Climate Vulnerability and Disaster Governance in Pakistan: The 2022 Monsoon Floods and the Evolution of Flood Management (2022–2026)

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Abstract: In spite of its below one percent global GHG emissions, Pakistan is extremely vulnerable to climate hazards. Of these risks, extreme monsoon rainfall and flooding pose a significant threat to human life, agriculture, infrastructure, livelihoods and economic stability. Monsoon floods in 2022 were one of the most devastating floods in the recent history of the country, affecting over 33 million people and resulting in more than US$30 billion in damages and losses across the country. This article takes the 2022 floods as a case study of the relationship between climate risk and disaster governance in Pakistan and continues the analysis until 2026 to see what happens next in terms of preparedness and flood management. The study employs a qualitative case study approach and document analysis, utilising rainfall data from Pakistan Meteorological Department, National Disaster Management Authority plans, PDNA, government policy documents and peer-reviewed literature on climate adaptation and disaster risk. It also explores if the reforms and preparedness measures put in place since 2022 have enhanced Pakistan's capacity to respond to the risks of the future monsoon. By 2026, the article identifies that mechanisms to provide early warnings, take anticipatory actions, coordinate between agencies, and plan for disaster have become more explicit, in Pakistan. But ongoing implementation gaps, vulnerability of infrastructure, risk-informed planning, and institutional capacity remain a constraint to the effectiveness of these measures. The research finds that to achieve climate resilience, a response to the crisis is not enough. It relies on translating meteorological warnings to the right action, incorporating DR into development planning, and building institutional capacity between disasters.

Keywords: Climate Change; Pakistan; Monsoon Floods; Disaster Governance; Climate Vulnerability; Flood Management; Disaster Risk Reduction; Climate Adaptation

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Introduction: Pakistan's climate change has emerged as an important challenge for development and governance. The country faces various climate risks such as flood, heat wave, drought, altered precipitation and risk from the cryosphere. Outside the environmental realm, these hazards can have impacts on agriculture, infrastructure, public health, livelihoods, poverty and economic security. Climate related disasters have been deemed a significant threat to Pakistan's development and adaptation and resilience must be better linked to economic planning (World Bank, 2022a). Pakistan's situation is especially precarious as the contribution from its GHGs is small, compared to the risks it faces due to climate change. This vulnerability was exposed in the national scale during the flood of 2022, with an extreme monsoon situation turning into a significant humanitarian and economic challenge (World Bank, 2022b).

Flood risk can be understood only in terms of the amount of rainfall received, however. Impacts of a flood are dependent on the characteristics of the physical hazard and the circumstances of people and infrastructure. Consequences of extreme rainfall can be exacerbated by factors such as settlements in exposed areas, poor drainage, poor protection infrastructure, lack of access to timely warnings, poverty, environmental degradation and institutional coordination weaknesses. Hence, the climate risk–preparedness–governance–local vulnerability link has become a growing research interest in Pakistan for flood management issues. A study on flood risk management in urban Pakistan, for instance, identified that local institutions still used reactive strategies and a lack of effective governance and limited corrective action was responsible for the ongoing flood risk (Khan et al., 2021).

The monsoon system in 2022 is an important case to study such issues. Rainfall in the country during July to September 2022 has been 175 per cent higher than the average, according to the Pakistan Meteorological Department. It was topographically very unevenly distributed. Sindh had received 426 percent of the average rainfall while Balochistan had 450 percent of the average rainfall. The total amount of rainfall recorded in Punjab was 70% more than the normal amount, in Gilgit-Baltistan it was 104% more, while in Khyber Pakhtunkhwa it was 33% more (PMD, 2022). PMD also said August was unusually wet, as the national rainfall was 243 per cent higher than normal and rainfall shortfall in Sindh and Balochistan was 726 per cent and 590 per cent respectively. The figures show the unusual character of the 2022 monsoon and the potential for analysis of the event as a LARGE SCALE FLOOD RISK CASE from a meteorological perspective.

