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Bridging Forecasts and Response: A Multi-Stakeholder Anticipatory Action Framework for Pakistan

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ABSTRACT

Climate-induced disasters, such as floods, droughts, heatwaves, and glacial lake outburst floods, are increasingly threatening Pakistan. Nevertheless, there is still a high difference between early warning mechanisms and timely and effective responses. The study examines how the institutionalization of anticipatory action proactive, forecast based interventions that occur before disasters are actualized can become institutionalized as part of the disaster management process in Pakistan. The research hypothesizes developing a multi-stakeholder anticipatory action framework, which incorporates meteorological forecasting and risk analysis, governance structures, and community level preparedness into a cohesive operational framework. Through qualitative and comparative analysis, the study will investigate the available early warning systems, institutional alignment and coordination, the role of humanitarian organizations, development partners and local communities. Major obstacles, which include lack of coordination in the data sharing between the various agencies, limited applicability of forecasts, funding pitfalls, and

inadequate inter-agency coordination, are identified. Such international best practices involve forecast-based financing, which is analyzed in relation to its applicability in the socio-political context of Pakistan. It focuses on predictive intelligence, financially established triggers that all participants agree to, coordinated governance, and local implementation to help transform Pakistan disaster management to be proactive rather than reactive.

Keywords: Anticipatory Action, Climate-Induced Disasters, Disaster Management, Forecast-Based Interventions, Early Warning Systems, Governance Mechanisms.

INTRODUCTION

Pakistan is becoming more prone to the diverse categories of climate caused hazards, such as recurrent floods, prolonged droughts, extreme heatwaves, and floods of glacier lakes. The last decade has increased these risks due to the variability in climate, excessively high rate of population growth, unplanned urbanization, and environmental degradation. The major events (the catastrophic floods of 2010 and 2022) emphasize the susceptibility of the country and reveal the critical lack of disaster preparation and response systems. The successful learning of forecasts into timely and decisive action has garnered little success though advancements are made around early warning systems especially through the process of meteorological forecasting and hazard monitoring. This lack of connection between warning and prior response keeps on adding to the human suffering, economic losses, and recovery costs (Eghtesadi and Jafarzadeh, 2026).

The concept of anticipatory action has gained momentum in the international disaster risk management arena where it has been identified as a transformational strategy that can be adopted in managing disaster risks within the global community. Rather than responding to disasters with a reactive intervention, post-disaster interventions, anticipatory action seeks to reduce disasters effects by focusing on early preparedness, resource deployment, and pre-established response guidelines. Nonetheless, the application of this strategy within a complicated governance framework of Pakistan poses a major challenge. The dissuasive measures can be extremely difficult to employ due to institutional fragmentation, coordination failures between federal and provincial governments, limited integration of scientific data into decision-making processes, and a lack of sufficient financial mechanisms (Muzondo, 2026).

The study aims to help fill the gap between the forecasts and response by proposing a multi-stakeholder anticipatory action framework that specifically meets the needs of Pakistan. In understanding that disaster risk management is a collective responsibility, the framework sees the significance of collaboration between a wide scope of stakeholders, such as meteorological agencies, disaster management authorities, humanitarian organizations, development partners and local communities. Each stakeholder has a crucial role to play in ensuring that early warning can be acted upon during the context and translated into timely, on the

ground interventions (Bhaduri et al., 2026).

The paper will investigate the available preliminary warning mechanisms, single bottlenecks in the institutions and operations of the Pakistan disaster management system and determine the suitability of those international best practices like forecast-based financing and anticipatory humanitarian action in the disaster management system in Pakistan. The suggested framework will establish a unified, scalable framework of anticipatory action, by integrating mechanisms of predictive analytics, governance, financing, and community-based approaches (Wang, Fu, and Managi, 2026).

This study eventually ties into the broader discussion of climate resilience and disaster/risk reduction by providing a structured route to transforming a disaster management paradigm as a reactive response to a disaster into a more proactive approach of mitigating a disaster by integrating multiple disaster risk avoidance methods. It is meant to inform policy reform, enhance institutional coordination and increase preparedness capacities which increases the capacity of Pakistan to protect vulnerable populations and mitigate the longevity effects of disasters related to climate changes (Munir & Hamid, 2026).

LITERATURE REVIEW

The growing number and severity of climate-related disasters have led to a large amount of academic research on early warning systems (EWS), anticipatory action (AA) and incorporating forecasts into disaster response. This literature review is a synthesis of some of the important theoretical discussions, empirical evidence along with the policy debates as far as the issue of bridging forecasts and responding is concerned in Pakistan. These five key themes are the evolution of early warning systems, emergence of anticipatory action, forecast-based financing mechanisms, governance and multi-stakeholder coordination, and the context of Pakistan.

