Bangladesh Health-National Adaptation Plan (HNAP)

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World Health Organization Bangladesh

IEDCR

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Bangladesh Health-National Adaptation Plan (HNAP)

May 2018

Directorate General of Health Services

Ministry of Health and Family Welfare

Government of the People's Republic of Bangladesh

Forward

Bangladesh is among the most vulnerable countries in the world facing the effects of climate change. Moreover, climate change and variability is and will continue to affect public health in Bangladesh in diverse and numerous ways. Through both direct and indirect pathways increasing temperatures, shifting rainfall patterns, sea-level rise, and increasing frequency and intensity of extreme weather events, including cyclones, flooding, and drought are threatening the health and well-being of millions of Bangladeshis. often with the most vulnerable populations facing the greatest risk. Most of these vulnerable peoples are constantly facing the mentioned risks.

These climatic impacts are driving and exacerbating the burden of various health outcomes including: increased risk of vector-borne diseases, such as malaria and dengue; water-borne and water-related diseases, such as cholera and other diarrhoeal diseases. Under-nutrition due to climate-related impacts on agriculture production; as well as deaths and injuries due to natural disasters. Besides these, due to climatic impact on agricultural production, which precipitates the under nutrition to the vulnerable groups and also causing injuries and death due to natural disasters.

In order to ensure better healthy life in context to the physical, mental, and social well-being of all peoples of Bangladesh the resilience of individuals, communities, and the health system must be strengthened to adapt to extreme effects of climate change. This includes such actions as increasing the awareness of the health risks of climate change, promoting community-based health adaptation, building the capacity of the healthcare workforce, and climate-proofing healthcare facilities and infrastructure, among others.

The Bangladesh Health-National Adaptation Plan (HNAP) will aim to guide the health sector over the next five years and beyond by building on existing national health adaptation to climate change efforts, as well as promote the integration of climate change and health risks into national health policies, planning, programming, and monitoring strategies. The HNAP will also align with national climate change adaptation processes, including the National Adaptation Plan, to support coordination across relevant sectors and with key stakeholders.

The Ministry of Health and Family Welfare fully supports and advocates the use of this HNAP as a broad framework for health sector action toward adaptation to climate change. Although Bangladesh is vulnerable to the health effects of climate change, we are also resilient. The hope is that his document will continue to build a strong foundation, through collaboration and partnership, for addressing the health risks of climate change in Bangladesh.

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Abbreviations and Acronyms

BCCRF	Bangladesh Climate Change Resilience Fund
BCCSAP	Bangladesh Climate Change Strategy and Action Plan
BMD	Bangladesh Meteorology Department
BNC	Bangladesh National Nutrition
CC&H	Climate Change and Health
CCHP	Climate Change and Health Promotion Unit
CSD	Climate-sensitive Diseases
CDC	Communicable Disease Control
DGHS	Directorate General of Health Services
EWS	Early-Warning System
GCF	Green Climate Fund
HNAP	National Adaptation Plan-Health
NPNSDP	Health Population, and Nutrition Sector Development Plan
INC	Initial National Contribution
ICMH	Institute of Child and Maternal Health
IEDCR	Institute of Epidemiology Diseases Control and Research
IPHN	Institute of Public Health Nutrition
INDC	Intended Nationally Determined Contributions
ICDDR-B	International Centre for Diarrhoeal Disease Research
LCD	Least Developed Countries
M&E	Monitoring and Evaluation
MoDMR	Ministry of Disaster Management and Relief
MoEF	Ministry of Environment and Forests
MoH&FWFW	Ministry of Health and Family Welfare
MOU	Memorandum of understanding
NAP	National Adaptation Plan
NAPA	National Adaptation Programme of Action
NDMC	National Disaster Management Council
NIPSOM	National Institute of Preventative and Social Medicine
NNS	National Nutrition Services
NCD	Non-communicable diseases
NCDC	Non-Communicable Disease Control
PHC	Primary Health Care
SDG	Sustainable Development Goals
SNC	Second National Communication
TOR	Terms of Reference
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change
V&A	Vulnerability and Adaptation
VBD	Vector-borne disease
WASH	Water, Sanitation, and Hygiene
WBD	Water-borne disease
WHO	World Health Organization

Definitions

Adaptation refers to the process of adjustment to actual or expected climate and its effects. In human systems, adaptation seeks to moderate harm or exploit beneficial opportunities. In natural systems, human interventions may facilitate adjustment to expected climate and its effects. In public health, the analogous term is “prevention”.

Adaptive capacity is the ability of a system to adjust to climate change, to moderate potential damages, to take advantage of opportunities, or to cope with the consequences.

Climate change refers to any change in the climate over time, generally decades or longer, whether due to natural variability or as a result of human activity.

Climate variability refers to trends in variation in the mean state and other statistics of the climate on all temporal and spatial scales beyond that of individual weather events. Extreme weather (storms, extreme temperatures) and climate events (drought) are part of climate variability trends.

Climate-resilient health systems have the ability to anticipate, respond to, cope with, recover from and adapt to climate-related shocks and stresses, so as to bring sustained improvements in population health, despite an unstable climate.

Climate-sensitive health outcome is any health outcome whose geographic range, incidence or intensity of transmission is directly or indirectly associated with weather or climate.

Climate-related risks are additional (exacerbated) risks that people and their livelihoods and assets face due to climate change. ese risks can be direct, such as in exposure to more frequent heat waves or floods; or indirect, such as when a drought negatively impacts food supplies (and prices) and in effect livelihoods and nutrition.

Exposure is the amount of a factor to which a group or individual is exposed; sometimes contrasted with dose (the amount that enters or interacts with the organism). Exposures may be either beneficial or harmful. Exposure to climatic conditions that affect health is heavily influenced by location, socioeconomic conditions and human behavior.

Resilience is the capacity of a social-ecological system to cope with a hazardous event or disturbance, responding or reorganizing in ways that maintain its essential function, identity and structure, while also maintaining the capacity for adaptation, learning and transformation.

Vulnerability is the degree to which individuals and systems are susceptible to or unable to cope with adverse effects of climate change including climate variability and extremes. e vulnerability and coping capacity of particular populations to changing meteorological conditions and its human and social consequences is influenced by a variety of factors. These include biological factors, sociocultural factors and access to and control over resources.

Executive Summary

The Bangladesh Health-National Adaptation Plan (HNAP) is a comprehensive document designed to guide the country toward building resilience to climate change impacts on health by empowering communities and individuals through an adaptive and sustainable health system in Bangladesh**.**

Bangladesh is often considered one of the most vulnerable countries to climate change in the world with vast coastal areas, high exposure to extreme weather events such as cyclone, drought, and flood combined with a reliance on natural resources, high population density and high rates of poverty. The health effects of climate change are already occurring in Bangladesh, with the health status of millions of people in vulnerable areas projected to be impacted in the coming decades. Vulnerability and adaptation assessments conducted in 2011 and 2015, helped to further define the health risks of climate change in Bangladesh. Priority climate-sensitive health outcomes explored included:

- vector-borne diseases (Chikungunyea, kala-azar, dengue, and malaria);
- water-borne diseases (cholera, diarrhoea);
- impacts from extreme weather events including under-nutrition, food insecurity, and mental disorders;
- effects on water, sanitation, and hygiene

The cause-effect relations of human health in relation to climate stimuli are not properly understood yet in Bangladesh. A concrete adaptation plan for health and the health sector is necessary to improve the understanding of the health impacts of an adaptation to climate change among relevant stakeholders, including health policy makers, professionals, workers, program designers, program implementers, civil servants, civil society members. The HNAP aims to give strategic guidance to the Bangladesh health sector for establishing a climate-resilient health system, including increased capacity to plan health adaptation measures to prevent and/or overcome existing and future risks, and to respond promptly to climate change risks for health and well-being. The over-arching purpose of the HNAP is to ensure the health sector works with partners in the environment, as well as other related sectors.

The NHAP was developed in collaboration with the CCHP Unit, IEDCR of Ministry of Health and Family Welfare and key climate change and health-related stakeholders with support from the World Health Organization (WHO). The HNAP development was guided by previous CC&H vulnerability and adaptation assessments (WHO, IEDCR 2011), the Health Adaptation Strategy (WHO-2012), Health, Population and Nutrition Sector Development Plan (HPNSDP 2017-2022), the Bangladesh Climate Change Strategy and Action Plan (2009), as well as other relevant policies. In addition, two workshops were held in 2018 to consult key stakeholders on aspects of HNAP development and validate the final document.

The plan's objectives and adaptation actions are organized around the following ten components of the World Health Organization's *operational framework for building a climate-resilient health system*, which provides a systematic and comprehensive approach to addressing the health effects of climate change. Under each component strategic objectives, current status, key barriers, and adaptation options are provided.

Component 1: Leadership and governance
Component 2: Health Workforce
Component 3: Vulnerability, capacity and adaptation assessment
Component 4: Integrated risk monitoring and early warning

Component 5: Health and climate research
Component 6: Climate resilient and sustainable technologies and infrastructure
Component 7: Management of environmental determinants of health
Component 8: Climate-informed health programs
Component 9: Emergency preparedness and management
Component 10: Climate and health financing

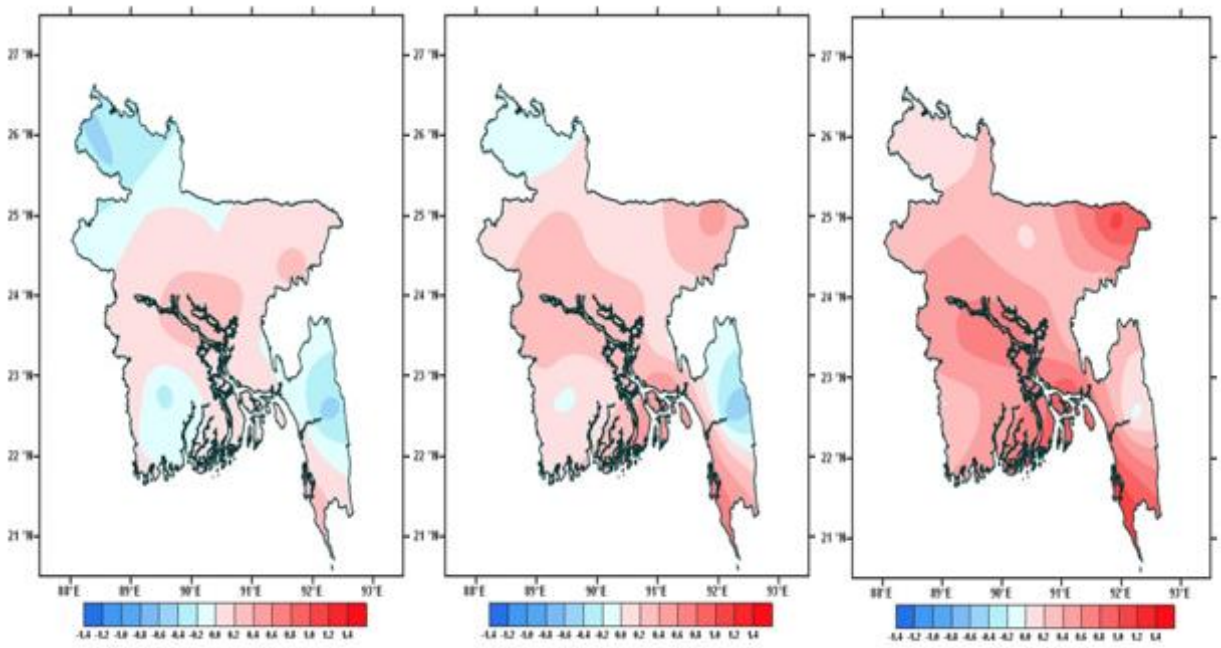
The HNAP is structured in six parts; Part 1 provides an introduction to the HNAP process;; Part 2 describes some of the key health and climate change considerations for Bangladesh;Part 3 outlines the institutional and policy framework in which the HNAP process is situated; Part 4 addresses each of the ten components of the operational framework; Part 5 specifies the implementation strategy of the HNAP; and Part 6 establishes the Monitoring & Evaluation Plan and the ongoing reporting requirements.

1. Introduction

Climate change and health in Bangladesh

Bangladesh is considered one of the most vulnerable countries in the world to the impacts of climate change. Vast coastal areas and a reliance on natural resources combined with high population density and high rates of poverty leave the population at high-risk of extreme weather events, including increasing temperatures, cyclones, erratic rainfall, flooding, drought, rising sea levels, and saltwater intrusion (WHO, 2015). Bangladesh has a humid, tropical climate that is influenced by monsoon circulations. There are four prominent seasons, including winter/northeast monsoon (December-February; summer/pre-monsoon (March-May); southwest monsoon (June-September); and Autumn/post-monsoon (October-November). January is the coldest month with average temperatures ranging from 18°-22°C and April is the warmest month with average temperatures ranging from 33°-36° C. Heavy rainfall is a major characteristic of Bangladesh, which most areas receiving at least 2000 mm of rainfall per year. Regions in the northeast are the wettest, receiving on average 4000 mm of rainfall per year compared to the relatively dry western region, which only receives on average around 1600 mm per year. More than 71% of rainfall occurs during monsoon season. Humidity is also highest during monsoon seasons and lowest in the winter season varying from 73% to 86%.

Figure 1: Deviation of yearly mean temperature during 1981-1990 (left), 1991-2000 (middle) and 2001-2010 (right) as compared with the previous decades based on local meteorological data



Source: Vulnerability and Adaptation Assessment Report, WHO-IEDCR 2012

The mean annual temperature in Bangladesh has risen by about 1°C during the period 1981-2010, with observed extreme temperatures (>40°C) also increasing from 62 from 1981-1990 to 139 from 2001-2010 (IEDCR, 2012) (Figure 1). Under low and high emissions scenarios, the annual mean temperature is expected to increase by about 1.4°C by 2050 and 4.8°C by 2100 respectively, compared to the current average of 25°C (WHO, 2015a). Similarly, rainfall patterns are becoming more erratic in Bangladesh leading to increased incidences of flooding and drought. Shifts in the magnitude and timing of monsoon rains has resulted in several reoccurring flood events over the past decade, as well as 21% less rain during the monsoon period (June-August) in 2012.

