Climate Centre

Country-level | Climate fact sheet

Bangladesh

The following climate factsheet summarizes available information on the climate of Bangladesh, climate change and impacts of these changes on humanitarian activities in country. Each of the factsheets were written as a compilation of information from peer-reviewed academic papers, government publications, and INGO documentation.

Figure 1: Map of Bangladesh

1. Climate Overview

Average annual temperature: 26°C (with seasonal variations between 15°C-34°C)

Average annual rainfall: 1000-2800 millimetres

Main driver of climate variability: 1. El Nino Southern Oscillation (ENSO) (typically every 2-7 years) 2. South Asian Monsoon 3. Southeast Trade Winds 4. Indian Ocean Dipole

1.1 Short overview

Bangladesh (Figure 1) is a country with a subtropical monsoon climate. The average temperature is around 26°C, but this varies seasonally between roughly 15°C and 34°C (Figure 2c), with colder extremes in the mountainous North and the highest extremes around capital city Dhaka. The warmest temperatures tend to accompany the summer rainy monsoon season from April to September (Figure 2c). Bangladesh is one of the wettest countries in the world, annual rainfall ranges from 1000 millimetres in west to more than 2800 millimetres in the east and south parts of the country (Figure 2b). Most rainfall is associated with the South Asian Monsoon, which brings warm and moist air from the Indian Ocean (World Bank, 2021). The country has three different climatological seasons from March to June characterised by hot and humid weather. From June to October, the rainy or monsoon characterized by hot and rainy weather. And from October to March characterised by cooler and dry weather. Most rainfall is associated with the South Asian Monsoon, which brings warm and moist air from the Indian Ocean (World Bank, 2021).

2022

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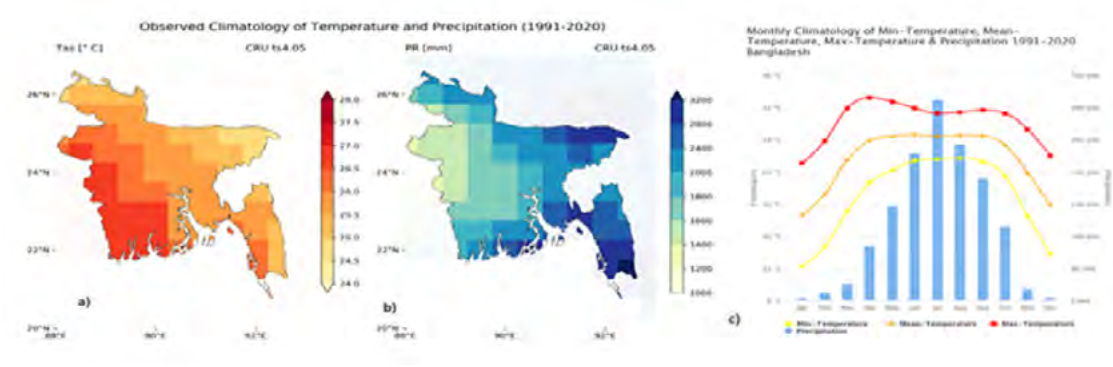

Figure 2: Observed Climatology of mean Temperature (a), annual precipitation (b) and monthly climatology (c) over 1991-2020. (Adapted from World Bank, 2022)

During El Niño periods, Bangladesh typically experiences drier than normal conditions during June to September and during La Niña periods, wetter than usual conditions typically occur (IRI, 2014).

Bangladesh ranked 27 out of 191 countries by the 2022 Inform Risk Index (DRMKC, 2022). Bangladesh has extremely high exposure to flooding, tropical cyclones, and drought (World Bank, 2021).

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1.2 Climate Change in Bangladesh

Historical climate	Projected Climate
Temperature	
Mean annual temperature have increased by 0.1-0.2°C per decade (1961 to 2015) (Gutiérrez *et al.*, 2021b). Increases happen mostly during monsoon seasons (World Bank, 2021). The number of 'hot' days (above 35°C) increased by 26 days per year from 1960–2003. This warming is also mostly seen in the early monsoon season (McSweeney *et al.*, 2010)	Mean temperatures are projected to rise by at least 2°-2.5°C (by 2050) for a high greenhouse gas (GhG) concentration scenario (SSP5-85) and 1.5°-2°C for low GhG concentration scenario (SSP2-4.5) (Gutiérrez *et al.*, 2021). Maximum and minimum temperature will increase, and heat waves will intensify in duration. Annual number of very hot days is projected to rise dramatically and with high certainty (Gutiérrez *et al.*, 2021b)
Precipitation	
Observed shift in rain distribution since 1960 with increases in March-May rainfall and decreases in June-August rains.	Heavy rainfall during the wet season is projected to become more intense. Increases in the intensity and frequency of heavy precipitation is predicted to cause flooding and soil erosion (Gutiérrez *et al.*, 2021a, 2021b; Seneviratne *et al.*, 2021).

