Bangladesh

Climate change, health & WASH

The current climate impacts on human health in Bangladesh are unprecedented. The country is ranked globally as one of the most vulnerable countries to climate variability and change. The following case study describes activities undertaken in Bangladesh from 2013-2018 to implement the United Kingdom's Department for International Development (DFID)-funded project on "*Building adaptation to climate change in health in least developed countries (LDCs) through resilient water sanitation and hygiene (WASH)*", the aim of which was to assist countries to respond to the health risks as a consequence of climate variability and change, through improved and more resilient health and WASH adaptation

1. Country profile & climate vulnerabilities

Bangladesh is located in a low-lying delta between the Bay of Bengal and the foothills of the Himalayas and experiences a tropical monsoonal climate. The country is considered to be extremely vulnerable to natural disasters due to the its geographic location and features, frequent severe weather events, widespread poverty and one of the highest population densities in the world.[1,2]

Currently, Bangladesh's resilience to extreme weather events is considered to be low, and the country's water resources are particularly vulnerable in terms of:[3]

- Floods, including flash flooding, which, compounded by inadequate sanitation, may increase the spread waterborne disease
- Cyclones, with storm surges in coastal areas, which can damage drinking-water supply and sanitation infrastructure and assets
- Drought, and corresponding over extraction, which can exacerbate saline intrusion in susceptible aquifers.

Existing climate projections for Bangladesh include higher temperatures, melting glaciers and sea-level rise (Fig. 1).[4] These projections are expected to result in increased frequency, intensity and erraticism of cyclones, flood and drought events. This in turn is set to exacerbate the impacts of climate change on livelihoods and public health in Bangladesh, and result in greater migration to already stressed urban centres.[3]

Currently, Bangladesh's water resources are particularly vulnerable to impacts from floods, sea-level rise, cyclones and drought; with these impacts projected to intensify, urgent attention is now required to improve the resilience of the health and WASH sectors to climate change to minimize future public health impacts.

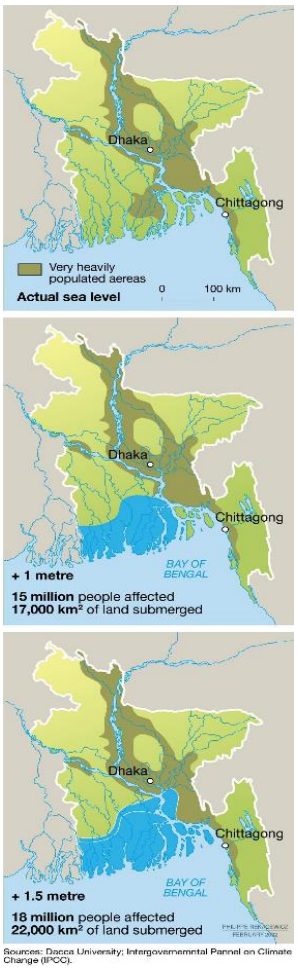


Fig. 1: Land submerged in case of a 1 or 1.5 meter sea-level rise (Philippe Rekacewicz, 2006). Currently, saline intrusion reaches 100 km inland impacting drinking water sources and public health; this situation is expected to intensify with climate change projections.[4]

2. Building adaptation to climate change in health in least developed countries through resilient water, sanitation and hygiene

In the above context, DFID supported a £6.85 m project (via the International Climate Fund) to support the development of effective strategies for climate adaptation in the health sector in low and low-middle income countries. The project aimed at improving policy and practice on health adaptation to climate change through robust evidence from field testing in Bangladesh, Nepal, Ethiopia and the United Republic of Tanzania. Countries were chosen to participate based on their exiting high burden of climate-sensitive diseases, including WASH-related disease, and the extent through which climate variability and change is expected to adversely impact health and WASH. An overview of the expected outputs from this project is presented in Fig. 2. The current case study focusses on Outputs 2 and 3 (i.e. from national to facility/utility level, respectively). Activities and outputs related to implementation of output 4 (i.e. research) are included in a separate synthesis report.

