

Urban Floods:

Implications for Resilience



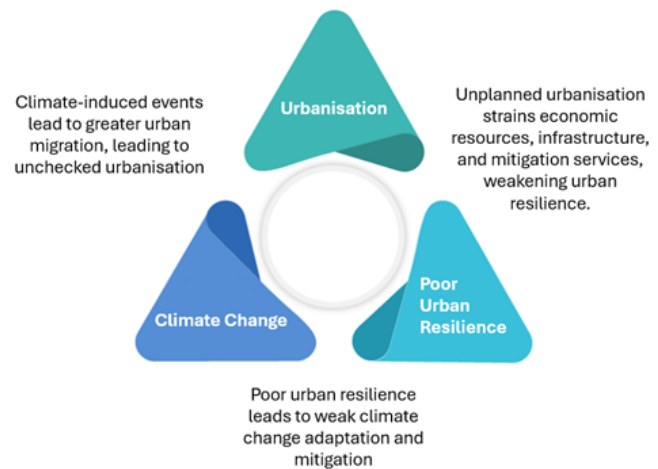
Urban Floods:

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Pakistan faces an unprecedented dual challenge: one of the fastest urbanization rates in South Asia and escalating climate vulnerabilities. By 2025, over half the population is projected to live in urban areas, many of which are ill-equipped to handle the severe impacts of climate change. The catastrophic 2022 floods, which submerged one-third of the country, are a stark reminder of the risks. Without immediate, coordinated action, urban resilience will continue to weaken under the weight of unplanned growth and intensifying climate stress.

Urban growth causes an increase in warming greenhouse gas emissions. This urban expansion is often unplanned and unregulated resulting in significant environmental stress and biodiversity loss. Primarily fuelled by migration, instability, and economic necessity, the rate of urbanisation in Pakistan is the highest in South Asia at 38.8 percent, with a 3.65% of annual growth in urban population between 2017-2023, nearly double than that of the rural population growth. Given Pakistan's heightened climate vulnerability, urban sprawl, deforestation, and the encroachment on floodplains are root causes of increased flood susceptibility in urban areas.

This interlinkage was evident in the catastrophic floods of 2022. An important dimension of these floods was the transition from riverine to urban flooding, which submerged one-third of the country under water. With the help of predictions based on satellite modelling and climate forecasting data, urban planners can pinpoint urban flooding hotspots and mitigate and manage urban flooding risks to enhance the resilience of cities.



Key Messages

- Rapid urbanisation has dramatically increased the vulnerabilities and risks of urban inhabitants in already exposed areas. Under severe threat of climate change, the frequency of flooding is expected to rise in urban areas in the coming years.
- The escalating frequency of urban floods will have dire economic, social, and human costs. Poverty traps will deepen as families lose homes and livelihoods, reconstruction and recovery needs will place a significant strain on the national economy, and the devastating impact on communities, with a loss of lives and displacement, could fuel social unrest and further destabilise vulnerable regions.
- The way forward for urban flood management hinges on a multifaceted approach that integrates robust institutional frameworks, evidence-driven planning, sectoral improvements, social inclusivity, and sustainable financing.

Key Challenges

Poor Urban Planning

Urban master planning in Pakistan is almost non-existent, with a housing backlog of 9 million units, poor housing conditions, unregulated and densely populated informal settlements, and weak enforcement of building codes, leading to increased vulnerability to disasters such as urban flooding.

Lack of Urban Response

Urban centres are under extreme stress due to global warming. In Pakistan, resilience to urban flooding is hampered by a lack of effective and evidence-based urban policies, poor institutional and governance capacities, and a dearth of targeted, climate-responsive interventions prioritising marginalised groups.

Globally, urbanisation is more rapid in flood-prone areas, with settlements expanding by 85 percent between 1985 and 2015 on average, whereas those exposed to the highest flood-hazard level increased by 122 percent. Pakistan is no exception, with informal settlements and encroachments often built in high-risk areas that lack resilient infrastructure, making them particularly susceptible to climate change and extreme weather events.

Various urban policies and development plans have been proposed for climate-resilient urban planning in Pakistan. These initiatives aim to improve infrastructure, including green spaces and water supply systems, which could help improve resilience to floods. The National Energy Efficiency and Conservation Authority developed the Building Energy Code of Pakistan to establish minimum performance requirements for buildings, but compliance remains weak, and many informal settlements lack basic building code requirements. Additionally, unregulated and illegal dwellings persist in areas with high flood risks, often without disaster risk strategies.

Institutional and governance capacity challenges also exist. Institutional structures and regulatory protections are largely ignored in managing Pakistani cities. Despite calls for national, regional, and local planned development since the 1960s, only local plans have been made, and city master planning is almost non-existent. Efforts to introduce master plans for major cities have stalled due to economic and political instability. There is no uniform national urban planning policy, and local planning organisations struggle with unplanned urbanisation. Data integration and climate modelling is still missing in the planning processes which can help communities better develop resilience against the climate induced floods related disasters in the urban centers. Federal and provincial roles in urban development and housing are poorly coordinated, and local institutions lack collaboration, leading to urban infrastructure that cannot meet the growing demands of urbanisation. The widespread urban impact of the 2022 floods was a testament to this poor planning and coordination.

