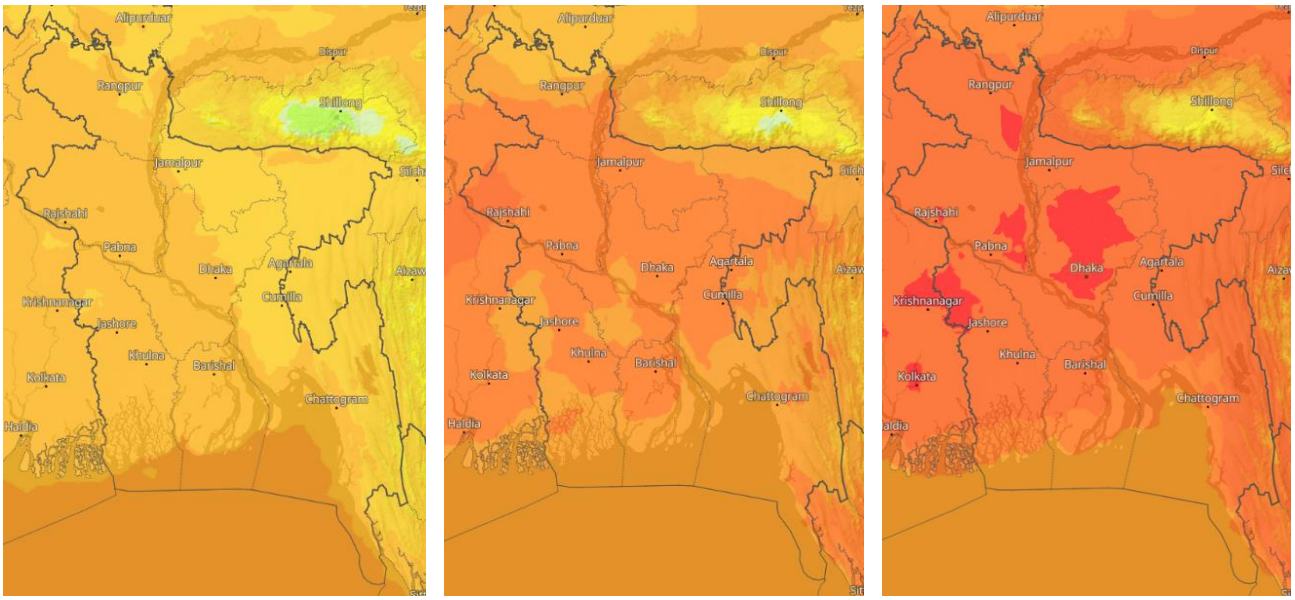
Extreme Heat in Bangladesh

A study about heat wave exposure, vulnerability, impact and response options



August 2025

Author: *Associates for Innovative Research (AIRD)*

Editor(s): *Felix Gossrau and Ritwika Chandra (Concern Worldwide)*

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List of Abbreviations

ADPC	Asian Disaster Preparedness Center
AIRD	Associates for Innovative Research
BCCSAP	Bangladesh Climate Change Strategy and Action Plan
BCCTF	Bangladesh Climate Change Trust Fund
BDP	Bangladesh Delta Plan
BDRCS	Bangladesh Red Crescent Society
BMD	Bangladesh Meteorological Department
BNBC	Bangladesh National Building Code
BRAC	Bangladesh Rehabilitation Assistance Committee
BRRI	Bangladesh Rice Research Institute
CCGAP	Climate Change and Gender Action Plan
DLS	Department of Livestock
DNCC	Dhaka North City Corporation
DRR	Disaster Risk Reduction
FGD	Focus Group Discussions
GUK	Gana Unnayan Kendra
Hi	Heat Index
HNAP	Health-National Adaptation Plan
IDI	In-depth Interviews
IFRC	International Federation of Red Cross and Red Crescent Societies
IPCC	Intergovernmental Panel on Climate Change
KII	Key Informant Interviews
MODIS LST	Moderate Resolution Imaging Spectroradiometer - Land Surface Temperature
NAP	National Adaptation Plan
PwD	Person with Disability
RIMES	Regional Integrated Multi-Hazard Early Warning System for Africa & Asia
SOD	Standing Orders on Disaster
SUHII	Surface Urban Heat Island Intensity
UHI	Urban Heat Island
UNICEF	United Nations Children's Fund
WBGT	Wet Bulb Globe Temperature
ZCRA	Zurich Climate Resilience Alliance

1. Introduction

Background and Rationale

Bangladesh is among the most climate-vulnerable nations due to its unique topography and geographical location. The country faces significant exposure to extreme weather events such as cyclones, floods, saline intrusion, and storm surges, causing extensive damage. Events like El Niño have further exacerbated these challenges, leading to below-average rainfall. The Global Climate Risk Index 2023 ranked Bangladesh the ninth most disaster-prone country globally.[1] In this uncertain environment, extreme heat waves are another hazard intensified by climate changes, as seen from 1980–2023, where Bangladesh's maximum temperature rose by 1.1°C, with its "feels like" temperatures increasing by 4.5°C, creating drier conditions, threatening agricultural productivity and livelihoods in both rural and urban areas, affecting people's lives and jobs.[2]

A heat wave (HW) is a period of excessively hot weather, which may be accompanied by high humidity. It is usually measured relative to the usual weather in the area and is relative to normal temperatures for the season.

In Bangladesh, a heat wave is defined as an event where the daily temperature exceeds 36 degrees Celsius across a vast area and remains elevated for at least 3 days. [3] [4]

Intensification of extreme weather events like heat waves are of relevance as they impact vulnerable populations and hence exacerbate existing inequalities and impede poverty reduction and resilience building. Despite the rising prevalence of heat waves and heat stress in Bangladesh, comprehensive data for its direct impacts on quality of life and public health remain limited. In addition, there are limited insights on the experiences of disadvantaged populations and comparing the effects of heat stress across rural and urban settings. To build resilient systems that protect livelihoods, the environment, and public health and to develop effective interventions, more insights and understanding of the differential impacts of heat stress in urban and rural contexts are urgently needed. More insights will also support the compilation of crucial evidence to inform policies and decision making aimed at mitigating and adapting to the growing threat of heat waves in Bangladesh.

With funding from the Z Zurich Foundation and as part of the Zurich Climate Resilience Alliance (ZCRA), Concern Bangladesh is implementing the 'Flood Resilience Project' in partnership with Gana Unnayan Kendra (GUK) in the Gaibandha and Lalmonirhat districts. The programme focuses on strengthening individual and systemic resilience, including improved policy implementation and funding availability to climatic hazards such as flood and extreme heat. With this study Concern seeks to analyse current trends and impacts of extreme heat in rural and urban areas. The study also aims to identify policy gaps and recommend effective interventions that enhance disaster response preparedness and establish robust resilience mechanisms in the targeted regions.

Objective of the Study

The overall objective of this study is to explore the context of heat risk in terms of hazard, exposure, vulnerability, and impact. It also aims to investigate heat stress coping, adaptive capacities in contexts of rural and urban communities, and recommends interventions to enhance response mechanisms, preparedness, and the overall resilience of disaster management, environmental, health, and other relevant ministries. In addition, the study identifies key stakeholders and policies relevant for heat wave adaptation, mitigation, and heat stress management.

Scope and Methodology

This study employed a mixed-method approach, integrating both qualitative and quantitative methodologies for data collection and analysis to understand the context, stakeholders, gender implications, and policies relevant to heat stress and identify certain areas of interventions.

Primary data sources included a survey with 576 participants, 15 focus group discussions (FGDs), 11 key informant interviews (KIIs), and 6 in-depth interviews (IDIs) and case study. Secondary sources encompassed relevant documents such as scientific articles, study reports and policy documents to gain a deeper understanding of the context and to identify gaps and policy amendments needed to address heat stress. Concern employed a consultancy company based in Bangladesh – Associates for Innovative Research (AIRD) – to undertake the study. The study followed a participative and consultative process with key stakeholders giving input and advice at different stages.

Figure 1: Flow diagram of the study

Conceptual Framework

The study employs a simplified version of the IPCC risk framework to explore context and factors of risk from extreme heat in Bangladesh. The framework emphasizes risk - and the impacts when the risk is realized - as result of the interaction between a climate hazard, exposure, and vulnerability, as well as the considerations of responses and adaptation to the risk to mitigate potential impact.[5]

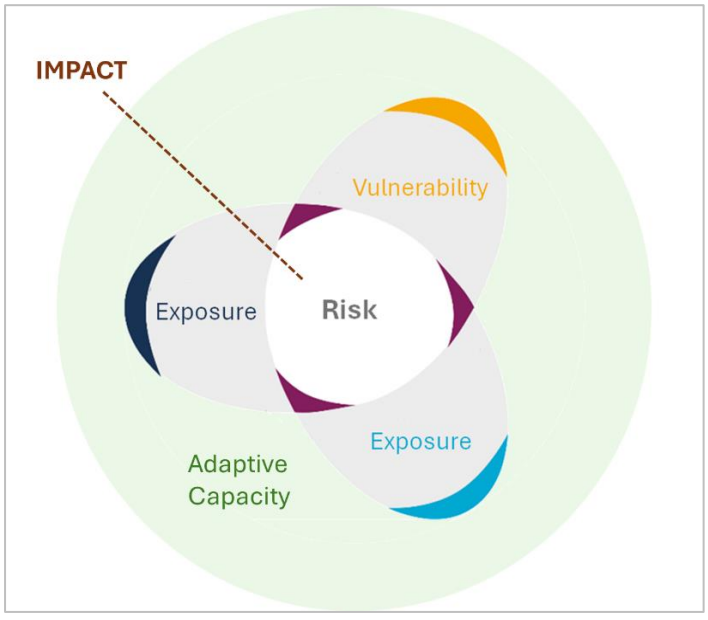

Figure 2: Adjusted IPCC risk framework

- **Hazard**: the occurrence of natural or human-induced physical events that may have adverse effects on vulnerable and exposed elements.
- **Exposure**: refers to the inventory of elements in an area in which hazard events may occur / The nature and degree to which a system is exposed to significant climatic variations.
- **Vulnerability:** refers to the propensity of exposed elements such as human beings, their livelihoods, and assets to suffer adverse effects when impacted by hazard events. The degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes.
- **Impact:** the effects and consequences of a hazard event on people and nature (natural and human systems).
- **Adaptive Capacity**: The ability of a system to adjust to climate change (including climate variability and extremes) to moderate potential damages, to take advantage of opportunities, or to cope with the consequences.

Structure of Report

The following section – Chapter 2 - elaborates on the findings from the study, including aspects of heat hazard, exposure, vulnerability, and impact, following the conceptual framework above. Chapter 3 discusses adaptive capacity and options to cope with heat stress. Chapter 4 deals with recommended actions both looking at the policy environment and practical interventions. Chapter 5 draws on the whole report and concludes with an outlook. In addition, the annexes provide an overview of heat relevant national policies and strategies, as well as stakeholders.

2. Findings: Extreme Heat in Bangladesh

2.1 Hazard Situation

In this section, we discuss the current context in terms of climate change, and trends of heat waves, and more specifically heat stress in Bangladesh. While the trends indicate how the situation has changed over the last few years, we also see the adverse impacts of increasing temperature, leading to heatwaves, and consequently heat stress.

Regions like South Asia, the Middle East, and Africa are particularly vulnerable to extreme heat events due to their climate and socioeconomic challenges. [6] In South Asia, especially in India, Pakistan, and Bangladesh, these events are becoming more frequent and severe.

