ISSUE BRIEF

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URBAN FLOODING IN PAKISTAN

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Urban flooding in Pakistan has become a pressing issue; with rapid urbanization and inadequate infrastructure, cities across the country are increasingly becoming vulnerable to the devastating impacts of heavy rainfalls. The recent spell of extreme monsoon across Pakistan has severely impacted several areas across the country. The province of Punjab has so far borne the brunt of extreme weather events with its capital, Lahore, receiving up to 291 millimeters of precipitation within 10 hours, on 5th July 2023.[1] The downpour has led to deaths across cities in Pakistan, whilst leaving major streets and low-lying areas submerged in water.[2]

Urban flooding is an issue that has grown significantly in Pakistan in the past few years. Pakistan is still recovering from the devastating floods that hit the country in July 2022 and caused urban flooding in various cities.[3] In the aftermath of recent rains, multiple cities including Lahore turned into an urban swamp with daily life coming to a halt with loss of life, livelihood, and property, with instances of urban flooding on the rise. In recent years unprecedented rainfalls due to climate

1 Ummay Farwa, 'Record-high Rainfall Claims Seven Lives as Lahore Sees Severe Urban Flooding,' *News*, July 5, 2023, https://www.thenews.com.pk/latest/1087272-lahore-life-disrupted-as-heavy-rain-breaks-30-year-record

2 "At Least 50 Dead In Monsoon Floods Across Pakistan Since June 25," *Dawn*, July 7, 2023, https://www.dawn.com/news/1763462/at-least-50-dead-in-monsoon-floods-across-pakistan-since-june-25

3 Paulina Smalinski, "Pakistan, Still Recovering From Last Year's Floods, Braces For More Flooding This Year," *CBS News*, May, 05, 2023 https://www.cbsnews.com/news/pakistan-more-floods-expected-2023/

change have given rise to intense and uncertain weather patterns, which along with other challenges have exposed major metropoles and cities to the phenomenon of urban flooding. While this is primarily due to unnatural weather conditions, population increase and unplanned infrastructure in pursuit of expanding cities have also led to an increased risk of urban flooding.

Global Disaster Alert and Coordination System[4]

While urban flooding in Pakistan has not caused devastation like the floods in 2022 it has raised alarm and caution regarding the susceptibility of urban flooding. The Global Disaster Alert Coordination System (GDACS) 'flood rank' for Pakistan stood at a strong 2.5 during the 2022 floods;[5] while it ranked the current urban flooding phenomenon at 0.5.[6]

Factors that Contribute to Urban Flooding in Pakistan

- *Inadequate Drainage Systems:* Many cities in Pakistan have outdated drainage systems that cannot handle heavy rainfall. The existing infrastructure is often overwhelmed, leading to waterlogging and flooding.[7]

- *Rapid Urbanization and Absence of Effective Urban Planning Regulations:* Pakistan has experienced rapid urban growth in recent years, with the expansion of cities and the conversion of agricultural land into residential and commercial areas. This haphazard and unplanned urbanization has led to the destruction of natural water absorption areas such as wetlands and open spaces, resulting in increased surface run-off during heavy rains.[8]

- *Encroachments and Illegal Constructions:* Encroachments on natural drainage channels, such as rivers, nullahs (streams), and canals, obstruct the natural flow of water. Additionally,

4 Floods Pakistan, *Global Disaster Alert and Coordination System*, June 2023, https://www.gdacs.org/report.aspx?eventid=1102120&episodeid=2&eventtype=FL
5 Floods Pakistan, Global Disaster Alert and Coordination System, 2022, https://www.gdacs.org/report.aspx?eventid=1101522&episodeid=1&eventtype=FL
6 Floods Pakistan, Global Disaster Alert and Coordination System, June 2023, https://www.gdacs.org/report.aspx?eventid=1102120&episodeid=2&eventtype=FL
7 "Down The Drain," *Dawn*, September 17, 2011, https://www.dawn.com/news/659769/down-the-drain
8 Mir Sher Baz Khetran, "An Appraisal Of Pakistan's Bulging Population," *Institute of Strategic Studies Islamabad,* October 06, 2021, https://issi.org.pk/wp-content/uploads/2021/10/IB_Khetran_Oct_6_2021.pdf

illegal constructions on floodplains and low-lying areas further exacerbate the problem, as they impede the natural flow of water and redirect it towards populated areas.[9] Illegal constructions and encroachments, especially in low-lying areas in the cities lead to urban flooding. Moreover, the lack of enforcement in building codes allows for the construction of substandard structures that cannot withstand inundation.