Extensive flooding occurred in several areas due to extreme rainfall. After floods, a Post-Disaster Needs Assessment was done by the Government of Pakistan and Asian Development Bank, European Union, United Nations agencies, and World Bank. The estimates of physical damage were an estimated US$14.9 billion, economic losses an estimated US$15.2 billion, and reconstruction and rehabilitation needs at least US$16.3

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billion. Losses were particularly heavy in the housing, agricultural and livestock industries, as well as the transport and communications sectors. The province of Sindh was the worst hit with damages and losses accounting for nearly 70 percent of the total damages and losses (Government of Pakistan et al., 2022).

The human toll was also devastating. Over 33 million were affected and over 1,700 people lost their lives. Millions were displaced and homes, farmland, roads, bridges, health facilities and other infrastructure were destroyed, disrupting the economic and social life in affected areas. The Post-Disaster Needs Assessment also estimated the possibility of a rise in the national poverty rate by 3.7 to 4.0 percentage points and the potential increase of poverty among 8.4 to 9.1 million people as a consequence of the floods (Government of Pakistan et al., 2022).

The magnitude of the calamity brings to mind some pertinent considerations on the link between climate change and disaster management. Stating the floods were a result of poor governance would be an understatement. This was an exceptional amount of rainfall and the Pakistan Meteorological Department has determined that the atypical monsoon pattern was caused by both atmospheric and climatic conditions. On the other hand, it would be a mistake to attribute effects of the lost only to extreme weather. Climate hazard interacts with human exposure and vulnerability to become a disaster. Institutional and socioeconomic factors impact how communities can be warned, evacuated, protected, and supported during emergencies and recover from losses.

Hazard and vulnerability are thus the main concepts in this study. The effects of hazards, caused by climate change, are the result of human choices and institutional capabilities. Pakistan's World Bank Country Climate and Development Report (CCDR) states that the climate risks may seriously hinder economic development and poverty alleviation and urges more investment in adaptation and resilience (World Bank, 2022a). This means that the climate policy is no longer about emissions reduction. Adaptation and disaster-risk reduction are both crucial in a very vulnerable country like Pakistan.

The 2026 National Disaster Management Plan is significant, as it introduces a concept of disaster management as a process of preparedness and institutional learning rather than just emergency response. The plan highlights the need to increase coping capacity, preparedness and response mechanisms and learn from past disasters. The 2026 Monsoon Contingency Plan also aims to increase the operational, measurable and trigger-based nature of planning to enable warnings to trigger response before avoidable losses can occur (NDMA, 2026).

This distinction between climate change and single weather events is also crucial for this argument. The flood event of 2022 in Pakistan cannot be narrowed down to a climate driver only. PMD's observations reveal the heavy rainfall received during the monsoon period; the climate research reveals the potential for changes in the climate system and temperature to affect extreme precipitation and flood risk. So the correct way of looking at climate change is not as a sole cause of each and every flood, but rather as a compounding exposure and vulnerability that already exists.

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The research is, therefore, centered on two interrelated aspects. First, the meteorological and physical features of the 2022 monsoon are examined, based on PMD data and other available resources. Second, it reviews the Pakistani Governance Response to Disasters preparedness, early warning, institutional coordination, infrastructure and the post-disaster planning. The next five years (2022-26) will be looked at to see if institutional changes have taken place based on the lessons learned from 2022.

Literature Review: Research on climate-related disasters has increasingly moved away from treating disasters as purely physical events. Earlier approaches often placed emphasis on the intensity of a hazard, such as rainfall, river discharge, or storms. More recent scholarship argues that disaster outcomes are also shaped by exposure, vulnerability, institutional capacity, and the ability of communities and governments to prepare for and respond to hazards. The literature on disaster risk provides an important foundation for this approach. The United Nations Office for Disaster Risk Reduction (UNDRR, 2015) defines disaster risk through the interaction of hazards with exposure, vulnerability, and capacity. The Sendai Framework consequently places considerable emphasis on understanding disaster risk, strengthening governance, investing in resilience, and improving preparedness for effective response.

Climate vulnerability is similarly understood as more than exposure to climatic hazards. The Intergovernmental Panel on Climate Change (IPCC, 2022) identifies vulnerability as a major factor determining the consequences of climate-related hazards and notes that social and economic conditions influence the ability of populations to cope with and recover from climate impacts.