Development of Early Warning Systems and the Gap between Forecasts and Response

Although primitive, hazard detection tools, early warning systems devices have evolved to be more sophisticated, people-oriented devices, whose fundamental role is to provide information or alerts related to a problem and to take an action about the issue. Even though we have made great improvements in meteorological forecasting, there is a big gap between issuing of early warnings and actual application of responses. Through poor communication networks, structural inadequacy and integration of scientific information with operations are other factors that drive this so-called forecast-response gap or currently the so-so last-mile problem. Latest debates support the idea of impact-based forecasting, which does not only predict hazards but also measures how strongly they might impact the world, match the forecasts to the outcomes of the actions to ensure more effective interventions (Scheve et al., 2026; Bukhari, A. U. Khan, and Noreen, 2024).

Emergent and Conceptual Understandings of Anticipatory Action

The innovation of anticipatory action has been an efficient change in managing disasters by applying proactive rather than reactive responses to a disaster. Established

according to reliable predictions and risk analysis, anticipatory action entails implementing actions prior to the occurrence of a disaster in a bid to minimize the exposure to seize the impacts. This paradigm shift involves taking on board both the disaster risk reduction and humanitarian response within the same framework. Even though there is a promise of anticipatory action, the realization of the said action is still in its infancy with technological challenges like little empirical validation, challenges in measuring long-term effects, and lack of standardized operational structures (de Boer et al., 2026; Pouresmaeil, Afroogh, and Jiao, 2026).

Forecast-Based Financing and Decision-Making Under Uncertainty

The forecast-based financing is central in anticipatory action by having the necessary financial resources activated by the presence of pre-determined forecasts, allowing timely interventions to be made before the occurrence of disasters. Not knowing which decision to take in a forecast results in a problem of planning based on the prospects of judgement of a situation rather than considering the costs of acting on the situation. Decision-making models based on the assessment of these trade-offs are important in making sure that interventions are not too early or too late. Nevertheless, the practical use of forecast-based financing is characterized by several barriers, such as uncertainty in the forecasts, institutional constraints, and scaling challenges, particularly in developing countries (Yorucu, Bekun, and Yitmen, 2026; Mamadiyarov et al., 2026).

Multi-Stakeholder Governance and Institutional Coordination.

Effective coordination of various stakeholders such as government agencies, meteorological institutions, humanitarian organizations, development partners, and local communities is needed to achieve successful anticipatory action. The ineffectiveness of the institutional coordination of fragmented governance structures is a major barrier to forecasting translating into actionable responses. The exchange of data, communication and incorporation of scientific predictions into policy systems are not in good shape. Moreover, community engagement and trust are essential to make sure that interventions are place-specific and successfully implemented. Interlinked governance models that focus on collaboration, role clarity and responsibility are essential in enhancing anticipatory action (Sharif and Faisal, 2026; Qadir et al., 2026).

Anticipatory Action in Pakistan: Context, Progress, and Gaps.

In Pakistan, the implementation of anticipatory action has been limited even though there has been progress in early warning systems which include flood forecasting and climate monitoring. Current programs, which are usually financed by external agencies, have demonstrated the benefits that may accrue due to taking anticipatory action but have not been fully integrated as part of a domestic disaster management strategy. The main challenges affecting Pakistan are poor coordination between federal and provincial governments, lack of funds, and the lack of community participation to disaster planning. Furthermore, data-sharing mechanisms and institutional capacities at the district level are not developed yet to implement effective anticipatory action (Mubashir, Abbasi, and Kainaat, 2026; Iqbal,

2026; Iftikhar, 2026).

Future Research and topics

The recent technological breakthroughs, such as data analytics, artificial intelligence, and integrated information systems, offer new possibilities to achieve anticipatory action. Such technologies have the potential to enhance the level of accuracy in forecasting, promote real-time coordinated decision making between stakeholders and enhance better communication between stakeholders. Nonetheless, there are still some gaps in the research regarding long-term functionality and cost-effectiveness of anticipatory action. Minimal research has been conducted on how governance structures and political dynamics contribute to the implementation outcome, and some comprehensive evidence-based, context-specific models are necessary that incorporate forecasting, financing, governance, and community engagement (Hoque, 2026).

This literature review highlights that it is significant to bridge the gap between forecasts and response and here is where there can be the need of a multi-stakeholder, integrated approach to anticipatory action that involves governance, financing, and community engagement, especially in the context of Pakistan.

