysis of the 2010 floods. *Journal of South Asian Development*, 10(2), 189-212.

[33] World Bank, p*akistan Floods: 2010 Post-Disaster Needs Assessment. (2011),* https://documents.worldbank.org/en/publication/documents-reports/documentdetail/099910001032330716/pdf

[34] Government of Balochistan, Irrigation Department, (2022), https://www.facebook.com/SamiBalochEngr/

populations[35]. Due to the lack of a formal water management system by the government, traditional water management systems known as Karez are used in Balochistan which are based on informal agreements between dwelling groups. However, these methods of management are insufficient to address the emerging grave water scarcity scenario, necessitating the state's involvement in resolving the issue. This situation of the climate-led emergency in Balochistan demonstrates how environmental factors can be a burden on the governing system while also exposing its vulnerabilities. Asian Development Bank has also emphasized the issue of water scarcity, stating that it can lead to tensions in society and impede the society's potential for sustainable development[36].

Literature Review

The interplay of climate change and governance is a topic that many scholars and researchers delved into. They explored the implications and the dynamic of this relationship. This literature review seeks to delve into the relevant theoretical frameworks and relevant research studies of developing countries and the reasons why there is a gap in the research sector in Pakistan specifically when it comes to the topic of nexus between climate change and governance. The Climate Conflict thesis is one of the theoretical theories that contend that climate change repercussions may give rise to economic, political, and social conflicts in society[37], as demonstrated in the Balochistan water scarcity crisis. According to this concept, when there is an acute shortage of resources or food security in a society, it triggers an

[35] Rafi Khan, Dr.M.M. "Scarcity of water in Quetta – a way forward," *Journal of Positive School Psychology*, Available at: https://journalppw.com/index.php/jpsp/article/view/15895.

[36] Asian Development Bank, Climate Change and the Future of Water in Asia, (2017), https://www.adb.org/publications/sector-briefing-climate-change-impacts-and-adaptation-water-supply-and-sanitation

[37] Ole Magnus Theisen, Helge Holtermann, & Halvard Buhaug, "Climate Wars? Assessing the claim that drought breeds conflict," *International Security*, 36(3), (2013): 79-106.

environment conducive to the collapse of governance structures, which subsequently contributes to disputes among different communities. Scientists have also investigated the theory of Environmental Security. According to this, climate change may have an impact on the survival of humans by disrupting the planet's vital resources and aggravating pre-existing vulnerabilities[38]. Thus, this notion encourages international environmental forums and state governments to formulate policies aimed at addressing climate change concerns and accomplishing sustainable development.

Different case studies from across the world especially from the developing countries related to the interconnection of climate change and governance are also useful resources for valuable insights. For instance, in the region of sub-Saharan Africa, researchers have observed that climate-triggered water and land-related scarcity is one of the major contributors to social unrest and collapse of governance structure. It has also been noted that climate change has also affected their agricultural productivity which led to tension among the society, thus causing social unrest[39]. Experts in the Asia-Pacific region have identified that coastal regions and island nations are particularly susceptible to climate change's implications, such as rising sea levels and coastal erosion[40]. Because of the immense risk that coastal communities confront, it becomes the additional duty of the government to safeguard them from any impending destruction and, in some cases, to relocate entire populations. For example, Fiji, a republic of over 300 islands in the South Pacific, recently decided to relocate 42 of its villages to more

[38] Jon Barnett, "Security and climate change," *Global Environmental Change*, 13(1), (2003): 7-17.

[39] Cullen Hendrix, Idean Salehyan, "Climate change, rainfall, and social conflict in Africa," *Journal of Peace Research*, 49(1), (2012): 35-50.

[40] Benjamin Sovacool, "Perceptions of climate change risks and resilient island life in the Republic of Marshall Islands," *Mitigation and Adaptation Strategies for Global Change*, 17(7), (2012): 773-800.

secure territories over the next ten years, with six already relocated as of today[41]. They are doing so in response to the severe impacts of climate change, such as rising sea levels and the recurring cyclones that cost human lives. This is a prime illustration of the government bearing an enormous burden by moving such a large number of people from one location to another to protect them from the fatal impacts of climate change.