The effects of climate change on health are severe in Bangladesh with the health status of millions of people in vulnerable areas projected to be impacted. Projected impacts include:

Table 1: Climate Change Impacts on Health

Climate change characteristics	Projected changes	Impacts on Health
Increasing air and sea-surface temperatures	Average air temperatures are expected to increase by up to 1.4° C by 2050 and by 4.8° C by 2100, depending on future greenhouse gas emissions scenarios (WHO, 2015a).	Reduced agriculture and fisheries production leading to increased food insecurity and food safety issues. Increased risk of heat-related illnesses.
Altered rainfall patterns	Most models predict drier dry seasons and wetter wet seasons for Bangladesh, as well as more "extreme/high "rainfall events (WHO, 2015a).	Increased risk of drought and flooding leading to negative effects on agriculture production and under-nutrition. Increased risk vector-borne disease (malaria, dengue, kala-azar, and chikungunya) and water borne diseases, notably diarrhoeal disease
More severe extreme weather events	Tropical cyclones are expected to decrease in frequency but increase in intensity. 20.3 million people are projected to live in cyclone high-risk areas by 2050 compared to 8.3 million in 2015 (WHO, 2015a).	Destruction of farming lands and health facilities. Injuries and death from extreme weather events. Mental health issues due to climate-related population displacement and effects on livelihoods
Sea-level rise	Current saline intrusion reaches 100km from the Bay of Bengal. 7.2 million people are projected to be affected by flooding due to sea-level rise every year between 2070-2100 under a high emissions scenario (WHO, 2015a).	For low-lying coastal communities sea-level rise can cause crop failure, saline intrusion into drinking water supplies, erosion and possibly even the need for relocation.
Ocean acidification	The increasing acidity of sea-waters has a detrimental impact on ecosystems and reduced biodiversity (WHO, 2015a).	Destruction of ecosystems and reduced biodiversity can have negative impacts on fishing industries and lead to increased food insecurity.
Air pollution	Many drivers of climate change also contribute to air pollution. Outdoor air pollution data for 5 cities in Bangladesh havePM2.5 levels greater than WHO guidelines. Household air pollution is also high in rural communities (WHO, 2015a).	Increased morbidity and mortality from respiratory infections, lung cancer, and cardiovascular disease

To address these concerns, the government of Bangladesh has outlined strategic plans and policies that aim to reduce vulnerability and build capacity to manage the health risks of climate change. In 2009 the government the Bangladesh Climate Change Strategy and Action plan (BCCSAP), which included six pillars, with health belonging to 1st pillar. After the call of Conference of Parties (COP-18) held in Doha, Qatar in 2012, the government of Bangladesh took initiative to develop National Adaptation Plans (NAP). The NAP process is intended to provide support for medium and long-term adaptation planning. The Ministry of Environment and Forests of Bangladesh, in collaboration with UNDP, has been providing support to develop the NAP. However, only a few programmes for mitigation and adaptation to climate change have been incorporated to date. Even though a national adaptation plan process has started with developing a roadmap, integration of health objectives has yet to begin. Health is a cross-cutting issue in the context of climate change, and there is a need to mainstream health in mitigation and adaptation strategies in all sectors. The Health component of National Adaptation Plan (HNAP) needs to be developed for integrating climate change adaptation into relevant national health plans and policies.

Need for HNAP

The impacts climate change and variability on human health and the health sector are inevitable with a variable magnitude. The cause-effect relations of human health in relation to climate stimuli are not properly understood yet in Bangladesh. A concrete adaptation plan for health and the health sector is necessary to improve the understanding of the health impacts of and adaptation to climate change among relevant stakeholders, including health policy makers, professionals, workers, program designers, program implementers, civil servants, civil society members.

Created under the global UNFCCC climate change agenda, the National Adaptation Plan (NAP) process builds on the National Adaptation Programmes of Action (NAPA) process that was designed to support least-developed countries (LDCs) to identify priority actions to respond to their urgent and immediate adaptation needs. The NAP process is intended to provide support for medium- and long-term adaptation planning needs in LDCs and other developing countries. The health national adaptation process (HNAP) should be the health component of the National Adaptation Plan (NAP), including as an output a detailed health adaptation plan designed to achieve the national health adaptation goals within a specific period of time and given available resources. (WHO, 2014).

Objectives of the HNAP

The HNAP aims to give strategic guidance to the Bangladesh health sector for establishing a climate-resilient health system, including increased capacity to plan health adaptation measures to prevent and/or overcome existing and future risks, and to respond promptly to climate change risks for health and well-being. The over-arching purpose of the HNAP is to ensure the health sector works with partners in the environment, as well as other related sectors, and follows a systematic process to:

- Engage in the overall NAP process at the national level
- Identify national strategic goals for building health resilience to climate change
- Develop a national plan with prioritized activities to achieve these goals, within a specified time period and given resources

In addition, the HNAP will support integration of the health risks due to climate variability and change into national health planning processes and promote implementation of health adaptation policies and programs at national and local levels. Furthermore, the HNAP is designed to be an iterative process to encourage the inclusion of new information and data as situations change. Community health adaptation options identified in previous climate change and health assessments and strategies include (CCHP, 2012):

- Public education and awareness
- Early warning systems for disease outbreaks
- Community based neighborhood support
- Climate-proof housing
- Disaster preparedness, including health system surge capacity
- Enhanced disease control programme
- Improved surveillance on risk indicators and health outcomes
- Appropriate workforce training and mid-career development

Health adaptation targets include (MoH&FW, 2011):

- Strengthening activities of the Climate Change and Health Promotion Unit to combat the health impact of climate change and updating guidelines for health protection from adverse effects and pre-and-post disaster situation.
- Developing an advanced preparedness plan to face the consequences of climate change.
- Standardizing emergency health supplies and their stockpiling as part of the readiness program on climate change.
- Creating an institute for environmental and occupational health safety.

HNAP Development Process

The NHAP was developed in collaboration with the CCHP Unit, IEDCR of Ministry of Health and Family Welfare and key climate change and health-related stakeholders with support from the World Health Organization (WHO). An extensive literature review was conducted to take stock of all relevant policies, legislation, strategies, programmes, and studies on climate change and health. The HNAP development was guided by previous CC&H vulnerability and adaptation assessments(WHO, IEDCR 2011), the Health Adaptation Strategy (WHO-2012),Health, Population and Nutrition Sector Development Plan (HPNSDP 2017-2022), the Bangladesh Climate Change Strategy and Action Plan (2009), as well as the WHO Operational Framework for Building Climate-Resilient Health Systems (2015).

In February and March 2018, two stakeholder workshops were organized and hosted by the Institute of Epidemiology Diseases Control and Research (IEDCR), with support by WHO to consult key stakeholders on aspects of HNAP development, including institutional arrangements, identification of medium-and-long term health adaptation needs, as well as monitoring and evaluation (see Annex for list of workshop participants).

2. Climate-related health risks in Bangladesh

Vulnerability and Adaptation Assessments

To better understand the health risks of and adaptation to climate change a vulnerability and adaptation assessment *Climate Change and Health: Bangladesh* was conducted in 2011 with the goal to assess existing patterns of climate-sensitive diseases, documenting climate change and health impacts on vulnerable populations, reviewing existing climate change and health-related policies and programmes, and recommend actions to further protect human health from climate change (IEDCR, 2011). Specific objectives aimed to assess the following at the national level:

- The appearance of new pockets of the population vulnerable to climate change;

- Identify what diseases are climate sensitive and describe the pattern of climate sensitive diseases
- Identify the population at risk and vulnerability of populations to climate sensitive diseases
- Existing policies and programmes of health sector to combat climate sensitive diseases and health impact of extreme weather events
- Burden of selected climate-sensitive diseases attributable to climate change
- Likely impacts of future climate change on selected climate-sensitive diseases
- Identify research needs and information gaps
- Identify policies, programmes and priorities to protect human health from climate change

The study, which was prepared by the Institute of Epidemiology, Disease Control and Research, the Directorate General of Health Services, and the Ministry of Health and Family Welfare with support from WHO, used qualitative and quantitative approaches based on data availability to explore associations between climatic variables and a range of climate-related health outcomes, including vector-borne diseases (kala-azar, dengue, and malaria), water-borne diseases (cholera and diarrhoea), and mental health, as well as impact from extreme weather events.The data showed significant co-relationship between climatic factors and kala-azar incidence in Mymensingh, Tangail and Jamalpur districts, the three districts with majority of kala-azar cases in Bangladesh.

To quantify the extent of impact from climate change on diarrhoea incidences, the report analyzed the relationship between temperatures and admitted cases of diarrhoea. These results were then used to establish scenarios as indicative measures of potential climate change impacts to diarrhoea distribution in Bangladesh by 2030. Estimates presented in the report predict a 4.5– 5.5% increase of initial risk of diarrheal diseases by year 2030 for a 1°C increase in temperatures for Bangladesh. Although the analysis was impeded by limited data availability, the V&A was able to take important steps toward evaluating climate change impacts on disease in Bangladesh. Nonetheless, a comprehensive V&A assessment, as well as further analysis and quantification of the health impacts of climate change is needed.

Additionally, in 2015 WHO conducted a *Vulnerability and Adaptation to Climate Change in Coastal and Drought Prone Areas of Bangladesh: Health and WASH,* to better understand the vulnerabilities of the communities due to the impact of climate change and its links to WASH and health in Bangladesh (WHO, 2015c). Specific objectives included:

- To assess the potential health risks associated with the current climate variability and change in coastal and drought prone areas,
- To assess the potential health risks specifically associated with water availability and quality considering climate variability in coastal and drought prone area,
- To determine the relationship between the climatic determinants (temperature, rainfall, humidity and extreme events) with different diseases (water born, water washed, water related, vector born and temperature related diseases) in coastal and drought prone area
- To make recommendations to reduce health vulnerability especially in relation to WASH and other key determinants in coastal and drought prone areas
- To make recommendations for the national scenario on the basis of the assessment of the vulnerabilities and adaptation needs of the case study areas.

The study used both qualitative and quantitative methods including a survey questionnaire, community workshops, and in-depth interviews. Field sites were pre-selected to include both flood and drought prone areas based on expert judgement. In total three communities (one in a drought prone area and two in coastal areas) were selected in three distinct geographical areas:

- Drought prone area: Sapahar Union, SapaharUpazila, Naogaon District
- Coastal area: Pattashi Union, ZianagarUpazila, Pirojpur District
- Patharghata Union, PatharghataUpazila, Barguna District

Drought prone areas were identified as the most vulnerable to changes in climate associated with reduced rainfall and reliability of seasons which impacted the drinking water supplies, agricultural production, livelihood and has been exacerbating poverty. The coastal communities were identified as being vulnerable to climate changes associated with increased rainfall, more frequent and extensive flooding, extreme temperatures (hot and cold), changing seasonal patterns and sea-level rise. Finally, the study provided the broad recommendations to enhance vulnerability assessments and evidence base for health adaptation, including the establishment of a climate-sensitive disease surveillance system, increased awareness of upazila health staff of collection of data for CSD, quality assurance measures for data collection and reporting, and daily data to allow for seasonal and cyclical patterns of CSD monitoring.

Water-borne and water-related disease

Climate change and variability, particularly impacts from drought, flooding, and tropical cyclones, pose a substantial threat to water security and are projected to increase the potential of waterborne infectious diseases in Bangladesh, including cholera and other diarrhoeal diseases. Cholera outbreaks, which often occur during seasonal monsoons could become a regular phenomena in the future due to climate change (Shahid, 2010). Extreme weather events also have the potential to damage water and sanitation infrastructure, disrupt health services, and create overcrowding situations resulting in serious waterborne disease risks to the affected population. This combined with other factors, such as high rates of urbanization and land-use change, put a significant strain on freshwater supplies and can lead to further risk of water-borne and water-related disease.

Diarrhoea

In the baseline year 2008, there were an estimated 25 500 diarrhoeal deaths in children aged under 15 years. Under a high emissions scenario, diarrhoeal deaths attributable to climate change in children aged under 15 years are projected to comprise about 8% of the over 8000 deaths projected in 2030. Although diarrhoeal deaths are projected to decline to just fewer than 900 by 2050, the proportion of deaths attributable to climate change will rise to 13%.Limited access to safe water and sanitation contributes to the risk of developing diarrhoeal disease. Children in poor rural and urban slum areas are at high risk. Transmission of enteric pathogens is higher during the rainy season. Drainage and storm-water management is important in low-income urban communities, as blocked drains are one of the causes of increased disease transmission. There have been significant gains in the provision of improved sanitation and safe water supplies over the past few years

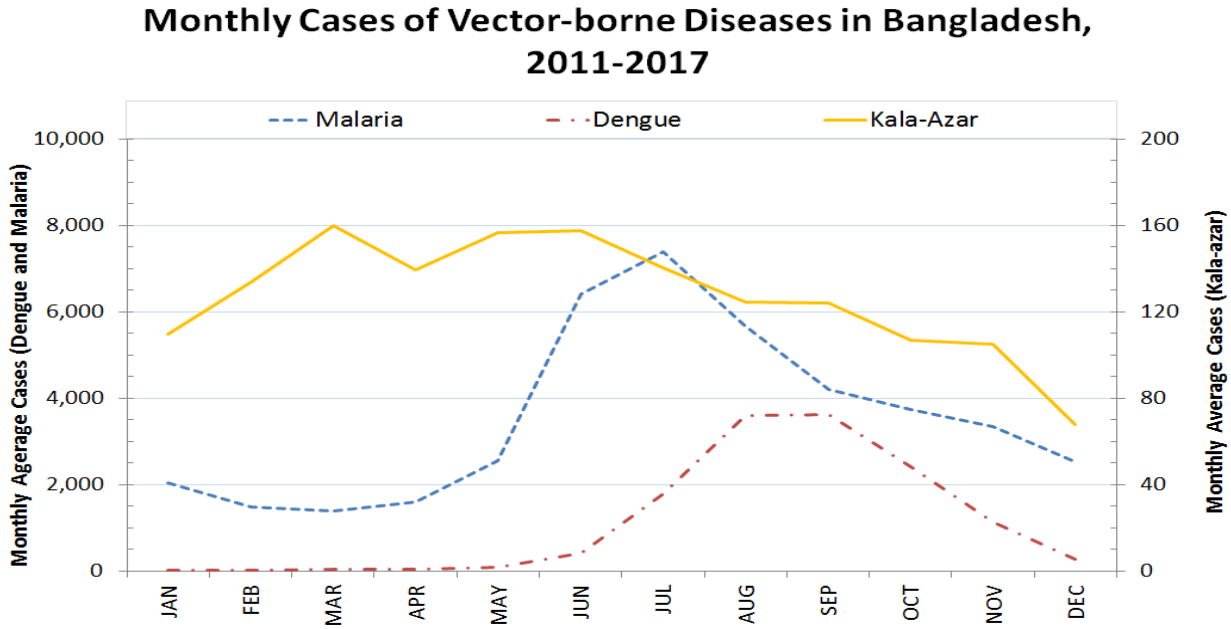
Vector-borne disease

The transmission of vector-borne disease, particularly mosquito-borne diseases, are sensitive to climatic factors such as increases in temperature and humidity and changes in rainfall patterns, which affect both the mosquito lifecycle and the number of breeding sites (Kovats et al. 2003). An assessment supported by the World Bank using monthly surveillance data in regions of high-incidence of vector-borne disease found strong seasonality and statistically correlation between short-term climate variability and vector-borne disease. For malaria and dengue, climate variables, including temperature, rainfall, and humidity, had a strong correlation with disease caseload, both current and lagged. For kala-azar, only temperature was significantly correlated (CCHP, 2014).