Pakistan-specific research supports this broader understanding of flood risk. (Manzoor et al., 2022), in their review of empirical research on floods in Pakistan, identify flooding as a recurring source of social and economic losses and examine the limitations of conventional flood-control approaches. Research at the local level further demonstrates the importance of vulnerability. (Nazeer and Bork, 2021) examined flood vulnerability in Khyber Pakhtunkhwa and found that vulnerability varied across localities according to social, economic, physical, and environmental conditions. Research concerning Pakistan's urban areas also points towards weaknesses in flood governance. (Khan et al., 2021) examined flood-risk management in Pakistan's urban context and highlighted problems associated with rapid urbanisation, inadequate planning, institutional limitations, and insufficient attention to risk reduction.

The 2022 floods generated a further body of research examining the scale and distribution of the disaster. The Post-Disaster Needs Assessment conducted by the Government of Pakistan with support from the Asian Development Bank, European Union, United Nations agencies, and World Bank provides the most comprehensive official assessment of the event. It estimates more than US$14.9 billion in physical damages, approximately US$15.2 billion in economic losses, and at least US$16.3 billion in reconstruction and rehabilitation needs. The assessment also examines the effects on housing, agriculture, transport, health, education, livelihoods, and other sectors (Government of Pakistan et al., 2022).

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Other research has used remote sensing and spatial data to examine the geographical consequences of the 2022 floods. (Nazir et al., 2023), for example, combined satellite imagery with population and infrastructure data to identify areas exposed to floodwater. Their analysis demonstrated the usefulness of combining flood mapping with information about populations and infrastructure for disaster planning. A related strand of literature examines adaptation and resilience. The World Bank's Pakistan Country Climate and Development Report identifies climate change as a significant threat to development and argues that Pakistan needs to integrate climate adaptation into economic planning and public investment (World Bank, 2022a).

This gap is particularly relevant after the 2022 floods. The disaster was followed by extensive recovery planning and renewed attention to preparedness, early warning, coordination, and resilience. NDMA's subsequent contingency plans provide evidence of attempts to strengthen preparedness and develop more systematic arrangements for monsoon-related hazards. The 2026 planning framework, for example, places greater emphasis on preparedness, defined responsibilities, coordination, and timely action. These developments create an opportunity to examine disaster governance not only at the moment of crisis but also as an evolving institutional process.

Research Question: To what extent did the 2022 monsoon floods expose weaknesses in Pakistan's disaster governance, and how far have flood-management and preparedness mechanisms evolved between 2022 and 2026?

Theoretical Framework: The Vulnerability and Capacity Framework is applied to this study to analyze the dynamics among climate hazards, exposure, vulnerability and disaster-management capacity. The framework is suitable since the main point of the study is that an extreme event has consequences that are not solely due to the physical hazard.

Disaster risk is assumed to be the product of a hazard and the conditions under which people and infrastructure are exposed. A large rain event can cause some harm in a well-drained area that has good warning systems, strong infrastructure and low exposure. Extensive losses can result from the same event in a vulnerable area, in weak infrastructure, in widespread poverty and in institutions that are under-resourced.

The latter is in line with the framework on disaster risks established under the Sendai Framework. According to UNDRR (2015), the essential priorities are to grasp the disaster risk, enhance disaster risk governance, invest in disaster resilience and preparedness.

This study consists of three main analytical parts of the framework.

The first is hazard, which is a physical climatic event. For the current situation, that encompasses the highly anomalous monsoon rain that occurred in 2022, reported by the Pakistan Meteorological Department. Second, vulnerability is the circumstances that make damage more likely in the event of a hazard. There is a wide variation in the vulnerability of flood across the locations and communities in Pakistan as reported in literature. (Nazeer & Bork, 2021).

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Third, capacity is the capacity of institutions and communities to predict, plan, react and rebuild hazards. The framework enables the study to distinguish between the intensity of the hazard and the conditions of governance influencing the impact of the hazard. This difference is at the heart of the research argument.