Fig. 2: Key outputs from the DFID-funded project "Building adaptation to climate change in health in LDCs through resilient WASH".

Climate resilient health and WASH activities implemented under the DFID project (2013-2018)

The following section presents some of the key outputs from the DFID project on climate resilient health and WASH. For more information and a full list of project outputs, refer to Appendix I.

Policy review (Output 2)

In order to identify the optimal entry points for promoting the integration of climate change, health and WASH considerations into relevant health and WASH policy instruments, a review of the relevant existing national policies is a key first step. In 2013, Bangladesh undertook such a review to aid the development and implementation of climate resilient health and WASH policies. This publication, *Review of Relevant Policies,*

Strategies, Plans and Programmes Relating to Health and Climate Change in Bangladesh (2013), considered global and national best practices in relation to climate change, health and WASH, alongside the exiting national policy settings and processes, to support the future development of health and water and sanitation policies that incorporate climate resilience towards public health protection. A number of key recommendations were made to the health and WASH sectors, including the need for more targeted research, awareness raising, capacity building and integration of climate change with health policies, as well as health into climate change adaptation policies. The outcomes from this review provided the foundation for the subsequent development of a formal climate change and health adaptation plan for Bangladesh.

Development of National Strategy for Water Supply and Sanitation (Output 2)

From this, the *National Strategy for Water Supply and Sanitation* was developed in 2014. As part of the Sectoral Development Plan for water and sanitation in Bangladesh (2011-2025), this strategy considered resilience to natural disasters and climate change as a key emerging challenge. The document presented strategies to increase national resilience to potential disasters (both natural and otherwise), as well as climate variability and change, including the development of common management and response frameworks, improved disaster preparedness and response planning (as well as capacity building from national through to local levels), and the streamlining of roles/responsibilities and delegation of administrative and financial powers to prepare for, and respond to, climate impacts and disasters.

Health and WASH vulnerability and adaptation assessments (Output 2)

In parallel, studies were undertaken to determine the health impacts of climate variability and change in high risk coastal and drought prone areas of Bangladesh to support the future development of a national health adaptation plan (see below). The reports *Assessment of Vulnerability Reduction to Climate Change in Bangladesh* (2014) and *Vulnerability and Adaptation to Climate Change in Coastal and Drought Prone Areas of Bangladesh: Health and WASH* (2015) examined five vulnerable areas (namely, the upzila's of Matbharia, Shyamnagar, Zianagar, Patharghata [all coastal] and Sapahar [drought prone]). These studies identified the current and anticipated future vulnerabilities with respect to climate impacts on health and WASH (namely, with regard to growing high salinity (in coastal areas) and water scarcity (in drought prone areas) and associated health problems), and proposed recommendations for sustainable adaptation strategies to support climate resilient health and WASH in these communities.

Development of the health component of the National Adaptation Plan (Output 2)

Based on the outcomes from the vulnerability and adaptation assessment, a national climate adaptation plan for health was published in 2018 to outline the priority adaptation strategies for a sustainable health system in Bangladesh. The plan outlines key strategies to ensure the integration of climate risks to public health into national health policies, planning, programming, and monitoring strategies. This information will ultimately feed into the development of the National Adaptation Plan for Bangladesh.

Climate resilient water safety planning (Output 3)

The water safety plan (WSP) process offers a systematic framework to manage climate-related risks by considering the implications of climate variability and change at each step of the water supply system, from catchment to consumer. This generates what is commonly referred to as a "climate resilient" WSP (CR-WSPs); however, it should be noted that a comprehensive and effective CR-WSP should consider and assess all risks within the water supply system (i.e. climate and non-climate related risks).