Bangladesh is also vulnerable to other emerging climate-sensitive vector-borne diseases, for example Chikungunya, an arboviral disease transmitted between human beings via the bites of infected female aedes mosquitoes (*Aedesaegypti and Aedesalbopictus*). In 2017, a major outbreak of

Chikungunya was reported in Bangladesh with 984 cases confirmed and more than 13 176 clinically confirmed cases in 17 of 64 districts, including the capital Dhaka (Kabir et al. 2017). The outbreak was anitipated based on the distribution of the aedes vector, suitable climatic condictions, and unusual, excessive rainfalls, however limitations in testing infrastructure and resources delayed containment efforts. Climate model projections under both high and low emissions scenarios suggest the likelihood of expansion of transmission-suitable areas in many parts of the world (Tjaden et al. 2017).

Figure 2: Trends and monthly patterns for vector-borne diseases, 2000-11

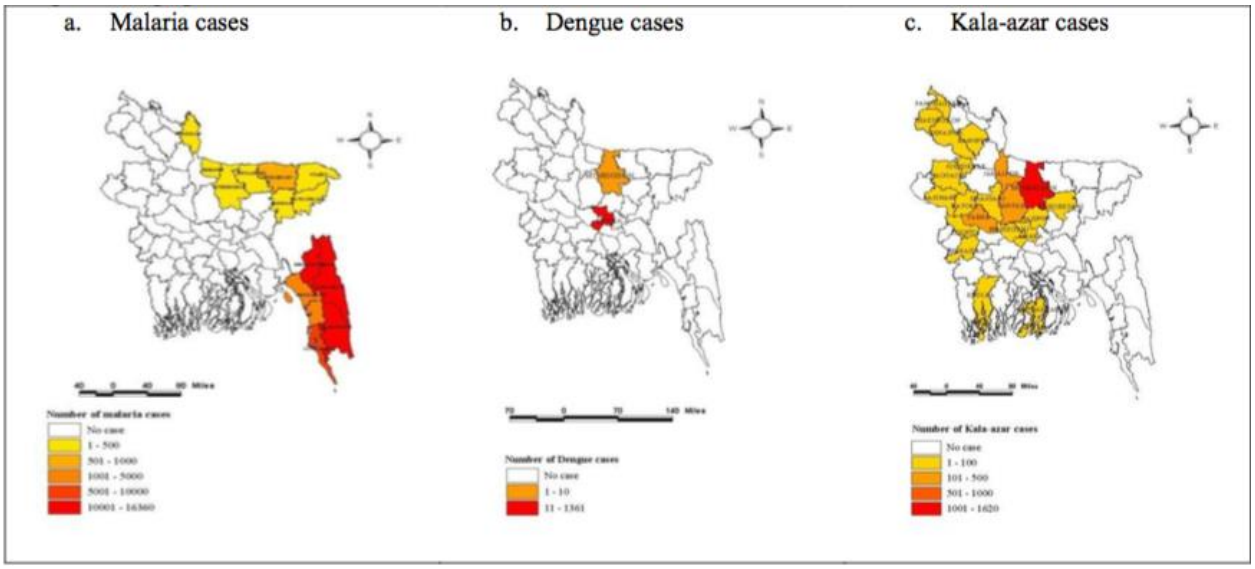


Source: National KalajarElimination and National Malaria Control Program, WHO 2017

Malaria

Considerable advances have been made in reducing the burden of malaria over the past decade. The National Malaria Control Programme is a vertical programme coordinated by the Communicable Disease Control Programme of the Directorate General of Health Services. Advances in diagnosis and treatment have contributed to reductions in severe malaria cases. A major problem for this programme is that the hyper-endemic forested and hilly areas are remote, largely undeveloped and inhabited by very poor people. The mainstay of prevention for populations at risk is the provision and use of insecticide-treated nets. Surveillance for malaria is performed mainly by nongovernmental organizations, and there is underreporting at the national level. Climate change will impact on the epidemiology of malaria in Bangladesh if the distribution of infected mosquitoes changes so that non-immune populations are exposed. It is projected that by 2070 over 147 million people will be at risk of malaria, assuming a high emissions scenario. If emissions decrease rapidly, this could decrease to 117 million people, remaining closer to the estimated baseline of 100 million.

Figure 3: Geographic distribution of vector-borne disease in 2011



Source: CCHP, 2014

Dengue

Dengue is becoming endemic in major cities in Bangladesh. The burden of disease is high, although it is difficult to quantify as only hospitalized patients are reported. Dengue incidence is related to precipitation, humidity and temperature. Although cases occur year-round, peak incidence occurs in post-monsoon season.Climate change is expected to affect the epidemiology of dengue via various mechanisms. Changes in rainfall pattern, particularly longer rainy seasons, will increase the sites where *Aedes* mosquitoes breed. Increasing urbanization will increase breeding sites in close proximity to human habitation. Population migration will alter the underlying immunity to particular dengue serotypes or contribute to changing geographical serotype distributions, which can lead to outbreaks. Extreme weather events will disrupt health systems and the capacity to perform surveillance of, and manage, outbreaks. Although it is difficult to quantify the projected burden of dengue under future climate change conditions, data from the Directorate General of Health Services of Dhaka city show that it is likely that the rapidly growing urban and peri-urban regions where public health measures (vector control, public education, surveillance) are compromised or neglected will be particularly affected.

Nutrition and food security

Higher temperatures, land and water scarcity, flooding, droughts and displacement negatively impact on agricultural production and cause breakdown in food systems, disproportionately affecting people most vulnerable to hunger and leading to food insecurity. Vulnerable groups, especially children, risk further deterioration into food and nutrition crises if they are exposed to extreme weather events. Without considerable efforts to improve climate resilience, it has been estimated that the risk of hunger and malnutrition could increase by up to 20% by 2050. In Bangladesh the prevalence of malnutrition in children aged under 5 years is 31.9% (WHO, 2015a).

Non-communicable diseases

In Bangladesh, non-communicable diseases (NCDs) are emerging as a major cause of morbidity and mortality, accounting for 61% of deaths in 2013 (Alam et al. 2013). Cardiovascular disease, diabetes, and tobacco-related illness are the three most common NCDs in Bangladesh and make up a considerable proportion of mortality, morbidity, and health system utilization. The effects of climate change have the potential to exacerbate the incidence of some NCDs, including cardiovascular

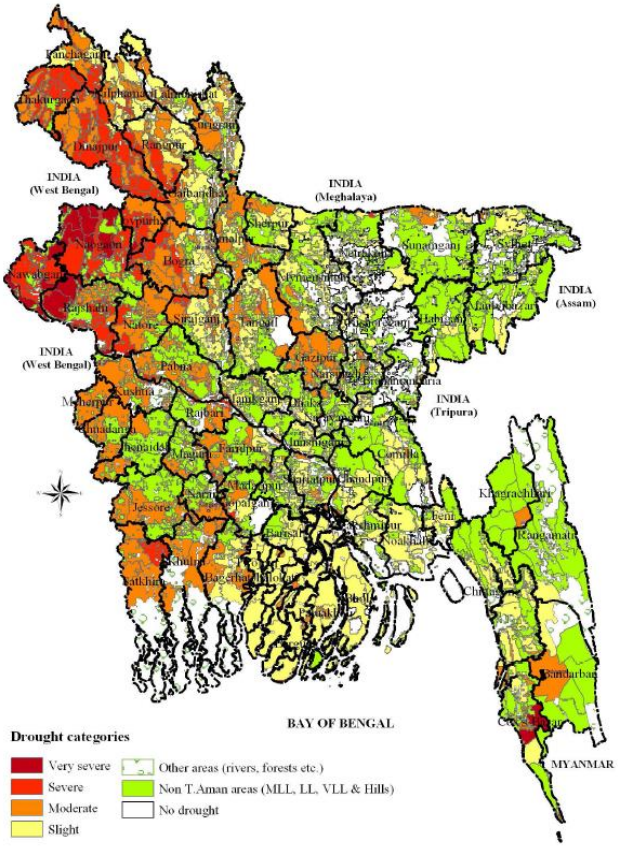
disease, some cancers, respiratory health, mental disorders, injuries, and malnutrition (Friel et al. 2011).

Although, literature remains limited, the impacts of climate change on NCDs, such as obesity, diabetes are an important emerging concern in Bangladesh. Examples of climate change as an additional driver of NCD risk include adverse effects on domestic agriculture, as well as climate change related population displacement leading to increased urbanization and driving unfavorable changes in diet and physical activity, further increasing the burden of NCDs.

Extreme weather events

Bangladesh has a long history of extreme weather events, such as flooding (coastal and inland), drought, cyclone, and storm surges, all of which have a significant impact on human health directly and indirectly, through injuries, disease outbreaks, nutritional deficiencies, psychological well-being, and lives lost. The total number of people killed as a result of natural disasters between 1980 and 2010 was around 191 836 (CCHP, 2014). Displaced populations as a result of climate-induced extreme weather events, economic distress, or conflict situations are also highly vulnerable to health risk. Coastal regions especially are vulnerable to sea level rise and saline intrusion leading to contamination of drinking water and low levels of freshwater. The 2011 assessment aimed to calculate the attributable incidence of injuries and psycho-social disorders (post-traumatic stress disorder) from cyclones and estimated an additional 7.06-9.10 million people would be vulnerable to inundation by 2030. Drowning is also a major public health issue and threat to child survival in Bangladesh (Rahman et al. 2017), which could be impacted by increases in the frequency of severe flooding and cyclones.

Figure 4: Drought-prone areas in Bangladesh, 2014

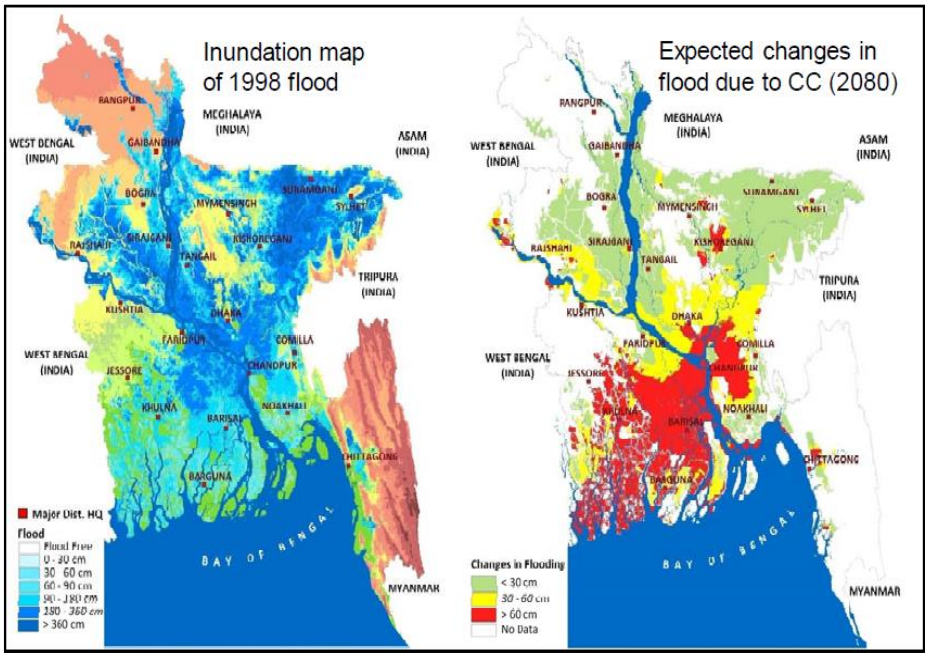


Source: M Alimullah Miyan, 2014

Frequency of drought and flooding event sare also increasing, exacerbating food and water security issues, as well as risk of disease outbreaks. Rises in sea-level and increased soil and water salinity may increase the risk of diarrhoeal diseases, including cholera. Additionally, decreased freshwater availability may lead to reduced food production, which in turn may lead to malnutrition.

The impact of extreme heat events or heat waves is another growing public health concern. Urban populations, farmers, people working in industries, children, and elderly are especially vulnerable to heat-stroke, dehydration, and other heat-related illnesses due to elevated temperatures (Shahid, 2010; WHO, 2015a).

Figure 5:Projected flood situation in Bangladesh, 2080



Source: Comprehensive Disaster Management Programme, Bangladesh at the CCAFS Workshop on Institutions and Policies to Scale out Climate Smart Agriculture, 2013

Mental Health

Climate change can also have significant indirect effects on the psycho-social well-being of individuals and communities (Berry et al. 2010). Extreme weather eventshave a profound impact on affected populations in Bangladesh, leading to adverse influences on mental health through various pathways, including declining income from agriculture production, displacement, and post-traumatic circumstances. The 2012 Vulnerability and Adaptation Assessment examined the relationship between mental health and climate change using hospital admissions records for various mental health disorders, meteorological data, and disaster information (CCHP, 2012). Although results are inconclusive, this was a step forward in better understanding the link between climate change and mental health in Bangladesh and further research is needed, especially concerning drought situations. Overall, mental health remains a low priority for the health sector, however with the impacts of climate change potentially increasing the risk of mental health disorders additionally resources are needed.

