

Bangladesh
Water, Sanitation and Hygiene (WASH)
Thematic Report



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Cover Photo: Using an aluminium pot, a girl collects drinking water from a hand pump (tube well) in village Ibrahimpur in Sunamganj district. Bangladesh. © UNICEF/BANA2009-00355/Noorani

Acronyms

BBS	Bangladesh Bureau of Statistics
BCC	Behaviour Change Communication materials
BDWQS	Bangladesh Drinking Water Quality Standards
CATS	Community Approaches to Total Sanitation
CBO	Community Based Organization
CM	Community Mobilizer
DFID	Department for International Development
DGHS	Directorate General of Health Services
DPHE	Department of Public Health Engineering
DTW	Deep Tube well
DU	Dhaka University
EC	Electrical Conductivity
EE	Executive Engineer
GIS	Geographic Information System
GoB	Government of Bangladesh
ICDDR, B	International Centre for Diarrhoeal Disease Research, Bangladesh
KAP	Knowledge, Attitude and practice
LGIs	Local Government Institutions
LGRD&C	Local Government, Rural Development and Co-operatives
MAR	Managed Aquifer Recharge
NGO	Non-Government Organization
O&M	Operation and Maintenance
PSF	Pond Sand Filter
RWHs	Rainwater harvesting systems
SAR	Subsurface Arsenic Removal
SMC	Site Management Committee
TS	Technical Supervisor
UNICEF	United Nations Children's Fund
UP	Union Parishad
WASH	Water, Sanitation & Hygiene
WHO	World Health Organization
WUC	Water User Committee
WSP	Water Safety Plan

Executive Summary

In January 2017, UNICEF Bangladesh started a new four-year programme cycle. This report covers results achieved in 2016 under the previous programme cycle (2012-2016) as well as priorities for the new one (2017-2020).

UNICEF's interventions in Bangladesh have contributed to increasing access to improved sanitation from 56 percent in 2012¹ to 61 percent in 2015,² directly benefiting over 1.45 million people. Interventions such as Community Approaches to Total Sanitation (CATS) have contributed to a reduction in open defecation from 4 to 1 percent and directly benefited an estimated 1.15 million people cumulatively who are now living in open defecation free communities.³ Demonstration of scalable models for drinking water safety provision has contributed to increasing access to improved water sources from 81 percent at baseline⁴ to 87 percent⁵ in 2015 and directly benefited 1.54 million people in ten UNDAF and three arsenic prone districts.

Some of the strategies used in 2016 to achieve these results include:

- (a) Demonstration of scalable models such as the Sanitation Marketing and Arsenic Safe Union approaches, benefiting 8,000 people with improved sanitation facilities⁶ and 35,000 people with arsenic safe water.
- (b) Approval of the National Implementation Plan for Arsenic Mitigation (2016-2025), the National Fecal Sludge Management Framework and two sector wide national concept papers outlining the Government of Bangladesh (GoB)'s strategy to meet the SDG targets 6.1 and 6.2 through participation in national technical working committees.
- (c) Advocacy: The 6th South Asian Conference on Sanitation held in Bangladesh in January 2016, was organized by the GoB with support from UNICEF. Attended by over 500 delegates from eight countries in the region, the conference emphasized the need for increased commitments from Governments. Two key note papers on the importance of harmonization for scaling up arsenic mitigation were also presented by UNICEF at the 6th International Congress on Arsenic in the Environment (As2016) in Stockholm. UNICEF presented on behalf of all development partners 'Directions in Water Safety Planning' at the National Conference on Water Safety Planning in October, 2016.
- (d) Policy dialogue contributed to the institutionalisation of the Policy Support Unit Project (2012-2015) into the organizational structure of the Ministry of Local Government, Rural Development and Cooperatives (LGRD&C).

Furthermore, as part of its pro-poor support to marginalized communities in urban areas, UNICEF continued its collaboration with Dhaka City Water and Sewerage Authority (DWASA) to improve safe water access to dwellers in Dhaka urban slums. As a result of UNICEF's direct contribution, more than 250 legal water connections are now being established in partnership with DWASA benefiting 45,000 poor slum dwellers in Jheel Par, Balurmat and Banani T&T slums. UNICEF facilitated community dialogues between DWASA to foster community ownership, and equitable access to the legal connections.

Bangladesh is classified as one of the most vulnerable countries to global climate change in the world.⁷ In 2016, UNICEF Bangladesh developed a climate change and environmental sustainability strategy to guide its support to the Government of Bangladesh between 2017 and 2020, to facilitate child survival

¹ WHO-UNICEF Joint Monitoring Program (JMP) 2012

² WHO-UNICEF JMP 2015

³ UNICEF Bangladesh Implementing Partners' Reports

⁴ Op.cit. JMP 2012

⁵ Op.cit. JMP 2015

⁶ Number of sanitation facilities sold between May and October 2016

⁷ Kreft, Sönke et al. *Global Climate Risk Index 2017: Who Suffers Most from Extreme Weather Events? Weather-related Loss Events in 2015 and 1996 to 2015*. Germanwatch e.V., November 2016.

and development centred approaches to climate change adaptation by the social services sectors in Bangladesh. The strategy has a focus on evidence generation, policy dialogue and advocacy, partnership and participation, equity response and resilient services delivery.

The absence of a harmonized system to collect, collate and report water quality data between the community, local and national levels is a major constraint to arsenic mitigation in Bangladesh. To address this, in 2016 UNICEF developed sector capacity to implement a three tier community based arsenic testing protocol by training 150 community members, Department of Public Health Engineering (DPHE) mechanics and Engineers at union, upazila and district level on arsenic testing. The testers provided information on 21,408 water points in 15 of the most highly contaminated unions in three upazilas in Bangladesh. The data was used by the community, local and national government for decision making about selection of beneficiaries, location and types of arsenic mitigation options. National and sub-national government's access to WASH information is critical for informed decision making.