RESEARCH METHODOLOGY

This paper will follow the qualitative and exploratory research approach to study the discrepancy between forecast and response within the disaster management system of Pakistan and to create a multi-stakeholder anticipatory response framework. Instead of testing prior hypotheses, an inductive approach is taken to generate commentaries of empirical evidence and prevailing practices.

The data obtained is based on both secondary and primary sources. Primary data will also consist of semi structured interviews with key participants including disaster management representatives, meteorological and humanitarian actors, and representatives of the community. The secondary data include documents and reports of the institution, case studies, and similar academic literature.

It uses a purposive sampling approach to identify participants possessing relevant expertise and will make sure to select participants of different institutional levels and geographic regions. Thematic analysis is used to analyze the data with the intent to identify key patterns associated with the effectiveness of the early warning, challenges related to organization and coordination, mechanisms of finance, and community response.

Based on the findings, a multi-stakeholder anticipatory action framework based on forecasting systems, pre-arranged financing, coordination of governance, and local implementation is developed. To guarantee validity, the study engages data triangulation and adheres to ethical standards, including informed consent and confidentiality.

Findings and Results

The research concludes that Pakistan has achieved significant advancements in the development of early warning systems, especially in the field of meteorological

forecasting and flood possibility monitoring. Accuracy and lead times of the forecasts have become even better, which allows us to better predict hazards. But these technical breakthroughs do not always find a reflection in prompt action. A big weakness is the inability to provide impact-based forecasting. Warning can often convey information about hazards but fails to indicate clearly what consequences are likely to occur, and what actions are recommended. This makes decision-makers and societies helpless in trying to recognize forecasts in terms of operation. Also, the dissemination mechanisms are not even in rural and vulnerable populations, they are often the case that the warnings are received late or unclearly.

Persistent Forecast–Response Gap

A key result is that there is a serious lack of contact between initial alert and acting in response. The driving force behind this gap is institutional inertia and the absence of predetermined response measures and uncertainty in decision-making. The reluctance to act on probabilistic predictions by authorities is due to the fear of false alarms, wasting of resources and accountability. Lack of clear triggers and standard operating procedures invariably results in delay in responding until after the disaster impacts are evident, which helps to confirm a reactive approach to disaster management.

Weak Institutional Coordination

The study identifies the fragmented governance systems as one of the obstacles to effective anticipatory action. There is still no unanimity in the coordination of federal, provincial and local institutions, overlapping mandates, and lack of clear roles. There is little data-sharing between the disaster management authorities and the meteorological agencies, which limits the usability of the forecasts by decision-makers. Moreover, the partnership between government entities and humanitarian organizations tends to be informal instead of formalized, and results in response inefficiencies.

Monetary Limitations and Sluggish Mobilization of Resources

The other important revelation is that there are no special financial means to take proactive action. In Pakistan, funding towards disaster response is mostly reactive where resources are mobilized after a disaster has happened. The lack of pre-determined financing and future-oriented triggers postpones the response of early interventions by evacuation, provision of cash support, and the protection of livelihoods. Current pilot projects show promising prospects of anticipatory financing but at scale and sustainability.

Poor Community Involvement and Local Capacity

The research paper concludes that the local populations are not always taken as proactive participants of the anticipatory action but as passive listeners of warnings. At the community level, preparedness is poor, especially in high-risk, and marginalized regions. Low risk awareness, lack of trust in official warnings, and failure to have plans to respond at the local level represent the obstacles preventing prompt action. Simultaneously, the research shows that there is a potential to open vast opportunities, leveraging local knowledge and community networks to increase

preparedness and response.

Pilot Anticipatory Action Initiatives Evidence

The results of the current pilot projects in Pakistan have shown that an anticipatory action can greatly mitigate the effects of the disaster provided it is undertaken in an effective manner. This has been facilitated by early interventions like pre-emptive cash transfer and timely evacuation drills to protect livelihoods and minimize the amount of losses in flood prone areas. These initiatives are, however, mostly externally supported and are yet to be fully incorporated in systems of nations. Their success does indicate that it is possible to achieve but simultaneously requires that it should be institutionalized and scaled.

The major elements of a good Anticipatory Action Framework

According to the analysis, the study identifies four key elements needed to bridge the forecast response gap and includes predictive and impact-based forecasting that translates hazard information to actionable conclusions; pre-agreed triggers and funding mechanisms to enable the mobilization of resources in a timely fashion; strong institutional coordination and clear definition of roles and data-sharing protocols and community approaches that enhance local preparedness and participation.

DISCUSSION

The results of this study offer a complex analysis of the discrepancy between predictions and reaction in Pakistan each of these viewpoints offering a valuable input in closing the gap between forecasts and response in Pakistan. An integrated conception of these points of view is crucial to the development of a functional, many-sided system of anticipatory action.