3. Climate change and health-related institutional and policy framework

Key policies, strategies, and plans

Over the last three decades, Bangladesh has made substantial investments to make the country more climate-resilient and less vulnerable to extreme weather events. To guide this process various plans, strategies, and policies have been developed. The following sections highlight key institutional and policy mechanisms for climate change and health (WHO, 2015d).

Seventh Five-Year Plan (2016-2020)

The Seventh Five-Year Plan recognizes the possible health impacts of a degraded environment, including due to climate change, under both the health and environment sector sections, including higher temperatures leading to new diseases vectors, as well as increased risk of malaria, dengue, and cholera, heat stress on vulnerable populations, and food insecurity. Strategic direction has been given to climate change and health under the following areas:

- Appropriate initiatives to manage emerging and re-emerging climate-related health problems
- Strengthening emergency preparedness and response capacity by health sector
- Developing a national institutional framework for allocating roles and responsibilities for different ministries to design an effective climate change adaptation strategy
- Enhancing understanding, knowledge, capacity, and coordination
- Developing climate-smart agricultural technologies and practices focusing on climate-resilient crop varieties to ensure food security
- Managing climate-related hazards and disasters
- Comprehensive research regarding the detrimental impacts on human health as a whole, as well as which diseases are more likely to spread as a result of climate change
- Efforts to address environmental health concerns related to climate change including inadequate access to safe water, lack of sanitation, and poor indoor and outdoor air quality

Sixth Five-Year Plan (2011–2016)

The Sixth Five-Year Plan recognizes the possible health impacts of a degraded environment, including due to climate change, and aims to "build capacity in the area of environmental health through both public and private sectors". Strategic direction has been given with respect to climate change and health as follows:

- devising a national programme to reduce the burden of diseases due to climate change;
- mainstreaming adaptation to climate change as a central part of public health services;
- short-, medium- and long-term research on the adverse effects of climate change on health;
- public awareness programmes on the health-related impacts of climate change;
- development of an advanced preparedness plan;
- partnership across society and with the global community to safeguard and enhance national and global public health security issues.

Health, Population and Nutrition Sector Development Plan [HPNSDP] (2011-2016)

The HPNSDP recognizes 'climate change and health protection' as one of eight key priority interventions. As a result, one section of the document deals with 'Environmental Health and Climate Change'. As per the *National Health Policy – An Update 2008*, this document recognizes the

impacts that climate change will have on maintaining basic health needs. It refers to the formation of the CCHPU, which was formed to strengthen necessary activities to prepare all levels of the health sector for long-term climate change impacts as well as post-disaster management. It specifies that further research will be conducted on the impacts of climate change on health and recommends creating an institute for environmental and occupational health safety, which will conduct academic courses, research and monitoring of environmental and occupational health issues.There are four priority interventions included in this section of the HPNSDP:

1) Strengthening activities of the CCHPU to combat the health impact of climate change and updating guidelines for health protection from adverse effects and pre and post disaster situation.
2) Developing an advanced preparedness plan to face the consequences of climate change.
3) Standardizing emergency health supplies and their stockpiling as part of the readiness program on climate change.

Initial National Communication (2002)

Health is primarily treated independently of other issues in this document. The INC has a number of adaptation measures for the health sector, although none of these are costed or aligned with clear timelines. Measures include:

- Improved health and disaster risk reduction infrastructure
- Improved health education to generate awareness of health care and preventative measures
- Investigation of the relations between diseases and climate variability
- Awareness building and strengthening of national capacity building for health emergency management
- Incorporation of climate change concerns and issues in all development and non-development programs and projects
- A climate change policy that involves coordination within sectors

Second National Communication (2012)

Health is primarily treated independently of other issues in this document. The SNC has a number of adaptation measures for the health sector, although none of these are costed or aligned with clear timelines. Measures include:

- awareness raising of health professionals about the impacts of climate change on health and the general public about dealing with health problems that may be exacerbated by climate change, such as heat stress and water borne diseases;
- improving and protecting water supply infrastructure and sanitation facilities;
- ongoing research into existing diseases to understand if and how they respond to climate changes, and developing appropriate adaptation measures in response to these changes, which will require building human and institutional capacity; and
- Identifying trade-offs that may be made with adaptation or mitigation measures in other sectors.

National Adaptation Programme of Action (2005)

The NAPA included fifteen priority activities of which two have a clear focus on health:

- Providing drinking water to coastal communities to combat enhanced salinity due to sea-level rise; and
- Mainstreaming adaptation to climate change into policies and programmes in different sectors (focusing on disaster management, water, agriculture, health and industry).

However, neither of these priority activities are currently being implemented. One of the sections of the NAPA on the 'actual and potential adverse effects of climate change' deals with 'water resources', of which 'human health' is a sub-component. The main vulnerabilities identified in this subsection were:

- Loss of life from increased heat stress
- Greater intensity or spread of infectious diseases
- Increased risks to human health from increased flooding and cyclones

The section highlights the uncertainty and knowledge gaps around the links between climate change and the magnitude of these impacts.

Bangladesh Climate Change Strategy and Action Plan (2008)

The Climate Change Action Plan is built on six pillars. The first, entitled "Food security, social protection and health" aims to ensure that the poorest and most vulnerable in society, including women and children, are protected from climate change and that all programmes focus on the needs of this group for food security, safe housing, employment and access to basic services, including health.

The remaining pillars include comprehensive disaster management; infrastructure; research and knowledge management; mitigation and low carbon development; and capacity building and institutional strengthening, do not directly mention health. However, in the Annex there is an exhaustive list of the programmes that relate to each of the six pillars, a number of which mention health, albeit superficially. Note though that no mention is made in BCCSAP about which programmes should be prioritized or how much they are likely to cost. The main body of the report is split into four sections:

I. Climate Hazards in Bangladesh – mentions health in the context of multi-purpose cyclone shelters being able to be used as health centers
II. Impacts of Climate Change – mentions health in the context of the impacts of climate change on safe drinking water, climatic changes affecting the health of the poor, and public health measures being needed to prepare for increasing incidences of water- and air-borne diseases associated with climate change
III. Adapting to Climate Change – mentions that the Department of Public Health Engineering is one of the government ministries involved in climate change. The Health Ministry is listed as one of the 'other ministries' responsible for sectors that are vulnerable to climate change. This section also acknowledges that civil society has improved health of poor people, thus making them more resilient.
IV. Towards a Climate Change Strategy and Action Plan – identifies that health education and awareness needed to address increased prevalence of disease and disease vectors.

Intended Nationally Determined Contributions (2015)

Bangladesh's intended nationally determined contributions were developed by the Ministry of Environment and Forests (MoEF) in 2015. The document outlines a two-fold strategy to increase resilience to the impacts of climate change, which are already affecting livelihoods of much of the population and will continue to do so, as well as activities to achieve lower-carbon emissions and more sustainable development. Key elements that are addressed include, mitigation contribution, adaptation components, implementation, and support needs. Many of the key areas identified are relevant to health and adaptation to climate change impacts on health is listed a key adaptation priority.

National Adaptation Plan Road Map (2014)

Prepared by the Ministry of Environment and Forests (MoEF) the National Adaptation Plan Road Map details steps and modalities, based on the UNEP Guidelines for Least Developed Countries (LDC), so that the country can formulate a NAP involving its own human and technical capabilities. Building from the four steps described in the LDC guidelines, the road map is comprised of several key elements such as:

- Setting up a core NAP team to carry out the process
- Stocktaking of adaptation activities and identification of gaps
- Framing future scenarios
- Analysis of impacts, institutional capacity, costs and benefits
- Establishing an inter-institutional coordination mechanism, monitoring and periodic reviewing

Climate Change and Health Adaptation Strategy Report (2012)

This report was funded by WHO and prepared by the Climate Change and Health Promotion Unit of the Ministry of Health and Family Welfare. The document provides an extensive overview of the current and potential impacts of climate change on health outcomes, including vector-borne disease, water-borne disease, cardiovascular diseases, mental health, and extreme weather events. Broad level health adaptation strategies, including possible financing, are highlighted, however a clear plan of action is yet to be developed.

Sustainable Development Goals (2030)

The United Nations 2030 global agenda for sustainable development contains seventeen goals, most of which are related to health. In addition to Goal 13: Take Urgent Action to Combat Climate Change and its Impacts, other goals are relevant to climate change and health adaptation, including Goal 2: End Hunger, Achieve Food Security and Improved Nutrition and Promote Sustainable Agriculture, Goal 3: Ensure Health Lives and Promote Well-Being for All Ages, Goal 6: Ensure Availability and Sustainable Management of Water and Sanitation for All, as well as others.

Key policy and implementation gaps for health adaptation

A Review of Policies/Strategies, Plans and Programmes relating to Health and Climate Change in Bangladesh conducted in 2013 identified the following gaps in policy for climate change and health adaptation.

- a clear definition of the climate change health sector
- a national strategic mechanism to address gaps in knowledge and ensure that research outputs inform policy and practice
- clear prioritization of health issues for adaptation
- identification of exactly who the health sector should engage with
- specification of how, where and when the health sector should engage with others
- evaluation of the extent to which past recommendations have been achieved and have reduced vulnerability to climate change;
- clear identification of measurable outputs or outcomes associated with future interventions; and
- Clear timelines for action and funding strategies.

Additionally, the WHO Climate Change and Health Country Profile (2015) reported the status of development or implementation of climate resilient measures, plans, or strategies for health adaptation and mitigation of climate change. Although much progress has been made, the following activities had not been completed as of 2015.

- Climate information included in Integrated Disease Surveillance and Response
- Development of EWS and response for climate-sensitive health risks
- Costing exercise for climate change and health adaptation
- CC&H resilience costs included into domestic and international planned allocations
- Conducted valuation of co-benefits of health implications of mitigation policies

4. Building a climate-resilient health system in Bangladesh

Introduction to the Operational Framework for Building Climate Resilient Health Systems

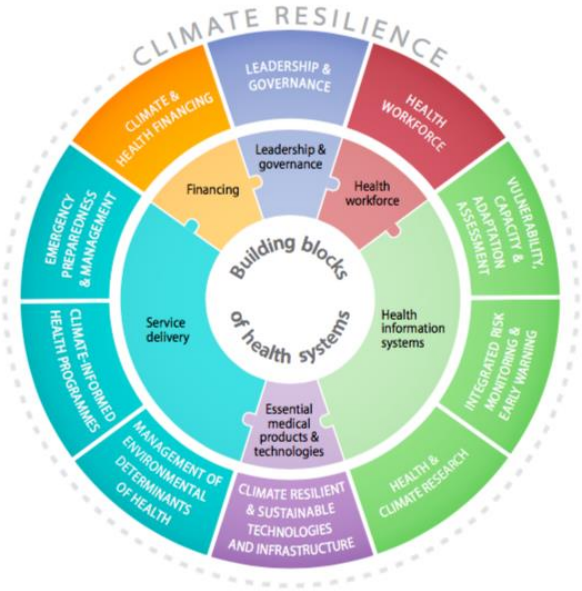
The WHO Operational Framework for Building Climate-Resilient Health Systems was launched in 2015 to guide Member States, particularly the health sector, to systematically and effectively address the increasing challenges posed by climate variability and change. The framework covers the six building blocks of health systems (leadership and governance, health workforce, health information system, essential medical products and technologies, service delivery, and financing) through 10 components (Figure 5) (WHO, 2015b).

In 2017, a South-East Asia Region framework for action (2017-2022) was developed to highlight the climate-related health risks specific to SEARO Member States, as well as highlight successful implementation of the WHO Operational Framework and plan for further action to build climate-resilient health systems in the region. The framework provides experiences from Member States in implementing the WHO Operational Framework and is a valuable tool to build best practices in climate change and health adaptation moving forward.

The framework for action in building health systems resilience to climate change in South-East Asia Region (2017-2022) also identified key points to be included in the draft Malé Declaration and Framework for Action, which delivers a prioritized list of actions to build climate-resilient health systems, based on the needs of the countries, and signed by the Health Ministers of Member States of the WHO South-East Asia Region. The declaration provides agreement on priorities, as well as a strong foundation by which to mainstream climate change into health planning at the country level (WHO, 2017).

The Bangladesh HNAP strategic actions are organized around these 10 components as a systematic and comprehensive approach to ensure the key aspects of a climate resilient health system are addressed and any gaps are easily identified.

Figure 6: Ten components comprising the WHO operational framework for building climate resilient health systems, and the main connections to the building blocks of health systems



Source: WHO, 2015b

Adaptation strategies and options in Bangladesh

The overall purpose of the HNAP is to support the development of a climate-resilient health system, as well as mainstream climate risks into health planning, policies, and programming. To achieve this, the following section outlines the 10 components of the operational framework, highlighting long-term strategic objectives, as well as medium to long-term adaptation activities specific to Bangladesh context. The resulting HNAP Action Plan 2018-2023 aims to prioritize these adaptation options and layout short-term actions, and related indicators to be implemented in the next five years.

Component 1: Leadership and Governance

This component aims to establish specific responsibility and accountability mechanisms for climate change and health within the Ministry of Health, including the incorporation of climate change and variability considerations into health policies and programmes. Strengthened coordination across sectors, such as water, agriculture, environment, and energy), as well as collaboration among departments and programmes within the Ministry of Health, is key to maximize synergies and ensure other sectors actively promote and protect health.

Strategic objectives:

- To have specific responsibility and accountability mechanisms on climate change and health established within the health ministry
- To have climate variability and change considerations reflected in the main health policies and programs
- To strengthen cross-sectoral collaboration and maximize synergies to ensure that decisions taken in other sectors protect and promote health.

Current status:

The Climate Change and Health Promotion Unit (CCHPU) was established within the Ministry of Health and Family Welfare in 2012 to serve as the umbrella group for activities related to climate change and health. The unit has been successful in leading some research project, however due to human resource and financial constraints, the overall effectiveness and ability to perform its core function of coordination and policy development remains limited. Additionally, the unit lacks an appropriate country-specific monitoring framework to guide the integration of climate change and health into various policies and plan, as well as provide feedback for decision-makers on key climate-related health risks.