In 2016, UNICEF facilitated humanitarian response to two major natural and one man-made disasters in: North West Flood; Cyclone Roanu, in 6 affected districts of Cox's Bazar; and the displacement of Rohingyas and subsequent settlement in Cox's Bazar. In response to these emergencies, through UNICEF support 140,000 affected people (69,835 females and 70,165 males) were reached with 1,580 improved water sources, 3,022 emergency sanitation facilities, 6,597 WASH hygiene kits and 150,000 WASH purification tablets, integrated with hygiene promotion sessions.

With regard to partnerships, UNICEF established a formal collaboration with the Oxford University in 2016 with the aim of leveraging results towards the achievement of three key UNICEF Bangladesh priorities; (1) achieving safe and reliable access to drinking water through risk informed programming, (2) ensuring water security for marginalised groups and (3) ensuring climate resilience to at-risk populations. A research framework has been developed in 2016. Three observatories have been set up in Comilla (Matlab), Dhaka and Khulna districts to provide information about coastal water security, impact of urbanisation on rivers and universal access to drinking water.

Significant challenges have remained with demand creation for quality WASH services, equitable access in urban slums, hard to reach, arsenic and disaster prone areas and behaviour change in relation to the adoption of new technologies. Consequently, the sanitation strategy in 2016 focused on sustaining the gains made in the reduction of open defecation and moving people up the sanitation ladder using CATS and Sanitation Marketing approaches. The water supply strategy focused on demonstrating sustainable methods for scaling up safe drinking water provision systematically, using the integrated arsenic safe union approach which includes safe sanitation and safe water objectives.

UNICEF Bangladesh Country Programme 2012-16 ended in December 2016. In January 2017, UNICEF Bangladesh started a new four-year programme, which follows a life cycle approach and its outcomes reflect the stages of life (0-5 years, 6-10 years, adolescence), highlighting the need for coordinated multi-sectoral programming to holistically address children's needs. Within this framework, the WASH Programme has identified two key priorities for the next four years: (1) Improving the quality, equitable access and sustainability of drinking water services in communities and institutions; and (2) Improving the quality, equitable access and sustainability of sanitation and hygiene services. The key strategies to achieve these priorities are: (a) Evidence Generation, Policy Dialogue and Advocacy (b) Equity-responsive and Resilient Service Delivery and (c) Partnerships and participation.

Strategic Context of 2016

Country trends and progress in 2016 in the situation of Children vis-à-vis WASH

Bangladesh is home to approximately 160 million people, of whom about 59 million are children under age 18 and 15 million are under age 5.⁸ In the last two decades, the country has achieved remarkable development progress and is well-positioned as the post-2015 era of the Sustainable Development Goals (SDGs) starts. Despite progress, the agenda for ensuring the full realization of the rights of all children and their mothers in Bangladesh is still unfulfilled. The significant reduction in poverty from 48.9 (2000) to 31.5 (2010) percent,⁹ has been hampered by unequal distribution of progress among income groups and geographical areas. Populations living in urban slums with limited access to quality and affordable services, and populations living in locations vulnerable to the effects of climate change are particularly at risk of inadequate social outcomes.

Bangladesh has made significant progress towards achieving its goal of universal access to improved water supply and improved sanitation for all its citizens. Open defecation rates have decreased from 19 percent in 2000 to 1 percent in 2015.¹⁰ Similarly, during the same period access to improved water sources increased from 76 percent to 87 percent. However, these figures mask stark variations in coverage and quality within districts and within unions, communities, schools and even households. For example, 80 per cent of the richest households compared to only 26.2 percent of the poorest have access to improved sanitation facilities.¹¹ In relation to the challenging hydro-geological context, the Water and Sanitation Sector Development Plan (FY 2011-2025) cautions that there are hard-to-reach areas (i.e., urban slums, islands, coastal and barind areas, wetlands, hilly terrain) where the sufficiency and reliability of access to improved water and sanitation services is lower than the national average.

The UNICEF Situation of Children in Bangladesh Analysis (2015) notes that key challenges in the sector include water quality and year-round access, inadequate sanitation facilities, and poor handwashing practices, all of which severely affect children's well-being, and physical and mental development. Other factors, including rapid urbanisation, declining water levels, and vulnerability to climate change/natural hazards, compound a challenging situation.

In terms of water quality, it has been recognised that Bangladesh suffers from the worst case in the world of arsenic contamination of water, with a diverse disease burden from this known carcinogen ranging from characteristic skin manifestations to heart and lung diseases and different types of cancers.¹² Some 22 million people—14.5 percent of the population—are exposed to water having arsenic contamination above the national standard, with half of this exposed population living in severely affected areas where more than 80 percent of tube wells are contaminated.¹³ Evidence also shows that manganese levels in water that exceed the internationally recommended standards impair the intellectual development of children. Although definitive findings on impact are not yet available, it is understood that an estimated 61 percent of water sources in the country supply an excess of the national standard for manganese.¹⁴

With regard to sanitation, one-fourth of pit latrines have only a slab, without a water seal, flap or lid; these latrines are not totally able to interrupt disease transmission routes. Moreover, experience has shown that once a single-pit latrine is filled up, there is a tendency in many households to revert to

⁸ Population Project of Bangladesh: Dynamics and Trends 2011-2061, Bangladesh Bureau of Statistics, November 2015

⁹ World Development Indicators 2017, World Bank < <http://data.worldbank.org/> >

¹⁰ Ibid.

¹¹ *Multiple Indicator Cluster Survey (MICS) 2012-2013*, Progotir Pathy: Final Report. BBS and UNICEF Bangladesh, Dhaka, 2014

¹² Ravenscroft, Peter et al. "Effectiveness of Public Rural Water Points in Bangladesh, With Special Reference to Arsenic Mitigation," in *Journal of Water, Sanitation and Hygiene for Development*, 2014

¹³ Ministry of Local Government, Rural Development and Cooperatives. *National Water Supply and Sanitation Strategy*. Dhaka, June 2014 (hereafter WSS Strategy 2014).