WATER SAFETY PLANS are a comprehensive risk assessment and management approach, considered to be the most effective means of consistently ensuring the safety of drinking-water supply from catchment to consumer

The current project aimed to use WSPs as a framework for building resilience to climate impacts in both large-scale urban water supplies, as well as their smaller rural counterparts, representing coastal, flood- and drought-prone communities. In total, climate resilient WSPs were developed in 20 pilot locations (six urban sites and 14 rural sites; see Figure 3). This included:

- Completion of baseline studies for all pilot sites, alongside knowledge, attitudes and practices (KAP) assessments, to assess the water supply systems, understand the hazard-exposure pathways, determine baseline water quality status and consumer awareness and practices, and to ascertain how these aspects may be impacted based on future climate change projections.
- The outputs from the baseline study reports were used to then inform the development of system specific climate resilient WSPs within the pilot locations.
- Following implementation of the CR-WSPs, end line study reports were conducted for all sites to measure progress and the impact of the climate resilient WSPs.

The water safety planning component of this project leveraged on existing water safety planning foundations laid by the Australian Department for Foreign Affairs and Trade funded Water Quality Partnership/AusAid, making use of existing resources for training and advocacy on water safety planning. Climate considerations were built into the existing training materials.

For more information on climate resilient water safety planning activities conducted under this project, please refer to Box 1.

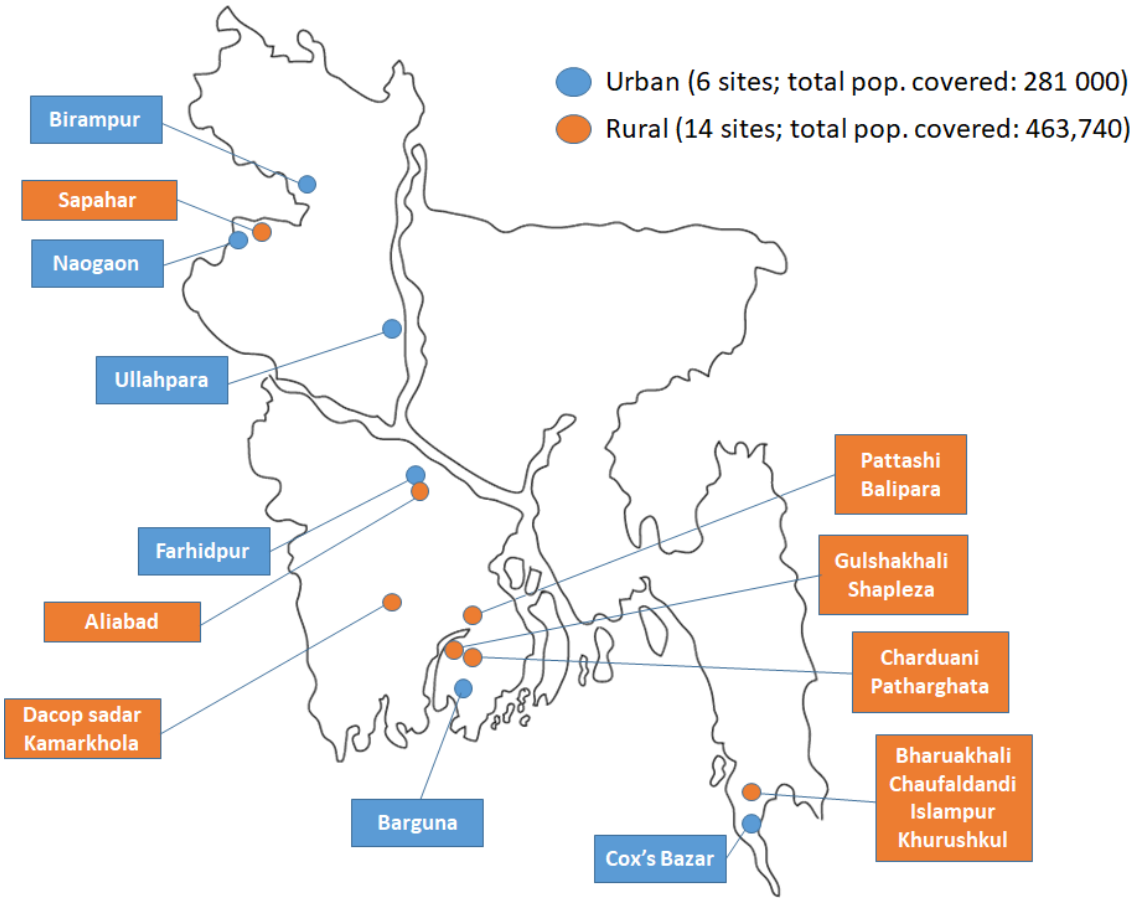


Fig. 3: Approximate locations of the urban and rural climate resilient WSP piloting sites in Bangladesh as part of the DFID project.