There are multiple research studies worldwide examining the intersection between climate change and governance, but there is still a huge research deficiency when it comes to Pakistan's specific predicament. Studies and research conducted in Pakistan have focused either on the effects of climate change or on the challenges associated with governance, but they have not examined how both of these factors are influenced by one another[42]. To close this gap, research on the relationship between climate change and governance must be done at both the national and local levels in order to understand how these two elements, which have an immediate influence on one another, affect Pakistan[43]. This will assist Pakistan in diagnosing the problems brought about by the interaction between governance and climate change. It will also help policy makers to formulate policies and initiatives specifically intended to tackle these unique Pakistan centric concerns and implement adaptive measures. There is evidence that cross-disciplinary study that integrates perspectives from various disciplines, such as economics, political science and environmental sciences, can be of great assistance when

[41] *How to move a country: Fiji's radical plan to escape rising sea levels Prevention Web*, (2022), Available at: https://www.preventionweb.net/news/how-move-country-fijis-radical-plan-escape-rising-sea-levels#:~:text=At%20present%2C%2042%20Fijian%20villages,being%20added%20to%20the%20list.

[42] Khan, N., & Khan, M. "Climate Change and Its Impact on Governance in Pakistan," LUMS Economics Working Paper Series, (2015), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2686989

[43] Mustafa, D., Akhter, M., & Nasrallah, N. "Understanding Pakistan's Water-Security Nexus," United States Institute of Peace, (2013), https://www.usip.org/sites/default/files/PW88-Understanding%20Pakistan%E2%80%99s%20Water-Security%20Nexus.pdf

designing policies based on empirical data[44]. In fact, states embracing this interdisciplinary research as an essential and compatible approach to comprehend their challenges and devise policies that tackle them. Pakistan should also concentrate on this specific multidisciplinary research in order to combat the compounding implications of climate change and governance.

Dimensions of Climate-Governance Nexus in Pakistan

- **Resource Scarcity and Climate Impacts on Water Crisis:**

As mentioned earlier, resource scarcity is a serious aggravating effect of the governance-climate change nexus which has the potential to demolish Pakistan's socioeconomic stability. This cascading effect tends to exacerbate existing vulnerabilities and deplete Pakistan's already-dwindling vital resources, such as fresh water. Pakistan is prone to these constraints because of the prospective effects of this increasing water scarcity, which transcend beyond agriculture to include water-intensive industries[45]. Abnormal increases in temperature and evapotranspiration interrupt the water cycle, which consequently leads to glacier melting and erratic periods of precipitation[46]. Water shortages spurred by climate change inevitably place an excessive burden on governance. As we encountered in the case study of the water scarcity crisis in Balochistan, this phenomenon may trigger fierce competition and strife amongst communities for access to this resource. Furthermore, the situation could grow worse if governance lacks the capacity to take on this responsibility to

[44] Kreft, S., Eckstein, D., Melchior, I. *"Global Climate Risk Index 2017"* Germanwatch, (2017), https://germanwatch.org/en/12978

[45] Akhtar, S., Kashif, M., & Abida, A., "Impact of climate change on water availability and crop water requirements of upper Indus basin," *Pakistan Journal of Agricultural Research,* 34(1), (2021): 163-170. https://doi.org/10.17582/journal.pjar/2021/34.1.163.170

[46] Adnan, S., Mahmood, R., & Hassan, D., "Evidence of climate change in Pakistan: Contemporary precipitation and temperature regime analysis," Environmental Challenges, 6, (2022): 100381. https://doi.org/10.1016/j.envc.2021.100381

deal with the water scarcity challenges wrought by climate change. As a result of this cascading effect of governance and climate change, disastrous outcomes such as violent disputes might be observed within society.