¹⁴ Bangladesh National Drinking Water Quality Survey, 2009

open defecation, largely because of poverty that prevents improvements to sanitation facilities.¹⁵ Despite the significant progress that has occurred following a national sanitation campaign which started in 2003, access rates for improved sanitation remain only moderate (61 percent), with a high proportion of shared facilities (28 percent), particularly in urban slums (30 percent).¹⁶

Furthermore, in Bangladesh the accelerating pace of urbanisation presents a particular challenge in the WASH sector. People in urban slums often lack basic water and sanitation services, along with other social services. The coverage by piped water supply in urban areas is low; only Dhaka has comparatively high coverage with piped water supply (83 percent), whereas coverage in most other cities and towns is far lower, at about 40 to 50 percent.¹⁷ To address this issue, urban slum dwellers often resort to illegal connections to piped water systems. This has wide reaching effects which include financial losses for the Water Service Providers and microbiological contamination of the water supply; thus raising the production cost (and consumer price) of water and increasing the risk of people contracting water borne diseases.

Likewise, inadequate and inappropriate urban sanitation is a major challenge. Conventional sewerage systems are absent in all urban areas except Dhaka, where only about 1 in 5 people is served by a sewer network.¹⁸ All other urban areas use on-site options like septic tanks, pit latrines, unhygienic latrines or none at all. On-site options are especially difficult to manage in large cities in terms of safe faecal sludge disposal, which represents an urgent emerging issue, with waste frequently dumped in canals, rivers or fields. Drainage also is an issue, with cities and towns regularly flooded.

Climate change directly affects water resources and water services for all economic, social and environmental functions that water supports; therefore, the impacts reach into many sectoral interest, such as health, tourism, agriculture and industry.¹⁹ Due to climate change, the shortage of safe drinking water is likely to become more pronounced in Bangladesh, especially in the coastal belt and the drought-prone areas of the northwest. It also is likely that the saline water boundary will be pushed farther inland; saline water over much of the coastal area contributes to hypertension and is a significant health risk, particularly for pregnant women.

Already, the WASH sector is affected in many different ways by weather and climate events, including variability and seasonality. Extreme events also have a profound affect: annual floodwaters submerge and contaminate tube wells and other water sources, and often wash latrines away. Hygiene practice during and after disaster is further constrained due to the absence of safe water, latrines and places for waste disposal. Crucially, most actions are taken only during the emergency and recovery periods, with less attention paid to preparatory measures.

With regard to the WASH sector's link to and effect on other sectors, in nutrition, for example a strong correlation has been found between household drinking water with under-5 child stunting, waste and underweight.²⁰ A total of 22 percent of under-5 children are stunted in households with unimproved drinking water sources, about the same proportion as those in households with improved sources; however, 22 percent also were severely stunted, compared to 15 percent in households using improved drinking water sources.²¹ Regular and prolonged bouts of diarrhoea as a result of poor hygiene practices and drinking water containing fecal coliforms continue to impede children's physical development, contributing to stunting and malnourishment.

¹⁵ Ministry of Local Government, Rural Development and Cooperatives. *Sector Development Plan (SDP) for Water Supply and Sanitation Sector in Bangladesh (FY 2011-2025): Summary Version*. Dhaka, 2011 (hereafter SDP 2011-2025).

¹⁶ Op.cit. JMP 2015

¹⁷ Op.cit. SDP 2011-2025

¹⁸ Op.cit. WSS Strategy 2014

¹⁹ UNICEF and Global Water Partnership. *WASH Climate Resilient Development: Strategic Framework*. New York, 2014.

²⁰ UNICEF Bangladesh. "WASH Section Innovation in Programme: WASH and Nutrition" (PowerPoint presentation). Dhaka, November 2014 (hereafter WASH Presentation 2014)

²¹ Op.cit. WASH Presentation 2014

Furthermore, unclean water, lack of sanitation and poor hygiene are also responsible for premature deaths and increased transmission of cholera and typhoid. The incidence of these diseases and others linked to poor hygiene and sanitation e.g. helminths infections (intestinal worms), measles, and malaria is highest among the poor, especially school-aged children. Moreover, inadequate access to safe water and sanitation and hygiene in health care facilities reduces the quality of obstetric care and impacts on the country's progress in maternal mortality indices. Similarly, poor hygiene practices in terms of handwashing and safe water handling by carers negatively impacts on progress in neonatal mortality and child mortality.

Most schools have access to water and sanitation facilities but, critically, often these are unhygienic, not functional or unavailable for students' use, which impacts children's enrolment, attendance, retention and completion rates. The 2014 National Baseline Survey on Hygiene indicates that only 45 percent of schools had functional unlocked toilets and 26 percent of water points in sampled schools were arsenic contaminated.²² In 12 percent of schools it was identified that children still bring drinking water from home. Moreover, the survey also reveals that only 43 percent of schools have separate toilets for girls and 40 percent of adolescent girls miss school during menstruation, increasing the probability of dropout and illiteracy with short and long term effects on the girl and her family.