Box 1. Climate resilient water safety planning in Bangladesh

Climate variability and change are currently impacting water security (i.e. quality and quantity) in Bangladesh. Significant climate change risks to health posed via water quality and quantity include:

- *Coastal areas:* increased salinization of surface and groundwater is expected due to reduced surface water flows, rising sea levels and inundation from storm surges
- *Flood-prone areas:* the frequency and intensity of severe storms is expected increase, with potential for inundation of sanitation and water treatment assets, with polluted run-off into surface and groundwater water sources
- *Drought-prone areas:* the availability of water is set to decline due to reduced flows, increased salinization (from over extraction and/or saline intrusion) and increased concentration of contaminants such as cyanobacteria metabolites (including toxins), major ions and heavy metals.

The above situation is compounded by socio-economic factors like population growth, rapid urbanization and expansion of industrial activities, which places additional stresses on the already vulnerable water resources in Bangladesh. Further, this situation expected to intensify based on future climate projections.

In the above context, the WSP framework was adopted to address water security risks posed by climate change. Climate resilient WSPs were developed and implemented in six urban and 14 rural pilot sites in Bangladesh from 2015 onwards. The WSPs gave special consideration to risks associated with climate variability and change during the development of the WSP.

To facilitate consideration of climate-related impacts within the pilot water supply systems:

- Specialized training was given to key stakeholders and CR-WSP teams were established, which included the necessary expertise to identify and manage climate risks (Fig. 4)
- KAP surveys were conducted in the pilot sites to provide a baseline understanding of:
    - the impacts of climate variability and change on the water supply
    - hazard-exposure pathways (Fig. 5)
    - sanitary and water quality status within the pilot sites, and
    - consumer practices/perceptions
- System-specific risk assessments were then conducted to identify and prioritize the risks associated with climatic hazards/hazardous events, including extreme weather events.
- Improvement plans were developed incorporating climate-related adaptation (or control) measures, alongside development of climate-related emergency response and management plans
- Climate-related supporting programmes were identified and implemented, including caretaker and consumer education and awareness raising on safe water management and water safety planning.

Fig. 4: Capacity building for urban climate resilient WSPs in Bangladesh

Fig. 5: Development of hazard-exposure pathways for climate resilient water safety planning

Through a process of systematic risk assessment, significant climate-related risks were identified and prioritized, and appropriate incremental improvement plans were prepared. Mitigation measures ranged from catchment management/source protection, treatment/storage, to household-level interventions (e.g. Fig. 6).

Fig. 6: Example of improvements to rural water sources identified and implemented through the WSP process; a tube well raised above the flood level.

Based on findings from the baseline study reports, it was apparent that stakeholder awareness on safe water management (including during extreme weather events) was low in many of the pilot sites. As such, CR-WSP supporting programmes targeting consumer/stakeholder education and outreach were a significant feature of the approach taken in Bangladesh. This included training and awareness raising for water supply staff and caretakers, as well as community level campaigns (including advertisements in local newspaper and billboards (Fig. 7) and grass-root community education campaigns, also targeting schools and colleges (Fig. 8).

Fig. 7: Example advertisement for public awareness raising in Bangladesh. "Let's all together implement the CR-WSP".

Fig. 8: WSP message dissemination via folk songs at a community event.

Following the end line assessment of the WSP pilots, some of the key impacts included:

- Greater consumer awareness on safe water management in the household in the face of a changing climate
- Improved microbiological and chemical water quality observed alongside improved sanitary risk scores
- Improved resilience of key water abstraction and supply assets.

It was recognised universally that sufficient funding for upgrading vulnerable infrastructure, as well as operations and maintenance, is critically important for the long-term success of CR-water safety planning.