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2. Priorities of the Movement and climate change

2.1 Scale up climate smart DRR, early action and preparedness: DRR portrait

Observed hazard	Projected Risk
Flooding	
Flooding is an annually recurring hazard especially during the monsoon (June to September). Figure 3 highlights the area's most at risk from severe tidal surges, river floods and flash floods. River flooding is particularly threatening as a large percentage of the landmass sits in the estuary of three major rivers (Brahmaputra, Ganges, and Meghna) (Parvin *et al.*, 2016). During the monsoon and in the pre-monsoon periods, flash flooding poses a threat to communities living in downstream of the Maghalaya hills in India and other lowland areas of Bangladesh, especially the districts of Sylhet, Moulayjbazae, Habigani, Netrokona and Kishoreganj (source: Asian Development Bank [ADB], 2021; Abedin and Khatun, 2020).	Under a low emissions scenario, the frequency and magnitude of extreme flood events are projected to increase significantly (Paltan, 2018; Mohammed, 2018). Extreme floods that would historically occur a 1 in 100-year frequency could become 1 in 50 or even 25-year events. Under a 1.5°C scenario Mohammed *et al.* (2018) estimate the magnitude of a flood extreme flood event to increase by 27% in the Ganges, 8% in the Brahmaputra and 15% in the Meghna. The figures for a 2°C scenario increase to 29%, 24% and 38% respectively. It is estimated that under the high-emissions pathway (RCP8.5), by the 2030's 5.3 million people could be affected annually by flooding. This would lead to an increase of $25 billion of the country's GDP (World Bank, 2021). Relative sea level rise in the Ganges delta has been projected to be occur at a rate of 5-10mm/year (World bank, 2021). As 6,170 km^2 of the Ganges Delta lies at less than 2 meters above sea-level, the region is incredibly vulnerable to the impacts of sea level rise and associated impacts on land, livelihoods, and communities. A scenario aiming to limit emissions at 2°C by 2100 (RCP4.5) projects a sea level rise of approximately 0.5 meters (World Bank, 2021). Without significant adaptation the number of people affected by coastal flooding in Bangladesh could be between 2.5 million to 7.2 million in the years 2070-2100 (UK Met Office, 2014). As a result of droughts combined with the compounding effects of flooding, landslides and soil erosion increasingly poses a threat to communities across Bangladesh. Ahmed (2021) points out that increasing spontaneous urbanisation in the hills of Bangladesh is causing a sharp increase in landslide disaster frequency. Landslides are impacted not only changing climatic conditions but also anthropogenic factors such as migration (Ahmed, 2021).
Cyclones	
Cyclones and associated effects such as storm surges can affect most areas of Bangladesh (figure 4) but pose the highest threat along the coastal regions, particularly in November and May. Tropical cyclones in Bangladesh stand as some of the most devastating disasters in recorded history. Alongside causing destruction of property and infrastructure and economic repercussions, cyclones also cause heavy precipitation, landslides, and heavy winds (Rahman and Rahman, 2015; World Bank, 2021). The ADB (2021) estimates that 12 of the major cyclones that have impacted Bangladesh since 1965 have led to almost 480,000 losses of life (ADB, 2021).	

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It is essential to note that many of these hazards are interrelated and produced compound risks to the same areas and communities. In addition, risk must be understood as the interplay between hazard risk, exposure, and vulnerability which make certain communities, individuals, and sectors more impacted by the hazards. All project design should consider the risk mentioned above and the compounding risks they represent.

Disaster Risk Management Strategies

The country's vulnerability to hazards is heightened by a high population density and increasing urban population and social vulnerability. It is important to note that several areas face the risk of compounding hazards (such as flood and drought for example).

Islam *et al.* (2020) have identified several key challenges to the effective integration of DRR and Climate Change Adaptation (CCA) in Bangladesh. These revolve around funding mechanisms, coordination challenges and competing actors, issues with implementation and mainstreaming of projects and difficulties with information and knowledge sharing. Furthermore, Udin *et al.* (2020) find that communities believe that local governments have failed to uphold good governance principles, corruption is widespread and that a lack of transparency and minimal inclusion of local populations all lead to barrier to the effectiveness of programs.