At the same time, marginalised urban groups bear the brunt of adverse climate events. Women in informal urban settlements face significant challenges related to health, hygiene, education, and social security, and are also disproportionately impacted during urban floods, with women and girls suffering from increased gender-based violence, learning poverty, and a lack of pre- and post-natal services during the 2022 floods. These vulnerabilities are also compounded for impoverished communities living in high flood-risk areas such as flood plains or embankments. Impoverished communities often lack adequate infrastructure, services, and resources for risk mediation, making them more susceptible to the impacts of urban flooding. Furthermore, poverty traps only deepen in times of climate catastrophe.

In view of this, in the last decade, the country has accelerated policymaking on climate change by developing the National Climate Change Policy 2012 and the National Disaster Risk Reduction Policy (NDRRP). Specifically with reference to floods, the NDMA has developed a national disaster risk strategy for managing floods in the country based on the Sendai Framework for Disaster Risk Reduction (SFDRR) (2015–2030). In view of the country's technical and financial capacity constraints, Pakistan has been actively ratifying multiple international climate agreements and developing climate-resilient policies at the national level to tackle the negative impacts of climate change. However, a lot more needs to be done.

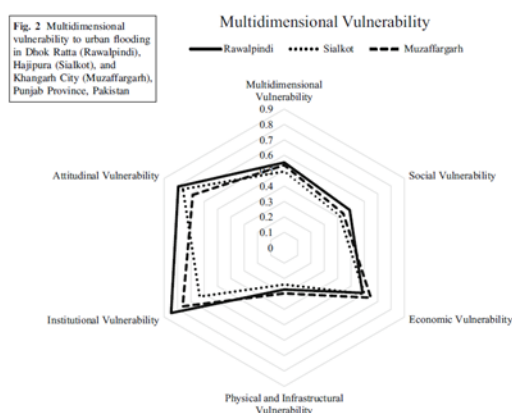
Policy Recommendations

- **Focus on coordinated, evidence-based policies:** Develop region-specific flood policies and enhance coordination across different line departments and provinces. This will ensure a unified and efficient approach to flood risk management, reducing duplication and resource wastage. Detailed flood simulations can project future flood scenarios and their potential impacts on infrastructure, aiding in strategic planning and investment in resilient infrastructure. By enhancing data collection and integration, cities can make informed decisions and develop effective flood management strategies.
- **Strengthen institutional building, coordination, and governance:** Create a cohesive institutional framework that integrates urban planning across all government levels. Strengthening coordination and governance will improve the implementation and enforcement of flood resilience measures.
- **Foster partnerships and inclusivity:** Promote public-private partnerships and involve local communities in decision-making processes. Foster strong relationships with civil society, SMEs, and local businesses to ensure a collaborative approach to urban flood resilience.
- **Mobilise financing:** Create sustainable revenue streams for flood-resilient urbanisation. Ensure adequate funding for flood prevention measures and infrastructure improvements to build long-term resilience.
- **Strengthen dissemination of policies:** Enhance the communication and dissemination of flood policies to ensure that all stakeholders, including local communities, are well-informed and can hold policymakers to account.
- **Focus on sectoral improvements:** Promote green urban mobility and climate-smart municipal services to reduce flood impacts, and advance improved water and floodplain management to lower the risk of floods. In addition, support climate-smart agriculture technologies and innovations – such as green infrastructure and early warning systems – for comprehensive sectoral improvements.

- **Promote awareness and social inclusion:** Promote risk communication and awareness around water management, flood risks, and community warning systems. Specifically, develop policies to enhance the resilience of groups such as youth, women, and migrant communities, who suffer from heightened vulnerabilities during climate events.
- **Integrate indigenous knowledge:** Incorporate indigenous knowledge into flood risk management strategies rather than imposing top-down perspectives. This approach respects local wisdom and practices, leading to more effective and culturally appropriate solutions.
- **Anticipatory actions:** Prioritise proactive and anticipatory actions over purely reactive reconstruction and recovery measures. This shift will reduce the overall impact of floods and enhance community resilience.
- **Breaking down silos:** Ensure transparent and efficient exchange of information across the National Disaster Management Authority (NDMA), Provincial Disaster Management Authorities (PDMAs), and District Disaster Management Authorities (DDMAs). This will facilitate coordinated responses and improve flood management efforts.

CASE STUDY: Assessing multidimensional flood vulnerabilities in Punjab

Rapid urbanisation has dramatically increased the vulnerabilities of people living in urban areas. Pakistan in particular is typified by heightened disasters, coupled with poor disaster risk management, which amplifies vulnerability.



Vulnerability is a multifaceted phenomenon, which is why vulnerability assessments similarly need to be multidimensional if they are to add value to climate change adaptation and disaster risk science efforts. A study presenting such a model was conducted in Punjab, exploring the vulnerabilities of 12,867 households from three flood-prone urban centres – namely Rawalpindi, Sialkot, and Muzaffargarh.