Research Methodology: The study uses a qualitative case study approach that focuses on the 2022 monsoon floods in Pakistan and its implications for disaster governance until 2026. A case study approach is suitable because the research aims to gain insight into how an extreme climatic event relates to the institutional setting of preparedness, response and policy development.

Document analysis is adopted as the main research method of the study. The evidence comes from four sources.

Firstly, official Pakistani sources such as Pakistan Meteorological Department and National Disaster Management Authority. The second type are official assessments after the disaster and during development. Since PDNA is developed on the basis of an internationally recognized damage, loss and needs assessment process it gives an important benchmark to understand the magnitude of the disaster (Government of Pakistan et al., 2022). The third includes peer-reviewed academic studies of climate vulnerability, flood management, disaster governance and the socio-economic impact of flooding in Pakistan. The fourth category are existing international institutional sources such as the World Bank, IPCC and UNDRR.

The analysis is done in three stages. The study determines the scale and nature of the 2022 monsoon, based on the analysis of PMD data and official evaluation. Second, it analyzes the conditions that contribute to increased exposure and vulnerability, such as socioeconomic, infrastructural and institutional aspects, as described in the literature and official assessments. Third, it analyzes the changes taking place from 2023 to 2026 to gauge the institutional learning and preparedness in Pakistan's disaster-management framework.

This study has a number of limitations. As for the first, disaster governance is a multi-level governance process, and there is unequal publicly-available evidence across provinces/districts. Second, information about disaster response is not available to the public in some operational aspects. Thirdly, the study focuses on a relatively limited span of the post-disaster phase, from 2023 to 2026, which may not be sufficient to assess long-term impacts of institutional reforms. Lastly, as this study is based largely on documentary evidence, it does not fully represent the experience of affected communities.

Historical Context: The debate over climate change is not a recent phenomenon, the vulnerability of Pakistan to floods is much older. The country has been prone to flooding several times due to its monsoon system, vast river network, agricultural land and settlements being vulnerable to flooding, and reliance on the Indus Basin.

The 2005 earthquake was an important institutional turning point. The disaster caused loss of life of about 73,000 people and damage to property and infrastructure, necessitating the development of a more robust national disaster response and coordination mechanism. Later a National Disaster Management Authority (NDMA) was set up under the National Disaster Management Ordinance 2006 (replaced by the National Disaster Management Act 2010). The

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institutional mechanism was established to shift the disaster management process from relief to preparedness, mitigation, response and recovery. In the aftermath of the 2005 earthquake, the World Bank's support helped to create a broader shift from the traditional response-based approach to a more proactive disaster-risk management (World Bank, n.d.).

The 2010 floods were the next big challenge to this fledgling system. The floods started from the summer monsoon season and covered a significant portion of the country. The World Bank and Asian Development Bank estimated total damage and losses at around US$9.7 billion, of which the agricultural sector was hit the hardest along with the livestock sector. In addition, the assessment indicates that there was significant damage to housing, roads, irrigation facilities and other productive assets (Asian Development Bank & World Bank, 2010).

The 2010 disaster stressed the public infrastructure and financial resources and highlighted the limitations of a mostly emergency response-based system (World Bank, 2010). Over 20 million people were affected and nearly 1 out of every 5th area of Pakistan was impacted. The 2010 experience brought the issue of DRR and reconstruction to the fore. The following policy approach involved investing in infrastructure, emergency response systems, cash assistance and systems for recovery. Over one million households affected received cash transfers through the Citizen's Damage Compensation Program, supported by the World Bank and other international partners. The program also involved grievance mechanisms and provisions to enhance transparency and accountability over the distribution of assistance (World Bank, 2011).

The prolonged period from 2010 floods to 2022 disaster also saw rising awareness of the impact of climate change on Pakistan's future risk profile. South Asia has been recognized by the Intergovernmental Panel on Climate Change (IPCC) as an area vulnerable to growing climate-related hazards, such as changing extreme rainfall and flooding (IPCC, 2022). Climate change has also been identified as a key threat to development by the World Bank's Pakistan Country Climate and Development Report, which calls for greater investments in adaptation and resilience (World Bank, 2022a).