A study indicates that in the next few decades, the Hindu Kush Himalayan region, one of Pakistan's largest mountain ranges, may lose a substantial percentage of its ice mass from its glacier reservoirs[47]. This will have a considerable impact on the meltwater contribution to the Indus River, which is Pakistan's primary source of water for agriculture. The World Bank has also issued a warning, stating that as time goes on, severe climate phenomena like droughts and monsoons will become more prevalent[48]. As an illustration, one can examine how Karachi's governance and infrastructure collapse every year during the monsoon season, causing enormous financial and human losses. For example, only in 2020 other than the economic losses, 40 human lives were lost during the monsoon season[49]. Both climate change and ineffective governance are to blame for this, with each amplifying the impact of the other. These scenarios not only deplete water supplies but also create erratic seasonal fluctuations making it challenging for governing bodies to implement water management strategies.

Another key variable in Pakistan's water crisis is the country's irrigation infrastructure. Two-thirds of the nation's network of canals are unlined, as reported by the International Water Management Institute. Since there is no barrier blocking water from infiltrating into the soil, these open canals serve as the source of earthen channels. Although this loss may not appear

[47] Relief Web, "*Melting at the world's 'third pole' endangers south asia - Pakistan* (2023)" Available at: https://reliefweb.int/report/pakistan/melting-worlds-third-pole-endangers-south-asia (Accessed: 21 April 2025).

[48] *World bank*. Available at: https://climateknowledgeportal.worldbank.org/sites/default/files/2021 05/15078-WB_Pakistan%20Country%20Profile-WEB.pdf (Accessed: 21 May 2025).

[49] United States Institute of Peace, *"In Karachi, flooding lays bare city's governance issues*," (2020), https://www.usip.org/publications/2020/10/karachi-flooding-lays-bare-citys-governance-issues

significant, it does drain a significant amount of water because this process operates in two-thirds of Pakistan's entire network of canals. As a result, seepage rates from these uncovered canals may be extremely high. According to a report, between 25 and 50 percent of the total water volume is diverted due to seepage through unlined canals[50]. Thus, a significant amount of water finally dissipates before it reaches its intended destination—the fields. With a significant portion of canal water lost through seepage, the actual amount reaching farmlands is considerably less than what's initially diverted. This directly impacts agricultural productivity, potentially leading to crop failures and decreased food security. The water lost through seepage from unlined canals is essentially "gone" from the system. It doesn't contribute to replenishing groundwater aquifers or flowing downstream to meet the needs of other users. This further exacerbates Pakistan's existing water scarcity issue. Seepage from unlined canals can also lead to waterlogging and salinization of surrounding land. This occurs when excess water raises the water table, causing salts naturally present in the soil to rise to the surface. Waterlogged and saline lands are rendered unsuitable for agriculture, further diminishing Pakistan's already limited arable land. Unlined canals require constant maintenance to remove weeds and silt buildup, which can further impede water flow. This adds an additional burden on already strained water management resources. Seepage losses tend to be higher at the head of the canal network, where water pressure is greatest. This translates to farmers located at the tail end of the canal system receiving a significantly lower share of irrigation water, exacerbating existing inequalities.

- **Food Security:**

[50] *Study of seepage losses from irrigation,* Available at: https://www.osti.gov/etdeweb/servlets/purl/20871720.

The correlation of governance and climate change poses a serious risk to Pakistan's food security. This is aside from its well-established detrimental effects on agriculture, which were previously discussed in this essay. In Pakistan, the livestock industry is crucial to the country's food security. It serves as the main source of protein for foods like dairy and meat. However, animals that are prone to heat stress due to global warming will eventually experience adverse impacts on their growth, health, and overall production[51]. Scarcity of food may result from this scenario in the communities, particularly for communities whose primary source of nutrition is livestock. Pakistan's coastline is home to a rich ecology with an abundance of fish species that considerably impact both the quality of life for the communities that live there and the country's food security. Yet, the viability of Pakistan's fisheries is being threatened by climate change, which is also affecting this vital supply. For instance, the rising sea surface temperatures (SSTs) is one of the major issues plaguing Pakistan's fisheries. According to a study, the Arabian Sea is becoming warmer, and by the end of the twenty-first century, this temperature rise could reach two degrees Celsius[52]. As a result, the marine ecosystem, fish breeding grounds, and fish dispersal patterns will all be greatly impacted. Temperature sensitivity makes important fish species like mackerel and tuna prefer colder climates. Therefore, if sea temperatures rise, these species may relocate to deeper waters or to colder places that may be outside Pakistan's Exclusive Economic Zone (EZZ). As a result, it will restrict the access to these fish species for the local fishermen. Another study found that the development of hypoxia zones is correlated with an increase in water temperature. The