Institutional/ Governance Perspective

In the perspective of governance, the recurrent lack of connection between predictions and reaction indicates structural and institutional disconnectness of the disaster management system in Pakistan. Institutions in the federal, provincial, and district level are usually siloed in nature, which disrupts coordination and removing timely decision making. An efficient anticipatory action involves well-defined roles, operating procedures that are standardized and strong data sharing mechanisms. Even the best of projections cannot provoke a response simply because there is no harmonization of the responses of various levels of government. In this respect, it is key to impart anticipatory action within formal structures of governance but not to make it independent, or a one-off endeavor. Enhancing both vertical coordination (between federal, provincial, and local levels) and horizontal coordination (among different agencies) is thus a key to having a coherent and effective response.

Economic and Financial View

Economically, the dependence on reactive funding models is grossly unsuitable to allow anticipatory actions to occur. A traditional mode of disaster financing that is triggered once losses have been incurred tends to increase the long-term costs and contribute towards the distribution of resources in a not the most efficient manner.

This research justifies the incorporation of predictive financing instruments, i.e., pre-allocated funds and prediction-based disbursement system, which can be used to pre-mobilize funds in anticipation of a disaster, i.e. in advance. Swift measures even in a state of uncertainty tend to be more cost-efficient than controlled responses. Nonetheless, risk aversion, consideration of accountability and low fiscal space often affect financial decisions making in disaster management. Thus, the change towards making disasters management more proactive should be institutionalized with the help of financial mechanisms that will support early interventions.

Scientific and Technological World View

On a scientific view, Pakistan has been making strides in enhancing their forecasting abilities, but the effectiveness of the possibilities is limited. The predictions are also usually very technical and not adequately adjusted towards the needs of operation respondents and thus carry less weight in informing operational responses. The need to have impact-based forecasting where a forecast is not just a prediction of a hazard, but it is a clear forecast on the possible effect and action that is required should the hazard occur. The opportunities posed by emerging technologies, including data analytics, satellite monitoring and integrated information systems should also be harnessed to increase the level of predictiveness and timeliness. But technology is not enough without effective communication and institutional adoption, whereby the scientific knowledge available is translated to practical ground-level decision-making.

Humanitarian and Development View

The humanitarian perspective of anticipatory action implies a change in responses to crisis management to preemptive mitigation of risks and resilience-building options. Early interventions may greatly safeguard lives, livelihoods and infrastructure, more so, vulnerable groups. Such a view is associated with a closer-knit association, where humanitarian input is subtly linked with the development planning. Humanitarian and development sectors, instead of working in parallelism should work to establish systems that can mitigate risks faced in the short term and those faced in the long run respectively. By turning successful pilot programs into national assistance programs, we will be able to secure the continuity and wider influence of anticipatory action by changing these interventions to sustainable national programs with a lasting impact on disaster resilience.

Community and Society View

Trust, awareness and local capacity at the community level are deeply involved with the success of anticipatory action. This research concludes that communities tend to be inactive consumers of early warning but not decision makers. This school of thought further highlights the need to integrate a people-based approach that embraces local knowledge base, enhances risk communication, and community empowerment to accept responsibility and take ownership of early warnings. The significance of social and cultural factors, including norms, past experiences, and they have lability of resources, has a tremendous impact on the perception and response to warnings. Consequently, community involvement cannot be considered as the

peripheral aspect of the issue, yet much rather as the core aspect of the issue of anticipatory action, where the interventions should be customized according to the local contexts and requirements.

Political and Policy Perspective

Policymaking wise, switching to anticipatory action will need political perseverance and patience. The reforms in disaster management are often subject to competition with any other policy priorities that limit the attention and resources devoted to the proactive policies. It is on this basis that the need to include anticipatory action in national disaster management programs, in climate-adaptation programs, and in overarching sustainable development frameworks has been noted. With this kind of integration, anticipatory action must not remain a side concern of policymaking but a central concern of the policy-making process. It is also necessary to have strong accountability mechanisms that serve to give legitimacy to early actions, make these actions transparent and effective, thereby creating a public perception that the system is just.

Comparative and Global Perspective

Comparatively speaking, global history recorded that anticipatory action can be effectively taken in favor of it, when an appropriate institutional framework in place, sufficient financial resources, and well-coordinated stakeholder interactions. Nevertheless, when transferring these international models into Pakistan, special care must be taken to adapt them to the local conditions and include local forms of governance, restrictions of resources, and socio-cultural processes that are peculiar to Pakistan. Although the global best practices can provide many desirable lessons, the solution is to be specific to the context of what needs to be done to Pakistan to ensure that anticipatory action is customized to the unique challenges facing Pakistan. Such adaptations must take into consideration the realities in these places to make the structures of anticipatory action practicable and sustainable.