These floods of 2022 happened in this already fragile environment. According to the data of the Pakistan Meteorological Department, the monsoon rainfall during 1st July to 30th September 2022 was 175% of the national average. This regional variation was especially noteworthy. In Sindh, rainfall was 426 percent above normal while Balochistan's rainfall was 450 percent above normal. The rainfall was 70 percent (PMD, 2022) above normal in Punjab, 104 percent in Gilgit-Baltistan and 33 percent in Khyber Pakhtunkhwa.

According to PMD, the heavy rains led to catastrophic flash floods in eastern and southern Balochistan, Sindh, South Western Punjab and Khyber Pakhtunkhwa, where crop and property damage was reported with over 1700 fatalities (PMD, 2022).

The effects started to be seen in various fields. According to the Post-Disaster Needs Assessment conducted in 2022, the cost of reconstruction and rehabilitation is at least US$16.3 billion, the economic losses are approximately US$15.2 billion and the physical damages are in excess of US$14.9 billion. Affected sectors were the most severely hit sectors

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of housing, agriculture and livestock, and transport and communications. Sindh alone had approximately 70 per cent of the total damages and losses (Government of Pakistan et al., 2022).

NDMA also increased its public guidance and contingency planning by 2025 and 2026. The current institutional status of its establishment sees NDMA as the federal lead agency for disaster management activities and has clear directives on floods, rain, roads and others. The forthcoming updates of the flood related guidance in 2025 and 2026 suggest that preparedness is being taken up beyond the emergency response phase (NDMA, 2026).

History has witnessed that the focus on disaster management has been gradually moving in the direction of Pakistan since the 2005 earthquake until the 2010 floods and later the 2022 floods. The institutional focus has shifted from emergency relief to preparedness, risk reduction and resilience and anticipatory action. But, disasters kept happening in the same manner suggest that institutional development has not eliminated the root causes of vulnerabilities.

Period	Major development	Significance for disaster governance
2005–2006	Earthquake and establishment of NDMA framework	Shift towards a national institutional approach to disaster management
2010	Major nationwide floods and ADB-World Bank damage assessment	Exposed large-scale weaknesses in flood preparedness, infrastructure and recovery
2010–2021	Expansion of disaster-risk management and recovery mechanisms	Gradual movement from emergency response towards preparedness and risk reduction
2022	Extreme monsoon floods and Post-Disaster Needs Assessment	Renewed focus on resilient recovery, climate adaptation and disaster preparedness
2023–2026	Updated contingency planning, early-warning measures and disaster guidelines	Provides basis for assessing institutional learning after the 2022 disaster

Table 1. Major Disaster-Management Turning Points in Pakistan

Source: *Compiled from World Bank (2010, 2011), Government of Pakistan et al. (2022), PMD (2022), and NDMA (2025, 2026).*

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A historical trend is thus clearly visible: in the aftermath of each disaster, Pakistan has been strengthening its formal disaster management institutions, but repeatedly has been finding that there are significant gaps between the national policy, physical ability to resist the disaster and the ability to implement it at the local level. Assessing flood governance in Pakistan post-2022 is a question of continuing vulnerability and institutional development.

Analysis and Discussion: The floods of 2022 offer an opportunity to see how well Pakistan can handle an extreme climate hazard. The Pakistan Meteorological Department (PMD) observed the monsoon rains in Pakistan during July to September 2022 were 175 percent above normal. The regional variation was even more pronounced with rainfall in Sindh being 426 percent of normal and 450 percent of normal in Balochistan (Pakistan Meteorological Department [PMD], 2022). The figures set a record for the meteorological aspects of the event. But rainfall cannot account for the size of the ensuing catastrophe.

The Economic and Physical Damage losses associated with the floods were estimated at over US$14.9 billion by the Post-Disaster Needs Assessment. There was a need to spend US$16.3 billion or more on rehabilitation and reconstruction. The damage to housing was the highest, followed by agriculture and livestock, and transport and communications. Sindh had almost 70% of total damages and losses (Government of Pakistan et al., 2022). The disaster hit some 33 million people and left over 1,700 dead (United Nations Development Program [UNDP], 2022).