- *Deforestation and Loss of Green Spaces:* Deforestation and the reduction of green spaces contribute to increased surface run-off. Trees and vegetation play a crucial role in absorbing rainwater and reducing soil erosion. However, the clearing of forests for urban development reduces these natural barriers and worsens the impact of flooding.[10]

- *Climate Change:* Pakistan is extremely vulnerable to the effects of climate change (ranked among top ten most vulnerable countries though with less than 1% emissions), including increased intensity and frequency of rainfall. Changing weather patterns result in sudden and heavy downpours, overwhelming the existing drainage systems and causing urban flooding.[11]

- *Poor Waste Management:* Inadequate waste management practices, such as improper disposal of waste and the accumulation of garbage in drains, can obstruct the flow of water, leading to localized flooding.[12]

- *Lack of Awareness and Preparedness:* Many urban residents are unaware of flood risks and lack knowledge about preventive measures. This hampers preparedness and timely responses to flooding events.[13]

Mitigation Strategies

The consequences of urban flooding are dire. Apart from immediate risks to human lives and property damage, there are long-term substantial economic impacts and implications with mounting infrastructure damage and costs. Moreover, it also adds to the health crisis due to water

9 National Water Policy, *Ministry of Water Resources*, Government of Pakistan, April 2018, https://ffc.gov.pk/wp-content/uploads/2018/12/National-Water-Policy-April-2018-FINAL_3.pdf

10 "Deforestation – Causes, Effects, and Solutions," ENV PK, April 08, 2021, https://www.envpk.com/deforestation-causes-effects-and-solutions/

11 "Climate Change Likely Increased Extreme Monsoon Rainfall, Flooding Highly Vulnerable Communities In Pakistan," *World Weather Attribution,* September 14, 2022, https://www.worldweatherattribution.org/climate-change-likely-increased-extreme-monsoon-rainfall-flooding-highly-vulnerable-communities-in-pakistan/

12 "Improper Management of Solid Waste in Pakistan and Its Effects," *ENV Pakistan,* March 23, 2021, https://www.envpk.com/improper-management-of-solid-waste-in-pakistan-and-its-effects/

13 Ilan Kelman, "Pakistan's Floods Are A Disaster – But They Didn't Have To Be," *UNDRR*, September 20, 22.

contamination and increased risk of waterborne diseases. However, regardless of its challenging nature, urban flooding can be mitigated through a combination of preventive measures and infrastructure improvements.

Addressing this issue requires a multidimensional approach that involves both short-term emergency measures and long-term sustainable strategies. Here are some strategies that can help mitigate urban flooding:

- *Improve Urban Planning:* Implement effective urban planning measures that consider flood risk and drainage systems. This includes avoiding construction in flood-prone areas, preserving natural waterways, and promoting sustainable urban designs.

- *Develop Efficient Drainage Systems:* Construct and maintain an efficient network of storm water drainage systems, including gutters, storm drains, and underground pipes. The infrastructure should be designed to handle heavy rainfall and prevent water accumulation on streets and in low-lying areas.

- *Green Infrastructure:* Incorporate green infrastructure solutions such as permeable pavements, rain gardens, and bioswales. These features help absorb and retain rainwater, reducing the burden on drainage systems and promoting natural infiltration into the ground.

- *Retention Ponds and Reservoirs:* Build retention ponds and reservoirs in strategic locations to temporarily store excess water during heavy rainfall. These reservoirs can then release the water slowly, reducing the risk of downstream flooding.

- *Floodplain Zoning and Regulation:* Implement proper land-use planning and zoning regulations in flood-prone areas. Restricting development in floodplains or enforcing strict building codes can minimize the exposure of vulnerable areas to flood risks.

- *Public Awareness:* Educate the public about flood risks, emergency preparedness, and the importance of maintaining proper drainage systems. Encouraging responsible waste disposal and discouraging littering to prevent blockages in drains and waterways.

- *Early Warning Systems*: Install and maintain effective early warning systems that can detect rising water levels and provide timely alerts to residents and authorities. This allows for timely evacuation and emergency response.

- *Urban Maintenance*: Regularly clean and maintain drainage systems, including clearing debris, sediment, and vegetation from gutters, drains, and canals. Proper maintenance ensures that the infrastructure functions optimally during heavy rainfall.

- *Green Roofs:* Promote the construction of green roofs, which are covered with vegetation. Green roofs absorb rainwater and reduce the volume of water entering the drainage system, mitigating flooding.

- *Sustainable Land Management:* Encourage sustainable land management practices, such as preserving natural wetlands and forests. These natural ecosystems act as buffers, absorbing and storing excess water during heavy rainfall.

Conclusion

Urban flooding is a complex and serious issue influenced by various factors, including climate change, inadequate infrastructure, and rapid urbanization. To address the issue of urban flooding in Pakistan, there is a need for improved urban planning, infrastructure development, and disaster management. Efforts should focus on government support and funding for flood mitigation projects and maintenance of infrastructure.

In Pakistan, urban flooding is classified as a growing hazard according to multiple models based on flood information with a forecast of life-threatening urban floods at least once in the next 10 years.[14]

A comprehensive and integrated approach is necessary to effectively mitigate the risks associated with urban flooding. Local authorities, urban planners, engineers, and communities should work together to implement these strategies and adapt them to their specific geographical and urban contexts. Local governments should invest in data collection, research, and monitoring of flood events to improve understanding and forecasting of urban flooding. The integration of both short-term and long-term solutions is crucial to effectively address the issue.

14 Urban Floods – Pakistan, *Think Hazard*, https://thinkhazard.org/en/report/188-pakistan/UF