[51] Muhammad Jamil, Iram Shakeel, Habib Ullah, Mukhtar Ahmad, and Saeed Ullah, "Livestock in Pakistan: An Insight into Climate Changes and Impacts," *Journal of Bioresource Management*, Vol. 09, Issue 04, Available at: https://corescholar.libraries.wright.edu/cgi/viewcontent.cgi?article=1505&context=jbm.

[52] *With rising temperatures, Arabian Sea no longer cool* (2024) *Outlook India*, https://www.outlookindia.com/national/with-rising-temperatures-arabian-sea-no-longer-cool-news-294236.

water in these zones has barely any dissolved oxygen in it. That's why in these hypoxia zones, marine life either migrates or perishes from suffocation[53].

- **Energy Security:**

The energy security of Pakistan has also become vulnerable due to the side effects of climate change. Extreme weather events such as cyclones, floods and heatwaves directly impact the country's energy infrastructure including power plants, transmission lines and distribution networks[54]. All of this causes power outages, which raises maintenance expenses and imposes an added burden on the government. Extreme weather events, such as heat waves, place immense strain on electrical grids due to high demand for cooling, and floods can overrun power plants while washing away transmission lines and disrupting fuel supply chains[55]. Power outages like these, especially during monsoon seasons and floods, have lasting effects on both domestic and commercial electricity consumers. For instance, on January 23, 2023, Pakistan experienced a nationwide power outage. A senior official at the Pakistan Chamber of Commerce and Industry (FPCCI) described that day as "Like we are at war". Because the single-day power outage cost the already fragile economy of the country $300 million. Furthermore, this was the second country-wide power outage in three months, resulting in massive economic losses, shackling the governance system[56].

---

[53] Christopher J. Gobler and Hannes Baumann, "Hypoxia and acidification in ocean ecosystems: Coupled dynamics and effects on Marine Life," *Biology letters*, (2016), https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4892234/.

[54] Surabhi Sahu, Kenneth Foo, and Haris Zamir, "Pakistan floods endanger power plants, aggravate energy crisis," *S&P Global, Commodity Insights*, (2022), https://www.spglobal.com/commodityinsights/en/market-insights/latestnews/energy-transition/091422-pakistan-floods-endanger-power-plants-aggravate-energy-crisis.

[55] *CISA*. Available at: https://www.cisa.gov/sites/default/files/2023-12/23_0906_oia_IEWE%20508.pdf.

[56] Person, *'like we are at war': Nationwide power outage shuts industry, causing $300 million losses*, *Arab News PK*, (2023), Available at: https://www.arabnews.pk/node/2238056/pakistan

Policy Recommendations

In order to tackle the interrelated constraints posed by climate change and governance-related issues, the state must develop novel strategies, make prudent investments, and build climate-resilient infrastructure. Here are policy proposals to promote sustainable development while enhancing climate resilience to address the aforementioned challenges:

As agriculture sustains a large proportion of Pakistan's population, addressing the issue of food security in the face of climate change is critical. Policies that can strengthen climate resilience and encourage sustainable resource management include:

- Developing heat-resistant and drought-tolerant breeds of crops through agricultural research centers to cope with rising temperatures and water scarcity[57].
- Implementing innovative irrigation systems like drip irrigation and rainwater harvesting. This will greatly help to conserve the limited water supply[58].
- Implementing agroforestry practices can help address erosion issues. This will also help to improve soil health and increase carbon sequestration.
- One of the most essential combat measures would be to build warning systems and preparedness strategies to respond promptly to climate change disasters like floods. This can be accomplished by financing and expanding the network of high-accuracy weather monitoring systems, with a greater emphasis on high-risk areas.
- Training farmers and those relying on agriculture to withstand climate-related disasters such as floods and recover from the aftermath.