2.2 Reduce health impacts of climate change

Climate change in Bangladesh is projected to have direct and indirect impacts: The direct health impacts of climate change in Bangladesh are numerous. They include morbidity and mortality due to heat stress, cyclones, floods, droughts, and other extreme events. Indirect impacts are more diffused. They include discruption in food systems, psychological effects, water insecurity and the spread of infectious diseases (Helldén *et al.*, 2021; Rahman *et al.* 2019).

Climate change will affect physical health and cause respiratory illness and damage to lung tissues (due to ground-level ozone) as temperature and humidity rise (Delwer & Hawlader, 2021; Mahmud *et al.*, 2021). Vector-borne diseases, especially dengue fever, will likely increase as climatic conditions become conducive (Mahmud *et al.*, 2021). Heatwaves and temperature affect the elderly and vulnerable populations first and can have widespread and sustained impacts on health and well-being (Ministry of Foreign Affairs of the Netherlands, 2019). These risks are compounded by a lack of access to proper sanitation facilities, a weak health sector and limited healthcare provision available in Bangladesh (Abedin *et al.*, 2019). Moreover, the healthcare system itself is threatened by physical climate impacts, with limited infrastructure and the ability to respond during extreme weather events (Shahid, 2010).

Climate change-induced environmental stressors exacerbate mental health risks that are usually mediated by gender inequalities. These risks include stress and amplification of previous traumas, disruption to long-term wellbeing, and widespread (im)mobility with its associated impacts. Others include displacement and evacuations into unfamiliar and hostile environments (for example, evacuation to cyclone shelters), child abuse and injury, domestic tensions, child marriages, and loan pressures (Hayward & Ayeb-Karlsson, 2021).

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2.3 Sustainable water: resources management, infrastructure and access

Water, Sanitation and Hygiene

The major climate change risk to water, sanitation and hygiene services in Bangladesh are saline intrusion, drought, floods (coastal, fluvial and flash floods) and cyclones.

Climate change will compound safe water access, hygiene and sanitation challenges that have been persistent due to environmental degradation, arsenic contamination in groundwater and salt-water intrusion in the coastal regions (Hossain *et al.*, 2022).

Bangladesh already faces a significant water crisis. In 2017, an estimated 22 per cent of the population did not have access to water at home. While just under 90 per cent of Bangladeshis have access to at least some basic services of clean water near their homes, approximately 45 per cent, or 73 million people, use contaminated water (Water Aid, 2021). There is no city with a significant sewer system. Only the capital city of Dhaka has a sewer system, and that system serves just 18 per cent of the city's population (World Bank, 2016).

Saline water intrusion into the ground and surface water is a major challenge in the coastal regions of Bangladesh due to sea level rise (World Bank, 2021). Drinking salinized water and the accompanying increased sodium intake can have adverse health effects, including a range of significant maternal health risks, notably leading to dangerous levels of hypertension in pregnant women (Khan *et al.*, 2011). In addition, saline and faecal surface water contamination drive people to use more groundwater resources which increases the risks of arsenic poisoning (IRC & Water for People, 2021).

Increasing drought due to rising temperatures threatens pond sand filters and rainwater harvesting in areas where groundwater resources are limited or are contaminated by arsenic or salts (Abedin et al, 2018). Prolonged droughts in the dry seasons are especially increasing in the north-west regions of Bangladesh (ICCCAD & Water Aid Bangladesh, 2021).

Cyclones and post-cyclone water logging negatively impact sanitation infrastructure. The cyclones induced high waves and flooding inundate toilet structures, especially pit latrines that serve most of the rural population (IRC and Water for People, 2021). Additionally, cyclones cause damage to water infrastructures, mostly boreholes in coastal regions (IRC and Water for People, 2021).

Bangladesh's water and sanitation sectors have increased coverage over the last several decades; however, hygiene promotion and education and the quality of water and sanitation facilities need improvement (Mahmud and Mbuya, 2016).

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Infrastructure, power and electricity

Bangladesh's capital Dhaka is one of the most densely populated cities in the world at 41,000 people per square kilometre. In Dhaka, 4 million people live in informal settlements (Habitat for Humanity n.d.) characterized by inadequate housing and services along with a range of high vulnerability indicators, which make these communities particularly at risk of climate-related shocks.

Monsoon-proof buildings are part of Bangladesh's vernacular architecture, but the importance of this knowledge is being reemphasized with recent demographic and environmental changes. Bangladesh has explored innovative ways to provide infrastructure and services within the context of flooding and monsoons, including the use of floating hospitals that expand the reach of medical services to coastal communities impacted by rising sea levels (Sampath 2017).