Key barriers:

- Coordination mechanism not in place
- Lack of relevant human resources

Adaptation Options:

- Strengthen CCHP Unit with designated focal point (fulltime) and budget
- Develop a reporting tool to assist ministries in reporting CC&H activities to strengthen interagency coordinating platforms for CC&H focal point and other climate-sensitive programmes and health-determining sectors (water, environment, agriculture, energy)
- Establish a HNAP task force with agreed TORs in charge of updating, monitoring, and evaluating progress
- A CC cell can be established in DGHS level for coordination of Climate change issues within health programmes.

Component 2: Health workforce

Climate variability and change can increase for health services, thus alerting the number and skills of the health workforce, of which the health system relies on to achieve the best health outcomes possible, given resources and circumstances. This component focuses on strengthening the technical and professional capacity of health personnel, the organizational capacity of health systems, and institutional capacity to promote collaboration between health and other sectors. Activities to build this capacity can come in the form of awareness-raising and the development of communication materials, both within and outside the health sector.

Strategic objectives:

- To ensure a sufficient number of health workers with the required technical capacity are available to deal with the health risks posed by climate variability and change
- To use resources, information, knowledge and processes employed by the health sector efficiently and in a targeted manner in the face of additional climate-related risks
- To increase awareness of the link between climate change and health outcomes among different target audiences (policy-makers, senior staff, media and communities)

Current status:
There are about 140 000 sanctioned posts of the Ministry of Health and Family Welfare and its agencies, of which 56% belong to the Directorate General of Health Services, 29% to the Directorate General of Family Planning and 13% to the Directorate of Nursing. Although a substantial number of employees were recruited during implementation of the Health, Population and Nutrition Sector Development Programme, there is still a shortage of human resources. Moreover, it is a challenge for the Ministry of Health and Family Welfare to retain the health workforce, especially physicians and nurses, in remote and hard-to-reach areas, which are most vulnerable to climate change. There is a need to undertake capacity and preparedness assessment of health-care facilities and health professionals to identify the strengths, weaknesses and gaps in responding to the rising threats of emerging and re-emerging infectious diseases and non-communicable diseases, including mental health in the context of climate change.

A regional training package consisting of 16 stand-alone modules on climate change and health was launched in 2015 for WHO SEARO and climate change and health has been included in school health programmes in Bangladesh. However, health professionals in the public-sector lack adequate knowledge on the adverse impacts of climate change on human health. Climate change impacts a wide range of programme areas, including communicable diseases, maternal and child health, and nutrition, but the non-communicable diseases control programme unit is responsible for addressing climate change in all health programmes. Currently, this unit lacks technical capacity and the institutional mechanisms to fully address the impact of climate change in all health programmes. Due to this, other health programmes often remain uninformed of how climate change is impacting their areas, and thus climate change remains unaddressed in their respective programmes.

Key barriers:

- Shortage of skilled technical staff, rapid turnover and difficult in retaining staff
- Limited financial resources to support health workforce
- Unbalanced distribution of resources
- Rapid turnover of the skill personnel and less involvement of younger workforce

Adaptation options:

- Advocate to MoH&FW and other relevant decision-makers for increased attention for climate-related health risks

- Provide in-service training for health workforce and leadership on Climate change and health in key health programmes (vector-borne disease, water-borne disease, nutrition/food security)
- Develop enhanced climate focused health education programmes for climate-related health risks, including mass media and communication campaigns

Component 3: Vulnerability, capacity and adaptation assessment

This component focuses on building evidence to guide and inform policy- decisions and programmes that documents the health risks of climate change, vulnerable populations, adaptation options and efforts, as well as levels of resilience and adaptive capacity. A Vulnerability and Adaptation (V&A) assessment, which aims to assess population vulnerability to different health effects, identify weaknesses in health and other systems, and recommend interventions to address these issues, is an essential tool to complete this component. V&A assessments are not one-time activities and should be updated periodically and systematically to capture new information and update stakeholders.

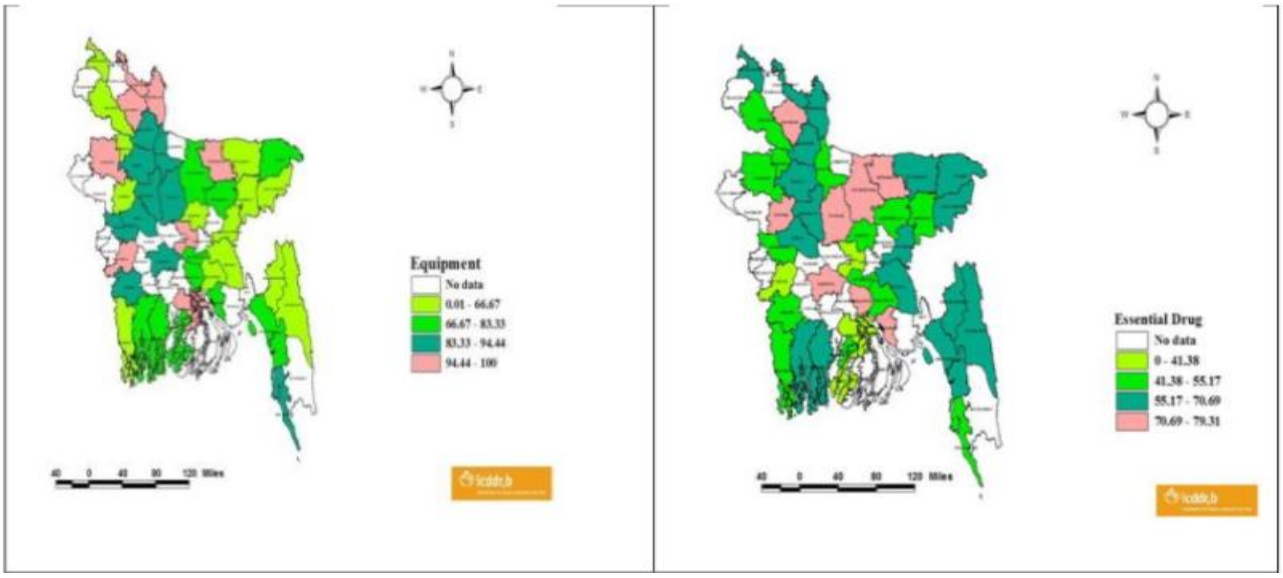
Strategic objectives:

- to develop a sound understanding of the main health risks posed by climate variability and change, and to identify the most vulnerable population groups in the country
- To develop a baseline record on capacities and gaps within the health system in dealing with the challenges posed by climate change
- To identify adaptation options, including their comparative advantages, potential costs and efficiency, to be made available for selection by health system decision-makers

Current status:
A climate change and health vulnerability and adaptation (V&A) assessment was conducted by the Climate Change and Health Promotion Unit in Bangladesh in 2011, which examined relationships between climatic variables and diarrhoeal disease, vector-borne disease (kala-azar, dengue, and malaria), mental health, and impacts from extreme weather events. However, there were many limitations to the study including geographic scope and data availability. In the end the V&A could not be mainstreamed into regular health programmes due to lack of awareness and motivation. In addition, WHO conducted a vulnerability and adaptation to climate change study focused on health and WASH. Although extensive, the assessment was limited to nine communities located in coastal and drought prone areas and only focused on WASH-related impacts. Moving forward, there is a need for an updated CC&H V&A assessment that incorporates more climate-sensitive health outcomes, geographic areas, and vulnerable populations.

Additionally, a World Bank supportedclimate change and health assessment conducted in 2014 attempted to measure health adaptation capacity. Using the 2011 Bangladesh Health Facility Survey and 2011 census data, the study measured and mapped quality of health service delivery based four core indicators, covering equipment availability, essential drug availability, staffing quality, and patient satisfaction. Though not directly linked to climate change, the exercise summarized that there was strong evidence of poor geographic targeting of public resources in the health sector, as well as basic environmental infrastructure in Bangladesh (CCHP, 2014).

Figure 7: Spatial distribution of overall health adaptation capacity, 2011



Source: Disaster risk and climate change unit, sustainable development department, SA region, World Bank, 2014

Key barriers:

- Financial and human resource constraints and unbalanced distribution
- Lack of coordination between key stakeholders (internal and external)
- Issues with data-sharing, availability, and quality

Adaptation options:

- Update V&A assessments (2012 & 2015) to include more climate-related health risks, as well as vulnerable populations and refined scope
- Adequate resource allocation
- Coordination among different actors

Component 4: Integrated risk monitoring and early warning

Integrated risk monitoring refers to the use of tools and epidemiological surveillance for early detection in conjunction with direct and remote sensing technologies for surveillance of the environmental determinants of health (e.g. water and air quality, variability in ambient temperature and humidity or incidence of extreme weather events). The overarching aim of this component is to use integrated disease surveillance and monitoring of a broad range of signals around a health risk and early warning systems to identify changing conditions more quickly to anticipate outbreaks and emergencies related to weather and climate.

<u>Strategic objectives:</u>

- To collect, analyze, and interpret data on climate-sensitive environmental risks and epidemiological trends on a continual basis and respond to identified risks continuous
- To report information on climate change impacts, vulnerability, response capacity, and emergency preparedness over time
- To communicate timely warnings to health decision-makers, the media, and the public and translate information into effective action to prevent negative health outcomes.

Current status:

The first phase of routine health information system development involved standardizing paper-based tools. Digitization of some data-collection tools was initiated for periodic reports generated at the health facility and community level. A review of this experience suggested full benefit would come from automating the process. The second phase of development is being piloted in two districts, Tangail and Habiganj, and has developed a comprehensive digital system for both the Directorate General of Health Services and the Directorate General of Family Planning, which could be replicated nationwide. The MoH&FW has taken steps to improve health management information systems to ensure delivery of timely and accurate disease information, including regular publications of health bulletins, modernization of data collection and storage, and the development of assessment tools (CCHP, 2014).

Gaps exist in the current disease surveillance system with regard to linking to the impact of climatic parameters. Insufficient meteorological and epidemiological data and limited monitoring of climate-sensitive diseases impedes the health system to provide early warnings, forecasts and adequate responses to potential outbreaks. The 2011 health vulnerability assessment revealed a strong correlation between climatic variable and some vector-borne diseases, but this valuable information could not be shared and used across the health programmes due to insufficient coordination between programmes and institutions (IEDCR, 2011).Overall, there no mechanism in place to measure the quality of data, including collection methods, thus leaving the health information system weak. Climate-sensitive diseases cannot be monitored separately, and climate/weather data has not been integrated with health data.

Key barriers:

- Lack of coordination between key stakeholders
- Issues with data-sharing, availability, quality, and timeliness

Adaptation options:

- Prioritize three climate-sensitive diseases to develop integrated monitoring system with climate/weather data
- Pilot climate-informed health early warning system for vector-borne diseases and water-borne diseases
- Develop risk communication strategy for vector-borne diseases, water-borne diseases, and nutrition/food security

Component 5: Health and climate research

Research (including operational and applied) on climate change and health is necessary to gain insights on how populations are affected, community capacities and solutions, and to build evidence to strengthen decision-making. Research should build from existing knowledge management platforms, be effectively and clearly communicated to communities and healthcare personnel and adapted for practical purposes when possible.

<u>Strategic objectives:</u>

- To identify and agree on a multidisciplinary national research agenda on climate change and health by emphasizing vulnerable groups/disadvantaged population
- To provide support for developing research capacity among professionals, academics and right workers
- To disseminate research findings to policy-makers for taking action

Current status:
Several globally recognized research institutes exist in Bangladesh that focus on climate-related health risks, however climate change and health research is still limited. In general climate change research remains fragmented in Bangladesh. The Climate Change Strategy and Action Plan (2009), highlighted the need to establish a centre for adaptation research and training to help facilitate knowledge management and capacity building on climate change issues, though the status of this is unknown. The CCHP Unit has received some funding through the Climate Change Trust Fund to conduct research, but influence within the Ministry of Health and Family Welfare is limited. Further, there is a lack of coordination between the various sectors, which impedes access to climate-related information with regard to scientific evidence, health risks of climate change, treatment technology, policies and interventions that can minimize the adverse impacts. There is a need for a clear research agenda for climate change and health to provide guidance for future research activities.

Key barriers:

- Financial and human resource constraints
- Unbalanced distribution of resources
- Lack of adequate operational strategies
- Difficulties in translating research into practice
- Conceptualization of ideas and resources

Adaptation options:

- Establish a national CC&H research agenda that includes climate-related sectors and resource mobilization
- Establish a MOU to between MoH&FW, BIDS, research centres and meteorology services department for data sharing, as well as establishing baseline date for prioritized climate-related health risks and valuation of co-benefits of health implications of mitigation policies
- Develop a knowledge sharing platform to disseminate CC&H research to key stakeholders and organize Climate Change Forum to showcase climate change activities, including those relevant for health
- Research findings should be prioritized for policy formulation and implementation

Component 6: Essential medical products and technologies

A climate-resilient health system requires essential medical products, including vaccines and surgical equipment. Additional, investment in specific technologies both within and outside the health sector can enhance health service delivery and reduce disruptions during extreme weather events. For example, access to safe water and sanitation facilities, reliable cold chains, enforced building codes, and dependable information communication technologies and energy sources all contribute to a climate-resilient health system. Further, reducing the carbon footprint of healthcare facilities through “greening” exercises, such as solar energy and water pumps, contributes to climate resilience and long-term sustainability. This component aims to strengthen and promote these key products and technologies.

<u>Strategic objectives:</u>

- To systematically consider climate risks when dealing with technologies, products and procedures for health infrastructure and services
- To select and promote new technologies, processes and productskeeping in mind climate resilience
- To promote and enhance the sustainability of health operations to build climate resilience and contribute to long-term sustainability.

Current status:
Health-care facilities, especially in remote areas, are vulnerable to extreme weather events and become inoperable during those events, when they are most needed. Remote facilities often lack access to safe running water and sanitation, which are preventive for many climate-sensitive diseases. Remote health-care providers have limited skill to diagnosis and treat climate-sensitive diseases. Health staff do not have access to treatment guidelines and are not skilled in epidemic preparedness. Community members, especially vulnerable groups such as poorer people, women and children, often do not have the resources to access health care.