3. Project outcomes

Overall, the following are the key outcomes from the climate resilient WASH project in Bangladesh:

- ☑ Strategic review of national policy settings and instruments and identification of key areas of health and WASH sectors to support the development and implementation of climate resilient WASH policies
- ☑ Integration of climate considerations into national health, water and sanitation strategy, policies and plans
- ☑ Development of capacity at national through to local levels on climate change and health, WASH and CR-water safety planning
- ☑ Enhanced public education and awareness on health and water safety and health with respect to climate change
- ☑ Improved management of climate-related risks to water supply in the pilot locations, including enhanced preparedness and emergency response for extreme weather events
- ☑ Establishment of robust "model" climate resilient water safety plans in urban and rural settings, which may serve as the basis for future CR-WSP scale-up across the country
- ☑ Assessment of the effect of climate change, climate variability and environmental events on drinking water quality, WASH behaviour and diarrhoeal prevalence aiming to enhance the adaptation of vulnerable communities in two climate hot spots of the country.

Key lessons learned…

- 〉 **Establishment of strong "model" CR-WSPs is very effective for advocacy and motivational purposes, as well as for building awareness and technical capacity and skills**
- 〉 **Government-level advocacy, coupled with consumer outreach, awareness raising and education, is critical for the uptake and sustainability of climate resilient water safety planning**
- 〉 **Sustainable funding is critically important to develop and sustain climate resilient water supplies in the longer-term**
- 〉 **Capacity building for water supply system caretakers and other key management personnel is essential to ensure effective CR-WSP development and implementation.**
- 〉 **Strong communication between local communities and government is essential for the successful uptake and sustainability of CR-WSPs in the longer-term.**
- 〉 **The existing community-based organizations, health workers, religious leaders, play an important role in the implementation of CR-WSPs through supervising and cross-checking caretaker's activities**
- 〉 **Technological innovation coupled with local/indigenous knowledge can help to build resilience in communities where resources are limited**
- 〉 **There is a need for further scientific research to evaluate the effectiveness of WASH interventions and strategies for building resilience to climate change.**

4. Next steps and future directions

- Continue advocacy at all government levels, alongside targeted grassroots community engagement and awareness raising activities
- Scale-up climate resilient water safety planning activities and programmes in additional areas, based on the lessons learned from the existing CR-WSP pilots
- Develop monitoring mechanisms to support the sustainable development and monitoring of CR-WSPs, including strengthening of the audit programmes with a feedback mechanism to water suppliers
- Seek appropriate resources and political support for mainstreaming of CR-WSP programmes into government policies and projects
- Leverage funding for the implementation of climate related-improvements (including operations and maintenance) identified through the CR-WSP piloting.

Appendix I

BANGLADESH: Roadmap of climate resilient health & WASH resources

The following resources have been developed to support climate resilient health and WASH activities in Bangladesh as part of the DFID-funded project on "*Building adaptation to climate change in health in LDCs through resilient WASH*", which aimed to provide target countries with a clear framework for protecting health and reducing the risk of disease as a consequence of climate change.

NATIONAL CLIMATE CHANGE AND HEALTH POLICIES, STRATEGIES & PLANS

Review of Relevant Policies, Strategies, Plans and Programmes Relating to Health and Climate Change in Bangladesh

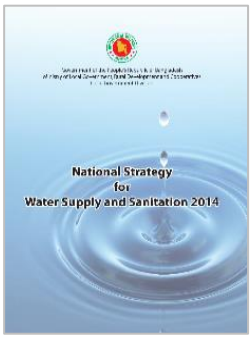
Towards Climate Change and Health Adaptation in Bangladesh

December, 2013

WHO Country Office for Bangladesh

This report examines the necessary policy settings and processes in Bangladesh to support the development and implementation of climate resilient health and WASH policies. It provides the basis for understanding the policy setting for climate resilient WASH and health adaptation in Bangladesh.

Key recommendations for the health and WASH sectors are presented, towards improving climate change and health adaptation practice, and to support the establishment of a more formal process of adaptation plan development and implementation.