Globally, a 0.5°C rise above the 2°C target could expose over 15% of land to severe heat stress, with over 95% of countries affected by the end of the century, amplifying health, wildfire, and agricultural risks in countries like India and Brazil.[7] Heat waves present direct health risks like heat exhaustion, heatstroke, and dehydration, as well as exacerbating pre-existing conditions.[8] Projections suggest that the frequency, intensity, and duration of heat waves will increase, raising concerns about long-term health impacts.[9] In Bangladesh, the frequency and intensity of extreme heat waves have risen in recent years due to global warming.[10] Bangladesh's tropical climate, high humidity, and dense population heighten its vulnerability to heat-related illnesses and declining labour productivity in sectors like agriculture and construction.[11]

The Wet Bulb Globe Temperature (WBGT) – a measure for assessing environmental heat stress - has risen in Bangladesh by 0.08–0.5°C per decade since 1979. Similarly, discomfort indices like heat index (HI) and Humidex rose significantly from 1961–2020 due to rising temperatures and humidity, with 'severe heat stress days' increasing threefold in Dhaka and twelvefold in Sylhet.[12] During the monsoon and pre-monsoon seasons, high-risk days have increased significantly, affecting larger areas and intensifying heat-related risks.[13] Based on the observation, it has been found that the number of hot days with temperature greater than or equal to 36°C has been increasing at Gaibanda (Figure 3), Lalmonirhat District (Figure 4) as the situation, and the Dhaka North City area (Figure 5).

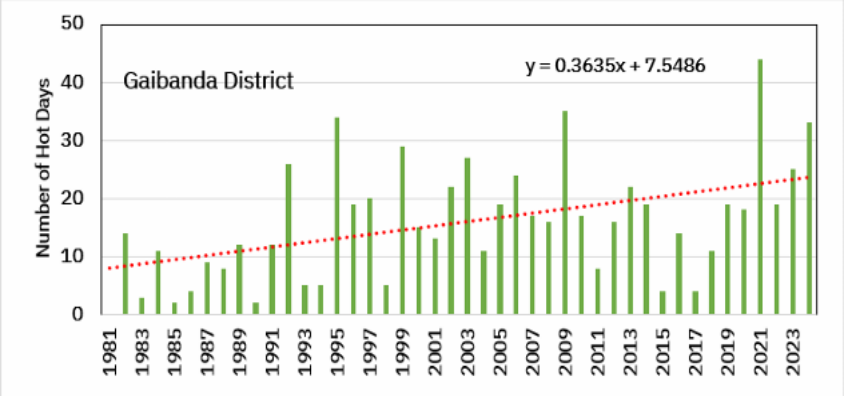

Figure 2: Temporal variation in the number of hot days (with maximum temperature ≥ 36°C) in Gaibanda District

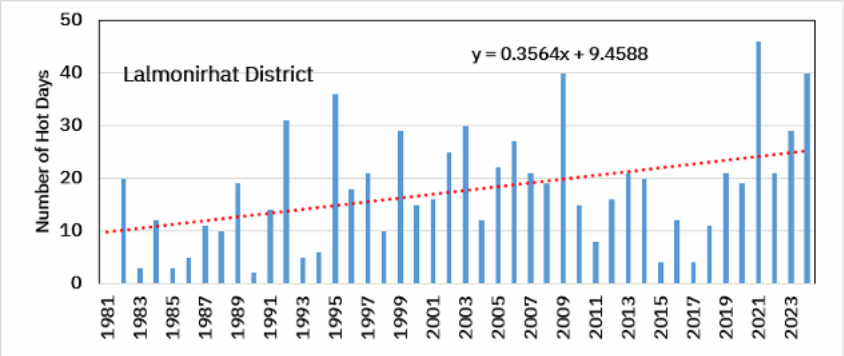

Figure 3: Temporal variation in the number of hot days (with maximum temperature ≥ 36°C) in Lalmonirhat District

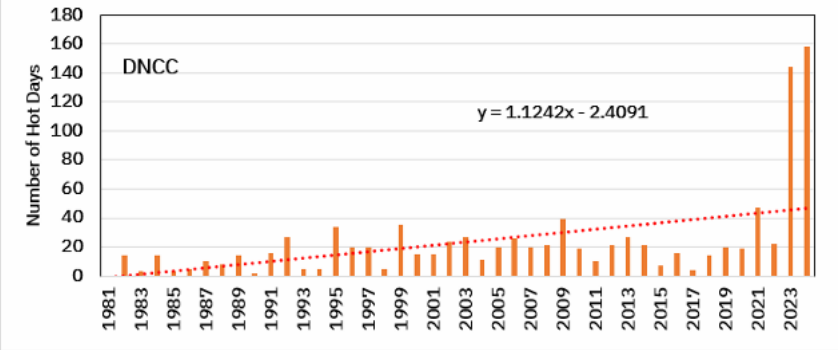

Figure 4: Temporal variation in the number of hot days (with maximum temperature ≥ 36°C) in Dhaka North City Area

Historical data shows that over the past 20 years, Dhaka's average daytime temperature has risen by approximately 2.75°C— surpassing the Paris Agreement target of limiting warming to below 1.5°C and significantly exceeding the global average temperature increase of 1.2°C.[14] Projections by Khatun and Saadat 2021 indicate that by 2030, Bangladesh will experience a 0.95% increase in average annual temperature, a 5.17% rise in greenhouse gas emissions, and adverse climate impacts affecting around 30 million households.[15]

In 2024, temperatures in Bangladesh peaked between 40°C and 42°C, making it the hottest year on record for the country.[16] The extreme temperatures led to nationwide school closures in April 2024, disrupting the education of approximately 33 million children and caused significant learning losses while negatively impacting children's mental health.[17] By 2050, nearly 35.5 million children in Bangladesh are expected to face heat stress, enduring an average of 4.5 or more heat waves annually[18].

2.2 Exposure

Exposure describes to which extent people (or nature, objects) are subjected to a hazard, i.e. extreme heat. Although, extreme heat events are increasingly hazardous for health, agriculture, and economies in the whole country, there is a difference in heat stress exposure in rural and urban areas of Bangladesh. It is determined by different factors such locality, duration/timing or intensity of the exposure, with distinct challenges driven by environmental (e.g. vegetation cover, effects of deforestation) and infrastructural factors (concrete building materials, high building density), as well as socio-economic factors such as living conditions, occupational activities, and access to resources.

Prevalence, frequency, and seasonal patterns

Heat impacts vary between rural and urban areas, influenced by local climate and seasonal patterns. Climate change has intensified extreme heat events, raising temperatures, especially in summer (March to June), as dry seasons amplify heat stress in both rural and urban settings. During the study, a vast majority of respondents reported experiencing heat stress annually, with 95.3% of rural and 98.8% of urban participants acknowledging yearly occurrences. A small percentage of rural respondents (4.1%) reported experiencing heat stress every two years, slightly higher than in urban areas (0.8%).

Discomfort due to extreme heat during summer was noted daily by workers in informal sectors, engaged in outdoor occupations such as rickshaw pullers, street vendors and construction workers, who also face heightened risks during peak heat hours with minimal relief, underscoring the intense exposure faced by individuals in physically challenging and outdoor work environments.

In rural areas like Gaibandha and Lalmonirhat, prolonged exposure affects farmers working outdoors with limited shade or cooling options, reducing productivity and labour capacity, and consequently crop yields. In urban areas like DNCC, heat stress is shorter but more intense due to dense infrastructure, limited greenery, and the Urban Heat Island (UHI) effect.

Heat stress is an escalating concern that significantly impacts both rural and urban communities, affecting health, work productivity, and overall well-being. As climate change intensifies, the frequency and severity of heat stress events are rising, further exacerbating challenges faced by vulnerable populations.

Urban Heat Island (UHI) effect

Urban areas are experiencing more significant temperature increases due to climate change and the UHI effect [19]: in urban areas impervious surfaces like concrete and asphalt absorb and retain heat, raising urban temperatures by 2°C to 10°C compared to rural areas.[20] This effect, combined with limited greenery, exacerbates heat exposure during the day and night, especially in areas with inadequate cooling options. The lack of vegetation reduces natural cooling through evapotranspiration, making outdoor spaces unsafe, particularly for vulnerable groups like the elderly and children.

Urban heat island intensity (SUHII) in Bangladesh's major cities is influenced by factors such as population density and lack of green space. A study using MODIS LST data for 2000-2019 found that Dhaka and Chittagong had higher SUHII than smaller cities, with daytime SUHII being greater than at night. [21] The UHI effect has intensified, increasing urban vulnerability to heat waves. A heat vulnerability index (HVI)[a] constructed for Dhaka shows high-risk zones in over 60% of the city, with exposure and sensitivity strongly correlated to vulnerability.[22]

Additionally, the UHI effect worsens air quality by trapping pollutants, increasing health risks such as respiratory issues, cardiovascular stress, and heat-related illnesses. Urban infrastructure also struggles under the strain of increased energy demands for cooling, leading to power outages that disproportionately affect low-income households without access to cooling technologies. This combination of extreme heat, poor air quality, and infrastructure challenges creates a cycle of vulnerability, leaving urban residents—especially in informal settlements—facing significant health and socio-economic risks.

Deforestation and extreme heat

Deforestation in Bangladesh exacerbates the challenges of heat stress and climate vulnerability, as the loss of tree cover diminishes natural cooling and shade, particularly in rural areas where planting of trees is a widely preferred coping strategy. The country lost around 246,000 hectares tree cover between 2001 and 2023 due to deforestation, representing a 13% decrease since 2000. [23] Deforestation is predominantly a rural concern that leads to a rise in temperature in immediate areas where land has been cleared of forest vegetation but can also affect temperatures regionally. Loss of forest vegetation can lead to an average rise of 4.4 degrees Celsius in daily high temperatures in tropical regions and thereby increasing exposure to heat stress.[24]

Population density and crowding during peak hours

Population density plays a key role in heat stress, especially in urban areas. While 49.8% of rural respondents reported living in highly populated areas, the dispersed nature of rural settlements allows for better air circulation and cooler conditions. 10% of rural respondents described their location as very high in density. In contrast, urban areas, with 36.9% describing their neighbourhoods as "very high" in density, experience intensified heat due to dense buildings, limited green spaces, and heightened human activity. As one urban resident noted, *"When it's hot in the city, it's even worse in the crowded areas where the buildings trap the heat."*

Overcrowding during peak heat hours worsens discomfort and stress, especially in urban areas. While 27.3% of rural respondents reported no crowding during the hottest parts of the day, only

[a] Heat Vulnerability Index (HVI) maps are used to identify areas in the state where people are vulnerable to heat. Heat vulnerability is how likely a person is to be injured or harmed during periods of hot weather.

12.7% of urban respondents shared this experience. Urban areas face frequent overcrowding, with 22.7% of respondents describing conditions as very crowded and 14.2% as extremely crowded. A substantial 81.5% of rural respondents and 78.8% of urban respondents attributed the intensified heat stress to higher population densities, particularly in densely packed residential and commercial areas.

The shared perception that crowding amplifies the effects of heat stress suggests that both urban and rural communities recognize the link between population density and thermal discomfort. A rural respondent stated, *"When the area becomes more crowded, there's less breeze, and it feels even hotter."* An urban respondent similarly shared, "*In the city, the heat just gets trapped by all the people and buildings."*

2.3 Vulnerability

This section investigates how people are susceptible to extreme heat events, e.g. based on socio-economic status and access to services. Heat waves are among the most dangerous hazards that directly impact individuals' physical wellbeing and health, contributing to heat stress, heat-related mortality, reduced labour productivity, and increasing poverty in both rural and urban settings. While extreme heat waves affect the general population, vulnerable groups such as outdoor workers, the elderly, individuals with chronic illnesses, children, and pregnant women face heightened risks and require additional protection. [25] [26] They are also a major cause of mortality for vulnerable groups. Socio-demographic factors, including gender, access to cooling systems, and time spent outdoors, amplify the physiological and psychological effects of heat stress. [27] [28] [29] Similarly, heat impacts are severe in Bangladesh's Readymade Garments (RMG) sector, where excessive indoor heat is common from May to August. [30] [31]

Women are particularly vulnerable to extreme heat events due to distinct aspects in physiology and women health,[32] but more critically due to structural inequalities which amplifies existing vulnerabilities and issues which are outlined in this section.