Bangladesh's southern district of Cox's Bazar hosts Rohingya refugees, one of the world's most persecuted minorities. It is estimated that more than 30,000 registered Rohingya refugees live in official camps, around 55,000 undocumented Rohingyas reside in makeshift settlements and between 300,000 to 500,000 live scattered within the host communities throughout the district and across the country. Overall, Rohingya refugees in Bangladesh live under severe conditions in camps and makeshift settlements, where the poverty level is high, economic opportunities are inadequate, and access to basic social services is limited. In 2016, as a result of increasing violence in Myanmar, additional 74,000 Rohingyas have sought refuge in Cox's Bazar District in Bangladesh.²³ This new influx of refugees not only aggravates the pre-existing crisis of Rohingyas in Bangladesh, but also puts additional pressure on the already fragile social and economic structure of Cox's Bazar. In host communities, about 45 percent of the new arrivals do not have access to adequate water supply while only 2 percent have access to their relatives' latrines and as high as 95 percent are practicing open defecation. The level of hygiene practices is very poor; about 94 percent of the new arrivals are not practicing handwashing due to lack of soap and 91 percent of adolescent girls and women face challenges during menstruation.²⁴ According to the Situation Report by humanitarian agencies on 3th February 2017, there is a high possibility of cholera outbreak in Balukhali due to lack of WASH facilities. Humanitarian partners are closely monitoring the situation.

A year after the launch of the SDGs, what are the key challenges and changes that are happening in the country narrative, partnerships, resources

Bangladesh's strong commitment to reduce poverty, improve human development and reduce inequality has translated into effective actions that have enabled people across the country to improve their lives and their future prospects. Particularly, Bangladesh attained lower middle income status in 2015 and registered considerable achievements on several Millennium Development Goal targets.

As Bangladesh embarks on the journey to advance the 2030 Agenda for Sustainable Development and given that it aspires to gain upper middle income status by 2021, the nature of development support to the country is starting to shift. Greater support is required particularly in the areas of capacity development and technical assistance for policy and advocacy, management, and data and knowledge generation. Central to this imperative, is to prepare Bangladesh at national level—the government and non-government organizations, including civil society and private sector—to take on greater

²² National Baseline Survey on Hygiene, 2014

²³ Inter-Agency Coordination Meeting at Cox's bazar, 19 February 2017.

²⁴ Multi-Cluster/Sectoral Initial Rapid Assessment (MIRA), Inter-agency coordination Group for Cox's Bazar, December 2016

ownership and responsibility for its own development. Nevertheless, during this transition period, a range of equity focused, environmentally sustainable, accessible and gender friendly service delivery interventions are also necessary for the maintenance and attainment of further equitable results for all children in the country.

In 2016, the government of Bangladesh initiated the implementation of the 7th Five Year Plan 2016-20. The Plan aims at bringing greater and shared prosperity with a higher growth trajectory of 7.4 percent a year during the next five years. Importantly, the Plan acknowledges the barriers that are preventing children from reaching their full potential and considers the enhancement of systems to provide children and their families' access to safe water and improved sanitation as well as HIV, gender and adolescent friendly services.

How is UNICEF positioned to engage or address these?

UNICEF Bangladesh Country Programme 2012-16 ended in December 2016. In January 2017, UNICEF Bangladesh started a new four-year programme cycle. The Bangladesh Country Programme 2017-2020 follows a life cycle approach and its outcomes reflect the stages of life (0-5 years, 6-10 years, adolescence), highlighting the need for coordinated multi-sectoral programming to holistically address children's needs.

Within this structure, UNICEF Bangladesh WASH Strategy 2017-20 takes its cue from the United Nations General Assembly Resolution 69/292 that recognizes water and sanitation as a human right, and the basis of the realisation of all other human rights. The strategy is thus based on the premise that WASH is important in its own right, and is also necessary for health, nutrition, education, protection and other outcomes for children and adolescents. Girls and women are particularly affected by poor WASH, as are people living with disabilities. Consequently, the WASH programme strategy is undergirded by a life-cycle approach highlighting children's need for water, sanitation and hygiene to survive and thrive across their life course, during periods such as pregnancy and infancy; as school-aged children and as adolescents; in times of stability and crisis; and in urban and rural communities. To promote the life cycle approach, the programme will align and integrate programming efforts across sectors within and outside UNICEF to contribute to key sectoral priorities in the areas of nutrition, health, HIV/AIDS, education, social policy and child protection.

It is important to mention that with regard to the situation of Rohingyas in Bangladesh, for the next two years, in line with the UN strategy as well as with UNICEF engagement in Myanmar for this particular population, UNICEF Bangladesh is proposing to provide support to new arrivals, UMN in makeshift settlements and host communities as well as refugees in official camps, based on priority needs and in consideration to level of vulnerabilities, in a way as to strengthen community level resilience and link up with development activities. As living in camps is not an ideal solution in the long term, UNICEF will also advocate and work collaboratively with relevant stakeholders to find durable solutions.

The WASH Programme will be implemented in partnership with the Ministries of Local Government, Rural Development and Cooperatives, Education, and Health and Family Welfare and their partner agencies. It will take into account the following key principles: (1) Reduce inequality; (2) Sustain demand for and access to quality services at scale; (3) Promote resilient development, climate change mitigation and engagement with the private sector; (4) Strengthen accountability at all levels; (5) Contribute across SDGs; (6) Integrate humanitarian and development programming; (7) Strengthen national systems; (8) Demonstrate scalable models using inter-sectoral convergence and empowerment-based approaches; and (9) leverage domestic resources.

What are our specific challenges?

The 2015 situational analysis and WASH bottleneck analysis identified the key bottlenecks and barriers to safe and sustainable water, sanitation and hygiene delivery in Bangladesh, as following:

- (a) Enabling environment for example: poor implementation and compliance with sectoral policies at national and sub-national levels; non-existence of strategies and guidelines for operation and maintenance of water and sanitation facilities in schools and communities; inadequate planning/budgeting for WASH in schools and health centres by national/sub-national government; weak capacity especially at subnational level; absence of an integrated water supply, sanitation and hygiene management information system; and poor inter-sectoral coordination and absence of sector wide planning and use of harmonized protocols (except for sanitation);
- (b) Supply, including inadequate WASH-friendly services in education, health and nutrition institutions and communities; poor adherence to technical guidelines and absence of low-cost appropriate technologies for arsenic and other priority parameters testing ;
- (c) Demand, individual and community socio-cultural practices and beliefs, poor adoption of alternative technologies for water supply:
- (d) Quality, adherence to required national standards for example in the construction of WASH in school facilities.

