Adaptation Gap Report 2023 – Case Study

Cascading impacts and floods: Building adaptive capacity in Pakistan

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Pakistan ranks consistently among the top 10 countries most affected by the climate crisis and natural disasters. Over the past three decades, climate-related disasters have caused a significant loss of life and sufficient socioeconomic damage to trigger a reversal of development gains.

Over time, the adverse and cascading impacts of disasters have eroded livelihoods and coping capacities. Disasters not only destroy crops and livestock, but also physical capital and livelihood assets, as well as market infrastructure and productive inputs. To cope, rural families will often use their savings or increase borrowing to meet basic needs, depleting their resource base even further, while raising levels of indebtedness and eroding livelihoods over time. Furthermore, disasters tend to damage or contaminate productive land, destroy critical infrastructure and disrupt market access and trade.

The cascading impacts of the climate crisis and related events amplify human vulnerabilities and risks (Bowen *et al.* 2022). No region or country remains untouched by these impacts, given that they are transmitted across systems and scales (Anisimov and Magnan eds. 2023), thus aggravating the challenges facing governmental and institutional systems, draining resources and restricting room for future climate action (Bowen *et al.* 2022).

The increasing frequency, scale and magnitude of climate extremes mean that the window for action in which to build back from each shock is getting smaller and smaller.

Responding to these cascading risks and impacts requires transdisciplinary, cross-scale and cross-sector action. To develop ways of building adaptive capacity and resilience, collaboration is needed, as is the identification of the links in these cascades (Bowen *et al.* 2022).

Between 1992 and 2021, climate- and weather-related disasters in Pakistan resulted in a total of US$29.3 billion in economic losses (Centre for Research on the Epidemiology of Disasters and UCLouvain 2022). The flood in 2010 alone affected more than 20 million people and resulted in the deaths of more than 1,700 individuals. It also covered over 20 per cent of the country's land area and caused billions of dollars of damage to infrastructure, housing, agriculture and livestock, in addition to other family assets.

In terms of gross domestic product, the full impact of the 2022 monsoon floods – the most extensive flooding event experienced in Pakistan to date – is not yet known. However, an early assessment indicates higher total damages and losses of around US$30 billion, with up to 9.1 million additional people being pushed into poverty and a further 1.9 million people falling into multidimensional poverty, due to a lack of services and resources at the local level (Pakistan, Ministry of Planning Development & Special Initiatives 2022). In this respect, reconstruction and rehabilitation activities may increase costs by billions of dollars.

Flood events between 2010 and 2014 destroyed 43,000 km² of crops in Pakistan, with a further 26,305 km² of crops ruined in the 2022 floods. In a country that is dependent on agriculture, this is particularly worrying. This table summarizes the causes and effects of the 2022 floods, which were the most extensive experienced in Pakistan to date.

Year	Region affected	Causes	Effects
2022	All provinces	• Record-breaking monsoon rain, which began early • Intense low-pressure air in the Arabian Sea led to heavy rain along the coast in June • Estimated to have been exacerbated by climate change by 50–75% • Main issue was the Indus River flooding, but urban flash floods, landslides and glacier lake outburst floods also contributed • Heatwaves in April and May meant that air could hold more moisture, causing a more intense monsoon • More than three times the average rainfall fell across Pakistan, with more than five times the average falling in the Sindh and Balochistan provinces • Sindh received 726% of its normal August rain, while Balochistan received 590% • From July to August, 190% more rain fell than the 30-year annual average (there is a 1% chance of this happening, but with high uncertainty) • Glacier melt contributed to faster river flow, but this had a much smaller effect than rainwater • Return period of the maximum 60-day rainfall over the Indus Basin ranges from 85–96 years in the current climate • Return period of the maximum five-day precipitation level over the Balochistan and Sindh provinces lies at 100 years in the current climate	• Displaced 33 million people, with 15% of the population affected • Over 1,500 deaths • 10–12% of the land area in Pakistan was flooded • US$14.9 billion of damage and US$15.2 billion of losses • In Karachi, effluent from an industrial estate overflowed into the streets for several days • Limitations to the assessment of damage and loss due to a number of factors, including poor communication of loss and damage via collection forms, lack of monitoring of flooding over geographical areas, limited engagement with non-governmental organizations, and difficulty in verifying and quantifying satellite data (also, data provided are often qualitative and not evidence based) • 1.2–1.7 million houses destroyed or damaged • 22,000 schools forced to close and 1,460 health facilities affected • 6,700 km of roads submerged • More than 800,000 livestock animals killed • Food crops worth US$2.3 billion destroyed • 269 bridges destroyed • Outbreaks of cholera, malaria and skin infections • Diarrhoea occurrences five times higher than normal • Six million people with no home sanitation • Eight million people requiring health assistance • Elongated lake in Sindh is 100 km wide, as there is nowhere for it to drain to • Landslides recorded due to heavy rains • Floodwater caused the Left Bank Outfall Drain to overflow in Lower Sindh • The Right Bank Outfall Drain overflowed due to high pressure and weak banks, submerging hundreds of villages

Much of the country's vulnerability is linked to its dominant arid to semi-arid climate, a high dependency on a single river system, and snow and glacial meltwater for the supply of water for agriculture. Natural hazards, especially flooding and drought, have a direct impact on agriculture and food security. Disaster risk in Pakistan is also driven by its social vulnerability, which is caused by high rates of multidimensional poverty.

The south-west monsoon period from June to September is the rainy summer season, with monsoons retreating from October to November. Sixty per cent of the annual rainfall in Pakistan occurs during this summer monsoon. Monsoons typically track north, but in 2022, all eight recorded monsoon depressions went towards the southern regions of Balochistan and Sindh. It is thought that this may have been due to elevated surface temperatures.

To initiate successful climate action and move equitable policymaking forwards, understanding, identifying and attributing cascading effects to specific climate shocks and stressors is key (Bowen *et al.* 2022).

However, because of the complex nature and long-lasting, transformative effect of cascading risks and impacts, adaptation costs will almost certainly be higher than anticipated, and some impacts will be unavoidable.

Along with comprehensive and coherent policymaking, adaptation planning, implementation and monitoring (Bowen *et al.* 2022), a focus on building adaptive capacity and resilience within countries and on a global scale is therefore key to reducing vulnerability.

Contributors

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On 3 November 2022 in Jacobabad, Sindh province, Pakistan, Aneefa Bibi holds her 5-year-old daughter, Hood, who is experiencing fever and chest pain.

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