Health Infrastructure and Accessibility

Access to emergency medical care is vital for mitigating the effects of heat stress. The study found slightly better access in rural areas (72.1%) compared to urban areas (68.5%), though a notable portion in both lacked access (16.6% rural, 17.7% urban). Rural respondents live an average of 4.48 km from the nearest healthcare facility, with distances ranging up to 28 km, with delays due to limited transport options, further exacerbating vulnerabilities, especially for the elderly and children. While health care providers are more common compared to urban area (57.1% vs. 47.7%), their effectiveness is limited, leading to community members rely on under resourced community health workers and clinics.

One rural respondent noted, "During the heatwaves, we depend on local health workers, but sometimes it's too late for them to help if the situation worsens." Another participant shared their frustration: "We never get the expected service from the Community Clinic. Most medicines in the clinic are useless, and staff members often misbehave with patients. Thus, we go to the Upazila Health Complex, which is at least 10 km away, and during heat emergencies, that's just too far."

However, in urban areas, traffic congestion delays medical care, with an average response time of 30-40 minutes. The absence of specialised services for heat stress and uncertainty around where to seek help is also a challenge faced by those in urban areas, as many say "*everything is about*

serious injuries and accidents" indicating that heat stress is often not prioritised. While rural providers offer some immediate relief, their limited capacity, combined with the lack of urban heat-specific services, leaves both populations at risk.

Poverty and Economic Inequality

Generally, poorer households face higher challenges dealing with extreme heat, due to the nature of their livelihoods and working conditions, and due to limited access to resources to mitigate and respond to the impacts of extreme heat. Income disparities play a key role in coping with heat in both rural and urban areas. In rural regions, 44.8% of households live below the poverty line and many depending on agriculture for a living, with limited access to resources like heat-resistant crops or irrigation systems which could mitigate the impact of heat on agriculture. Many rely on manual outdoor labour, being more vulnerable to immediate direct heat impact on their physical wellbeing. One respondent stated, "*We can't afford equipment to protect us from the heat, so we endure it daily.*" In urban areas, wealthier households (22.3%) have better access to cooling solutions, but poorer households, especially in informal settlements, face overcrowding and poor ventilation, worsening heat exposure. One urban respondent said, *"Even with a fan, the cramped space doesn't help."* While financial constraints are a major barrier, other factors like limited education in rural areas and poor infrastructure in urban areas exacerbate heat stress, deepening the gap in adaptive capacity between wealthier and poorer households.

Occupational Vulnerabilities to Heat Stress

Occupational patterns in rural and urban areas reveal distinct vulnerabilities to heat stress, affecting health and productivity. In rural areas, farmers face prolonged sun exposure, increasing risks of dehydration, heatstroke, and reduced productivity, while women taking care of family and home experience indirect heat stress from household chores.
Heatwaves also disrupt education by causing school closures, affecting adolescents' learning. In urban areas, outdoor and poorly ventilated workplaces amplify heat risks. Rickshaw pullers, daily labourers, and garment workers face heat exhaustion and lower incomes. Older adults in transport or market jobs are particularly vulnerable to heat-related illnesses. Additionally, roles like street beggars and road roller drivers are highly exposed.

However, difference in urban and rural communities is largely driven by the predominance of outdoor, physically demanding jobs in rural settings, such as farming, where workers face prolonged exposure to the elements. In contrast, urban jobs, especially those in formal sectors, often provide better access to shade, air conditioning, or indoor environments that offer relief from the heat.

Water Availability

Water availability is key to mitigating heat stress, as it is instrumental for cooling and regulating the body temperature. Water also plays a role in maintaining agriculture-based livelihoods, and household upkeep in general. When asked to describe their household's ability to adapt to changes in water availability (e.g. seasonal variations) 35.1% of respondents from rural areas and 33% from urban areas indicated they are affected by reduced water availability. Where agricultural activities are predominant, water demand for irrigation is higher, which cannot compete with household needs, putting a strain on groundwater resources while potentially exacerbating water scarcity during prolonged heat waves.

98.7% of the rural respondents rely on tube wells as their primary source of water. However, prolonged heat stress and drought conditions lower water tables and reduces the availability of

water from tube wells, which exacerbate the impacts of heat stress for vulnerable populations. Of people in rural areas, 60% reported shortages of water from tube-wells in the summer month April, when demand for irrigation and household use is highest. This shortage stresses vulnerable communities, especially farmers, limiting crop irrigation, increasing losses, and amplifying heat stress impacts.

In urban settings, although access to water is relatively stable, challenges can still arise due to high population density and reliance on centralized water systems for cooling, hydration, and other needs, which already struggle during peak demand and extended heat stress. In DNCC area, 68.5% of respondents rely on tap water and the availability of water is more dependent on supply systems. The tap water supply affected by various aspects like pressure fluctuations, leakage, or contamination risks during high demand periods, making it difficult for urban residents to maintain adequate hydration or cooling, making urban households more vulnerable to water usage. City dwellers often resort to fetching water from distant sources, which is costly for those in poverty. In extreme cases, some move to suburban areas to access water. Urban areas face more significant water challenges overall.

Housing Structure

Housing structure significantly influences the level of heat stress both in rural and urban areas. In rural settings, a large proportion of respondents (92.1%) reside in tin or wooden houses, which are poorly equipped to cope up with high temperatures due to low insulation properties, as they absorb and retain heat, exacerbating discomfort during heat stress. As one rural respondent noted, *"Our house is made of tin, and in the summer, it feels like the sun is right above us inside."* Urban areas show a different pattern, as 47.3% of respondents live in more durable brick or cement structures, which provide better insulation and are more effective in keeping indoor temperatures lower. However, these brick houses are built in proximity (for example in DNCC), and often not built properly, have exceptionally low ventilation facility and therefore are unable to release heat energy. They also absorb more heat during heat stress period and eventually become a high temperature zone. Moreover, the more better off households in the city area are utilizing air conditions that releases exhausted air to the outside which is absorbed as heat energy by the neighbouring houses. This situation deteriorates the heat stress condition of their neighbours. As a result, the highly populated urban areas become a heat source during heat stress.

The disparity in housing quality underscores a significant divide between rural and urban populations in terms of their ability to withstand heat stress, with rural populations more vulnerable to temperature extremes due to the use of less resilient building materials.

Age-Specific Vulnerabilities to Heat Stress

Children and adolescents have a heightened vulnerability to extreme heat because their body and immune system is still developing and because they depend on adults and carers to reduce exposure and employ appropriate behaviours to heat[33]. In rural settings, adolescents are particularly vulnerable due to their involvement in outdoor activities like farm work, chores, and recreation, with heatwaves often disrupting education through school closures, limiting physical activities, and affecting social development.

Adults working in agriculture face prolonged heat exposure, leading to health issues like heatstroke, dehydration, and fatigue, which diminish productivity and adversely impact household incomes and agricultural output. In urban areas, youths' involvement in education alongside roles in businesses, construction, and service industries increases exposure and exacerbated by the urban heat island effect, causing fatigue, dehydration, and heat-related illnesses that reduce

productivity and elevate healthcare costs. Older adults in urban settings, often employed in markets or transport services face similar risks from extended heat exposure, while being at risk of exacerbation of pre-existing conditions and increasing hospitalizations.

2.4. Impact

Heat stress can affect many aspects of people's lives, however there are disparities in the impacts whether based on different populations (women, children, older people), professions (outdoor workers, labourers) or contexts (rural, urban). This chapter explores those impacts based on different contexts and areas of impact including education, occupation, health, livelihood, and food security.

Education and Family workload

Heat stress has a profound impact on the education system in both rural and urban areas. In rural areas, 74.6% of households participating in the survey have school-going children, and 63% of these families reported that school closures due to heatwaves and disrupts their children's education. One rural respondent shared, "When schools close because of the heat, the children miss out on important lessons, and it's hard to catch up." This disruption limits learning opportunities and children's social development. In urban areas, 66.2% of households have school-going children, with 70% indicating that academic institutes reschedule their routines. Additionally, 55% of parents in both areas mentioned that changes in school timings added pressure to their daily routines, particularly increasing stress levels among women, who often bear the brunt of managing both household and work responsibilities. One urban mother noted, "With the heat affecting the school timings, I have to adjust everything, and it becomes overwhelming."

Labor Productivity

Heat stress significantly affects work dynamics due to variations in job types and environments. 11% of participants in rural areas and 9.6% in urban areas reported being present at the workplace but working less due to heat stress. In addition, 15.4% in rural areas and 13.1% in urban areas reported being absent from workplace due to extreme heat the last year.

This variation underscores the stark differences in exposure and coping mechanisms across contexts. In rural areas, agricultural workers endure extended hours of physical labour in the heat, whereas urban informal workers, such as street vendors, experience shorter but more frequent interruptions. This highlights how the severity and frequency of heat stress impacts vary, with rural workers often facing longer, more debilitating exposures while urban workers cope with recurring but briefer disruptions

Job loss due to extreme heat is a notable impact on day labourers in rural areas, with 15% of rural respondents reported job loss compared to only 3.6% of urban respondents.

This discrepancy reflects the nature of day labour work, which is often more dependent on weather conditions and outdoor environments, where heat stress can directly halt productivity. For most of respondents, however, job loss is not a direct consequence of heat stress, while a smaller group indicated that the question is not applicable, due to part-time or non-day labour roles. This suggests that while extreme heat poses a significant challenge for day labourers, particularly in rural areas, other workers may not experience the same level of disruption in their employment.

Overall, the economic consequences of heat stress are also significant. Studies estimate that heat stress results in an average annual economic loss of $281 per individual in Bangladesh, primarily due to reduced labour productivity. [34]

Discomfort and Illness

Discomfort from heat stress affects the daily lives of both rural and urban residents. Discomfort caused by extreme heat during summer months is a frequent experience for most respondents. Daily discomfort is reported by 72.4% of rural and 74.6% of urban participants, while weekly discomfort was noted equally (25.4%) by both groups. Reports of discomfort occurring monthly or rarely have minimal and observed only among rural respondents. During discussions, many daily wage earners have mentioned missing work on peak heatwave days due to illness or an inability to tolerate extreme conditions. Women involved in household chores and informal sectors have shared experiences of reduced productivity during heatwaves, often prioritizing their health over work. Discomfort is particularly acute in poorly ventilated environments. Urban slum residents have faced heightened challenges due to overcrowding and limited access to cooling infrastructure, further exacerbating the impact of extreme heat.

Health Impacts

Heat stress poses significant health risks across both rural and urban communities. Among the specific health impacts identified by respondents, headache emerged as the most common effect, cited by 82.8% of rural and 82.7% of urban participants. Other notable impacts include dizziness, diarrhoea, and stroke. Less frequently mentioned effects included anxiety, seizures, and coma. Urban respondents also reported a higher incidence of specific conditions such as kidney failure (7.8% urban, 0.85% rural) and were more likely to report heart attacks (24%) compared to rural participants (21%) as a result of heat stress. Additional impacts noted by a few respondents include fever, heat rash, and a combination of fever and cough, illustrating the diverse health effects of heat stress across settings.