Furthermore the analysis indicated that improved water coverage reduces significantly when analysed within the context of other standards defined by the GoB such as distance to source (accessibility), quality (effective coverage) and utilisation (all year round access). For example, although improved water source coverage is 97.9 percent,²⁵ the effective coverage drops to 87 percent when arsenic safety of the sources is considered. Moreover, only 35 percent of the population has access to water that meets the national guidelines for both arsenic and microbiological safety. Additionally, there are environmental vulnerability of Bangladesh results in droughts which reduces the effectiveness of some of the WASH technologies, while frequent floods destroy WASH facilities and contaminate water supplies.

²⁵ Op.cit. MICS 2012-2013

Results in the Outcome Area

UNICEF Bangladesh initiated a new four-year programme cycle in January 2017. This Thematic Report covers results achieved in 2016 under the previous programme cycle (2012-16). The assessment of results in 2016 is organized according to the four outputs of the Water Supply, Sanitation and Hygiene 2012-16 Country Programme Document.

1. Water Supply, Sanitation and Hygiene Delivery Output

By 2016, 9 million deprived population in rural and urban communities in 23 districts practice positive hygiene behaviour facilitated by adequate water and sanitation promotion

In 2016, as part of UNICEF hygiene promotion programme, WASH messages reached 589,184 people. In the reporting period the UNICEF-supported Community Approaches to Sanitation (CATS) programme contributed to an increased practice of handwashing with soap from 13 to 86 percent between 2015 and 2016, an additional 645,085 people stopping open defecation and 454,450 people in urban and rural areas gaining access to improved sanitation facilities.

The demonstration of the Sanitation Marketing model contributed to the development of a strengthened market system for improved latrines. About 170 local sanitation entrepreneurs were linked to the wider market and six district-wise Sanitation Business Associations (SBA) were formed. Over 8,000 improved latrines were sold between May and October 2016.

The demonstration of scalable safe water delivery models in rural and urban areas resulted in 111,861 people gaining access to improved water sources in 2016, through the construction and rehabilitation of 1,130 water points. The models included i) the provision in rural areas of 350 arsenic safe water sources; ii) the provision of 250 legal water connections in urban slums, in partnership with Dhaka City Water and Sewerage Authority (DWASA), to the benefit of 45,000 slum dwellers; and iii) 530 water points benefitting 31,861 people as humanitarian response.

The Government used a Vulnerability Risk Assessment for the first time to target the 15 most arsenic prone unions and reduce political influence. A total of 21,408 arsenic tests were conducted with SMS-based reporting of results to the national server, 561 baseline studies of water, sanitation and hygiene knowledge and practices as well as community action plans were completed. This has strengthened citizens' ability to demand safe water as they have improved knowledge to identify water and sanitation related problems, and to prioritise and plan for solutions

Inception activities have begun in Sirjganj and Kurigram districts on the design and community trials of the first manganese removal technology unit in Bangladesh, with the aim of reducing the risk of neurological damage to children from exposure to high levels of manganese through drinking water.

UNICEF established a formal collaboration with the Oxford University with the aim of leveraging results towards the achievement of three key UNICEF Bangladesh priorities, as following: (1) achieving safe and reliable access to drinking water through risk informed programming, (2) ensuring water security for marginalised groups and (3) ensuring climate resilience to at-risk populations. A research framework has been developed in 2016. Three observatories have been set up in Comilla (Matlab), Dhaka and Khulna Districts to provide information on coastal water security, impact of urbanisation on rivers and universal access to drinking water. The information gathered will assist Bangladesh to assess the threats and quantify risks to the vulnerable communities in coastal areas from cyclones and salinity and identify appropriate responses. This partnership will increase the sector's ability to use risk informed programming to deliver services at scale.

In 2016, as the WASH cluster lead, UNICEF assisted in improving coordination and response at national and sub-national levels by providing technical assistance to reactivate the Strategic Advisory Group (SAG) and revise the operational guidelines for WASH in Emergency in Bangladesh.

UNICEF also facilitated humanitarian response to man-made and natural disasters by providing 280

improved water sources and 600 emergency sanitation facilities to 50,000 displaced Rohingyas in host communities of Cox's Bazar including hygiene promotion sessions with the distribution of 2,000 hygiene kits in Teknaf and Ukhia Upazilas of Cox's Bazar district. The UN Joint Programme of Support to North West Flood benefitted 30,000 people with 300 improved water sources, 1,172 emergency latrines, hygiene promotion sessions and distribution of 2,397 hygiene kits in Kurigram and Gaibandha districts. WASH Support to Cyclone Roanu in six affected districts of Cox's Bazar, Chittagong, Noakhali, Bhola, Barguna and Potuakhali benefited 60,000 affected people through the rehabilitation of water points, construction of 1,250 household emergency latrines, hygiene promotion sessions, and the distribution of 2,200 hygiene kits and 150,000 water purification tablets.