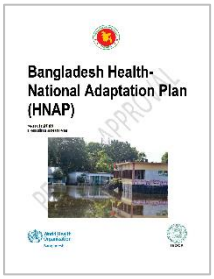


National Strategy for Water Supply and Sanitation

December, 2014

Local Government Division, Ministry of Local Government, Rural Development and Cooperatives, Government of the People's Republic of Bangladesh

This publication presents strategic guidance to the water supply and sanitation sector and its stakeholders for achieving safe and sustainable water supply, sanitation and hygiene services for all citizens of Bangladesh. The strategy addresses strengthening of sector governance, WASH interventions, as well as addressing emerging sectoral challenges, including adapting water supply and sanitation service to climate variability and change.



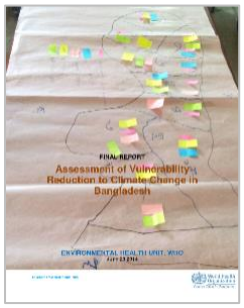
Bangladesh Health National Adaptation Plan (HNAP)

(Pending approval)

Ministry of Health and Family Welfare, WHO Country Office, Bangladesh

This document details the national climate adaptation strategies to mitigate the projected adverse effects of climate change and variability in the health system of Bangladesh.

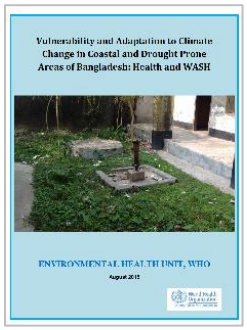
VULNERABILITY & ADAPTATION ASSESSMENTS (V&A)



Assessment of Health Vulnerability Reduction to Climate Change in Bangladesh
Final Report
June, 2014
WHO Country Office for Bangladesh

This report describes the application of a qualitative methodology to assess the reduction of perceived vulnerability to climate change in two coastal areas in Bangladesh. The tool was applied at various levels (from national government through to community levels) to determine the effectiveness of existing climate change adaptation activities and opportunities to ensure the future sustainability of such programmes.

Caveats relating to the application of the tool are presented, alongside recommendations on how to optimize its future application.

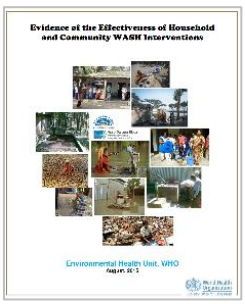


Vulnerability and Adaptation to Climate Change in Coastal and Drought Prone Areas of Bangladesh: Health and WASH

August, 2015
WHO Country Office for Bangladesh

This assessment examines the health impacts of climate variability and change on health in coastal and drought prone areas in three district of Bangladesh, alongside the adaptation capacity of the target communities.

Recommendations are made regarding requisite adaptations required to support the delivery of climate resilient WASH within these communities, alongside broader recommendations to enhance future vulnerability assessments and expand the evidence base for climate adaptation within the health sector of Bangladesh.

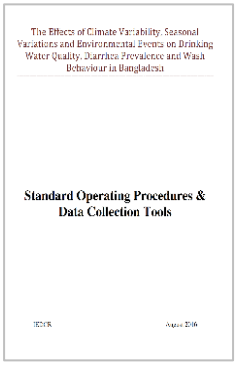


Evidence of the Effectiveness of Household and Community WASH Interventions

August, 2015
WHO Country Office for Bangladesh

The effectiveness of WASH interventions may be impacted by changing and more variable climate, extreme events and social issues. This technical report examines the current evidence base for the effectiveness of household and community level WASH interventions (including policy, technical and social interventions) in the face of a changing climate.

Recommendations are made to ensure that future scientific research and government policy adequately consider climate impacts to improve the resilience of the health and WASH sectors.



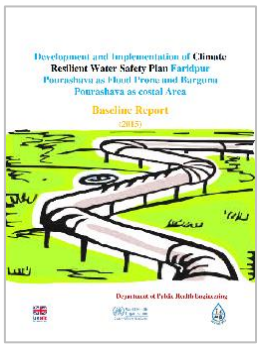
The Effects of Climate Variability, Seasonal Variations and Environmental Events on Drinking-water Quality, Diarrhea Prevalence and WASH Behavior in Bangladesh
Standard Operating Procedures & Data Collection Tools

August, 2016
Institute of Epidemiology, Disease Control and Research

This guidance document outlines standard operating procedures (SOPs) and tools to support data collection and training of field-level implementation teams.