In the interactive discussion, participants frequently mentioned dehydration, heat exhaustion, and chronic fatigue as immediate health impacts. A small percentage of respondents have reported hospitalization due to heat stress, with rural areas slightly higher at 5% compared to 3.8% in urban areas, indicating that severe cases leading to medical admission are rare. Of those who required hospitalisation, an average expense of 4446 BDT, with a range from 1200 BDT to 12000 BDT was reported, highlighting differences in medical care costs. Notably, no respondents either in rural or urban areas have reported fatalities due to extreme heat stress, suggesting that heat-related deaths are not a concern among the surveyed population or respondents did not see a connection between the death of a person during heat waves and the impact of extreme heat on the person's health.

Energy Demand and Supply

During Heat Stress, urban households experienced a significant increase in power demand (54.2%) compared to rural households (37%), highlighting a pronounced reliance on electricity-intensive cooling measures in urban areas. This disparity reflects urban households' greater access to advanced cooling technologies, such as air conditioners, which are used by 18.3% of urban respondents but virtually absent in rural areas. Fan usage is the most common cooling method in both contexts, leading to increased electricity use in households, particularly in rural areas (80.5%) and less in urban areas (57.4%).

There is a significant gap between demand and supply of electricity during heat stress with 96.6% of rural respondents and 90.8% of urban respondents indicating insufficient power supply during heat stress, when they require increased power. During non-heat stress periods there is a gap between demand and supply, but it is tolerable. On the other hand, during the heat stress period this gap is beyond tolerance. One rural participant said that "Power supply is not sufficient when it is most needed, it suffers us mostly on hot days." These findings underline the vulnerability of both settings, although urban households face heightened electricity challenges with due to the greater demand of electricity-intensive cooling solutions like air conditioners and refrigerators.

Agricultural Livelihoods

Heat impacts livestock and crops as seen when the Temperature Humidity Index (THI) [2] exceeds 74, common from February to December in Bangladesh. As a result, livestock productivity declines, and diseases increases.[35] [36] From an agricultural perspective, heat stress and drought, affect 73% of rural areas, and 45.8% of urban areas, reduce crop growth and yield.[37] [38] Heat waves disrupt agricultural cycles as seen in April 2024, when prolonged increased heat put the *boro paddy* (which is harvested during April and May) under threat and led to mango buds falling prematurely. Rural livestock production was also severely affected with a 25% decline in rural milk, egg, and meat production.[39] Dairy cows also suffer reduced milk production and physiological disturbances, requiring targeted interventions such as cooling management and breeding for resilience.[40] [41] Such disruptions directly threaten rural livelihoods adversely affects farmers' incomes and threatening overall food security [42].

During our study, rural participants cited reductions in crop yields (57.7%), crop losses (55.8%), and deteriorated crop quality (37.3%) as the main consequences of heat waves. These issues are reported at significantly lower rates in urban areas, where reductions in crop yields (26.9%) and crop losses (28.5%) are also notable, reflecting lower dependency on agriculture in urban settings. Rural areas also faced more severe livestock-related challenges, including reduced productivity (11.3%), health deterioration (8.2%), and even livestock death (7.2%), while such issues did virtually not exist in urban environments, as livestock practices are less in urban areas. Livestock commodities are slaughtered in rural area immediately after carrying from the rural areas to fulfil the demand. While rural participants noted concerns such as soil degradation and the risk of fires or overheating equipment, these are only minimally reported.

Food Crises and Negative Coping

Heat stress-induced food crises are more prevalent in rural areas (33.9%) compared to urban areas (13.5%), reflects the heavy dependence on agriculture for livelihoods in in rural regions. The impacts of reduced crop yields, loss of income, and disruptions in food availability are more acute in rural settings, leading to a higher incidence of food insecurity. To cope with these crises, rural households are commonly resorted to borrowing food, with 55.6% of respondents reporting this strategy. In urban areas, 42.9% of respondents reduced meal portions as a means of managing food shortages. However, asset sales or relief support were rarely utilized in either context, suggesting limited access to emergency resources or financial coping mechanisms.

Water availability for household needs

During periods of extreme heat, the demand of usable and drinking water increases for managing heat stress risks. Heat stress usually evolves in summer (when the rainfall is suppressed), hence storage of water reduces to lower level. Interestingly, in both rural and urban areas 98.1% of respondents said that they have always access to water for household needs which indicates that

access to water seems not to be a major constraint perceived by households. However, this does not give an indication about the quality of water available and even though the overall water access remains high, households may experience intermittent shortages or reduced water quality during extreme heat events due to increased consumption and strain on supply systems.

While most rural and urban respondents reported no year-round water shortages, those who did experience scarcity mainly faced it in April, the hottest month of the year, i.e. in urban areas, 66.75% of respondents of those who reported water shortages face these in April, when heatwaves increase cooling demands. This strains municipal water systems and exacerbates the difficulty of maintaining hydration and cooling during extreme heat. Seasonal and ad hoc water shortages can amplify the effects of heat stress on crops and livestock, particularly during the peak dry months, as outlined under 'Livelihood impacts' above.

Heat impact on women

Although this study does not provide a disaggregation of impact based on gender, women and girls are more vulnerable to and more affected by extreme heat than men, due to structural inequalities.

While men are known to be exposed and vulnerable in their role as outdoor workers, such as day labourers or during their farming activities, women are disproportionally affected due to their dual role in the household as well as income earners, which often goes unnoticed.[43] Women are more likely to lose income or their job during heat waves, while at the same time caregiving and household responsibilities increase. This has effects on education, economic opportunities, as well as on their overall wellbeing, and exacerbates already existing gender inequalities.[44] Many household chores and caring work requires work inside, which is a struggle when indoor temperatures rise, and worse in sub-optimal housing such as tin-roof houses with poor ventilation, or densely populated areas, when heat is trapped inside. Workers in the informal sector workers, such as in the ready-made garment industry where women make up the majority of the workforce — face serious conditions which exacerbate tremendously when heat rise, e.g. high humidity, fabric dust, poor ventilation, inadequate water access, minimal bathroom breaks. These conditions result in reduced energy of workers and ability to focus, affection efficiency and productivity of their work, while having overall health impacts.[45]

In addition to impact of heatwaves on general human health, women face distinct vulnerabilities, as extreme heat can have effects on different aspects specific to women health, including reproductive, menstrual, and maternal health, with harmful and effects on menstruation, fertility, pregnancy, and menopause. For example, women experience increased physiological susceptibility during pregnancy, because of differences in thermoregulation. The effect of extreme heat can result in preterm and stillbirths and generally serious long-term health complications both for the mother and for the child. [46]

A study looking at the links between environmental stress and marriage in Bangladesh suggest that families cope by rushing marriage of daughters or accepting less desirable marriage proposal when facing environmental shocks such as heatwaves. The study found that women and girls are at increased risk of getting married in a year with a heatwave or the year following a heatwave or that they would get married into poorer families or to men with less education and who were more supportive of intimate partner violence.[47]

3. Adaptive Capacity and Positive Coping

Adaptive capacity – as outlined in the conceptual framework - enables individuals, households, and communities to adjust to climate variability and extremes, moderate potential damages, take advantage of opportunities, or to cope with the consequences. In this section we briefly look at what people do to cope with immediate shocks and mitigate effects of extreme heat using existing resources and strategies. We also look at capacities/opportunities that can help people to adjust practices and help to transform systems towards better heat resilience.

Agricultural practices adopted to cope with extreme heat

In rural areas, only a small percentage of farmers have adopted practices to mitigate heat stress, with 8.8% switching to heat-tolerant crops, 10% have adjusted planting schedules, and 10.3% have increased irrigation efforts. A slightly higher proportion, 19.4%, have reported using more pesticides, while 17.9% have used additional fertilizers to counter the effects of extreme heat. A significant 61.8% of rural respondents have not implemented any alternative strategies, reflecting a general gap in awareness or access to adaptation solutions to the challenges posed by heat stress or that the respective households do not undertake agriculture activities.

Adaption rates are lower among urban participants who practice agriculture: 5.4% respondents cited using more fertilizer and 5% cited using more pesticides to cope with production losses due to extreme heat. Fewer respondents reported of increasing irrigation frequency (3.8%) and switching to heat-tolerant crop varieties (2.7%) to cope with heat stress effects on the agricultural production. Only 1.2% respondents indicated that they prefer adjusting planting and harvesting schedules.

Protection measures for vulnerable groups

Specific age groups such as infants and children, or elderly, as well as groups with specific health and care requirements such as pregnant women or people with disabilities (PwD) are at higher risk for heat stress. Hence employing effective coping is critical to reduce the risks.

Ensuring elderly, pregnant women and disabled children stay in cool and shaded places emerged as the most common heat protection strategy during the study, with more than 75% of participants mentioning it. Providing light meals is also a common response to heat in rural areas (around 40%) and more common in urban areas - for elderly (64.6%) and pregnant women and disabled children (53.5%). Respondents in urban areas emphasize healthcare, with 49.2% ensuring regular check-ups, compared to rural areas where 36.1% mentioned that as a measure for pregnant women and disabled children, and 31.7% for elderly. Dressing the elderly in light-coloured clothing is much more common in urban areas (around 50%) than in rural areas (around 25%). Only few respondents mentioned hydration as a response to heat stress.

In rural areas, many respondents take steps to protect children from extreme heat, with 74.3% avoiding leaving them unattended and 53% reducing sun exposure. Common cooling methods include using wet cloths (39.8%) and lightweight clothing (35.1%). However, only 5.3% use sunscreen or sunglasses, due to limited awareness or access. A participant noted, “We try to keep them cool with cloths, but sunscreen is not something we use.” In urban areas, similar practices are observed, with 76.9% avoiding leaving children unattended and 60.4% limiting sun exposure. More families use wet cloths (55.4%) and lightweight clothing (54.6%), while 12.7% use sunscreen and sunglasses, reflecting better availability. An urban mother shared, “We always put sunscreen on our kids before they go outside.” Only few respondents in both settings reported

using umbrellas, often due to a lack of awareness about their benefits. One remarked, “I’ve never thought about using an umbrella for heat.”

Overall, community support systems, especially within families, play an essential role in protecting vulnerable individuals

Interest and need for different coping strategies

A majority of rural (74%) and urban (76.5%) respondents expressed a desire to prepare for future heat stress, recognizing its growing challenges. Tree plantation emerged as a popular solution, supported by 66.5% of rural and 57.3% of urban respondents. Shaded areas were another common strategy, favoured by 37.3% of rural and 39.2% of urban respondents. Urban respondents showed greater interest in solutions like water reservoirs (24.6% vs. 11.4% in rural areas) and lightweight clothing (41.7% vs. 33.5%). Training programs on heat stress preparedness were also more popular in urban areas (19.1% vs. 15.3%), along with suggestions like distributing work to minimize exposure (10.1% vs. 5.1%). A small portion of urban respondents (2.5%) mentioned air conditioners, highlighting the demand for advanced cooling solutions, though cost and accessibility limit rural adoption. These findings underline the need for tailored strategies: rural communities prioritize natural and low-cost measures, while urban communities seek diverse and technology-driven solutions to cope with the challenges of future heat stress.

Awareness and knowledge about heat waves, heat stress and its symptoms

Knowledge about at what point high temperatures constitutes a heat wave, the understanding that heat stress results in negative effects for someone’s body, and recognizing symptoms of heat stress, are all critical for individuals and communities to prepare for extreme heat, act beforehand and mitigate negative impacts of heat waves.

During the survey, participants were asked if they know what **heatwaves** are and the responses indicate that awareness differs significantly between rural and urban respondents. 60.2% of rural respondents and 72.3% of urban respondents are not familiar with the concept of heatwaves. However, of those who indicated that they know what heat waves are, respondents from urban areas demonstrated a better understanding of heatwaves’ characteristics (84.7%) compared to rural areas (56.7%). During interactive sessions, participants have expressed various levels of awareness about heatwaves, often describing them as prolonged periods of intense heat that disrupt daily activities, whereas many associated it recent climate changes and urban environmental factors, and some were unaware of the term "heat wave" but recognized symptoms of discomfort during summer months.