[57] Lamaoui, M. *et al.*, Heat and drought stresses in crops and approaches for their mitigation, *Frontiers*, (2018), https://www.frontiersin.org/articles/10.3389/fchem.2018.00026/full (Accessed: 28 May 2025).

[58] Farrukh, Water conservation methods in agriculture, *H2O Global News*, (2023). https://h2oglobalnews.com/water-conservation-methods-in-agriculture/

Climate resilient infrastructure is of paramount importance in Pakistan for confronting environmental issues and improving governance in order to mitigate the implications of climate change. This can be accomplished by a variety of techniques, including:

- To boost climate resilience, prioritize vital infrastructure such as transportation, energy, and water using internationally recognized design standards and risk assessments. Other initiatives, such as capacity building for essential stakeholders, innovative financing, and public-private partnerships, can play a vital role in this situation.
- To protect coastal communities, an integrated coastal management zone should be established. This will protect them and coastal infrastructure from climate change-related hazards such as coastal erosion, storm surges, and sea level rise.
- Investing in climate-resilient housing and urban planning initiatives can help cities and urban communities become more resilient to climate change.
- Green infrastructure options, including wetlands, permeable surfaces, and urban forests, can minimize heat island effects and flooding.
- Initiating a strategy to utilize international climate finance and public-private partnerships for large-scale infrastructure projects can contribute to sustainable development.

Effective governance is critical to the effective implementation of climate initiatives and strategies. Combating corruption and encouraging transparency are essential for ensuring productive resource allocation and public trust in government systems. Aside from that, tailored approaches are required to address unique governance issues aggravated by climate change. The proposed measures include:

- Preventing misguided allocation of climate change funding, it's essential to strictly enforce anti-corruption laws and establish efficient enforcement mechanisms.
- Open data initiatives, independent auditing, and data sharing can assist build public trust. In the long run, they will contribute to increased transparency and governance[59].
- Implementing e-governance solutions to streamline bureaucratic processes can reduce the risk of corruption to a large extent.
- Cross-party consensus is essential for implementing climate change initiatives during political transitions.
- By Utilizing international financing for green initiatives such as solar power and motivating organizations such as the textile industry to employ recycled materials with tax incentives. Carbon pricing can be utilized as well to encourage polluters to choose cleaner alternatives.

Conclusion

Pakistan's experience with recurring climate-induced disasters has demonstrated how deeply intertwined environmental stresses and governance challenges have become. These events collectively reveal how institutional weaknesses ranging from coordination failures to inadequate resource management magnify the impacts of climate shocks. Case studies of major climate induced disasters and ongoing the water crisis in Balochistan illustrate how environmental pressures can strain governance and destabilize socioeconomic governance. The arguments laid down in this essay urge for interdisciplinary and comprehensive measures to tackle the challenges created by this nexus, such as energy disruption, rising temperatures, food

[59] Data Europe.EU (2023) Rethinking the impact of open data. Available at: https://data.europa.eu/sites/default/files/report/Rethinking%20impact%20of%20open%20data.pdf (Accessed: 28 March 2024).

poverty, and resource scarcity. It was also noted that the current governance structure must be strengthened to properly allocate resources, implement policies, and be aligned with climate change mitigation efforts. To address the climate governance nexus in Pakistan, various tiers of government, local communities, and civil society organizations will need to implement context-specific policies. This would need policymakers to develop policies that consider the cultural, socioeconomic, and ecological contexts of various regions around the country. Another approach would be to improve the skills and mindsets of government officials, policymakers, and other stakeholders to address these challenges.

Moreover, there is a dire need to fix the research deficit in Pakistan associated to the climate change and governance nexus. Given the country's susceptibility, researchers have to diagnose these challenges by conducting localized, evidence-based, and context-specific research. This will assist policymakers in developing efficient strategies for climate change diminution, adaptation, and resilience development. This would help not only to better understand these challenges but also strengthen governance structures. To address the climate governance nexus in Pakistan, collaboration among all relevant stakeholders is indispensable. Only a well-planned, context-specific, and thoroughly analyzed effort can be effective and then Pakistan would be able to strengthen its governance structure, allowing it to control and adapt to the challenges posed by climate change.