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Reducing Flood Risk by Anticipatory Governance: The Case of Pakistan

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Summary

Climate change is exacerbating flood crises in Pakistan because of increasing events of extensive and even extreme rainfall. Destructive flooding in 2022 and 2025 painfully exposed the inadequacy of traditional solutions based on grey infrastructure against complex and high-magnitude disasters. Several interrelated problems increase Pakistan's vulnerability to natural calamities like floods. Despite extensive reforestation/afforestation initiatives, forest loss continues unabated mainly due to suboptimal species selection, low survival rates of planted trees, and poor cross-sectoral integration in watershed management.

Pakistan faces a stark choice. Either continue with the cycle of fragmented and costly interventions that offer temporary relief or pursue lasting resilience through meaningful governance reforms. To enhance flood resilience, however, the country requires transparent and innovative financial solutions for which it needs to mobilise private sector investment or climate finance. It may achieve this by introducing payment for ecosystem services (PES) and green bonds that will ensure community-led restoration and augment governance reforms. Ultimately, the implications go beyond forest and flood management to Pakistan's overall progress towards sustainability and socially just development.

If business-as-usual continues, Pakistan will be spending more and more on disaster response while becoming more vulnerable to floods. For instance, in 2022 alone, Pakistan lost nearly $15bn to climate-related issues despite emitting only 0.9% of global carbon discharges. Without systemic change, projections for the future are bleaker. Rural communities will remain under the poverty line, forest degradation will get worse, and Pakistan will not be able to fulfil its climate commitments.

If an anticipatory governance approach is adopted, then Pakistan may access billions of dollars in international climate finance available for climate degradation and nature-based solutions (NBS) approaches. The country can lead in climate change adaptation and create resilient landscapes for sustainable development among the Global South countries experiencing amplified flood risk due to climate change.

The time for proactive action is shrinking. The passage of every flood season without governance reforms makes future adaptation more difficult, complex, and costly.

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This Policy Brief:

- Seeks to understand how catastrophic humanitarian, economic and social impacts of extensive flooding can be reduced in Pakistan.
- Highlights that existing solutions to manage flood risks in the country are inadequate.
- Recommends the use of nature-based solutions (NBS) e.g., reforestation in mitigating flood risks.
- Presents a governance pathway to increase resilience against floods.
- Advocates inclusion of NBS within existing policies, such as the "Upscaling Green Pakistan Programme".

CLIMATE CHANGE AMPLIFIES FLOOD RISKS IN PAKISTAN

In the last few decades, extreme precipitation events around the globe have been on the rise, with South Asia being especially hard hit. A recent study by World Weather Attribution indicated that Pakistan, in recent years, received 10-15% more rainfall than normal, and these trends will continue to worsen (Hairsine, 2025). It implies that monsoon-induced flooding may occur more often. This is not unique to Pakistan. From Europe to Australia, Africa to Asia, countries are realising the inadequacy of traditional disaster management approaches due to rapidly evolving climate-related calamities (Pörtner et al., 2022).

Climate change is driving unprecedented flooding worldwide, with Pakistan exemplifying how governance failures turn natural hazards into humanitarian disasters. The 2022 floods, Pakistan's worst in decades, demonstrated that traditional responses of mass tree planting and concrete infrastructure cannot address interconnected risks of deforestation, watershed degradation, and extreme weather events (Bizenjo et al., 2023) (Figure 1).

Figure 1. Flood in Swat region, Pakistan (Pictures by: Fayaz Zafar; ex-President Swat Press Club)

TWO SCENARIOS FOR MITIGATING FLOOD RISKS

In this policy brief, we present two scenarios linked to floods in Pakistan: 1) vulnerability to floods, and 2) flood resilience. The first is based on an existing business-as-usual situation reflecting fragmented and inefficient flood risk governance in Pakistan, and the second is on building flood resilience through nature-based solutions (NBS). Alongside the scenarios, we outline a pathway for moving from the current situation towards flood resilience through anticipatory governance approaches (Figure 2).

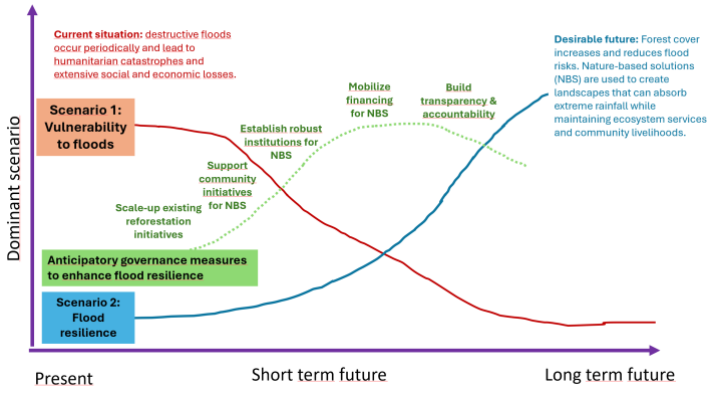

Figure 2: Three horizons framework

Figure 2. shows application of the three horizons framework to present the two scenarios: vulnerability to floods (in red) and flood resilience (in blue). The green curve illustrates anticipatory governance measures needed to be taken to enhance flood resilience. The figure implies that without action, the flood risks in Pakistan are likely to increase, leading to devastating social and economic consequences.