Respondents’ knowledge was also assessed regarding their awareness about **heat stress** and its effects like heavy sweating and discomfort caused by extreme heat. A larger proportion of rural respondents (77.1%) are familiar with the concept of heat stress compared to urban respondents (54.2%), due to the direct impact of extreme temperatures on agricultural activities. Common misconceptions included attributing heat stress solely to direct sunlight exposure, ignoring the role of high humidity and poor ventilation.

Most respondents are aware of the **symptoms of heat stress**, with a higher level of awareness in rural participants (84.6%) compared to urban participants (66.9%). Heavy sweating emerged as the most frequently identified symptom, with prevalence of headaches. Other symptoms include hot, red, dry, or damp skin, and dizziness, among others.

Traditional Building and Cooling Practices

In rural settings, traditional coping mechanisms such as mud-plastered walls, thatched roofs, and earthen pots effectively mitigate indoor heat and preserve water coolness. A rural farmer explained, *"Our mud walls keep the house cool even when the outside feels like an oven."* These practices reduce reliance on modern cooling technologies and promote sustainability. In urban areas, traditional methods have declined due to introduction of modern infrastructure and limited space. High-density housing and concrete structures worsen the urban heat island effect; residents are now more dependent on electrical cooling systems. An urban resident shared, *"We grew up using mud pots for water, but here in the slum areas of the city, it's all plastic bottles and refrigerators; unfortunately, not everyone can afford refrigerators."*

Organization or scheduling of work times

Behavioural adaptations, such as adjusting work schedules to avoid peak heat, are common in both rural and urban areas but differ in flexibility. Rural farmers often reschedule labour-intensive tasks to early mornings or late evenings to minimize heat exposure. A rural labourer explained, *"The midday sun is unbearable, so we work early and rest when it's hottest."* While effective in maintaining productivity, these adjustments can limit essential agricultural activities, potentially affecting crop yields and income. In urban settings, workers similarly adjust their routines, avoiding outdoor activities during peak heat. However, rigid work schedules often restrict flexibility. An urban worker shared, *"I plan my tasks early in the morning, but work deadlines don't always allow for breaks."* This rigidity can lead to physical strain and reduced efficiency, especially for outdoor labourers or informal workers who lack access to shade or hydration facilities.

4. Gaps and Challenges in Coping and Adapting to Extreme Heat

Extreme heat poses a significant risk to rural and urban populations, having impact on human health, assets, and livelihoods, as well as the natural environment.

In response, people employ a range of different coping activities. With the trend of increasing frequency and intensity of climate hazards such as heat, much more emphasis needs to be put on increasing people's capacity to prepare for and adapt to extreme heat events and mitigate their effects. This is especially paramount for those groups of society who are already vulnerable or have higher exposure to heat risk.

Mitigation requires urban planning strategies like increasing green spaces, using reflective materials, and enhancing cooling infrastructure.[48] In rural areas, adaptation strategies should focus on agricultural resilience through crop diversification, advanced irrigation, and heat-resistant varieties.[49] Improving rural healthcare infrastructure and emergency systems is also crucial.[50] Socioeconomic factors such as income level and access to air conditioning are key to coping with extreme heat [51], and equitable access to resources can reduce health disparities.[52]

There is a diversity of short and longer-term measures and interventions focusing to mitigate impact of heat risk, e.g. focusing on early warning systems, public health preparedness, cooling infrastructure, and adaptive strategies for agriculture and urban planning. The feasibility of implementing measures, including traditional and non-traditional coping measures, requires tailored strategies and activities in both urban and rural areas, and varies based on available resources, knowledge, and local contexts.

Constraints in coping and adapting to heat

While people draw on both traditional and non-traditional coping interventions and strategies to mitigate heat impact, effective use, adoption and scale-up is facing challenges.

In urban centres like DNCC, non-traditional strategies such as rooftop gardening, blue spaces (lakes, fountains), and vertical greening struggle due to high population density, limited space, and extensive infrastructure. Building modifications like improved airflow and thermos-shield materials are hindered by inflated costs, regulatory gaps, and maintenance issues. Informal settlements, with poor ventilation and infrastructure, face additional difficulties. As one urban slum dweller remarked, "Living in a poorly ventilated slum feels like being trapped in an oven." These barriers exacerbate inequalities, especially for low-income groups, deepening the urban heat burden. Cooling infrastructure, such as public cooling centres, is notably absent in urban areas, worsening the effects of heatwaves while urban planning fails to prioritize climate-resilient measures.

In rural areas, traditional coping mechanisms like resting in shaded areas or using minimal cooling methods offer limited relief. Financial constraints and energy poverty prevent access to modern cooling technologies like fans or air conditioning. A rural respondent shared, "We can't afford fans, and air conditioning is out of reach, so we rely on the old ways, even if they aren't always effective." Traditional construction and storage methods (mud-plastered walls, thatched roofs, and earthen pots) seem effective, but houses made with mud and thatch are also associated with a lower socio-economic status, are less durable than tin-sheds or cement, and are more prone to hazards such as storms and floods.

Currently, effective early warning systems for heatwaves are lacking, as existing disaster risk reduction frameworks primarily focus on cyclones and floods. Public health preparedness is insufficient, with current health guidelines not tailored to heat stress, and there is a pressing need for specialized training and facilities to handle heat-related health emergencies.

In agriculture, although drought-resistant crops are being promoted, there is limited research on heat-resistant crop varieties, and farmers lack the technology and training needed to manage rising temperatures. Public awareness campaigns on heat stress are scarce, leaving many vulnerable populations unaware of protective measures.

Limited healthcare access also hampers effective management of heat-related illnesses. Additionally, gendered vulnerabilities arise, as women often perform both agricultural work and household duties, increasing exposure to heat stress. Urban areas struggle with space, costs, and policy gaps, while rural areas face challenges of poverty, energy deficits, and reliance on traditional practices. Both contexts require context-specific interventions to effectively address heat stress.

Finally, research on heat-resilient infrastructure and crops remains underdeveloped, with much of the focus on floods and cyclones, highlighting the need for a more comprehensive strategy to address heat stress.

Combining piloting and scaling interventions with an enabling environment

Communities' ability to deal with heat stress is determined both by their access to services (such as health, cooling) and their own ability to strengthen their resilience, building on available types of resources and capital (e.g. social, which offer an opportunity to change practice, behaviours, and opportunities).

To effectively take up and enhance proven practices and change behaviours, practical low-cost interventions need to be coupled with an enabling environment that leverages planning and investment into heat stress management.

While the country has made substantial progress in addressing various climate change related issues such as floods, cyclones, and droughts, heat stress has not been adequately incorporated into national frameworks and disaster management policies. The lack of a targeted policy or strategy on heat stress presents several challenges.

Inadequate recognition in national frameworks

Heat stress, although increasingly recognized as a severe public health and environmental issue, is not explicitly addressed in significant national policies, e.g., BCCSAP, SOD, or NAP. These policies primarily focus on more traditional climate hazards, such as floods and cyclones, which leaves heat stress largely unaddressed regarding mitigation and adaptation strategies. As a result, heat stress is often treated as an afterthought, with responses being reactive rather than proactive. Moreover, approaches and strategies on heat stress are ad-hoc and not integrated into broader DRR or climate resilience frameworks. Without a clear policy mandate, there is no coordinated approach for managing the risks associated with heat stress, which limits the effectiveness of response measures and adaptation initiatives. There is also a lack of preparedness to address heat stress at the local government level, leading to inadequate implementation of preventive measures and a delay in response during heat events. As heatwaves and extreme temperature events become more frequent due to climate change, a clear and actionable policy framework can be instrumental to ensure timely interventions, such as early warning systems, public health campaigns, and adaptation measures.

Limited funding for heat stress adaptation

Despite the increasing risk of extreme heat, heat stress is often overlooked in climate adaptation funding streams. Financial resources are not channelled toward research, awareness programs, infrastructure development (like cooling centres), or interventions that would help vulnerable communities cope with heat stress. Considering the increase in intensity and frequency of extreme heat events, more attention and funding need to be directed towards heat to allow vulnerable communities to strengthen effective coping and adapt.

5. Recommendations for Interventions

The previous chapters outlined how Bangladesh faces significant challenges due to rising temperatures and heat stress in both rural and urban contexts. Extreme heat events exacerbate vulnerabilities, particularly for marginalized groups such as the elderly, outdoor workers, home workers, especially women, and children, while placing immense pressure on local health systems and livelihoods. The effects are particularly severe in sectors such as agriculture, construction, and health, where exposure to extreme heat impacts human health, livelihoods, and overall well-being.

Although heat stress is increasingly recognized as a major public health and environmental concern, it is not explicitly addressed in most national policies which focus on more traditional climate hazards, such as floods and cyclones, leaving heat stress largely unaddressed in terms of mitigation and adaptation strategies.

While a policy framework is critical to ensure a coordinated approach for managing heat risks, there is scope for a variety response measures and adaptation initiatives to mitigate the effects of heat stress with the aim reduces immediate risks and build long-term resilience.

5.1 Short-Term Measures

In response to the immediate and critical challenges posed by heat stress focus needs to be on sets of practical and urgent interventions. These interventions aim to alleviate the immediate risks of heat stress while strengthening the resilience of vulnerable communities in both rural and urban areas.

Awareness Campaigns

Objective: Raise awareness of heat stress, its effects, and preventive measures among high-risk populations.

Conduct community-based campaigns in rural areas targeting outdoor workers, such as farmers and labourers. Use local channels like agricultural cooperatives, religious gatherings, health clinics and existing peer-groups to share practical tips, including staying hydrated, seeking shade, and managing work schedules. In urban areas, include digital campaigns and public service announcements for slum dwellers, rickshaw pullers, and street vendors. Focus on heat stress risks and self-care strategies. Collaborate with local NGOs to distribute educational materials in urban informal settlements, public spaces, and rural areas.

Community Cooling Centres

Objective: Provide temporary protection and relief from extreme heat for vulnerable groups.

Set up mobile cooling centres equipped with fans, water stations, and shaded seating. Use solar-powered cooling systems combined with methods like water sprinklers. Cooling centres can be located near agricultural fields, markets, or religious institutions in rural areas, and in slums and densely populated areas urban areas where exposure is highest. Use SMS, social media, public announcements, radio to share cooling centre locations and operating hours.

Enhancing Early Warning Systems

Objective: Ensure timely communication of heatwave alerts and actionable advice.

Collaborate with the Bangladesh Meteorological Department to ensure that heatwave alerts are communicated effectively to communities. To enhance the reach and usability of early warning systems, establish partnerships with Union Parishads and community leaders in rural areas to disseminate heatwave warnings through community radio and public announcements. Provide guidance on adjusting work schedules and accessing shaded rest areas. In urban areas collaborate with municipalities to broadcast alerts via SMS, digital displays, and local broadcasts. Consider including real-time updates on cooling centre availability and emergency services.

Strengthening Healthcare Preparedness

Objective: Equip local health systems to respond effectively to heat-related illnesses.

Heat stress can overwhelm local health systems, especially during extreme events. To ensure that healthcare providers are prepared, focus on building the capacity of local health workers and equipping with health facilities and the necessary resources.

- Conduct trainings for rural and urban healthcare workers to recognize and treat heat related illnesses, including heat stroke and dehydration. Tailor training to address localized

scenarios, such as outdoor worker health in rural areas and overcrowding challenges in urban slums.
- Deploy mobile health units during peak heat periods for on-the-spot care.
- Establish specialized heat stress care units in urban health centres to manage cases in densely populated areas.
- Distribute Heat Stress Relief Kits: Include oral rehydration salts (ORS), cooling packs, and first-aid supplies for clinics with limited resources.