The figures show how hazard and exposure are related. These effects of the rainfall were exacerbated by the location of settlements, by the reliance on agriculture, by housing, by infrastructure weaknesses, and by the capacity of many communities to absorb a major shock. Vulnerability is also highly unevenly distributed within and across regions and is influenced by socioeconomic conditions, inequality, land use and governance, as the IPCC (2022) argues. The climate risk scenario in Pakistan, therefore, is apt for illustrating the intersection between climatic risk and development vulnerability.

Climate Change and the 2022 Rainfall Event: Climate change and the floods of 2022 need to be treated with care. It is not correct to say that the floods were caused by climate change. The country of Pakistan has seen extreme floods in the past, especially in 2010 and even more prior to that. Meanwhile, it's also a problem to view the 2022 event as having nothing to do with a changing climate.

The IPCC (2022) also concludes that temperature increases are heightening climate risks, including the risk of flooding, throughout Asia. The assessment also highlights growing risks due to the melting of glaciers in the Hindu Kush Himalaya region. The World Weather Attribution assessment of the 2022 event is another piece of evidence, and shows how careful one must be in attribution. Its analysis concluded that the five-day extreme rainfall event which struck Sindh and Balochistan in the recent warmer climate had significantly intensified, and the researchers also noted significant uncertainty in the quantification of the contribution of climate change caused by humans.

The Pakistan Meteorological Department's rainfall data is in support of this argument. The provincial averages are already very high and explain the severity of the consequences in

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Sindh and Balochistan. Rainfall was more than 4 times the normal level creating conditions which would have put significant pressure on even stronger systems. The policy issue is thus not about whether Pakistan can stop extreme rainfall, but whether its institutions can minimize the losses caused by extreme rainfall.

Exposure, Poverty, and Infrastructure: Socio-economic vulnerability is crucial as demonstrated by the distribution of flood losses. The PDNA noted that the floods had a significant impact on more vulnerable and poorer communities. Agricultural land, livestock, roads, schools, and health facilities were also severely impacted, as were more than two million houses (Government of Pakistan et al., 2022).

Agriculture is a critical sector as the rural household is not only relying on the land and livestock for income but also for food security. Loss of crops then has repercussions on top of agricultural losses. The loss of productive assets may lead to a decline in household income, a rise in debt, and less ability to bounce back. Based on the PDNA estimates, the floods have the potential to add 8.4-9.1 million people to the national economy's poverty roll, pushing the national poverty rate by 3.7-4 percentage points (Government of Pakistan et al., 2022).

This is supported by research conducted in Pakistan on their flood vulnerability. At the local level, there was significant local variation in vulnerability in KP as reported by Nazeer and Bork (2021).

The same goes for infrastructure. The ability of a community to protect itself from flooding is related to drainage, embankments, roads, bridges, irrigation systems, housing characteristics and communication facilities. But infrastructure built based on rainfall in the past may not be sufficient should extremes of rainfall increase in intensity and become more unpredictable. The World Bank (2022a) thus considers investment in climate resilience as an important component of Pakistan's development plan.

Early Warning and the Warning-to-Action Gap: One of the most important areas of disaster governance is the conversion of information into action. Pakistan has a national meteorological institution with the capability to watch rainfall and provide the forecasts and warnings. Additionally, NDMA serves as a coordinating agency at the federal level on disaster management. Absence of information is not the central problem as a result of the existence of these institutions.

The more complicated issue is whether or not warnings are delivered in time to exposed communities and whether local officials are sufficiently resourceful and empowered to respond. This issue is now being acknowledged in the Pakistan planning documents from 2022 onwards. The 2026 Monsoon Contingency Plan outlines a proposed approach to enhance planning to be more operational, measurable, and trigger-based, which facilitates timely action before loss of life to the community is avoided (NDMA, 2026).

Implementing policies is a significant hurdle in Pakistan's climate governance, as noted by Masud and Khan (2024), who highlight issues related to coordination, decentralization, stakeholder engagement, and the conversion of national policies into on-the-ground action.