The vulnerability assessment was categorized into different dimensions. In terms of social vulnerability, it was concluded that around 21 percent of households were illiterate, and 22 percent included members with chronic illness or disabilities. This translated into extended social vulnerability owing to a poor understanding of early warning protocols. Similarly, economic vulnerability was exacerbated because household heads were

mostly the sole earners, and 82 percent had no assets outside the flood-prone area. Physical and infrastructural vulnerabilities were also amplified, as almost half the households lived in highly vulnerable floodplains or even embankments. Vulnerability in an institutional sense existed because of the poor reach and efficiency of early warning systems and flood risk communication, and in an attitudinal sense because of the poor trust between communities and local institutions.

In short, this assessment highlights how vulnerability assessments must be multidimensional to effectively address challenges related to risk mitigation and flood recovery. Social factors influence resilience and response capabilities. Economic conditions determine resources available for recovery and the ability to mediate risk. Infrastructural elements directly impact the severity of flood damage and recovery speed. By considering these diverse dimensions, assessments can identify specific vulnerabilities, tailor interventions to community needs, and foster comprehensive strategies that facilitate local institutions in enhancing overall resilience.

Source: Rana and Routray. Multidimensional Model for Vulnerability Assessment of Urban Flooding <https://doi.org/10.1007/s13753-018-0179-4>

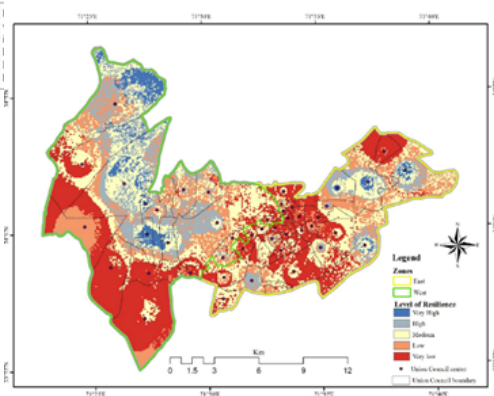
CASE STUDY: Creating an urban flood resilience map for Peshawar, Khyber Pakhtunkhwa

Floods are the most frequently occurring and widespread disaster worldwide. Urban flooding has become a frequent phenomenon in Pakistan, bolstered by unchecked urban growth. To explore this further, a study aimed at identifying flood sensitivity and coping capacity was conducted in Peshawar, Khyber Pakhtunkhwa.

An integrated approach, in the form of an urban flood resilience model (UFResi-M) was created, based on Geographical Information System (GIS) and Remote Sensing (RS). The model consisted of four dimensions – flood hazard, exposure, susceptibility, and coping capacity – to create a resilience map for Peshawar. This showed which parts of the city had high and low resilience to disasters, and served as a predictor for the extent to which an area could withstand floods effectively.

The study showed that Peshawar is highly vulnerable to urban floods due to its geographical location, topography, and inadequate infrastructure. It forecasts that urban floods in the study area will become more frequent and intense in the coming decades. This increase is driven by dynamic climate changes, a high influx of people, rapid urbanisation, inadequate development measures, and low adaptive capacity.

These results highlight the need for more urgent interventions from all relevant line agencies, and for them to work closely with local communities and design low-cost and effective measures for the prevention and mitigation of urban floods in the less resilient parts of the city.



In this context, assessing the resilience of cities to urban floods is critical for reducing the risk of future flooding events. Urban areas are often densely populated with complex infrastructure, making them particularly vulnerable to the devastating impacts of floods. By evaluating resilience, cities can identify weaknesses in their infrastructure, emergency response systems, and community preparedness. This enables the development of targeted strategies to strengthen flood defenses, improve drainage systems, and enhance early warning systems. A proactive approach to resilience not only mitigates immediate risks but also ensures long-term sustainability.

Source: Tayyab, Zhang, Hussain, Ullah, Liu, Khan, Baig, Hassan and Al-Shaibah. GIS-Based Urban Flood Resilience Assessment Using Urban Flood Resilience Model: A Case Study of Peshawar City, Khyber Pakhtunkhwa, Pakistan.

<https://doi.org/10.3390/rs13101864>

Source: World Bank. 2023. Rentschler, Avner, Marconcini, Su, Strano, Voudoukas and Hallegatte. Global evidence of rapid urban growth in flood zones since 1985.

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About PGCEP

The Pak-German Climate & Energy Partnership (PGCEP) was established in 2021 to support Pakistan in reaching its commitments under the Paris Agreement and Agenda 2030. The Partnership represents German Development Cooperation's bilateral portfolio in Pakistan, which is being implemented by GIZ, and KfW on behalf of the German Federal Ministry for Economic Cooperation and Development (BMZ). The Partnership leverages the breadth of the bilateral portfolio to drive action that leads to sustainable, climate resilient development in Pakistan, in close collaboration with Government, private sector, civil society and think tanks.

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