Water Supply, Sanitation and Hygiene Delivery Results Framework

No.	Context-Specific Indicators	Target	As of Date	Status	Primary Source
1	Proportion/number of people in programme area using sufficient, year-round, safe drinking water (≤ 50 mg/l As and <1 CFU/100 ml)	By end of 2016, 18%	December 2016	16.5 % - Over 1.54 million people in programme areas using sufficient, year-round, safe drinking water	Implementing partners report
2	Proportion/number of target people in programme area using improved sanitation facilities	By end of 2016, 61%	December 2016	58% - Over 1.45million people using improved sanitation facilities	Implementing partners reports
3	Proportion/number of people practising open defecation in rural programme areas	By end of 2016, 5% or 2.2 million	December 2016	4.4%, equal to 1.94 million people practicing open defecation in programme areas	Implementing partners reports
4	Proportion/number of target population in programme area who wash both hands with soap and water after defecation	By end of 2016, 31%	December 2016	42.4% - 7.44 million people reached by hygiene promotion and wash both hands with soap and water after defecation	Report on WASH Programme in Twenty UNDAF and Eight Worst Affected Arsenic and Salinity Districts under Water Supply, Sanitation and Hygiene (WASH) Programme to Assess Programme's Impact (GOB-UNICEF WASH project)

2. WASH in Schools Output

One million school children in 23 districts have increased access to safe water and appropriate sanitation facilities through hygiene education by 2016

Provision of WASH services in schools, including improved water sources, gender-segregated toilets, hygiene education and menstrual hygiene management, is a major component of UNICEF Bangladesh contribution to ensure the realisation of children's right to water and sanitation as well as to support school attendance, completion and learning achievements. UNICEF's technical and financial assistance to the government has contributed to an increased use of improved drinking water sources and availability of gender-segregated improved sanitation facilities in 81 percent of schools in 20 UNDAF and three arsenic-prone districts. Since 2012, over 3.06 million students in 3,941 primary and secondary schools have gained access to improved WASH facilities. This has been possible through the construction and rehabilitation of 2,449 water points and 6,304 latrine cubicles, and the installation of 7,340 water taps to facilitate the practice of handwashing by students. Through UNICEF's direct support, an additional 105,500 students in 280 primary and secondary schools gained access to improved WASH facilities.

In 2016, hygiene promotion sessions were conducted by teachers and members of the School Brigades in 580 schools in 13 districts. Similarly during the reporting period, 1,290 school teachers and 1,720 School Management Committee members were trained in the effective operation and maintenance of WASH facilities. Advocacy at national and sub-national levels resulted in an increased budget allocation from the GoB to 240 schools for operation and maintenance. For the fourth Primary Education Development Programme, UNICEF is designing the WASH component which will provide opportunity to include key interventions that are necessary for sustainably scaling up a WASH friendly learning environment.

In response to findings from a survey conducted in 2014 that 20 percent of improved water sources in sampled schools were arsenic contaminated,²⁶ UNICEF piloted the School-Led Water Quality Testing concept in four secondary schools in Sherpur, a severely arsenic-contaminated district. Eight teachers and 24 students (15 females) were trained in arsenic testing and 600 tube wells were tested. Lessons learnt from this pilot will be used to inform the design of the Accountability Framework for water quality testing and responding, as well as for advocacy for inclusion in Education Sector Plans.

In 2016, the Ending Child Marriage Project activities continued in 100 secondary schools to the benefit of 47,500 students. A total of 15,000 adolescent girls engaged as peer volunteers disseminated key hygiene messages, including menstrual hygiene management in eight project upazilas across the country. Eight Sanitary Marts were established and are being operated by the girls for the production and sale of low-cost sanitary napkins to increase access and hygienic menstrual management in project areas. Over 500 people were sensitized during the 2016 Menstrual Hygiene Day to raise awareness on menstrual hygiene management.

WASH in Schools Results Monitoring Framework

No.	Context-Specific Indicators	Target	As of Date	Status	Primary Source
1	Proportion/number of school children in programme area using an improved drinking water	By end of 2016, 89%	December 2016	81% of schools in programme area using an improved drinking water	Report on WASH Programme in Twenty UNDAF and Eight Worst Affected Arsenic and Salinity Districts under Water Supply,

²⁶ Bangladesh National Hygiene Baseline Survey - 2014

	source			source	Sanitation and Hygiene (WASH) Programme to Assess Programme's Impact (GOB-UNICEF WASH project)
2	Proportion/number of school children in programme area using gender-segregated improved sanitation facilities	By end of 2016, 89%	December 2016	75.9% of schools in programme area using gender-segregated improved sanitation facilities	Report on WASH Programme in Twenty UNDAF and Eight Worst Affected Arsenic and Salinity Districts under Water Supply, Sanitation and Hygiene (WASH) Programme to Assess Programme's Impact (GOB-UNICEF WASH project)
3	Proportion/number of school children in programme area with functional handwashing facilities (with soap and water)	By end of 2016, 45%	December 2016	47.2% of schools in programme area using functional handwashing facilities (with soap and water)	Report on WASH Programme in Twenty UNDAF and Eight Worst Affected Arsenic and Salinity Districts under Water Supply, Sanitation and Hygiene (WASH) Programme to Assess Programme's Impact (GOB-UNICEF WASH project)
4	Number (and proportion) of schools with budgetary allocations for Operation and Maintenance of WASH facilities	By end of 2016, 500	December 2016	580 schools have increased budgetary allocations for Operation and Maintenance of WASH facilities	CATS implementing partners progress report

3. Local Government Capacity Building Output

By 2016, 25% LGIs in the programme areas have the technical and managerial capacity to implement integrated WASH interventions and take appropriate measures to ensure safety and sustainability of drinking water

To strengthen the ability of national and sub-national institutions responsible for WASH services to deliver and scale up those services, UNICEF Bangladesh built capacity in various WASH thematic areas. With UNICEF's support, the planning skills of 240 staff from 20 Union Parishads in three programme districts were improved, enabling them to develop plans to implement and monitor integrated WASH services for a target population of 250,000 people. Twelve of the Union Parishads used the plans to

leverage funds (USD 306,000) from the Local Government Support Programme. Between 2012 and 2016, about 15 percent of the LGIs in programme areas had their capacity enhanced on integrated WASH delivery.

Through UNICEF's support, 28 districts completed WASH equity assessments using MoRES. The major findings were on issues around water quality (bacteriological and arsenic), year-round access to safe water supply, availability of soap near toilets, and year-round access to sanitation facilities in disaster-prone areas. These findings are being used by UNICEF and other stakeholders to review approaches and strategies for effective WASH programme delivery.