From Reactive Response to Institutional Learning

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An important change following 2022 has been the increased focus on preparedness and resilience in official policy. The 2022 PDNA did not just call for rebuilding damaged infrastructure but also for resilient reconstruction. The Resilient Recovery, Rehabilitation, and Reconstruction Framework that was prepared following this was aimed at lending a longer-term policy and financing framework for recovery and boosting resilience against future climate-related disasters (Government of Pakistan, 2022).

This also shows in the National Disaster Risk Reduction Strategy 2025-2030. The strategy is more focused on preparedness, resilience, and inclusive governance, technological capacity, and learning from past disasters (NDMA, 2025).

The NDMA planning system by 2026 had a National Disaster Management Plan 2026-2030, a National Disaster Response Plan and a Monsoon Contingency Plan. The National Disaster Management Plan 2026 defines itself as a more proactive plan and emphasizes on building up coping capacity and learning from past disasters. The Monsoon Contingency Plan also distributes responsibility between federal and provincial stakeholders, and aims to link warnings to action (NDMA, 2026).

This is especially relevant when assessing 2026. By 2026, the evidence collected indicates the Pakistan formal disaster-management framework has become more proactive. It is not yet time to draw the more sweeping conclusion that the nation has addressed its flood-governance issues.

Table 2. From Hazard to Disaster: Key Governance Factors

Dimension	Evidence from the 2022 floods	Governance implication
Climate hazard	National monsoon rainfall was 175% above normal	Extreme events require planning beyond historical averages
Geographic exposure	Sindh and Balochistan experienced exceptionally high rainfall	Risk assessment must be location-specific
Social vulnerability	Poor and rural communities suffered major livelihood and housing losses	Disaster planning must include poverty and livelihood protection
Infrastructure	Housing, roads, agriculture and communications suffered major losses	Reconstruction should incorporate stronger climate standards
Early warning	Meteorological information existed but warning-to-action capacity remained uneven	Forecasts need clear local triggers and response mechanisms

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Institutional coordination	Multiple federal, provincial and local actors were involved	Roles and communication channels need to be clear before disasters
Post-disaster planning	PDNA and 4RF emphasised resilient recovery	Recovery should reduce future risk rather than restore previous vulnerability
2025–2026 reforms	NDRRS and NDMA plans emphasise preparedness and anticipatory action	The next challenge is implementation and measurement

Source: Author's synthesis based on PMD (2022), Government of Pakistan et al. (2022), Government of Pakistan (2022), World Bank (2022a), and NDMA (2025, 2026).

Assessment of the 2022–2026 Period: What has been assessed is the 2022-2026 Period.The assessment is of the 2022-2026 Period. Overall, the evidence shows that Pakistan's disaster governance has shifted towards being more preventive since 2022 floods. There is greater emphasis on early warning, anticipatory action, preparedness planning, resilient reconstruction, and coordination. Formulation and revision of formal plans suggest that the 2022 disaster was not viewed as an isolated emergency but required institutional responses.

There are three limiting factors, however. There is a gap between the implementation of national planning and local capacity. National policies are set at the Federal level and response happens at the Provincial, District and community level. Masud and Khan (2024) reveal the issues with bridging the gap between national policies and sub-national actions at various governance levels in Pakistan. This implies that institutional coordination should be evaluated more than on the basis of plans, but also by the availability of responsibilities, resources and authority at the point where action is needed.

Secondly, infrastructure continues to be a problem. The PDNA 2022 highlighted the economic value of unsafe housing, transport systems, agriculture, and public services. Restoring the same assets in the same manner would ensure that communities would remain vulnerable to the same risks.

Third, continuity is a key feature of disaster governance. Preparations have to start well before the onset of the monsoon and conclude only after the relief operations are completed. Sustained attention is needed for risk mapping, drainage maintenance, land use planning, infrastructure inspection, and community awareness and evacuation preparation. The 2025-2030 NDRRS offers a longer-term policy framework for this longer-term approach, but will be effective only if implemented and monitored (NDMA, 2025).