To address the needs of healthcare facilities, Bangladesh has started to pilot the "green hospital" initiative, which aims at systematically improvewater, sanitation and hygiene, waste management, and promote the use of solar power.

Key Barriers:
- Financial constraints
- Unbalanced distribution of resources

Adaptation options:
- Implement "green hospital[1]" initiative in pilot facilities
- Develop guidelines and SOPs for health protection from adverse health effects and pre-and-post disaster situations including standardizing emergency health supplies and stockpiling
- Advocate the provision of equipment and supplies for laboratories and institutions to test, report, and address climate-related health risks (e.g. WBD testing and treatment)

Component 7: Management of environmental determinants of health

Climate change will likely impact other determinants of health, such as water quality and quantity, air quality, nutrition and food security, waste management, and housing. Although the health sector may not play a direct role in managing environmental determinants of health, Component 7 recognizes they can provide evidence, raise awareness, support monitoring of environmental exposures, and define regulatory standards, both at policy and programmatic levels.

Strategic objectives:
- To ensure joint monitoring of climate-sensitive environmental risks against evidence-based standards
- To promote the creation, revision and enforcement of regulatory policies protecting populations against climate-sensitive environmental risks
- To enhance coordinated management of the environmental determinants of health, with clear roles and responsibilities defined across sectors.

Current status:
Water, Sanitation, and Hygiene
Water, sanitation, and hygiene (WASH) issues are led by the Department of Health and Engineering within the Ministry of Local Government, Rural Development and Cooperatives in Bangladesh. Groundwater is the major source of drinking water in Bangladesh with an estimated 7 million tube wells (hand pump tube wells, deep set tube wells, and deep tube wells), serving an average of 20 people each in country. Although, the coverage of the population with access to improved water

[1] https://www.greenhospitals.net/wp-content/uploads/2016/07/Global-Green-and-Healthy-Hospitals-Agenda.pdf

sources has increased to 80%, difficulties still exist. Notably, arsenic contamination is becoming a problem with 25% of existing wells being exposed to arsenic (WHO, 2015c). Bacteria contamination, due poor maintenance is also a concern.

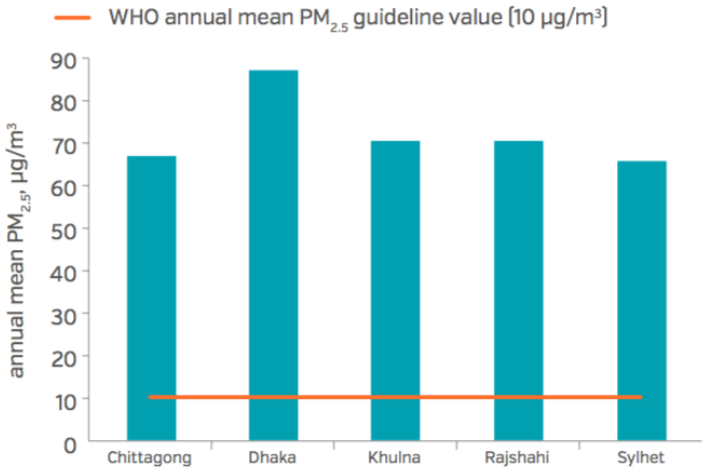
Sanitation coverage has historically been low in Bangladesh. Although improvements have been made, a MICS survey conducted in 2013-14 found that only 59.9% of the population were using improved sanitation facilities.

WASH issues have been identified as a significant impact of climate change for Bangladesh. Water supply is challenged in some parts of the country where droughts are more common and in dry seasons due to limited storage and water contamination of natural water sources.Flooding is associated with increased with contaminated water and seasonal water quality issues due to disruption to normal supplies and contamination of surface water supplies. Cyclones, storm surges, and sea-level rise also affect water quality due to disruptions in supplies, damaged WASH facilities, and reduced freshwater availability. Although some WASH strategies (e.g. Water Safety Plans) have worked to combat communicable diseases and helped increase resilience to extreme weather events, more focus and resources are needed to prepare and management current and future climate-related risks.

Air Quality

Outdoor air pollution can have direct and sometime severe consequences for health, leading to increased risk of respiratory infections, lung cancer, and cardiovascular disease (WHO, 2015a). In Bangladesh, the five most populated cities with available air pollution data have annual mean PM2.5 levels higher than the recommended WHO value of 10 µg/m3 (Figure 7). Household air pollution is also a growing health concern in Bangladesh, especially in rural areas that primarily rely on solid fuel for cooking.It is estimated that Nearly 88,000 deaths (44% of deaths from stroke, cardiovascular disease, lung cancer etc.) are attributable to indoor air pollution which accounts for 10% of all death in Bangladesh in 2012 (WHO, 2015a). Despite increasing evidence of the health impacts of poor air quality (Shahid et al. 2010; WHO, 2015a) policy and programmatic interventions are limited in Bangladesh.

Figure 8: Outdoor air pollution in cities in Bangladesh annual mean pm2.5 (µg/m3) 2013



Source: WHO 2015a

Key barriers:

- Lack of internal and external coordination
- No clear guidance and standard operating procedures for identified health risks
- Limited technical capacity to conduct necessary assessments

Adaptation options:

- Implement/scale up pilot project for climate-resilient water safety plans
- Implement activities to reduce household air pollution (identified in NCD plans) and develop strategy to pilot climate-proofing housing for vulnerable communities
- Strengthen monitoring system for ambient air quality and link with disease surveillance

Component 8: Climate-informed programmes

Increased frequency and intensity of extreme weather events will cause injuries and death, mental and occupational health issues, and damage health facilities. Moreover, climate variability and change will impact transmission pathways for vector and water-borne diseases. This component aims to ensure that health policies, programmes, and operations are aware of and take into account both current and future climate change risks.

Strategic objectives:

- To integrate information on current and projected climatic conditions into strategic planning of health programmes for climate-sensitive diseases
- To revise public health programmes standard operating procedures to respond to climate risks in delivery of interventions

Current status:
There is inconsistent incorporation of climate change considerations into public health strategies, plans and policies. There is no mention of climate change in the Health Sector Strategy of the *Sixth Five Year Plan*, the current *National Health Policy*, the *National Food Policy*, the *National Water Policy*, the *National Sanitation Strategy*, or the *Strategic Plan for Surveillance and Prevention of Non-Communicable Diseases*. The only document that not only identifies the likely impacts of climate change on health, but also sets out priority interventions is the *Health, Population and Nutrition Sector Development Plan* (HPNSDP) (WHO, 2015d). The strategies and actions of this HNAP will contribute significantly to the mainstreaming of climate change in health.

Key barriers:

- Lack of awareness of climate-related health risks among decision-makers

Adaptation options:

- Mainstream climate change risks into relevant policies and operational plans for VBD, WBD, and nutrition.
- Develop risk maps for VBD, WBD, and nutrition/food security using GIS (strengthen CBNP in hot spot areas)
- Develop and implement health adaptation prevention and control interventions based on risk maps

Component 9: Emergency preparedness and management

Holistic management of overall public health risks with an emphasis on preparedness, as well as emergency response is key for building climate-resilient health systems. This component will achieve this through various measures, such as climate-informed preparedness plans, emergency systems, and community-based disaster and emergency management.

Strategic objectives:

- To ensure emergency and disaster risk management protocols and policies include current and likely future climatic conditions
- To strengthen health system capacity to manage risks so that overall vulnerability and exposure to hazards are reduced, and residual risks and uncertainties are effectively managed
- To empower communities to effectively prevent and respond to the health risks posed by extreme weather events.

Current status:
Comprehensive disaster management was highlighted as a key theme of the Climate Change Strategy and Action Plan (2009). Specifically, objectives were set to improve early warning systems and forecasting for floods and cyclones, including increasing community awareness and enhancing information dissemination techniques. However, these early warning systems were not linked with health information systems.

The Directorate General of Health Services is responsible for providing preventive and curative health services during disasters following extreme weather events by coordinating and funding medical teams on an emergency basis. The Directorate General of Health Services works in all four phases of disaster management: normal, alert and warning stage, disaster stage and rehabilitation stage. Additionally, the Ministry of Disaster Management and Relief is responsible for reducing the risk of people from hazards and ensuring that there is an efficient emergency response management system in place. For data collection and disaster early-warning systems, the Bangladesh Meteorology Department (BMD) collects real-time meteorological information from 35 observatories and the Bangladesh Water Development Board (BWDB) collects ground and surface water information, as well as monitors flood and drought situations. Finally, the Disaster Management Information Network, within the Disaster Management Bureau, support 64 districts and 482 sub-district offices, providing information on risks, mapping risk reduction activities, maintaining information databases on disaster management capacity, and operating a national information portal.

The National Disaster Management Council (NDMC) and Inter-Ministerial Disaster Management Coordination Committee also play significant roles in facilitating policy-making, planning and implementation of disaster risk reduction and emergency response management in Bangladesh.

The V&A assessment (2011) explored the relationship between mental health and climate change, specifically impacts from extreme weather events. Although, the impacts could not be quantified, it is likely that as the intensity and frequency of extreme weather event increases, so too will the effects on mental health and well-being. Currently, mental health is a low priority for the health sector with not mention of mental health in the national disaster management policy and no standard operating procedures in place (IEDCR, 2011).

Key barriers:

- Weak communication and coordination mechanisms at sub-national levels
- Limited resources and emergency supplies
- Unclear management structure and lack of standard operating procedures

Adaptation options:

- Integrate climate-sensitive health risks and climate data into national disaster risk reduction strategy

- Incorporate climate-related health risks into emergency preparedness and response plans for health facilities
- Strengthen procurement system to access and manage medical and disaster response supplies during emergencies

Component 10: Climate and health financing

To successfully build climate-resilient health systems will require additional funds. For example, there is a need for resources to expand geographical and seasonal ranges or population coverage for surveillance and control programmes for climate-sensitive diseases, as well as retro-fitting for healthcare facilities to withstand extreme weather events. To accomplish this, component 10 will assess funding needs as well as identify, monitor, access financial mechanisms to mobilize necessary resources for climate change and health investments. A comprehensive approach that builds on basic health system investments (such as an adequate health workforce) and strengthen health infrastructure and services, as well as climate change funding both internally and through external donors need to be adopted.

Strategic objectives:

- To develop health-specific funding mechanisms for climate change
- To ensure climate change considerations are included in proposals funded by health funding mechanisms
- To incorporate health and climate change considerations in projects and programmes to make funding available for sectors influencing health
- To ensure availability and accessibility of climate change funding streams at the national level.

Current status:
The Bangladeshi Government has incorporated climate change into national planning. In the existing development planning process, all projects worth more than US$ 6.37 million go to the Executive Committee of the National Economic Council of the Ministry of Planning for review and approval. Now, projects related to climate change and costing less than US$ 250 million will not need to go to the Executive Committee. The Monitoring and Evaluation wing of the Ministry of Planning monitors and evaluates Bangladeshi Government-funded projects.

A cost-effectiveness analysis was conducted in 2014 to estimate the cost and health benefits of three adaptation interventions focused on WASH, nutrition, and early-warning/risk reduction systems (CCHP, 2014). In summary, the study identified several key gaps, including lack of cost data on projects and programmes related to access safe WASH, investment in early-warning systems, and risk management measures, as well as absence of rigorous impact evaluations for health adaptation interventions.

In addition, a small amount of funding, distributed through the Climate Change Trust Fund, has been disbursed to the CCHP Unit for climate change and health projects. Further, a GEF proposal for building climate resilient health systems in Bangladesh has been approved with funds set to be disbursed in 2018.

Key barriers:

- Multiple stakeholder agendas with limited coordination and collaboration
- Reliance on donor-driven agendas

Adaptation options:

- Develop a resource mobilization plan that identifies funding mechanisms for health (e.g. Climate Change Trust Fund) as well as resource gaps
- Conduct a cost-benefit analysis for adaptation to climate change in the health sector
- Develop and submit proposals for building climate-resilient health systems to international climate change and health funding sources (e.g. GEF, GCF, bi-lateral donors)