As part of the efforts to strengthen capacity for effective delivery of WASH services in urban areas, 60 Sector professionals attended a learning and experience sharing workshop on WASH interventions in urban slums organized by UNICEF, in collaboration with other stakeholders like the Dhaka Water Services and Sewerage Authority. Lessons learnt will enable policy makers and practitioners to adopt and adapt approaches for more effective and context specific urban service delivery.

In alignment with UNICEF's risk-informed programming, officials from national and sub-national government offices and NGOs were oriented on the use of Vulnerability Risk Assessment to map and target 15 of the most arsenic-prone unions in three selected districts and upazilas in Bangladesh. A total of 150 participants (56 females and 94 males) were trained on arsenic testing, SMS-based reporting and the use of GPS as part of facilitating community involvement in the provision of arsenic-safe water sources.

In 2016, the partnership with the Directorate General of Health Services (DGHS) and engagement of Front Line Health Facility Workers (FLHWs) continued to contribute significantly to effective hygiene promotion and the sustainability of improved hygiene practices in project communities. For example, FLHWs incorporated regular hygiene promotion sessions into their routine activities. In this reporting period, the capacity of 988 Health Workers (515 female and 473 male) to deliver on hygiene promotion was enhanced, and they are now supporting hygiene education activities in project communities.

UNICEF Bangladesh supported two senior government officials to attend an International Learning Exchange on WASH in Schools in Indonesia, to enhance the Government's capacities for effective scaling up of successful models of WASH in schools and to exchange best practices in Asia.

Local Government Institutions Result Monitoring Framework

No.	Context-Specific Indicators	Target	As of Date	Status	Primary Source
1	Number of LGIs which have carried out WASH equity assessments in the programme area	By end of 2016, 31	December 2016	28 LGIs completed WASH equity assessment using MoRES	Implementing Partner Report
2	Number of LGIs in the programme area which have the capacity to develop, implement and monitor Integrated WASH Plans	By end of 2016, 71	December 2016	60 LGIs acquired capacity to develop, implement and monitor integrated WASH plans	Implementing Partner Report (BUET)
3	Number of LGIs which have increased budget allocation for WASH	By end of 2016, 18	December 2016	12 LGIs increased budget allocation for	Implementing Partner

	interventions			WASH interventions	Report
4	Number of LGIs with increased technical and managerial capacity to plan, implement and monitor WASH interventions	By end of 2016, 72	December 2016	60 LGIs with increased technical and managerial capacity to plan, implement and monitor WASH interventions	Implementing Partner Report (BUET)

4. Policy and Legislative Instruments Output

By 2016, authorities of 30% WASH-related institutions at all levels observe policies and guidelines related to decentralized sector planning and financial management including PME systems to facilitate sustainable, efficient and climate resilient WASH service delivery

UNICEF Bangladesh supported 64 LGIs to develop and implement decentralized integrated WASH plans from 2012 to 2016, representing about 16 percent of WASH institutions in programme areas.

The absence of a harmonized system to collect, collate and report water quality data between government levels is a major constraint to arsenic mitigation. As part of the efforts to address this, UNICEF developed sectoral capacity to implement a three-tier community-based arsenic testing protocol and SMS-based reporting of collected data in 15 highly arsenic prone unions. The data collected was used by community, local and national governments for decision making about the selection of beneficiaries, location and types of arsenic mitigation options.

Government access to WASH information is critical for informed decision making. In 2016, UNICEF provided technical assistance to the DPHE to develop a web-based nationwide water point's data accessibility platform to facilitate stored information of 300,000 DPHE constructed and 150,000 privately constructed water points. The information includes technology type, location, water quality and functionality. In addition to allowing stakeholders to access this information for planning and decision making, other outputs of the project included mechanisms to monitor water quality and functionality status in real-time through SMS based reporting, generate MIS/GIS reports of the status of the water points and upload water points by other stakeholders that use the unique 20-digit coding system approved by the government.

Furthermore, this platform will be used to share the World Bank-supported Bangladesh Rural Water and Sanitation Supply project (BRWSSP) and future government projects. As part of this process, UNICEF provided quality assurance support to ensure the accuracy of the uploaded data. By November 2016, 50 percent of 250,000 water points in 64 Unions were validated. UNICEF support has contributed to reducing the data error from 56 to 6 percent in the MIS/GIS system.

UNICEF conducted a bottleneck analysis and study of Community Participation in WASH budget tracking from the national to the Union Parishad level. The study showed that the WASH allocation at Union Parishad level is about 10 percent of total allocation. A key recommendation is to allocate a separate WASH budget for Union Parishads to increase spending on WASH and facilitate tracking and reporting of WASH related expenditure.

The Minister of Local Government, Rural Development and Co-operatives (LGRD&C) for Bangladesh participated in the Global Partnership for Sanitation and Water for All Meeting of Ministers held in Addis Ababa, Ethiopia, March 15 -16, 2016. The meeting aimed to sensitize political leaders on the implications of the SDGs and plans to achieve the SDG WASH targets.

Policy and Guidelines Results Monitoring Framework

No.	Context-Specific Indicators	Targets	As of Date	Status	Primary Source
1	Number of national WASH-related strategies, policies, acts, guidelines standards developed and disseminated (related to water supply and quality, urban, sanitation and emergencies)	By end of 2016, 4	December 2015	National Strategy for Water Supply and Sanitation 2014. The national Plan on Arsenic Mitigation (IPAM) is in the final stages of approval by the National Forum for Water Supply and Sanitation. Implementation plan of the National Standards of Water, Sanitation and Hygiene in Schools developed.	PSU progress briefings
2	Volume of quality-controlled data records stored in WASH database and used routinely for generating information	By end of 2016, 500,000	December 2016	475,000 water points data recorded in the National Water Point Mapping Database	DPHE MIS/GIS unit's National Water Point Mapping Database
3	Percentage increase in the government funding disbursement for equity-focused WASH programmes to LGIs	By end of 2016, 5%	December 2016	44% increase in allocation of LGIs budget for WASH	HDRC budget tracking study

Financial Analysis

A total of USD 11,029,100 was planned for the WASH Programme in Bangladesh in 2016. Available funding at the beginning of the year was USD 11,738,355, mainly from Other Resources. The largest portion of the budget was planned for WASH services. Table 1 shows the budget planned and funded for each output and by funding type.