Bangladesh's energy consumption is exptremely low at just 220 kilowatt-hours (kWh) per year (89 kilogrammes of oil equivalenet (kgoe) / capita), producting less than 0.2 per cent of the world's total greenhouse gas (GHG) emissions. This is due, un part, to the low production capacity and existing grid infrastructure, resulting in a growing energy crisis with deficits is supply, leading to fuel poverty. As a result, only 31.2 per cent of the population is connected to the gris – 80 per cent of whom are urban dwellers (Ministry of the Environment, Forest and Climate Change 2011).

Already existing and projected increases in the frequency and severity of extreme weather events puts the country's energy sctor and under heightened risk. The infrastructure is no only at risk of damage from weather events including high winds, flooding or salt intrusion, but climatic and environmental changes shift demand patterns. During heatwaves and droughts, the high temperatures increase the demand for electricity from users, puts pressure on the power infrastructure's cooling systems, and affects wind power potential (Shahid, 2012)" Inadequate access to emergy cooling, weather due to accessibility issues or power outages, can have dire consequences during extreme heat events.

2.4 Enable climate resilient livelihoods and economic security

Higher temperatures and shifting precipitation patterns will reduce living standards in Bangladesh (ManL *et al.*, 2018). Climatic changes will also directly impact flood protection and labour productivity in urban areas such as Dhaka due to heat stress (World Bank, 2021).

Bangladesh's agriculture sector contributes about 17 per cent of the country's GDP (Rahman, 2017). Yet, the sector is vulnerable to climate impacts, including flooding, storms and cyclones, heatwaves and droughts, as well as saline intrusions. The yield of staple crops, for example, rice and wheat, will suffer from temperature increases (Sikder & Xiaoing, 2014; World Bank, 2021). Indirectly, climate change's effect on the health of smallholder farmers affects production, exacerbating poverty and food insecurity (Talukder *et al.*, 2021).

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Saline intrusion leads to losses on major crops by up to 20-40% (Miah *et al.*, 2020). Increasing climatic variability, salinization, more frequent inundation, and temperatures above critical thresholds will decrease major crop production and Bangladesh's cultivable by 17%, as 30% of cultivable land is in the coastal area (Ministry of Foreign Affairs of the Netherlands ,2019; Miah *et al.*, 2020).

Climate change risks the livelihoods of people dependent on fisheries and livestock, exacerbating food insecurity, unemployment, poverty and malnutrition. Since the 1990s, rates of undernutrition have declined, but prevalence remains high with 38.7 per cent of under five-year-olds 'short for their age' and 35 per cent underweight (Mahmud and Mbuya, 2016). Loss of habitat, habitat degradation, ocean acidification and changing reproduction patterns due to climate change poses significant risks to fisheries (Barange *et al.*, 2018). Similarly, the livestock sector is at risk of reductions in grazing lands and increased heat-related mortality and diseases among farm animals.

Bangladesh has experienced steady economic growth (a rate of 5.8 percent annually) during the last decade, with relatively low inflation and stable domestic debt alongside improvements in nutrition and health outcomes (Mahmud and Mbuya, 2016). However, Bangladesh's economic stability is vulnerable to climate impacts across many sectors. World Bank research suggests higher temperatures and shifting precipitation patterns will reduce living standards in Bangladesh soon (Mani *et al.*, 2018).

2.5 Address climate displacement and protection

Current and future displacement challenges

Over a million people are already displaced annually within the country (IDMC, 2021).

Climate-related disasters trigger the most displacement, with approximately 110,000 people displaced by cyclones and a million people by floods. This displacement trend is projected to worsen due to loss of agricultural livelihoods and as tidal flooding due to rising sea levels increases, as well (ibid.).

Climate displacement is projected to be widespread in Bangladesh, with most climate displacement projected to occur internally rather than across international borders. Approximately one-third of the estimated 17-36 million slow-onset climate-induced internally displaced people in South Asia are expected to be in Bangladesh (World Bank, 2021). Key expected hotspots of out-migration are suggested to be around Dhaka City as well as the northern and eastern regions of the country (Rigaud *et al.*, 2018). The main populations displaced from slow-onset climate change will be those dependent on rain-fed crops due to a loss of livelihoods and food security (*ibid*.).

Sea-level rise is projected to displace up to 18 million people irrespective of other hazards – but people are projected to continue to migrate towards coastlines. The scale of displacement due to sea-level rise illustrates the large-scale impacts of climate change on Bangladesh. Research finds that the negative consequences of salinity on crop production due to sea-level rise increases both internal and international migration away from coastlines (Chen & Mueller, 2018). However, it is projected that people will still migrate towards Bangladesh's coast irrespective of coastal flooding (Bell at el., 2021).