SCENARIO 1: VULNERABILITY TO FLOODS

Existing grey infrastructure-based solutions to flood risk management do not provide permanent protection, as they often collapse under pressure.

Weak coordination between various policy actors and the lack of community involvement in decision-making lead to reactive and fragmented governance. This results in ineffective policymaking and poor implementation. Consequently, repeated destruction takes place where floods inflict substantial human, economic, and environmental damages.

While floods are likely to increase with climate change, Pakistan has inadequate means to mitigate flood risks illustrated by 1) continuing forest loss despite ongoing efforts to plant trees e.g., the Ten Billion Tree Tsunami Programme (TBTTP) and 'Upscaling Green Pakistan Programme', 2) insufficient flood mitigation measures creating a sense of false security, and 3) prevailing fragmented and reactive governance approaches.

1. **Large-Scale Tree Plantation Failures:** Pakistan's tree plantation projects mobilised impressive numbers but achieved limited flood resilience outcomes. Independent assessments show low survival rates of the planted trees primarily because:

- Exotic species like eucalyptus were planted in inappropriate ecological zones
- No integration with watershed management or flood risk reduction
- Low levels of community involvement allowed elite capture and poor maintenance
- Programmes focused more on the numbers than meaningful ecological contributions

2. **Infrastructure Constraints:** Engineering solutions like embankments provide temporary protection, thereby giving a false sense of security. During the 2022 floods, multiple embankments failed catastrophically, causing worse flooding than if natural floodplains had been preserved (Peshimam & Hassan, 2022). Infrastructure approaches also:

- Cost millions of dollars for construction and maintenance
- Displace local communities.
- Lead to conflicts over water management between up- and downstream.
- Face difficulties in adapting to climate variability.

- **Governance Fragmentation:** In Pakistan, several agencies handle forest and flood management. These include National, Provincial, and District Disaster Management Authorities; Federal Flood Commission; Provincial Forest Departments; and Provincial Irrigation Departments, among others. In general, their mandates often overlap, and cross-sectoral coordination mechanisms are weak. The central administration designs policies without taking input from local communities, which eventually leads to:

- Interventions that ignore local ecological knowledge
- Elite capture of benefits intended for vulnerable populations
- No accountability mechanisms for monitoring long-term outcomes
- Political discontinuity when governments change

Key Statistics for Policymakers in Pakistan

- According to the UN Office for the Coordination of Humanitarian Affairs (OCHA), natural disasters cost Pakistan around 1%-2% of its GDP every year.
- Pakistan's forest area is 4.8%, far below the global average of 31%.
- Tree survival is higher in forests that a community manages, as compared to government plantation initiatives.
- Riparian buffers can reduce flood peaks by 20-30% while providing multiple ecosystem services.

SCENARIO 2: FLOOD RESILIENCE

Flood resilience refers to the ability of individuals, communities, and social systems to prepare for, endure, and quickly recover from flood events with minimal long-term damage (Fu et al., 2021). For Pakistan, enhancing flood resilience can be enhanced by creating landscapes that can absorb extreme rainfall while maintaining the ecosystem services and community livelihoods. This requires a shift from crisis-driven reactive interventions to anticipatory systems that deal with floods before disasters occur. Such initiatives with a focus on governance for enabling and enhancing NBS can increase flood resilience in the long run. Key concepts underpinning scenario 2 are:

Nature-based solutions (NBS) are *"actions to protect, sustainably manage and restore natural or modified ecosystems, that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits"* (IUCN, 2020).

Anticipatory governance redirects attention from reactive disaster response to proactive risk reduction by institutional mechanisms flexible enough to face future uncertainties (Guston, 2014).

In scenario 2, Pakistan adopts anticipatory governance methods for breaking the destructive cycle of floods, forest loss and failed recovery. By combining ecosystem restoration and NBS with institutional reforms, transparent financing, and community participation, Pakistan can create the resilience that can reduce the destructive impacts of floods proactively rather than merely responding reactively to floods.

POLICY WINDOWS FOR ENHANCING FLOOD RESILIENCE

Pakistan is strongly committed to climate mitigation and adaptation as inherent in initiatives like the 'Upscaling Green Pakistan Programme' (UGPP) and 'Ten Billion Tree Tsunami Programme' (TBTTP). The country is investing heavily in such projects to rebuild degraded forests and critical ecosystems which presents a timely policy window to scale NBS. These efforts should, however, be more focused on changes in governance and community-based approaches to meet national goals and increase resilience. Scholarly research repeatedly demonstrates how effectiveness of NBS is contingent not only on technical design, but also on institutional quality (Sangalli et al., 2021; Sari et al., 2023).