The resources cover a diverse range of qualitative and quantitative data collection approaches, including surveys/questionnaires and sanitary inspections, as well as water quality sampling and analysis.

CLIMATE RESILIENT WASH



Development and Implementation of Climate Resilient Water Safety Plan Faridpur Pourashava as Flood Prone and Barguna Pourashava as Costal Area

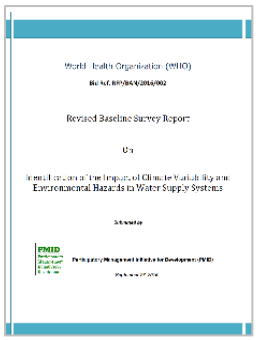
Baseline report (Urban 1)

August, 2015

Dept. Public Health Engineering and WHO Country Office, Bangladesh

This report documents the baseline status of two urban water supply systems in Bangladesh (namely, Pourashavas of Faridpur and Barguna [Urban 1 group]) to inform the future development of appropriate climate resilient interventions, with a specific focus on water safety plans.

The baseline was determined through application of a knowledge, attitudes and practice survey, which gathered qualitative and quantitative information, including on consumer awareness about climate change impacts, safe household water management practices, and the baseline sanitary status and water quality within the water supplies. This information was used to develop tailored climate resilient water safety plans and supporting programmes, and as a baseline to monitor future project progress.



Identification of the Impact of Climate Variability and Environmental Hazards in Water Supply Systems

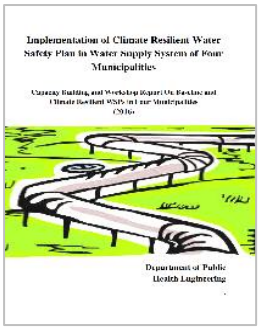
Baseline Survey Report (Urban 2)

September, 2016

Participatory Management Initiative for Development, Dept. Public Health Engineering and WHO Country Office, Bangladesh

This baseline survey was conducted in four Pourashavas in Bangladesh (namely, Birampur, Cox's Bazar, Naogaon and Ullahpara [Urban 2 group]) to provide an understanding of the existing water supply systems and current consumer practices, and how this may be impacted based on climate projections, to inform future development of urban climate resilient WSPs in these vulnerable Pourashavas.

The assessment consisted of an in-depth review of the urban water supply systems, water quality sampling/analysis alongside a knowledge, attitudes and practice survey to determine current consumer practices and awareness with regards to safe water collection, storage and handling.



Implementation of Climate Resilient Water Safety Plan in Water Supply System of Four Municipalities (Urban 2)

2016

Dept. Public Health Engineering, Bangladesh

This workshop report describes capacity building activities on climate resilient WSP development and implementation in four urban municipalities in Bangladesh (namely, Birampur, Cox's Bazar, Naogaon and Ullahpara [Urban 2 group]).

Activities included assessing the water supply system, identification of climate related hazards/hazardous events and associated control measures, risk assessment and prioritization, and development of supporting programmes and awareness raising activities.

KAP Baseline Study Reports

Development and Implementation of Climate Resilient Water Safety Plan in Vulnerable Rural Communities: WHO-WSP Project

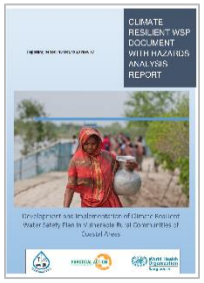
Rural 1 (2017)

Rural 2 (2017)

Practical Action Bangladesh and WHO Country Office for Bangladesh

This study was conducted in several rural areas in the flood, saline and drought prone areas of Bangladesh (namely, the Rural 1 and 2 groups) to determine the baseline situation with regards to water safety and the effects of climate variability and change.