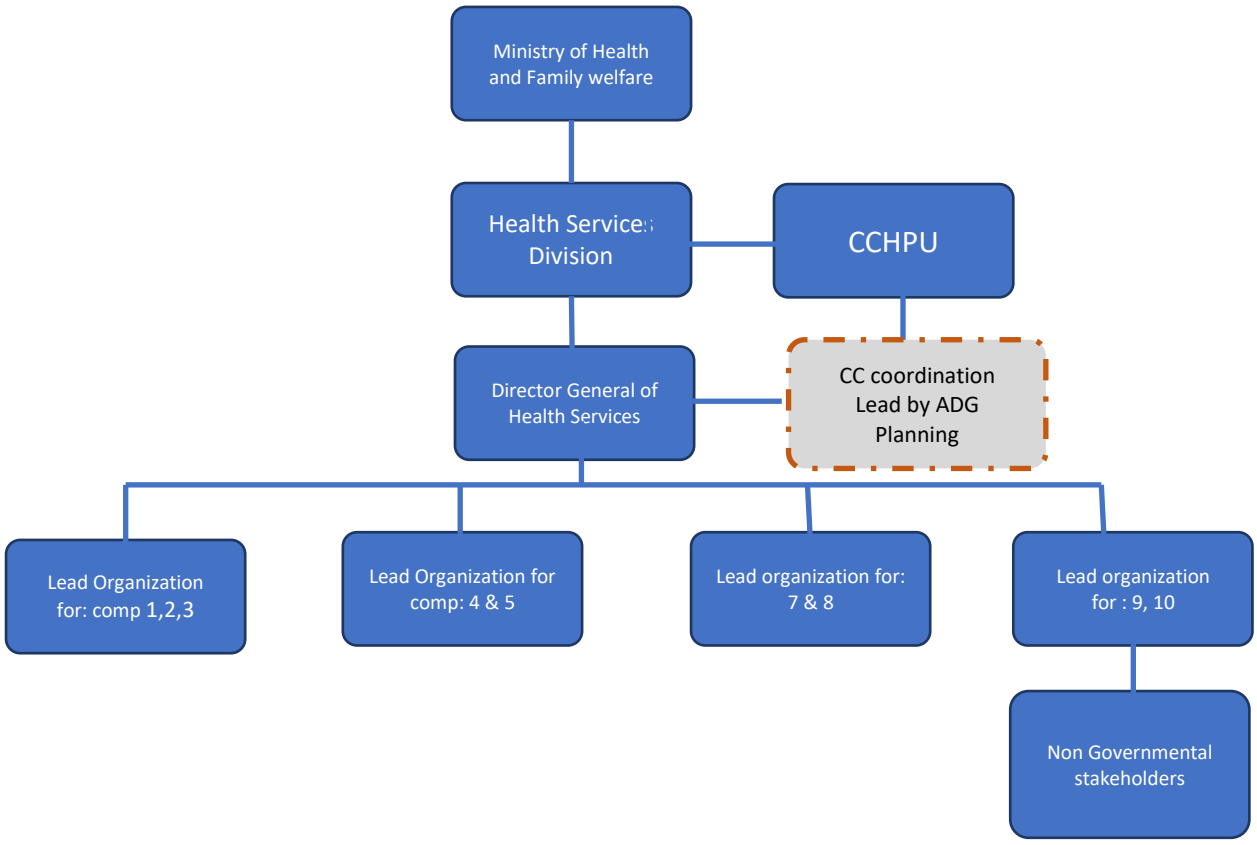
5. HNAP Implementation Strategy

To successfully accomplish the goals outlined in the HNAP, a comprehensive implementation strategy is needed. Building from the strategic objectives and health adaptation options described in Part 4, the implementation strategy guides key stakeholders on the various components needed to develop a climate-resilient health system. Importantly, the implementation strategy is careful to support the mainstreaming of climate change into existing health programmes and operational plans, rather than creating parallel systems. As noted, climate change will exacerbate existing health problems in Bangladesh, therefore the activities under the HNAP should complement and strengthen on-going health programmes. This requires effective coordination within the health sector, as well as with other sectors and the overall NAP process, to ensure priorities are aligned and health has a strong, consistent voice in national climate change adaptation and mitigation efforts. Additionally, financial constraints have been highlighted as a major barrier for implementation of health adaptation strategies, therefore a financial strategy will need to be developed to cost proposed adaptation options, integrate climate change and health into government budgets, access external financing streams, and mobilize resources.

Coordination mechanisms

The coordination of the HNAP is led by the Ministry of Health and Family Welfare, Climate Change and Health Promotion Unit.The CCHP unit has both an advisory group, which provides oversight for all CC&H activities, as well as technical working group, that is focused on the HNAP. This group will also link with the focal point for development of the NAP. Additionally, key stakeholders will support the implementation of the HNAP (a proposed list is in the Annex). Figure 7 provides a simplified diagram of the organizational structure. The coordination mechanism for implementation of the HNAP will be based on existing institutional arrangements and structures within the health sector to ensure alignment with national priorities. To ensure effective coordination, the HNAP will aim to strengthen the CCHP unit, as well as establish a specific HNAP task force, involving relevant stakeholders across ministries, departments, and institutions that will lead the updating, monitoring, and evaluating progress.

Figure 9: Simplified institutional arrangements in the health sectors



HNAP Action Plan 2018-2023

The HNAP Action Plan outlines key short-and-medium term health adaptation activities to be carried out over a five-year period (2018-2023). The prioritized actions build from the strategic objectives presented in Part 4, with the aim of building a climate-resilient health system in Bangladesh. The action plan also provides intended deliverables for each action, as well as the responsible institution.

It is estimated that about US$ 1,038,000 will be needed to implement the activities under this action plan in five years.

Actions	Deliverable	Timeframe	Responsible institutions	Budget In US$
Component 1: Leadership and governance				
Strengthen CCHP Unit with designated focal point and budget	Competent and functional CCHP unit with adequate human and financial resources	2018-2023	*Lead:*MoH&FW; CCHPUT *Other:*DGHS,	48000
Develop a reporting tool to assist ministries in reporting CC&H activities to strengthen interagency coordinating platforms for CC&H focal point and other climate-sensitive programmes and health-determining sectors (water, environment, agriculture, energy)	CC&H technical working group has identified cross-sectoral/departmental members, with established TOR, and regular meetings	2018-2020	*Lead:* CCHPU *Other:* DPHE, WASAs, DGHS, Municipalities, DDM, BMD, DOE,	30000
Establish a HNAP task force with agreed TORs in charge of updating, monitoring, and evaluating progress	HNAP disseminated to all regions and relevant ministries	2018-2023	*Lead:*MoH&FW; Other: DGHS, key stakeholders	10000
Component 2: Health Workforce				
Advocate to MoH&FW and other relevant decision-makers for increased attention for climate-related health risks	Policy and decision-makers with better awareness and understanding of CC&H issues	2018-2019	*Lead:* DGHS, CCHPU, Other: IEDCR, ICDDR-B	20000
Provide in-service training for health workforce and leadership on CC&H in key health programmes (vector-borne disease, water-borne disease, nutrition/food security)	Health professionals with better awareness and understanding of CC&H issues	2018-2023	*Lead:* DGHS *Other:* IEDCR, NCDC, PHC, MoE, ICDDR-B, BSMMU, NIPSOM, BIDS	25000
Develop enhanced health education programmes for climate-related health risks, including mass media and communication campaigns	Communities with better awareness and understanding of CC&H issues	2018-2020	*Lead:* DGHS *Other:*(CDC, IEDCR, NCDC, PHC), MoE, City Corporation, DGHS (BHE), IPH, IEDCR, NIPSOM	50000
Component 3: Vulnerability, capacity and adaptation assessment				
Update V&A assessments (2012 & 2015) to include more climate-related health risks, as well as vulnerable populations and refined scope	CC&H V&A updated and reported	2018-2022	*Lead:* CCHP Unit and IEDCR, *Other:* BSMMU, ICDDCR-B, BCAS	60000
Component 4: Integrated risk monitoring and early warning				
Situation analysis of the climate sensitive diseases (WBD, BBD, NTD, etc....)		2018-2019	*Lead:* IEDCR, *Other:*DGHS	20000
Prioritize three climate-sensitive diseases to develop integrated monitoring system with climate/weather data	Climate-informed health early warning system developed for priority climate-sensitive diseases	2018-2023	*Lead:* IEDCR, *Other:* DGHS, BMD, DGHS (CDC), DPHE, BMD (Metoffice) ICDDR-B	60000
Defining integrated indicator and designing climate-based health early warning system		2019-2020	*Lead:* IEDCR, DGHS	30000
Pilot climate-informed health early warning system for VBD and WBD		2020-2023	*Lead:* IEDCR *Other:* BMD, DGHS (CDC), DPHE,	150000

			ICDDR-B	
Develop risk communication strategy for VBD, WBD, and nutrition/food security		2018-2020	*Lead:* IEDCR *Other:* DGHS (CDC, NCDC, PHC), MoE, NNS, IPHN, BNNC, NIPSOM, ICMH City Corporation, ICDDR-B, Health based NGOs	35000
Component 5: Health and climate research				
Establish a national CC&H research agenda that includes climate-related sectors and resource mobilization	Enhanced climate change and health research	2018-2020	*Lead:* IEDCR, BMRC Other: DGHS,ICDDR-B	15000
Establish a MOU to between MoH&FW, research centres and meteorology services department for data sharing, as well as establishing baseline date for prioritized climate-related health risks and valuation of co-benefits of health implications of mitigation policies		2018-2020	*Lead:* DGHS, *Other:* Hydro-Met Services, IEDCR, ICDDR-B	15000
Develop a knowledge sharing platform to disseminate CC&H research to key stakeholders and organize Climate Change Forum to showcase climate change activities, including those relevant for health		2018-2023	*Lead:* DGHS, Other: CDC, IEDCR, NCDC, PHC, MoE, City Corporation	50000
Component 6: Essential medical products and technologies				
Implement "Green hospital" initiative in pilot facilities (http://apps.searo.who.int/PDS_DOCS/B5370.pdf),	Vulnerability of healthcare facilities identified and addressed	2018-2023	*Lead:* CBHC/PHC, DGHS *Other:* DPHE, , Health Engineering Dept. DGHS	200000
Develop guidelines and SOPs for health protection from adverse health effects and pre-and-post disaster situations including standardizing emergency health supplies and stockpiling		2018-2020	*Lead:* NCDC *Other:* DPHE; Disaster Management Bureau;	75000
Advocate the provision of equipment and supplies for laboratories and institutions to test, report, and address climate-related health risks (e.g. WBD testing and treatment)		2018-2021	*Lead:* MoH&FW; CCHP Unit; IEDCR, NIPSOM, ICDDR-B, National Public Health Laboratory	20000
Component 7: Management of environmental determinants of health				
Implement/scale up pilot project for climate-resilient water safety plans	Water safety plan strengthened and safe water and sanitation for healthcare facilities ensured	2018-2023	*Lead:*LGD, DPHE, WASAs, *Other:*DoE, Municipalities,	100000
Develop strategy to pilot climate-proofing hospitals for vulnerable areas	Integrated air quality monitoring developed	2018-2023	*Lead:* LD Hospital/CBHC,NCDC, IEDCR, HED	15000
Strengthen monitoring system for ambient air quality and link with disease surveillance		2018-2021	*Lead:* DGHS(NCDC) , Other: IEDCR, DOE, NIPSOM, BSMMU	30000

Component 8: Climate-informed programmes				
Mainstream climate change risks into relevant policies and operational plans for VBD, WBD, and nutrition.	Climate risks included in planning and implementation of climate-sensitive diseases (VBD, WBD, nutrition/food security)	2018-2021	*Lead:* MoH&FW, planning cell/CCHP Unit, *Other:* DGHS, identified programmes, IEDCR	15000
Develop risk maps for VBD, WBD, and nutrition/food security using GIS (strengthen CBNP in hot spot areas)		2019-2023	MoH&FW, DGHS, CCHP Unit, identified programmes	20000 + 30000
Develop and implement health adaptation prevention and control interventions based on risk maps		2020-2023	*Lead:* DGHS *Other:* CCHP Unit, identified Health programmes	25000
Component 9: Emergency preparedness and management				
Incorporate climate-related health risks into emergency preparedness and response plans for health facilities	Climate change and health risks included in disaster risk management plans	2018-2020	*Lead:* DGHS, Disaster Management, *Other:*IEDCR,	10000
Strengthen procurement system to access and manage medical and disaster response supplies during emergencies		2018-2023	*Lead:* DGHS, Disaster Management programme, CMSO	25000
Component 10: Climate and health financing				
Develop a resource mobilization plan that identifies funding mechanisms for B (e.g. Climate Change Trust Fund) as well as resource gaps	Fund mobilized for adaptation and mitigation measures	2018-2020	*Lead:* Planning cell, MoH&FW, *Other:*DGHS, CCHP Unit	25000
Conduct a cost-benefit analysis for adaptation to climate change in the health sector		2018-2020	*Lead:* Planning cell, MoH&FW *Other:* DGHS, CCHP Unit	40000
Develop and submit proposals for building climate-resilient health systems to international climate change and health funding sources (e.g. GEF, GCF, bi-lateral donors)		2018-2023	*Lead:* Planning cell, MoH&FW *Other:* DGHS, CCHP Unit	45000

HNAP financing strategy

The Climate Change and Health Promotion Unit (CCHPU) of MOH&FW will seek financial support from internal and external fund source as listed below for HNAP implementation over next 5 years. CCHPU will also monitor the implementation progress of HNAP. Additionally, the cost of monitoring and future updating of the HNAP will be sought from the same sources. If funding is inadequate, then effort will be made to access funds from different external sources, for example GCF, LDCF, and UK climate fund. CCHPU will coordinate with the various programmes to synergize with ongoing similar programmes and avoid duplication.

Cost estimates for HNAP actions

The cost estimates are developed based on a review of current OP expenditure of HPNSDP and HNAP development team. The costs were also validated at a stakeholders meeting held in April 2018 that involved MOH&FW, MOEF, DPHE, WHO, CCHPU and BMO.

Climate change and health financing in Bangladesh

Bangladesh has established funds, the Climate Change Trust Fund and Act and Bangladesh Climate Change Resilience Fund (BCCRF) to finance climate adaptation programmes and projects.

Bangladesh Climate Change Resilience Fund (BCCRF)

The Government of Bangladesh, with support from the European Union, Denmark, Sweden, Switzerland, the United Kingdom, the United States and Australia, has established a Bangladesh Climate Change Resilience Fund. It is managed by the Government with technical assistance from the World Bank. Development partners have pledged USD118 million to this fund. Some projects directly target the impacts of climate change on health, such as *Impact of Climate Change on Climate-Sensitive Diseases and Implications for the Health Sector* being conducted by The World Bank.

Additionally, in 2017 Bangladesh, with support from WHO and UNDP submitted a Global Environment Facility (GEF) proposal for a project on "building resilience of health systems to climate change." The project has now been approved with the funds set to be distributed in 2018. One of the main outcomes of the project is to support the development and implementation of the HNAP.

Climate Change Trust Fund Act (2010)

The Government of Bangladesh created the Climate Change Trust Fund in 2009. Since then it has approved 43 government projects and 32 NGO projects, in total worth USD73.5 million. Some of these projects directly target the impacts of health on climate change, such as:

- Risk reduction and adaptation measures in the context of climate change impact on health sector in Bangladesh being conducted by the Health Promotion and Climate Change Unit of the Ministry of Health and Family Welfare
- Safe water supply, sanitation and bio-gas technology for rural livelihood improvement in climate victim people of Bangladesh being conducted by the Centre for Irrigation and Water Management
- Supplying of safe drinking water by solar desalinization/purification panel to the climate vulnerable areas of Bangladesh

Funding sources

Internal

The HNAP promotes and guides the mainstreaming of climate change into existing health and other relevant programmes, plans, and strategies, which should improve the ability to access internal Government funds. Completion of a costing exercise will provide evidence and information that will also advance the inclusion of climate change and health-related costs into operational plans and budget.

External

The HNAP action plan includes an activity to develop a resource mobilization plan. This plan provides the opportunity to identify key external funding sources to target, as well as the best way to access funds. Health, climate change, and climate change and health-related sectors (e.g. water, agriculture,

etc.) funding streams should be included in the resource mobilization plan. The following sections highlight possible funding options.