Supporting Outdoor Workers

Objective: Mitigate heat stress risks for outdoor labourers.

- Provide protective kits for outdoor workers: Wide-brim hats, lightweight cooling towels, and portable water filters, UV-resistant clothing.
- Adaptive Work Practices: Coordinate with farming cooperatives in rural areas to reschedule labour-intensive activities during cooler hours. In urban areas, work with construction and transport employers to introduce staggered shifts, cooling breaks, and reduced quotas during peak heat.

Localized Heat Action Plans

Objective: Strengthen community-level preparedness and response to heat stress.

Preparedness is crucial to effectively managing heatwaves and minimizing their impacts. Localized tailored heat action plans can assist local communities to guide responses during extreme heat events.

- Facilitate the development of localized heat action plans by engaging government bodies, NGOs, and community stakeholders.
- Align these plans with existing disaster management systems to maximize resource efficiency.
- Include provisions for setting up cooling centres, ensuring water access, and communicating early warnings
- Heat action plans need to consider and focus on specific situations and needs of vulnerable groups such as elderly, people with disability (PwD), children, pregnant women.

5.2 Long-Term Intervention

To ensure sustainable heat stress resilience intervention focus needs to include long-term interventions that enhance both the natural environment and community infrastructure. These interventions not only provide immediate relief but also establish enduring systems to cope with the increasing intensity of heatwaves. The proposed actions include the development of green and blue infrastructure, climate-resilient building designs, community-based capacity building, strengthening local governance, and leveraging advanced technologies.

A. Green and Blue Infrastructure Development

Nature-based interventions and solutions provide an effective and sustainable approach to mitigating heat stress over the long term. Development and enhancement of green and blue infrastructure can create natural cooling systems, improve urban and rural biodiversity, and reduce the effects of heat stress, especially in urban areas.

Context-specific tree planting initiatives

In rural areas, where resources may be limited, promoting the large-scale planting of drought-tolerant and native tree species (e.g., neem, banyan, tamarind) along roadsides, near agricultural fields, and around community spaces can provide immediate relief. These trees will help cool the environment by creating shade, improving air quality, and enhancing the resilience of crops. There is scope to collaborate with local agricultural extension services to incorporate tree planting into existing farming practices, using trees to create windbreaks or shade for crops and livestock. Additionally, urban areas like Dhaka North can benefit from tree planting along streets and public spaces to counteract the urban heat island effect, cooling the environment and providing shade for residents.

Preservation and enhancement of water bodies

Water bodies such as ponds, canals, and wetlands, which are already part of the rural landscape, can serve as natural cooling systems. However, many of these water bodies are facing degradation due to urban expansion, pollution, and lack of proper management. Focus can be on efforts to protect and restore these water bodies by working with local authorities to remove pollution, enhance water flow, and integrate water bodies into local urban and rural planning processes. In urban areas, the creation or revitalization of artificial water bodies, such as ponds and fountains, can also be incorporated into public spaces to regulate temperature during heatwaves.

Development of green corridors linking urban and rural spaces

Developing green corridors that connect existing parks, forests, and water bodies can create cooling belts in urban and rural areas. In Dhaka North, these corridors can help mitigate the urban heat island effect by providing cooler areas that promote outdoor activities and social interaction. In rural areas, green corridors can serve as ecological highways that support local biodiversity, enhance connectivity between agricultural lands, and offer sustainable paths for rural populations to travel. Foster collaboration of development partners with urban planners and local communities to develop these corridors, prioritizing areas with high vulnerability to heat stress, like densely populated zones and low-income neighbourhoods.

Community involvement and local capacity building

To ensure the long-term sustainability and effectiveness of green and blue infrastructure interventions, local communities must be actively involved in the planning, implementation, and maintenance processes. Establishment of training programs for local leaders, volunteers, and community-based organizations on the importance of nature-based solutions and how to maintain green spaces, water bodies, and tree planting initiatives. Additionally, creating platforms for community engagement and feedback will ensure that the infrastructure is aligned with local needs and that stakeholders take ownership of the interventions. Finally, recognizing the role and knowledge of women in undertaking nature-based work is critical to ensure success of such initiatives.

B. Community-Based Capacity Building

Empowering communities to take proactive measures against heat stress is key to building self-reliance and improving community preparedness over the long term. There is scope to invest in leadership training, education, and local capacity building programs to create a more heat-resilient society.

Leadership training

Providing training for community leaders and disaster management committees on heat stress management is essential. These leaders can be equipped with the knowledge to organize local responses, raise awareness, and provide immediate assistance during heat events. Training local volunteers on first aid, heat stress prevention, and water conservation techniques will ensure communities are better prepared to handle heat-related emergencies.

Integration of heat stress in school curriculum

Long-term behavioural changes are often best achieved when children are engaged early. Instilling a sense of responsibility toward climate adaptation by integrating heat stress education into school curricula can support this behavioural change. In addition, teaching children about hydration, first aid for heat stress, and environmental conservation will not only protect them but also ensure that these messages are carried home to their families. Schools can also serve as safe spaces during heat stress, where children and families can receive information and support.

C. Strengthening Governance and Policies

Effective governance is vital for ensuring that heat stress adaptation measures are integrated into local and national planning frameworks. Collaboration with relevant government authorities and advocating for policy changes can help institutionalize heat stress adaptation in a way that ensures sustainability.

Policy integration

Support the development of heat stress adaptation policies by advocating for the inclusion of heat-related measures in urban planning, disaster management, and climate resilience strategies. This could involve incorporating cooling strategies in building codes, land use planning, and climate action plans at local and national levels.

Advocacy for heat stress recognition

In many countries, heat stress is not yet formally recognized as a critical hazard. There is benefit in strengthening efforts to lobby for the formal recognition of heat stress as a major public health and environmental issue. This would help to allocate dedicated resources and create a policy framework that prioritizes long-term interventions, such as building climate-resilient infrastructure, improving healthcare capacity, and conducting continuous public education.

D. Sustainable Energy Management

Long-term heat resilience requires a focus and investment on energy-efficient solutions that ensure adequate cooling while minimizing environmental impact.

Energy-efficient cooling systems

Promote research and uptake of energy-efficient cooling systems in homes, public buildings, and industries. By promoting passive cooling techniques, better insulation, and low energy air conditioning systems, these interventions will ensure that communities can stay cool without significantly increasing their carbon footprint.

Solar energy

The integration of solar energy can significantly enhance the sustainability of cooling systems. Encouraging the use of solar panels to power cooling technologies can help reduce the dependency on conventional electricity grids, which are often unreliable during heatwaves. Solar-

powered solutions can also offer an affordable and environmentally friendly way to keep communities cool, especially in remote or off-grid areas.

E. Technology and Data-Driven Solutions

The application of technology and data-driven solutions can significantly enhance understanding heat vulnerability and the efficiency and targeting of heat stress adaptation strategies, and direct resources where they are most needed.

Heat vulnerability mapping

Geographical Information System (GIS) and satellite data can support to map heat vulnerability across regions, identifying areas most at risk of heat stress. By combining socio-economic, health, and environmental data, impact-based heat stress maps can be developed, which can help pinpoint specific interventions that will benefit the most vulnerable populations, such as low-income communities, children, the elderly, and outdoor workers.

Monitoring and evaluation

Collecting and analysing data on effectiveness of implemented solutions, their impact and their suitability for different groups (e.g. women, elderly, specific occupational groups) will help to understand what works best for whom under which circumstances. Having such information available will help to identify strengths and weaknesses of solutions, point at barriers and opportunities for scaling, and inform future adaptation actions to address extreme heat.

6. Outlook

Increasing frequency and intensity of extreme heat events is a growing concern in rural and urban areas in Bangladesh, a country which is considered one of the most climate-vulnerable nations. The study followed the IPCC risk framework as guiding concept to explore heat as a climate risk, looking at heat as hazard itself, how people are exposed and vulnerable to heat, the impact of extreme heat on people and their response strategies and adaptive capacity.

People are exposed to heat in their work environment - like during inside home-based work, farming, construction, rikshaw pulling - and through their place of living, which is especially the case in densely populated urban areas. Aspects like age, gender and socio-economic status exacerbates vulnerabilities and impact of extreme heat. At the same time people follow certain behaviours and put strategies in place to protect themselves and their families from heat impacts and safeguard their income and livelihoods.

It is evident that heat risk plays in an increasing role in climate resilience for vulnerable people in Bangladesh. Leveraging people's existing responses and boosting adaptive capacities for people and systems to mitigate impacts of heat is a paramount concern. The study recommends different medium-term and long-term measures which can help strengthen communities' response and resilience to extreme heat in both rural and urban areas of Concern Worldwide operational areas in Lalmonirhat, Gaibandha, and Dhaka (North) and beyond. To note there are aspects of early warning and nature-based solutions which play a profound role in mitigating impact of climate hazards and build resilience, and on which Concern, and the Zurich Climate Resilience Alliance put profound emphasis.

Overall, the findings give relevant insights to explore heat as a climate risk in Bangladesh, and while different aspects covered are to a large extent generic, they provide a starting point to think about and approach heat risk from a practical as well as systems viewpoint. The following key points and areas require specific attention and need to be looked at in more detail:

- Gendered impact: women and marginalized groups face disproportionate impact of heat stress while they are already vulnerable due to structural factors. This demands for more targeted research on specific vulnerabilities and impact, the design and adoption of tailored solutions to women needs (in comparison to generic mitigation measures), and increased emphasis in strategy and finance.
- Sector specific vulnerability and adaptation: Sectors like agriculture, healthcare, infrastructure face increased challenges and impacts of heat which need to be look at in more detail to prepare effective heat responses and mitigation.
- Balance the urban and rural focus: Heat is very much recognized as being a critical issue in urban contexts where the UHI effect exacerbate heat impact, consequently adaptation efforts focus on urban contexts. The impact of heat in rural areas needs to have stronger focus in research and development and implementation of adaptation interventions.
- Community knowledge and ownership: these elements are crucial to mitigate impact of extreme heat by strengthening locally relevant and adapted solutions. Moreover, building on existing place-based knowledge and involving communities in decision-making over medium- and long-term measures fosters buy-in, commitment and hence effectiveness and sustainability of such interventions.

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ANNEX A- Key Stakeholders, Existing Intervention, Gaps and Opportunities

This overview details roles and contributions of various stakeholders to the heat topic, including government agencies, NGOs, INGOs, private sector actors, and other relevant entities.

