

Flash Floods in Bangladesh: Effects, Causes, and Reducing

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Abstract: Bangladesh is very prone to flooding due to its location at the confluence of the Ganges, Brahmaputra and Meghna rivers and because of the hydro-meteorological and topographical characteristics of the basins in which it is situated. On average, annual floods inundate 20.5 per cent area of the country and this can reach as high as about 70 per cent during an extreme flood event, approximately 3.5million people in Bangladesh are affected by annual river flooding, an issue that is only worsened by the climate crisis. Some major floods were recorded in 1842, 1858, 1871, 1875, 1885, 1892, 1974, 1987, 1988, 1998, 2004 and 2007. The most recent flooding in Bangladesh occurred in August 2024, and was one of the worst flood events in the country's recent history. Heavy monsoon rains and upstream runoff have caused severe flooding, particularly in the eastern and northern regions. The most impacted districts include Noakhali, Cumilla, Lakshmirpur, Feni, Chattogram, and Moulvibazar.

Keywords: flash floods, effects, causes, reducing, environmental regulations, climate change, river management, human awareness.

1. Introduction

Bangladesh is located at the confluence of three large rivers the—Ganges, Brahmaputra and Meghna (Fig. 1). About 92.5 per cent of the combined basin area of the three rivers lies outside of the country. Furthermore, 80 per cent of the annual rainfall occurs in the monsoon (June–September) across the river basins. Therefore, Bangladesh is forced to drain out huge cross-border monsoon runoff together with its own runoff through a network of rivers. Most of the time, the volume of generated runoff exceeds the capacity of the drainage channels and this makes it one of the most flood-vulnerable countries in the world. Flooding in Bangladesh is highly dependent on the magnitude and pattern of precipitation in the three river basins. Results from general circulation models (GCMs) indicate that future warming, due to an enhanced greenhouse effect, may increase monsoon precipitation in South Asia. This may lead to increase in peak discharges of the major rivers and may eventually exacerbate the flooding problem in Bangladesh. Global warming may also effect the characteristics of floods in other ways. The flash flood of August which began early in the morning August 19, 2024, over parts of Bangladesh and eastern India caused by a sudden cloudburst -- is a reflection of climate change's role in intensifying extreme weather events. It unleashed excessive rainfall over a short period of water

flowing downstream from Tripura causing severe flooding across Comilla, Feni, and neighboring regions. The cloudburst extended over a 50 to 70km range, stretching from Tripura to Comilla and Feni, where the rainfall reached alarming levels.

2. Effects of Flash Floods

Since late August, severe flash floods and monsoons plaguing Bangladesh have affected nearly 6 million people. Bangladeshi officials have declared the floods to be the country's worst climate disaster in recent memory. These recent floods follow the wake of Cyclone Remal, which devastated Bangladesh and West Bengal earlier this year. Floods have caused widespread destruction in Bangladesh, with the Feni, Cumilla, Lakshmirpur, Chattogram, and Noakhali districts among those hit hardest.



Fig. 1.



Fig. 2.

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The floods have resulted in a loss of 282 million US dollars due to crop damage, impacting over 1.3 million farmers. Some 5.8 million people in the northeastern and southeastern regions have been affected and more than 1 million people are in communities cut off by the flooding. A reported 502,501 people are displaced in 3,403 evacuation shelters. Over 7,000 schools are closed due to flooding, affecting 1,750,000 primary students across the affected districts. Displacement and overcrowded temporary shelters have heightened protection concerns, including for women and girls. The United Nations Children's Fund (UNICEF) has stated that 71 people have been reported dead. The floods have decimated villages, with thousands of homes having been destroyed or submerged underwater, causing widespread internal displacement.

3. Causes of flash Floods

Heavy Rainfall: During the monsoon season, regions within the Ganges basin can receive up to 500 mm of rain in a single day, leading to severe flooding.

River Convergence: The convergence of the Ganges, Brahmaputra, and Meghna rivers in Bangladesh causes massive flooding, particularly during the monsoon season.

Tectonic Uplift: The continuous uplift of the Himalayas increases erosion rates, depositing large amounts of sediment into the rivers, thus exacerbating flood risks.

Deforestation: Significant deforestation in the Himalayan region decreases interception rates and increases peak discharge, heightening flood risks.

Snow Melt: Melting snow and ice from the Himalayas contribute to the volume of water flowing into the rivers, further increasing flood potential.

Cyclones: Tropical cyclones originating from the Bay of Bengal can cause extensive coastal flooding, compounding the problem.

Human Intervention: Unplanned infrastructure development, coupled with inadequate enforcement of environmental laws and regulations, leads to increased flood risk due to poor land use and drainage management.

Drainage Congestion: Ineffective drainage systems result in water congestion during heavy rains, aggravating flood conditions.

Low-Lying Floodplain: As a predominantly low-lying country, Bangladesh is inherently more susceptible to flooding.

Climate Change: The impacts of climate change, including more erratic weather patterns and rising sea levels, have exacerbated the incidence and severity of flash floods in Bangladesh.

Non-compliance with Environmental Regulations: The lack of adherence to environmental laws and regulations further intensifies flood risks, underscoring the need for stringent policy enforcement and sustainable development practices.

4. Reducing the Flash Floods

Structural Measures: Implement and maintain infrastructure such as dams, levees, bridges, and culverts to manage floodwaters effectively.

Nonstructural Measures: Promote the use of water-resistant construction materials and cultivation of salt-resistant crops to withstand flood impacts.

Land Use Planning: Discourage settlements in high-risk flood zones through strategic zoning and urban planning.

Early Warning Systems: Utilize comprehensive forecasting and early warning systems to alert communities in advance of impending floods.

River Management: Restore natural river channels and address encroachments to facilitate better water flow and reduce flood risks.

Community Participation: Enhance flood and disaster risk governance by fostering greater community involvement and awareness programs.

Regional Cooperation: Strengthen regional cooperation to develop joint strategies and share resources for preventing future disasters.

Climate Change Mitigation: Bangladesh must actively work towards fulfilling its Nationally Determined Contribution (NDC) commitments under the Paris Agreement to mitigate climate change impacts.

Individual Flood Proofing: Encourage individual measures such as flood-proofing homes and properties to reduce personal risk.

Clear Drainage Systems: Ensure drainage systems are unclogged and functional to allow efficient water flow during heavy rains.

Retaining Ponds: Create and maintain retaining ponds to temporarily hold excess floodwater and prevent overflow.

Human Awareness and Environmental Compliance: Raise awareness about flood risks and enforce environmental regulations to ensure sustainable development practices and reduce vulnerability.

5. Conclusion

Every year, Bangladesh faces significant damages and losses due to flash floods. These floods result from various natural and human-induced factors, including heavy rainfall, river convergence, deforestation, unplanned infrastructure development, and climate change. It is imperative to address and rectify these causes to control and mitigate the impact of flash floods. By implementing necessary initiatives such as building and maintaining flood defense infrastructure, enforcing environmental regulations, promoting sustainable land use planning, and enhancing community awareness and participation, Bangladesh can significantly reduce the devastating effects of flash floods and ensure a more resilient future for its communities.

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