Policy Implications: Pakistan needs to deepen the synergy between meteorological forecasting and district level responses. PMD forecasts and NDMA warnings should be linked to pre-defined actions at a provincial/ district level for evacuation, temporary shelter, transport, protection of livestock, movement of emergency equipment and communication with

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vulnerable communities. An institutional direction is provided by the focus on trigger-based action in the 2026 NDMA Monsoon Contingency Plan. The next step should be to set up clear metrics to determine if warnings led to action and the speed of action (NDMA, 2026).

Roads, bridges, drainage systems, schools, health facilities, housing and irrigation systems should also be designed and maintained to be resilient to flooding. The intent should not just be to rebuild what was lost in 2022, it should be to lower the risk and level of loss. This approach is based on the concept of resilient reconstruction highlighted in the 2022 PDNA (Government of Pakistan et al., 2022).

Another component of Pakistan's adaptation strategy should be risk sensitive land-use planning. When communities and infrastructure grow into flood prone areas, disaster risk rises. Therefore, there should be a link between improvements in flood-risk mapping and decisions at the provincial/district level. Risk mapping is of little value if it doesn't stop development in high-risk areas. In the context of Pakistan, therefore, the strategies for disaster risk management should link disaster risk information with planning and construction decisions.

Pakistan's disaster management system comprises federal, provincial, district, technical, humanitarian and community actors. Responsibilities must be clarified in advance of a disaster. Masud and Khan (2024) demonstrate how institutional fragmentation and less coordination can pose implementation challenges for Pakistan's climate policy. The same goes for Disaster Management. Delays in emergencies can be minimized through regular exercise, joint planning, information sharing and clear responsibilities.

The 2022 floods have also highlighted that the sustainable adaptation to climate change is not possible without poverty reduction. The PDNA estimate that millions of more people may find themselves in poverty underscores the fact that adaptation has to be considered as a distinct environmental policy issue. This means livelihood protection, agricultural resilience, social protection, housing support and access to basic services should also be part of flood preparedness. This would lessen the chances of a single catastrophe resulting in permanent poverty.

Last, Pakistan's contribution to global GHGs is relatively small, leaving its adaptation financing requirement unchanged. The size of the disaster in 2022 shows that funding from domestic sources might not be enough for investment in infrastructure and social protection to build resilience to climate change. There is, therefore, a need for international assistance to make more of an effort on adaptation and resilience and give less attention to emergency relief after a disaster. The adaptation assessment by the World Bank also stresses the need for substantial investments to safeguard the development path of Pakistan (World Bank, 2022a).

Conclusion: The monsoon floods in 2022 were a great challenge for Pakistan's capacity of handling the climate related disaster risk. This was an extraordinary rainfall event as national monsoon precipitation recorded 175% more than normal, especially in Sindh and Balochistan (PMD, 2022). The disaster caused damages and losses of over US$30 billion, and impacted about 33 million individuals collectively (Government of Pakistan et al., 2022).

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The study has claimed the 2022 floods cannot solely be attributed to climate change and should also not be blamed on governance issues. Pakistan has suffered from significant floods in history and climate change is changing the general risk profile where these hazards play. This is therefore an appropriate explanation of interaction. When vulnerable people, infrastructure, livelihoods and institutions can't withstand the shock of extreme climatic conditions, they are more damaging.

The post-2022 evidence suggests that the formal disaster-governance system in Pakistan has become more prepared. This is reflected in the increasing focus on resilience, early warning, anticipatory action and institutional coordination, seen in the 4RF, the National Adaptation Plan (NAP), the National Disaster Risk Reduction Strategy 2025-2030, and the NDMA contingency plans 2025 and 2026.

But, policy making does not equal policy success. Based on the available evidence, the conclusion should be drawn that the planning framework in Pakistan has improved by 2026, but it's premature to consider that the weaknesses that were revealed during the 2022 floods have been overcome. The key issue now is implementation, at the Provincial, District and Community level.

Thus, the lessons to be learnt from 2022 are two-fold. First of all, the extreme monsoon (EM) rainfall events are beyond the control of Pakistan but can be mitigated through strengthened preparedness, resilient infrastructure, effective warnings, and planning to reduce the human and economic impact in the event of occurrence. Second, disaster governance should not be considered an emergency measure that is only triggered during disaster but rather an ongoing development process.

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