Name of Key stake Holder	Intervention, gaps, and opportunities
Department of Livestock Services (DLS)	DLS (https://dls.gov.bd) in Bangladesh is actively addressing heat stress impacts on livestock, focusing on: • Temperature Monitoring and Alerts: Collaborating with RIMES for heat stress monitoring and issuing alerts and advisories through their website (nlas.dls.gov.bd). • Farmer Support: Providing direct advisory services at the field level through upazila and union offices, helping farmers manage heat stress. • Animal Care and Health: Educating farmers on cooling livestock, proper ventilation, and hydration. Additionally, they offer guidance on preventing and treating heat-related illnesses like dehydration or heatstroke. • Early Warning Systems: Issuing warnings and preparing farmers to implement preventive measures such as providing shade or cooling methods for animals. These activities are part of DLS's broader efforts to safeguard livestock, an essential source of protein for the population, ensuring both animal welfare and the economic security of farmers during extreme heat events.
Asian Disaster Preparedness Center (ADPC)	ADPC is implementing the USAID-funded **BRACE (Bangladesh Resilience Advancement on City Ecosystem)** project to enhance urban resilience, with heatwaves prioritized among 12 identified hazards. Through participatory Urban Risk Assessments involving 986 participants from Dhaka South City Corporation and Cox's Bazar Municipality, heatwaves emerged as a major concern, leading to the development of **Priority Implementation Projects (PIPs)**. Key community-driven initiatives include: • **Heat Wave Shelter Belts**: Establishing shelter belts in high-risk areas. • **Nature-based Solutions**: Reducing heat island effects and improving soil moisture retention. • **Youth Engagement**: Mobilizing students to raise community awareness. Launched in June 2023 and running until September 2025, the BRACE project began implementing PIPs in November 2024. However, gaps remain in research and community-led initiatives on heatwaves, emphasizing the need for localized, inclusive solutions to address heat-related challenges effectively.
Dhaka North City Corporation (DNCC)	The DNCC is actively addressing heat stress and climate change impacts through key initiatives: • **Climate Action Plan (CAP)**: A long-term strategy launched in 2024 to reduce vulnerability, build awareness, and engage citizens. • **Vulnerable Ward Mapping**: Identifying high-risk areas for targeted heat stress interventions. • **Public Awareness**: Promoting proactive measures through education and community engagement. • **Blue City Project**: Restoring water bodies and enhancing urban ecosystems for better resilience. • **Climate Justice Assembly**: Ensuring inclusive climate policies through public participation. These efforts reflect DNCC's commitment to building a resilient and climate-adaptive urban environment.

Bangladesh Red Crescent Society (BDRCS)	BDRCS has implemented a comprehensive response to the ongoing heatwave, focusing on immediate relief and long-term preparedness. Key interventions include: • Awareness Campaigns: Dissemination of heatwave safety information through natok (dramas), public announcements, and PSAs, along with the display of safety banners. • Distribution of Resources: Providing 70,000 litres of safe drinking water, electrolyte drinks, and shade items (umbrellas, caps) to vulnerable populations. • Cooling Stations: Temporary stations set up in key locations in Dhaka to provide relief. • Healthcare Services: Offering first aid, psychosocial support, and ambulance services. • Cash Assistance: Monetary aid distributed to slum dwellers and persons with disabilities. • Volunteer Engagement: Red Crescent Youth (RCY) volunteers play an essential role in the delivery of these services. • Local Collaboration: Working with local authorities and mobilizing resources for broader outreach. These actions aim to mitigate the immediate impacts of heat stress while planning for longer-term resilience.
International Federation of Red Cross and Red Crescent Societies (IFRC), Bangladesh	IFRC in Bangladesh has implemented targeted measures to mitigate heat stress and support vulnerable communities: • **Early Action Protocol (EAP) for Heatwaves**: Developed for Dhaka, focusing on early warnings, safe drinking water distribution, oral saline, and cash grants for vulnerable households. • **Relief Measures**: Provided BDT 4,500 per household to 4,700 households, benefiting 23,500 people. Temporary cooling stations and ambulance services were also set up in high-impact areas. • **Community Awareness**: Educated high-risk groups, such as slum dwellers and outdoor laborers, about heat stress and protective measures. • **Impact Reach**: Aimed to assist over 123,700 individuals with early warnings, water distribution, and financial support. These initiatives reflect IFRC's commitment to reducing the risks of extreme weather and enhancing community resilience. For more detailed information, you can visit the Bangladesh | Heatwave - DREF Operation Appeal: MDRBD034 - Bangladesh |
IFRC Bangladesh and Bangladesh Red Crescent Society (BDRCS)	**Early Action Protocol (EAP) for Heatwaves in Bangladesh** The IFRC and BDRCS have implemented an Early Action Protocol (EAP) to mitigate heatwave impacts, focusing on pre-emptive and rapid response measures, especially in Dhaka. **Key Actions:** • **Early Warnings**: Disseminating alerts to help communities prepare. • **Resource Distribution**: Providing safe drinking water, oral saline, and BDT 4,500 cash grants to vulnerable households. • **Target Groups**: High-risk populations like slum dwellers, outdoor laborers, and those in poorly ventilated housing. **Collaboration:** • Supported by the **IFRC Disaster Relief Emergency Fund (DREF)** and partner societies like the German, American, Swedish, and Swiss Red Cross. • Efforts are underway to extend support to additional vulnerable districts. This collaborative approach highlights timely and proactive measures to reduce heatwave risks and protect the most affected communities.

Department of Agriculture (DAE)	DAE in Bangladesh, along with institutions like the **Bangladesh Rice Research Institute (BRRI)**, is taking key actions to mitigate heat stress in agriculture. These efforts include: • **Heat-Resistant Crop Development**: Developing heat-tolerant varieties of rice, wheat, and tomatoes to maintain agricultural productivity under high temperatures. • **Adaptation Strategies**: Promoting sustainable agricultural practices such as optimized planting schedules, improved water management, and crop rotation to build resilience against heat stress. • **Farmer Support**: Distributing stress-tolerant seeds and educating farmers on climate adaptation strategies. Additionally, the DAE provides **special bulletins** through the **BAMIS portal** and SMS to raise awareness and help farmers make informed decisions during critical heat events. These bulletins are issued twice a week, with special advisories during high heat periods. However, there is a gap in continuity as there is no clear exit strategy to sustain these efforts beyond the immediate response period.
BRAC	BRAC Bangladesh is tackling heat stress through several key initiatives: • Weather Index Insurance for Farmers (BRAC Microcredit Programme): This program offers weather-based insurance to farmers, helping them mitigate the financial impacts of heat stress, safeguard livelihoods, and reduce vulnerability to extreme heat events. • BRAC Health Programme: This initiative raises awareness in urban low-income communities about heat-related health risks, providing knowledge and strategies for preventing and coping with climate-sensitive diseases caused by heat stress. • Climate Bridge Fund: Supporting small-scale projects in Rajshahi and Khulna, this fund focuses on enhancing resilience to heat stress through climate change adaptation and health interventions, implemented by CA/AVAS and BRAC Health Programme. Challenges include limited budgets, inadequate WASH facilities, and insufficient compensation for affected workers. However, opportunities exist for increased funding, improved health infrastructure, and early warning systems to strengthen responses to heat stress.

Bangladesh Meteorological Department (BMD)	• Heat warning specially heat wave warning is ongoing during specially temperature rises (according to WMO) 36°C and onward by different category
	  • Mild heat wave: 36-37.9°C
	  • Moderate heat wave: 38-39.9°C
	  • Severe heat wave: 40-41.9°C
	  • Very severe heat wave: ≥42°C
	• Different kinds of Mass People (child, senior citizen, workers, rickshaw pullers, sick people) aware by the heat wave warning and available our aro-meteorological sector by cultivating, irrigation and harvesting.
	• Available when situation is meet. (Long term Process)
	• Implementation modality- required different forecast individual.
	• Demands more and more area specific.
	• BMD limited staffing in manual If implement AWS properly then huge specific (spatial) coverage possible
	• Need more station to acquire cover observational data field. And collaboration in integrated way in relevant organization

Bangladesh Rice Research Institute (BRRI)	**BRRI Interventions on Heat Stress in Bangladesh** • **Heat-Resistant Rice Varieties**: BRRI is developing rice varieties resilient to high temperatures, especially during flowering.

	• **Heat Stress Mapping**: Using climate models like CMIP6 to identify regions vulnerable to heat stress for targeted interventions. • **Agronomic Practices**: Researching planting dates, water management, and soil fertility to mitigate heat impacts. **Gaps:** • Limited research on nighttime heat stress. • Need for deeper understanding of the molecular mechanisms behind heat tolerance. • Lack of integrated approaches combining varieties, agronomy, and water management. **Opportunities:** • Expanding research on heat-tolerant rice for both day and night heat. • Developing climate-resilient rice systems that combine tolerant varieties and improved practices. • Strengthening collaborations and advocating for heat-resilient rice systems in national policies.
Regional Integrated Multi-Hazard Early Warning System (RIMES)	RIMES, in partnership with Save the Children and MJSKS, has implemented a project funded by the **Humanitarian Fund** titled "**El Niño Anticipatory Actions for Drought and Heatwave in Bangladesh**." This initiative, targeting the vulnerable communities in **Ulipur** and **Chilmari Upazilas** in **Kurigram District**, aims to mitigate the impacts of heat stress and droughts linked to El Niño. Key interventions include: • **Early Warning and Risk Monitoring**: Providing alerts on imminent heatwaves and drought conditions to enable communities to take preventive actions. • **Community Awareness**: Raising awareness about heat stress, its risks, and coping strategies. • **Anticipatory Measures**: Distributing water and emergency supplies ahead of extreme events to minimize heat stress impact. The project seeks to enhance local resilience to climate extremes, ensuring better preparedness for heatwaves and drought in vulnerable areas. Heatwave Alert Portal: **https://rimes.int/News_HeatwavePortal_Bangladesh**
The Directorate General of Health Services (DGHS)	DGHS launched activities to address heat stress, including public awareness campaigns, dissemination of safety guidelines, and implementing the "B.E.A.T the Heat" framework. This approach focuses on recognizing symptoms, immediate actions, and ensuring timely medical care. The DGHS is also coordinating with healthcare facilities to improve readiness during heatwaves National Guideline on Heat-Related Illness - Bangladesh | Global Heat Health Information Network and New guidelines on heat-related health risks launched in Bangladesh with UNICEF's support | Health. The National Guidelines for Heat-Related Illness by Bangladesh's Directorate General of Health Services (DGHS) aim to equip healthcare professionals, communities, and individuals to prevent, identify, and manage heat-related illnesses effectively. Developed with UNICEF support, the guidelines include: • B.E.A.T the Heat Framework: ▪ Be Aware of heat stress risks. ▪ Easily Identify symptoms. ▪ Act Immediately for relief and treatment. ▪ Take to Healthcare facilities for severe cases. • Target Populations: Emphasis on protecting vulnerable groups such as children, pregnant women, and outdoor workers. • Long-Term Strategies: Facility preparedness, capacity building, and community education to mitigate heat impacts in future scenarios.

	These guidelines focus on awareness campaigns and healthcare system readiness to reduce fatalities from rising heatwaves in Bangladesh.
Save the Children Bangladesh	Save the Children Bangladesh's ongoing project, EL-NINO, focuses on mitigating heat stress and drought impacts, with an emphasis on early warning systems. Key activities include developing heatwave thresholds with partners like RIMES, FAO, DAE, and BMD, and distributing drought-tolerant rice seeds and cash assistance in Kurigram. They also distribute safe drinking water, provide awareness campaigns, and advocate for climate-resilient education and healthcare systems. The project has shown success in anticipatory actions, minimizing impact and reducing response costs. However, continued government involvement and scaling up are necessary for long-term effectiveness and sustainability. More details can be found Save the Children International ps://www.savethechildren.net/news/bangladesh-extreme-heat-closes-all-schools-and-forces-33-million-children-out-classrooms).

ANNEX B - Policy Environment - Overview of Heat Relevant Policies

National policies and frameworks play a vital role in guiding climate change as well as DRR efforts, ensuring preparedness, response, and recovery are effective and sustainable. This chapter assesses and identifies existing policies aligned with addressing heat stress and highlights the gaps. While Bangladesh has made significant strides in addressing traditional climate-induced hazards such as floods and cyclones, the rising threat of heat stress—a growing impact of global warming—remains insufficiently addressed in existing policies. Heat stress disproportionately affects public health, livelihoods, agriculture, and urban ecosystems, with vulnerable groups like women, children, and marginalized communities. Addressing this emerging hazard requires urgent, integrated, and cross-sectoral approaches to enhance resilience and achieve sustainable development goals while protecting vulnerable populations.