Development Partners (DPs), including bilateral donors, multilateral and UN organizations and non-government organizations contribute a large proportion of climate finance and may be approached for initial funding to begin implementation of the HNAP.

The **UNFCCC** has some financing mechanisms which, are a significant international source of adaptation funding. The two funds (Adaptation Fund, and Green Climate Fund) have different rules and accessing mechanisms.

Green Climate Fund (GCF) The Green Climate Fund (GCF) is a new global fund, within the UNFCC mechanisms, created to support the efforts of developing countries to respond to the challenge of climate change with both mitigation and adaptation actions. As the HNAP is linked to the NAP, climate actions identified in the HNAP contributes to the implementation of the NAP. This is key for accessing GCF resources, which requires high quality proposals aspiring to promote paradigm shifts. The GCF is aiming for 50% of the funds to go to Least Developed Countries (LDCs), Small Island Developing States (SIDS), and African States.

The Adaptation Fund (AF) was established by the Parties to the Kyoto Protocol of the UN Framework Convention on Climate Change to finance concrete adaptation projects and programmes in developing countries that are parties to the Kyoto Protocol. It provides resources for adaptation projects and program in developing countries including LDCs.

The Global Environment Facility (GEF) is an international partnership of 183 countries, international institutions, civil society organizations and the private sector that addresses global environmental issue and funds are available to developing countries and countries with economies in transition to meet the objectives of the international environmental conventions and agreements. Two funds under GEF are the Least Developed Country Fund (LDCF) and the Special Climate Change Fund (SCCF).

The Least Developed Country Fund (LDCF) was established under GEF to assist least developed countriesto take quick actions including implementing projects identified under NAPA. The Tanzania NAPA identified the health sector to be among of priority sectors that have been affected by climate change and need urgent adaptation initiatives.

Special Climate Change Fund (SCCF), a GEF initiative, supports adaptation and technology transfer in all developing country parties to the UNFCCC. The SCCF supports both long-term and short-term adaptation activities in water resources management; land management; agriculture; health; infrastructure development; fragile ecosystems including mountainous ecosystems; and integrated coastal zone management.

Finally, the **World Bank**, and **other development banks**, have climate funding streams which can be accessed for HNAP implementation and adaptation actions.

6. HNAP Monitoring, evaluation, and reporting

A key component to the successful implementation of the HNAP is a detailed and functional monitoring and evaluation (M&E) plan. The M&E framework should be flexible and practical, and aim to promote an iterative process, engage a broad range of stakeholders, and align with existing M&E mechanisms, as well as global and regional reporting commitments. Further, it is

recommended that indicators be both process and outcome based. Objectives of the M&E plan include:

- to track the progress of implementation of the HNAP action plan on the level of input and output;
- to evaluate the effectiveness and appropriateness of the adaptation actions to the strategic objectives and the overall objectives of the HNAP, including the allocated resources;
- to provide information to the beneficiaries, implementing agencies and financiers on the progress of HNAP actions.

HNAP review process

The HNAP will be reviewed once a year by a steering committee and chaired by the MOH&FW. The Climate Change and Health Promotion Unit will coordinate the review process to ensure all relevant stakeholders are engaged. DPs will also be members of the review committee to provide technical support and guidance.

HNAP reporting

The HNAP reporting mechanisms will focus on quarterly and annual reports to monitor the progress of implementation of the Action Plan (2018-2023) based on the indicators described in the M&E Plan.

M&E Plan (2018-2023)

Based on the Action Plan and identified deliverables, the M&E plan outlines indicators, including baseline, means of verification, frequency of reporting, and responsible institutions.

Deliverable	Indicator	Baseline	Means of Verification	Frequency of reporting	Responsible institutions
Long-term HNAP strategic objective					
To build resilience to climate change impacts on health by empowering communities and individuals through an adaptive and sustainable health system in Bangladesh					
Component 1: Leadership and governance					
Competent and functional CCHPUwith adequate human and financial resources					Lead: MoH&FW; Others: DGHS, CCHP Unit
CC&H technical working group has identified cross-sectoral/departmental members, with established TOR, and regular meetings	CC&H TWG established with approved TORs	CC&H TWG within CCHP Unit, but capacity remains low	Meeting minutes written TORS	Quarterly	Lead: MoH&FW Others: DPHE, WASAs, DGHS, Municipalities, DDM, CCHPU
HNAP disseminated to all regions and relevant ministries	Dissemination meetings conducted in all regions	HNAP not developed	HNAP meeting report	Quarterly	Lead: MoH&FW Other: CCHP Unit, key stakeholders
Component 2: Health workforce					
Policy and decision-makers with better awareness and understanding of	Percentage of MoH&FW and other relevant decision-makers	CC&H awareness meetings not held for	Meeting reports	Annually	Lead: CCHP Unit, Other: IEDCR, ICDDR-B

Deliverable	Indicator	Baseline	Means of Verification	Frequency of reporting	Responsible institutions
CC&H issues	attending CC&H awareness meetings	MoH&FW and other relevant decision-makers			
Health professionals with better awareness and understanding of CC&H issues	Percentage of health workforce trained on CC&H in key programmes during in-service training	No CC&H training conducted	CC&H awareness survey	Quarterly	Lead: CCHPU Other MoH&FW, DGHS CDC, IEDCR, NCDC, PHC), , ICDDR-B
Communities with better awareness and understanding of CC&H issues	Percentage of school organize class/programmes on CC&H risks for students; Number of mass media campaigns on climate-related health risks	Only a few schools in coastal areas organize CC&H programmes	MoH&FW/ Ministry of education reports	Quarterly	Lead: Bureau of Health Education (BHU) Other: MoH&FW, DGHS (CDC, IEDCR, NCDC, PHC), City Corporation, DGHS (BHE), IPH, IEDCR, NIPSOM
Component 3: Vulnerability, capacity, and adaptation assessment					
CC&H V&A updated and reported	CC&H V&A updated and submitted to MoH&FW	V&A assessments conducted in 2011 and 2015, though not comprehensive	MoH&FW reports	Annually	Lead: CCHP Unit Other: IEDCR
Component 4: Integrated risk monitoring and early warning					
Climate-informed health early warning system developed for priority climate-sensitive diseases	Monitoring system for prioritized CSD incorporate climate/weather data	Monitoring systems for CSD do not incorporate climate/weather data	MoH&FW assessment report	Annually	Lead: IEDCR Other: DGHS, CCHP Unit, BMD, DGHS (CDC), DPHE, , ICDDR-B
	Climate-informed health early warning system piloted for VBD and WBD	No climate-informed health early warning system exists	MoH&FW assessment report	Annually	Lead: IEDCR Other: , BMD, DGHS (CDC), DPHE, ICDDR-B
	Risk communication strategy for VBD, WBD, and nutrition/food security developed and approved by MoH&FW	No risk communication strategy exists	MoH&FW assessment report	Annually	Lead: IEDCR Other: DGHS (CDC, , NCDC, PHC), MoE, NNS, IPHN, BNNC, NIPSOM, ICMH City Corporation, ICDDR-B
Component 5: Health and climate research					
Enhanced climate change and health research	National CC&H research agenda that includes climate-related sectors and resource mobilization	No CC&H research agenda exists	Resource mobilization plan, TWG meeting minutes	Quarterly	*Lead:* IEDCROther: DGHS, CCHPU, ICDDR-B, NIPSOM, NIPORT

Deliverable	Indicator	Baseline	Means of Verification	Frequency of reporting	Responsible institutions
	developed				
	MOU to between MoH&FW, research centres and meteorology services department for data sharing established	No MOU exists	Resource mobilization plan	Quarterly	*Lead:* IEDCR; *Other:* DGHS,DOE
	Climate Change Health Forum established	No climate change forum exists	Reports for forum	Annually	*Lead:* IEDCR; *Other:*DGHS CDC, IEDCR, NCDC, PHC), City Corporation, NGO Forum for Public Health
Component 6: Essential medical products and technologies					
Vulnerability of healthcare facilities identified and addressed	"Green hospital" initiative piloted in 3 hospitals	3 climate resilient green hospital piloted	Green hospital assessment	Quarterly	*Lead:* Director Hospital, DGHS *Other:* MoH&FW; Health Engineering Dept.
	Guidelines and SOPs for health protection from adverse health effects and pre-and-post disaster situations developed and approved	Guidelines and SOPs do not exist	MoH&FW assessment reports	Quarterly	*Lead:* CCHPU *Other:* MoH&FWDisaster Management Bureau; Water Resources; BMD; DPHE;
	All health care facilities have adequate supplies to manage CSD	All health care facilities (down to upazila health complex) have adequate supplies	Smart hospital assessment	Quarterly	*Lead:* Director Hospital, DGHS *Other:* MoH&FW, CCHPU, Disaster Management Bureau; Water Resources; BMD; ICDDR-B, National Public Health Laboratory
Component 7: Management of environmental determinants of health					
Water safety plan strengthened and safe water and sanitation for healthcare facilities ensured	Climate-resilient water safety plan implemented in X number of facilities	No climate resilient WSP developed and implanted yet for any health care facilities	WSP assessment	Quarterly	*Lead:* DPHE *Other:* LGD, WASAs, DoE, Municipalities,
Integrated air quality monitoring developed	Strategy to pilot climate-proofing health facilities developed	No strategy developed	Different Air quality assessment reports and assessment	Quarterly	*Lead:* DOE *Other:* MoH&FW, CCHPU Unit, NCDC, IEDCR
	Air quality is tested routinely and linked with disease surveillance	Air quality not tested routinely and linked with disease	Environmental health risk assessment	Quarterly	*Lead:* IEDCR *Other:* CCHPU IEDCR, DOE

Deliverable	Indicator	Baseline	Means of Verification	Frequency of reporting	Responsible institutions
		surveillance			
Component 8: Climate-informed programmes					
Climate risks included in planning and implementation of climate-sensitive diseases (VBD, WBD, nutrition/food security)	VBD, WBD, and nutrition/food security policies and operational plans include climate risks	VBD, WBD, and nutrition/food security policies and operational plans do not include climate risks	MoH&FW assessment report	Annually	*Lead:* MoH&FW *Other:* MoH&FW, DGHS, CCHP Unit, identified programmes
	Risk maps develop for VBD, WBD, and nutrition/food security	Mapping is inconsistent and not targeted for decision-makers	MoH&FW/DGHS assessment report	Bi monthly	*Lead:* IEDCR *Other:*MoH&FW CCHP Unit; IEDCR, NNS, IPHN, BNNC, NIPSOM, ICMH, ICDDR-B
	Implement health adaptation intervention in high-risk areas	Health adaptation interventions not targeted in high-risk areas	MoH&FW assessment	Annually	*Lead:* IEDCR MoH&FW, DGHS, CCHP Unit, identified programmes
Component 9: Emergency preparedness and management					
Climate change and health risks included in disaster risk management plans	Climate-sensitive health risks and climate data integrated into national disaster risk reduction strategy	Climate-sensitive health risks and climate data not integrated into national disaster risk reduction strategy	Disaster management reports	Annually	*Lead:* IEDCR *Other:* MoH DGHS, Disaster Management, Hydro-Met Services. DOE, BMD, DPHE
	Health facilities emergency preparedness plans are developed that incorporate CC&H risks	Generic hospital emergency preparedness plans are developed	MoH&FW assessment reports	Bi-monthly	*Lead:* IEDCR *Other:* MoH&FW, DGHS, Disaster Management, DOE, DPHE, Bangladesh Meteorological Department
	All health facilities are fully supplied to manage emergencies	Data needed	MoH&FW assessment reports	Bi-monthly	*Lead:* IEDCR *Other:* MoH&FW, DGHS, Disaster Management, Hydro-Met Services
Component 10: Climate and health financing					
Fund mobilized for adaptation and mitigation measures	Resource mobilization plan that identifies funding mechanisms for health developed	No resource mobilization plan for CC&H exists	MoH&FW assessment reports	Annual	*Lead:* MoH&FW *Other:*DGHS, CCHP Unit
	Cost-benefit analysis for adaptation to climate change in	Cost-effectiveness analysis completed	Report on cost-benefit analysis	Annual	*Lead:*MoH&FW *Other:* DGHS, CCHP Unit

Deliverable	Indicator	Baseline	Means of Verification	Frequency of reporting	Responsible institutions
	the health sector completed	2014 (World Bank)			
	X number of proposal submitted and approved for CC&H related funding	GEF proposal submitted and approved (2018)	Funding reports	Bi-monthly	*Lead:* MoH&FW *Other :*DGHS, CCHPU IEDCR, CDC, NCDC, Met-Services

Annex 1: Proposed climate change and health stakeholders

- Climate Change and Health Promotion Unit (CCHPU)
- Directorate General of Health Services (DGHS)
- Health Information and Surveillance Systems
- Department of Public Health Engineering (DPHE)
- Vector-borne disease control programme, DGHS
- Bangladesh National Nutrition Council
- Community-based Health Care, DGHS
- Primary Health Care, DGHS
- Non-Communicable Disease Control (NCDC) programme, DGHS
- Communicable Disease Control Program (CDC)
- Ministry of Environment and Forestry
- Department of Environment (DOE)_
- Bangladesh Meteorological Department (BMD)
- Disaster Management Bureau
- Institute of Epidemiology Diseases Control and Research, IEDCR
- International Centre for Diarrhoeal Disease Research, ICDDR,B
- NGOs/civil society organizations/Media
- WHO, other UN agencies (UNDP, UNICEF etc.), development partners
- Communities
- Media (print, electronic)

Annex 2: Stakeholder engagement

On 15 February 2018, a one-day workshop was held in Dhaka with key stakeholders to discuss the development of the health component of the National Adaptation Plan (HNAP). The workshop was hosted by the Institute of Epidemiology, Disease Control and Research (IEDCR) with technical support provided by the WHO Bangladesh country office and a consultant. The overall objectives of the workshop were to identify and confirm priority areas for health adaptation, identify gaps or barriers, discuss health adaptation strategies and options, and provide timeline for finalization of the draft HNAP document. Additionally, key topics, including institutional arrangements, implementation strategy, as well as monitoring and evaluation were discussed.

Participant list

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