To conclude, the multi-perspective discussion illustrates that the forecast-response gap in Pakistan needs to be addressed through a comprehensive approach involving institutional, financial, scientific, humanitarian, community, political and comparative insights. All these approaches help to comprehend the nature of complex dynamics of anticipatory action, which enable the proposed framework to be efficient and adjustable to the specific conditions in Pakistan.

CONCLUSION

This research paper has critically discussed the gap between prediction and response in the disaster management system in Pakistan and how a multi-stakeholder anticipatory action framework could be used to address this gap. Although the forecasting capacities have greatly improved, especially in the areas of meteorology and hazards monitoring, the ability to translate these forecasts into responding appropriately and timely has not been fully developed. It is not so much a technological issue but rather an issue that is systemic in that it is deeply rooted in fragmented governing structures, sluggish financing mechanisms, ineffective

institutional coordination as well as inadequate community engagement. The study highlights the fact that anticipatory action is indeed a feasible route to the elimination of reactivity and adoption of proactive approach to disaster management. This approach, however, would be successful depending on the interplay of forecasting systems and decision-making processes, financial mechanisms, and localized implementation strategies. Although pilot projects in Pakistan have positive outcomes, their small size and absence of institutionalization imply that they can have a limited impact. The main finding of this paper is that to help bridge the forecast response gap a holistic, coordinated framework that incorporates multiple stakeholders, such as government institutions, humanitarian actors, scientific agencies and local communities, is necessary. This framework must be entrenched in both the national policies as well as supported by sustainable funding and effective governance systems. It is quite clear that without systemic reforms, anticipatory action will continue to be fragmented, and underutilized. Finally, the paper has mentioned the importance of a reevaluation of the disaster management situation in Pakistan, particularly as long as the risks of climate changes continue increasing. Enhancing anticipatory capacities is not only a policy option; it is also an inevitable measure toward a reduction of human and economic losses and the formation of national resilience.

Recommendations

Make Anticipatory Action a Part of Policy Structures

Formal integration of anticipatory action into national and provincial policies on disaster management should be undertaken. Instead, guidelines, standard operating procedures, as well as legal requirements should be outlined so that whenever there is an early warning, predefined actions should be taken by all governing bodies.

Enhance Institutional Coordination Mechanisms

Better coordination of institutions in federal, provincial, and local is essential. Creating specific coordination platforms and defining the roles and responsibilities can further facilitate information sharing and allow making decisions timely.

Furnish Impact-Indirect Forecasting Systems

Forecasting agencies need to shift towards impact-based forecasting, which represents actionable information, connecting hazards and their likely impacts, and suggested responses, to weaker hazards. This will enhance the utility of forecasts for decision-makers and local communities.

Have Forecast-Based Financing Mechanisms

Specific financial instruments ought to be created to endorse expectancy response. The funds that will be saved in prediction triggers will allow implementing early interventions, lowering delays and making the process of disaster response more cost-effective.

Strengthening Community Relationship and Local Capacity

There is need to actively involve communities in preparing and responding to disasters. The use of indigenous knowledge, enhanced risk communication, and strengthening capacities at local levels can be used to build trust in early warnings

and prompt action.

Increment and institutionalize Pilot Initiatives

Potential pilot projects of successful anticipatory action need to be scaled and integrated into national systems. This will involve commitment in the long term, allocation of domestic resources and less reliance on external sources of funding.

Use Technology and Data Integration

The accuracy of the forecasts and the efficiency of the decision-making process could be improved through investing in new technologies including data analytics, remote sensing and integrated information systems. The creation of centralized platforms for sharing data will also enhance the coordination of the stakeholders.

Promote Multi-Stakeholder Partnerships

Coordination of Government agencies, Non-Governmental Organizations, players in the private sector and academia need to be enhanced. These alliances can contribute technical knowhow, money and creative solutions to facilitate the anticipatory action.

Establish Capacity and Training Program

Policymakers, disaster management officials and local authorities should be taken through capacity-building initiatives that are ongoing. Knowledge of approaches to anticipatory action and better preparation by the institutions can be created through training programs.

Be certain to Monitor, Evaluate and Account

Effective monitoring and evaluation systems ought to be established to evaluate the success of the interventions of anticipatory actions. Clear systems of accountability will instill trust in the stakeholders and will help in ensuring effective utilization of the resources.

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