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There is a high risk of secondary displacement due to climate hazards. Key areas where IFRC works, Cox's Bazar and Bhasan Char, are at high climate risk, which prompts concerns about future secondary displacement for Rohingya refugees as well as Bangladeshis living in the region. Projections of increased urban and coastal flooding, cyclones, and wildfire (ThinkHazard, 2022) all pose risks for increased displacement in these areas. In June 2019, for example, over 28,000 refugees in Cox's Bazar in south-eastern Bangladesh were affected by heavy monsoon rains, with over 10,000 people being displaced due to floods and landslides (ReliefWeb, 2019).

Protection

A public health study in Dhaka shows that the children in these communities are substantially more at risk of diarrhoea and asthma than the non-migrant population, leading to lower life-expectancy (Molla *et al.*, 2014).

In addition to internal migration and displacement, climate-induced migration from Bangladesh to India is increasing. This could potentially cause socioeconomic tensions, destabilization of politics, and a range of economic and environmental impacts. The protection of climate-induced migrants and understanding these migration patterns are essential to properly address this cross-boarder issue (Panda, 2010).

Climate migration, within Bangladesh, has both a socioeconomic and a gender component as climate impacts disproportionately affect individuals of lower economic status and women. In Bangladesh, women are more vulnerable to shocks for socioeconomic reasons, with less resources to adapt, and are more likely to be killed or injured during extreme weather events (Parvin *et al.*, 2013; Cannon, 2002). Globally, disasters exacerbate gender inequality; and, within Bangladesh, where pre-disaster conditions are already poor, and disasters often occur at the same time or in sequence, this effect is magnified (Rahman, 2013).

Potential needs for migrants and displaced people

Livelihoods diversification will be a key adaptation strategy to mitigate migration or to help make it sustainable; some work has focused on providing livelihoods opportunities in secondary towns in Bangladesh to avoid climate migrants moving to informal settlements around Dhaka, which pose concerns due to overcrowding and lack of infrastructure (Rana & Ilana, 2021; Alam, 2022).

Migration Law and Policies

Presidential Decree No. 331 of 1980, 28 May, 1981. This decree adopted the 1951 Refugee Convention as domestic law.

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2.6 Policy

Relevant information from the Nationally Determined Contribution (NDC) (2021)

GHG Emissions Reduction target: In the unconditional scenario, GHG emission would be reduced by 6,73% by 2030 it could be reach 21.85% with support from the international community.

Area of focus on Adaptation: (1) Food security, social protection and health; (2) Comprehensive disaster management; (3) Infrastructure development; (4) Research and knowledge management; (5) Mitigation and low carbon development; and (6) Capacity building and institutional development.

Inclusion of DRR: Yes, DRR is an explicit part of the NDC with a focus on vulnerable populations. It includes enhancement of information system, activities related to flood and cyclones.

National Designated Entity: Department of Environment, Ministry of Environment, Forest and Climate Change

Key stakeholders: Ministry of Environment, Forest and Climate Change, Ministry of Agriculture, Ministry of Fisheries and Livestock and Ministry of Food

Other National Policies on Climate

- National Adaptation Programme of Action (NAPA) (2019). The NAPA will soon be strengthened by the National Adaptation Strategy (NAP).
- Bangladesh Climate Change Strategy and Action Plan (BCCSAP), released in 2009, priorities food security, social protection and health, disaster management and capacity building and institutional development".
- Various policies aiming to leverage climate finance, for instance the Bangladesh Delta Plan 2100, and the Bangladesh Climate Change and Gender Action Plan.

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Climate finance

National Societies can explore options for accessing climate funds through smaller funds, such as the GEF's Small Grants Programme or the FFEM's Small Scale Initiatives Program. These grants range from about $20,000 to $50,000 USD and are intended to support community-level initiatives. The GEF Small Grants Programme sits under UNDP and has a National Coordinator in each country. Some countries have National Climate Funds, which may be accessible to the National Society. Other funding from bilateral donors, national climate funds, or multilateral climate funds like Adaptation Fund, CREWS, or GCCA+ could be explored.

National societies (NS) cannot directly apply for climate finance from the GCF, but they can be an implementing partner for an accredited entity. NS can investigate national GCF projects that are being designed to create partnerships.

Engaging in national climate adaptation planning is vital for accessing climate finance.

Additional Resources

Climate Centre. (2022). Factsheet on Climate Finance. https://www.climatecentre.org/wp-content/uploads/Fact-Sheet-on-Climate-Finance.pdf

Climate Centre. (2022). Entry points for National Societies on Climate Finance partnerships. https://www.climatecentre.org/wp-content/uploads/Entry-Points-for-Climate-Finance-Partnerships.pdf

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