Information was gathered from multiple sources, including literature review, water quality testing, household surveys and observations and sanitary inspections. Further, information is presented on the development of a hazard-pathway matrix was developed for specific technologies, to support the identification of climate-related hazards within the water supply chain.



Climate Resilient WSP Document with Hazards Analysis Report

Rural 1

Rural 2

2017

Practical Action Bangladesh, Dept. Public Health Engineering and WHO Country Office, Bangladesh

These technical reports describe the development of climate resilient WSPs in vulnerable water supply systems in Bangladesh (namely, the Rural 1 and 2 groups).

The process to identify climate-related hazards/hazardous events, identify existing control measures and perform a risk assessment/prioritization is outlined, alongside the development of an improvement plan with special consideration of climate resilient control measures, to inform the development of the climate resilient WSPs. The development of climate-related emergency response plans and supporting programmes is also considered. Appropriate mechanisms for stakeholder and community engagement/outreach are also discussed.

Development and Implementation of Climate Resilient Water Safety Plan in Vulnerable Rural Communities

Project Completion Report

Rural 1

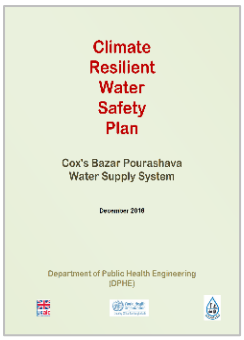
Rural 2

2017

Practical Action Bangladesh, Dept. Public Health Engineering and WHO Country Office, Bangladesh

This report highlights the key achievements of the climate resilient WSP development and implementation project in Bangladesh (namely, the Rural 1 and 2 groups).

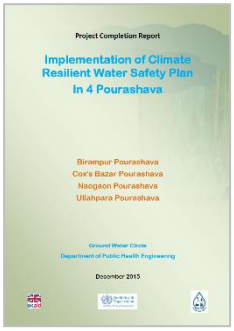
The key outcomes with respect to consumer awareness and safe water practices are presented alongside water quality testing data, based on the project baseline and end-line surveys. Key lessons learned are shared, alongside a tangible roadmap for the future roll-out and scale-up of climate resilient WSPs in rural Bangladesh.



Climate Resilient Water Safety Plans (Urban 1 & 2)
2015-2016
Cox's Bazar Pourashava
Barguna Pourashava
Birampur Pourashava
Faridpur Pourashava
Naogaon Pourashava
Ullahpara Pourashava
Dept. Public Health Engineering and WHO Country Office, Bangladesh

These plans outline the system specific assessment, management, monitoring and communication considerations to ensure the continued supply of safe drinking-water in the face of a changing climate.

Special consideration is given to climate-related hazardous events, risks and system improvements, as well as emergency management and supporting programs to manage extreme climatic events.



Implementation of Climate Resilient Water Safety Plan
Project Completion Report
Urban 1
Urban 2
2015
Dept. Public Health Engineering, Bangladesh

These technical reports describe the key outcomes from the development and implementation of climate resilient WSPs in 6 vulnerable water supply systems in Bangladesh, representing coastal, drought and flood-prone regions.

The key outcomes are presented with respect to improvements in operator and consumer awareness raising, stakeholder collaboration and system operational and risk management.

[1] World Bank (2009). Bangladesh - Policy note on climate change. Washington, DC. http://documents.worldbank.org/curated/en/691511468208161047/Bangladesh-Policy-note-on-climate-change, accessed March 2018.

[2] WHO (2015). Climate and health country profile: Bangladesh. http://www.searo.who.int/entity/water_sanitation/ban_c_h_profile.pdf?ua=1, accessed February 2018.

[3] USAID (2016). USAID/Bangladesh comprehensive risk and resilience assessment. Washington, DC. https://www.usaid.gov/bangladesh/documents/2016-comprehensive-risk-and-resilience-assessment. Accessed March 2018.

[4] Karmalkar et al. (2010). UNDP Climate change country profiles: Bangladesh. http://www.undp.org/content/undp/en/home/librarypage/environment-energy/climate_change/adaptation/undp_climate_changecountryprofiles.html, accessed March 2018.