Research from 'Pakistan Agricultural Research Council' (PARC) advocates that native species restoration with management by the community provides better results. Hence, the ongoing tree plantation initiatives in Pakistan, like UGPP, present a great opportunity for operationalising the approaches based on anticipatory governance associated with NBS. Apart from driving more planting of trees, national efforts need to be focused on bringing in NBS for flood resilience, biodiversity preservation, watershed management, and re-planting. By ensuring community involvement, transparency and innovative funding in these efforts, Pakistan can not only boost national resilience and sustainability but also position itself as a regional leader in climate-resilient environmental restoration.

The business sector recognises that NBS investment opportunities are on the rise. Pakistani textile and agriculture industries lost almost $4 billion in the 2022 floods (Ministry of Planning & Development & Special Initiatives, 2022), which provides an acute private sector incentive for watershed protection.

Civil society organisations emphasise that without genuine community participation, even well-designed projects fail. It is highlighted that top-down projects consistently underperform community-led initiatives (see Box 2).

Success Stories in Flood Risk Management and Their Relevance for Pakistan

Community-Managed Success Stories: Considerable improvement in results towards flood resilience occur when communities are the forest owners or integral parts of co-management approaches. In a recent report, IUCN noted that community-first approaches strengthen climate adaptation and resilience in Pakistan (IUCN, 2025). Similarly, farmer-managed natural regeneration in Niger has restored 5 million hectares of forests by combining traditional knowledge with supportive policies (Abasse et al., 2023).

Integrated Watershed Approaches: Costa Rica's 'Payment for Ecosystem Services' programme demonstrates how governance integration works (Hinojosa, 2017). By combining forest protection, sustainable agriculture, and transparent benefit-sharing, Costa Rica increased forest cover from 21% to 52% over three decades while also reducing flood damages (Hinojosa, 2017). The key to this success was governance coordination across sectors. For Pakistan, cross-sectoral governance coordination is imperative for robust policymaking and execution.

Economic Evidence: A World Bank and the Global Facility for Disaster Reduction and Recovery (GFDRR) report discussed the economic value of adaption, finding that investing in resilient green infrastructure could yield $4 in benefits for every $1 invested (World Bank Report, 2019). For Pakistan, this means anticipatory governance seeking to boost NBS could prevent billions in annual flood damages while generating employment and ecosystem co-benefits.

RECOMMENDATIONS FOR ENHANCING FLOOD RESILIENCE

1. Establish Legal and Institutional Frameworks

- Ensure river basin-level governance by establishing 'Watershed Task Forces' in Pakistan's five major river basins. This will bring together all relevant agencies under unified command structures with clear mandates, budgets, and accountability mechanisms.
- Enact and implement river setback laws by passing provincial legislation requiring 100-metre setbacks from major rivers and 50-metre setbacks from tributaries. This must be enforced through local authorities, and there must also be a compensation mechanism for affected communities.

2. Deploy Community-based Governance Interventions for Enhancing Nature-based Solutions

- Native species restoration by prioritising riparian buffers using indigenous species, e.g., salix, poplars, and alnus, that provide flood protection while supporting biodiversity and community livelihoods.
- Community woodlots and agroforestry by establishing village-managed forest areas that reduce pressure on natural forests while providing sustainable income through timber, non-timber forest products, and carbon credits.
- Prioritisation of affected regions by focusing initially on high-risk watersheds in Khyber Pakhtunkhwa, Punjab, and Sindh provinces, where communities are most vulnerable to floods.

3. Mobilise Innovative Financing

- Launch 'Payment for Ecosystem Services' (PES) pilot programmes in the Swat Valley and annual payment of upstream communities for forest protection and restoration services.
- Develop parametric insurance by partnering with international insurers to offer flood insurance that pays out automatically when river levels exceed defined thresholds. This will provide immediate relief without lengthy claims processes.
- Issue green bonds backed by NBS projects, attractive to international investors seeking climate-aligned investments
- Initial investments will save money in the long term, because these initiatives decrease humanitarian, economic and environmental catastrophes. Investment programmes can also be complemented by international funders (e.g. the World Bank and the Asian Development Bank) by making Pakistan a showcase of climate change adaptation and disaster risk reduction by nature-based solutions and their governance.

4. Build Transparency and Accountability

- Develop public monitoring dashboards by opening an online platform for tracking of tree survival rates, forest cover change, flood risk reduction outcomes, and budget expenditures, with quarterly updates available to citizens and donors.
- Independent auditing by contracting third-party organisations to carry out annual audits of NBS programme implementation, with results made publicly available and tied to continued funding.
- Empower community oversight by training and supporting community monitoring groups with tools and authority to report on programme effectiveness and recommend course corrections.

5. Scale Through Learning

- Three-phase implementation by starting with the Swat Valley pilot to expand to three more watersheds and then develop a national scaling framework.
- Adaptive management by developing a systematic learning mechanism where programmes can be modified based on monitoring data and community feedback.
- Pakistan's policymakers must now take action to put in place the legal frameworks and start pilot implementations now. The monsoon season in 2026 will present a crucial test of existing preparedness; 2026-2028 offers the window to demonstrate the effectiveness of governance-centred NBS before the impact of climate change becomes even more severe.

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