Climate Change and DRR Policies Bangladesh

Climate Change Strategy and Action Plan (BCCSAP)

The Bangladesh Climate Change Strategy and Action Plan (BCCSAP) is a 10-year program (2009-2018) designed to build the country's resilience to climate change. Its goal is to manage climate change impacts through a comprehensive action plan focused on the needs of vulnerable groups, including women and children. The plan is based on six pillars: (i) food security, social protection, and health; (ii) disaster management; (iii) infrastructure; (iv) research and knowledge; (v) mitigation and low-carbon development; and (vi) capacity building. However, heat risk is not explicitly integrated within the other thematic areas. For instance, comprehensive disaster management focuses on the improvement of flood forecasting and early warning systems and improvement of cyclone and storm surge warnings, whereas it could also focus on heat risk management and improvement of early warning systems for heatwaves.

Standing Orders on Disaster (SOD)

Bangladesh has developed a comprehensive disaster management framework known as the Standing Orders on Disaster (SOD), which establishes mechanisms for inter coordination across local and national levels. The SOD 2019 emphasizes a structured approach to disaster preparedness, response, and recovery, aiming to enhance the nation's resilience to various

hazards. However, despite its extensive coverage of traditional climate-related disasters, significant gaps persist in addressing heat stress, a growing hazard exacerbated by climate change.

Notably, the SOD 2019 does not explicitly recognize heat stress as a distinct climate hazard, which limits the adoption of targeted preparedness and response strategies. For instance, the absence of specialized early warning systems for heat waves constrains timely forecasting and preparedness efforts. Similarly, adaptation measures—such as establishing cooling centres, developing green infrastructure, and initiating widespread public awareness campaigns—are notably absent. Healthcare preparedness for managing heat-related illnesses is also underrepresented, with no explicit guidelines to equip health facilities for such events. Moreover, the integration of climate change adaptation measures within the SOD, particularly those addressing urban heat risks and promoting cross-sectoral collaboration, remains underdeveloped.

Disaster Management Act 2012

The Disaster Management Act 2012 provides a comprehensive legal framework for disaster risk reduction and management across national, regional, and local levels in Bangladesh. It emphasizes proactive disaster management approaches, including risk reduction, resilience-building, and coordinated preparedness, response, and recovery efforts to mitigate the impact of natural and human-induced disasters. However, the Act lacks explicit provisions to address emerging climate change-induced hazards, particularly heat stress.

Bangladesh Delta Plan 2100

The Bangladesh Delta Plan 2100 (BDP 2100) is a forward-looking strategy designed to address the country's long-term challenges related to water and food security, economic growth, and environmental sustainability. It integrates climate resilience into national planning, focusing on reducing vulnerability to natural disasters and building adaptive capacity to withstand the impacts of climate change. Key components of the plan include the development of climate-resilient infrastructure, sustainable water resource management, and disaster preparedness measures. While the BDP 2100 emphasizes long-term resilience, but it has not been considered heat stress as an emerging climate hazard. Addressing this gap by incorporating strategies such as heatwave early warning systems, cooling infrastructure, and heat-resilient urban planning is essential for ensuring the plan's comprehensive approach to climate adaptation.

Bangladesh Climate Change Trust Fund (BCCTF)

Bangladesh Climate Change Trust Fund (BCCTF) has been set up under Bangladesh Change Trust Act 2010 aimed to address climate change challenges through initiatives in adaptation, mitigation, and research. One of its significant achievements is the development and introduction of 12 stress- and heat-tolerant crop varieties, ensuring greater food security and resilience in the agricultural sector amid rising temperatures. These efforts have directly benefited farming communities, safeguarding livelihoods against climate-induced stresses. However, the BCCTF primarily focuses on agricultural and natural resource resilience, with limited attention to heat stress as a distinct climate hazard. It is required to include targeted actions to mitigate the impacts of heat stress on public health, urban livelihoods, and labour productivity, ensuring a more comprehensive response to the diverse challenges posed by climate change.

National Adaptation Plan (NAP) 2022

The National Adaptation Plan (NAP) 2022, developed by the MoEFCC, charts a sustainable and climate-resilient development path for Bangladesh, focusing on reducing climate risks and

vulnerabilities. Building on earlier efforts like the NAPA (2005) and BCCSAP (2009), the NAP 2023-2050, provides a comprehensive framework to address climate challenges, incorporating both scientific and indigenous knowledge across all levels of governance. However, the NAP reveals gaps in addressing the growing threat of heat stress. While acknowledging extreme heat stress risks, it is lacked with detailed strategies to mitigate heat stress impacts on agriculture, livestock, health, and vulnerable livelihoods in both rural and urban settings. Notably, the plan does not include a robust early warning system for heat stress, a critical tool for timely alerts that enable communities to safeguard health, productivity, and economic stability against extreme heat. This omission leaves vulnerable populations unprepared to manage the escalating impacts of heat stress.

Climate Change and Gender Action Plan (CCGAP) 2024

The Climate Change and Gender Action Plan (ccGAP) 2024 in Bangladesh is pivotal in integrating gender perspectives into climate policies and actions. It highlights the disproportionate impact of climate hazards like floods, cyclones, and droughts on women, particularly in vulnerable communities, and promotes strategies to empower women, strengthen their decision-making roles, and enhance their ownership of assets to build resilience against climate impacts. Despite its strengths, the ccGAP falls short in addressing the specific challenges posed by heat stress, an emerging climate hazard. Heat stress significantly affects women's physical, reproductive, and mental health, intensifying their vulnerability due to caregiving and domestic roles. The absence of targeted strategies to mitigate heat stress impacts on women underscores a critical gap in the plan, given the growing risks associated with rising temperatures/

Health Focused Policies

National Guideline on Heat-Related Illness 2024

The National Guideline on Heat-Related Illness 2024 outlines a comprehensive framework to manage and mitigate the risks of extreme heat, with a focus on protecting vulnerable populations such as children, the elderly, and individuals with pre-existing health conditions. It serves as a vital resource for healthcare professionals, equipping them to identify and treat heat-related illnesses effectively and implement preventive strategies. The guideline highlights immediate response measures, providing clear directives for healthcare facilities and community interventions. It emphasizes public awareness campaigns to educate on heat risks and recommends targeted prevention strategies for homes, workplaces, and public spaces. The guideline also prioritizes long-term strategies to strengthen healthcare systems. These include building heat-resistant infrastructure, establishing cooling centres, and enhancing health professional training to address the rising frequency of heatwaves due to climate change. Such measures aim to enhance resilience and reduce heat-related fatalities

Bangladesh Health-National Adaptation Plan (HNAP) 2018

The Bangladesh Health-National Adaptation Plan (HNAP) addresses the health impacts of climate change, including diseases and extreme weather events, by outlining strategies to mitigate heat-related illnesses. However, it falls short of integrating a specific heat stress adaptation plan that addresses the broader implications of heat waves on agriculture, food security, and the livelihoods of vulnerable populations. While the HNAP focuses primarily on the health aspects of heat-related illnesses, it overlooks the significant socio-economic challenges posed by heat stress, particularly for rural and urban poor communities.

Sectoral Policies

National Agriculture Policy 2018

The National Agriculture Policy 2018 of Bangladesh includes provisions to address the challenges posed by extreme temperatures, but it does not specifically address heat stress in agriculture. The policy focuses on strategies for mitigating both cold and heat extremes. For instance, it emphasizes the cultivation of cold-tolerant Boro rice varieties, such as Kushi and Kaich-Thore, designed to withstand lower temperatures, particularly during the Boro season. This strategy addresses the challenges of cooler temperatures, rather than heat stress. Additionally, the policy advocates for the development and dissemination of high-temperature-tolerant wheat and Aus rice varieties, but it does not explicitly mention heat stress as a distinct issue. While the policy does promote the development of production technologies to adapt to both extreme heat and cold, these measures primarily aim to improve overall resilience to temperature extremes rather than focusing on the direct impacts of heat stress, which involves the physiological strain on crops due to excessive heat. Thus, while the policy addresses the broader challenges of rising temperatures, it does not explicitly frame its strategies around mitigating heat stress in the agricultural sector.

National Water Policy 1999

The National Water Policy 1999 of Bangladesh emphasizes the sustainable management, equitable distribution, and efficient use of water resources across sectors such as agriculture, industry, and domestic consumption. It establishes a framework for managing surface and groundwater resources, prioritizing the needs of key sectors while promoting decentralized water management and community participation. The policy also highlights gender equity, ensuring that women and children have fair access to water resources. Despite its comprehensive approach to water resource management, the policy does not directly address climate change or heat stress. While it emphasizes water conservation, river basin management, and drought preparedness, there is no explicit mention of the challenges posed by rising temperatures or extreme heat. These issues have become more prominent in recent years, especially with growing evidence of the impacts of heat stress on agriculture, water demand, and human health. Moreover, since the policy has not been updated since 1999, it lacks provisions for addressing emerging challenges like heat stress and other climate change impacts.

Urban Focused Policies

Bangladesh National Building Code (BNBC) 2006

The Bangladesh National Building Code (BNBC) 2006 provides a solid framework for regulating construction practices, fire safety, materials, and structural design. However, it does not adequately address the emerging challenges posed by climate change, particularly the increasing risks of heat stress. The code lacks provisions to incorporate climate-resilient design features, such as high ceilings, cross ventilation, shading devices, or the use of reflective and insulating materials, which are essential for mitigating heat gain and improving thermal comfort in buildings. Furthermore, the BNBC does not integrate climate data or future temperature projections into its guidelines. As a result, it overlooks the need for adaptive infrastructure that can withstand rising temperatures and the growing frequency of heatwave events. This gap leaves urban and rural structures ill-equipped to handle the escalating impacts of heat stress, potentially exacerbating public health risks and increasing energy demands for cooling.

Natural Water Body Protection and Preservation of Open Space and Playground Act 2000

The Natural Water Body Protection and Preservation of Open Space and Playground Act 2000 was enacted to protect essential natural water bodies and open spaces in both urban and rural areas, aiming to prevent encroachment and harmful land-use changes. These areas are vital in maintaining ecological balance and mitigating climate-related risks, including heat stress, by providing natural cooling and improving air quality. While the Act aligns well with heat stress mitigation—since water bodies and open spaces help cool urban areas and enhance climate resilience—there exists a significant enforcement gap. Unauthorized construction, encroachment, and changes in land use continue to threaten the integrity of these spaces, reducing their ability to mitigate the urban heat island effect. The failure to effectively implement and enforce the Act compromises the cooling benefits these spaces could offer, thus limiting their potential to counter the adverse impacts of heat stress.

Donors' Policy Prescription

The Heat is On! Towards a Climate Resilient Education System in Bangladesh 2022

The UNICEF report "The Heat is On! Towards a Climate Resilient Education System in Bangladesh" outlines strategies to address the challenges posed by extreme heat in the education sector. It advocates integrating climate resilience into educational planning through seven core components: policy frameworks, finance, curriculum, teacher training, partnerships, community engagement, and monitoring and evaluation. The report specifically recommends embedding heat-stress awareness and response strategies into school curricula, enhancing teacher training on climate-related health risks, and establishing partnerships for efficient implementation. These measures aim to build a climate-resilient education system in Bangladesh.

Policy Brief on Adapting to the Impacts of Extreme Heat on Bangladesh's Labour Force 2023

The Policy Brief on Adapting to the Impacts of Extreme Heat on Bangladesh's Labour Force prescribe by the Grantham Research Institute on Climate Change and the Environment and the Centre for Climate Change Economics and Policy. It provides important guidance on addressing heat stress, particularly for workers who are highly exposed to outdoor and manual labour. The brief highlights several key strategies, including adjusting working conditions; Infrastructure and urban planning; Mechanization and protective policies; and support for Vulnerable Workers. These directives aim to protect worker health while sustaining economic output and poverty reduction efforts amidst rising temperatures.