Table 1: Planned budget by outcome area

Outcome Area 3: Education Bangladesh Planned and Funded for the Country Programme 2016 (In US Dollar)			
Intermediate Result	Funding Type ¹	Planned Budget ²	Funded Budget ²
03-01. QUALITY H&N,EDN,WES,HIV SERVICES	RR	1,800,000	1,182,625.3
	ORR	9,229,100	7,942,054.13
	ORE		226,510.09
03-03. PRACTICE KEY LIFE SAVING BEHAVIOUR	RR	-	45,001.51
	ORR		395,570.06
	RRS		125,000.00
03-05. SOCIAL POLICY, PLANNING, M&E	RR		45,000.00
	ORR		489,911.16
03-06. ADVOCACY, COMM. AND PARTNERSHIP	RR		684,063.62
	ORR		602,619.95
03-07. PROGRAMME SUPPORT	RR		
	ORR		
DEVELOPMENT EFFECTIVENESS	RR		
	ORR		
Sub-total Regular Resources		1,800,000	1,956,690.43
Sub-total Other Resources- Emergency			226,510.09
Sub-total Other Resources - Regular		9,229,100	9,430,155.3
Sub-total Regular Resources- Set-aside			125,000
Total planned for 2016		9,229,100	11,738,355.82

¹ RR: Regular Resources, ORR: Other Resources - Regular (add ORE: Other Resources - Emergency, if applicable)

² Planned budget for ORR (and ORE, if applicable) does not include estimated recovery cost.

In 2016, the UNICEF Bangladesh WASH Programme received a total programmable amount of USD 54,665 as country thematic contributions from the Belgian Committee for UNICEF and United Kingdom Committee for UNICEF. Table 2 shows the thematic contributions by donor.

Table 2: Country-level thematic contributions received in 2016

Outcome Area 3: WASH Thematic Contributions Received for Outcome Area 3 by UNICEF Bangladesh in 2016 (In US Dollars)			
Donors	Grant Number	Contribution Amount	Programmable Amount
Belgian Committee for UNICEF	SC1499030064	55,928.00	53,266.22
United Kingdom Committee for UNICEF	SC1499030076	1,469.00	1,398.78
TOTAL Country Thematic Contributions		57,397.00	54,665.00

Financial Implementation

In 2016, UNICEF Bangladesh spent the total of USD 9,525,023 to achieve the planned results of its Water Supply and Sanitation Programme, of which around 69 percent was from Other Resources. The available funding was utilised in all seven programme areas of the Strategic Plan. The larger proportion was expended in three programme areas in decreasing order. These are: i) WASH in general (37 percent), ii) Sanitation (33 percent) and iii) Water supply (14 percent). Table 3 shows the expenditures by Outcome area and funding type, while Table 4 shows details of the thematic funding expenditure by programme area and Table 5 provides information on the expenditures by Specific Intervention Code.

Table 3: Expenditure in the Outcome Area

Outcome Area 3: WASH Bangladesh 2016 Expenditures by Key-Results Areas (In US Dollars)				
Organizational Targets	Expenditure Amount			
	Other Resources - Emergency	Other Resources - Regular	Regular Resources	All Programme Accounts
03-01 Water supply		1,011,731	329,374	1,341,105
03-02 Sanitation		2,703,936	450,928	3,154,864
03-03 Hygiene		439,812	185,280	625,092
03-04 WASH in Schools and ECD centres		58,798	128,083	186,881
03-05 WASH and emergencies	413,436	269,584	39,600	722,619
03-06 WASH # General	15,283	2,097,893	1,381,286	3,494,462
Grand Total	428,719	6,581,754	2,514,550	9,525,023

Table 4: Thematic Expenses by programme area

Outcome Area 3: WASH
Bangladesh
Thematic Expenses by Programme Area in 2016

Intermediate Result	Expenses
PCR 1. QUALITY H&N,EDN,WES,HIV SERVICES	1,100,587
PCR 3. PRACTICE KEY LIFE SAVING BEHAVIOUR	58,202
Total Expenses	1,158,789

Table 5: Expenses by specific intervention Codes

Outcome Area 3: WASH
Bangladesh
Expenses by Specific Intervention Codes in 2016

Specific Intervention Codes	Expense (USD)
03-01-01 Rural water supply	867,536
03-01-02 Peri-urban and urban water supply	336,358
03-01-04 Water Supply Sustainability	1,439
03-02-01 Open defecation elimination and improved sanitation: rural	2,882,874
03-03-01 Hand-washing with soap	33,796
03-03-02 Other hygiene promotion	499,923
03-04-01 WASH in Schools (general)	52,203
03-04-02 WASH in Schools hygiene promotion	121,603
03-05-02 WASH emergency preparedness	710,221
03-06-01 WASH sector coordination (non-humanitarian)	239,066
03-06-02 WASH social policy (social safety nets)	159,844
03-06-03 WASH # General	2,486,486
03-06-08 WASH monitoring and bottleneck analysis	111,821
08-01-02 Annual review	8,895
08-02-08 Monitoring # General	36,209
08-03-01 Cross-sectoral Communication for Development	240,331
08-03-02 Communication for Development at sub-national level	77
08-03-03 C4D # training and curriculum development	181,608
08-04-02 Community based child care	70
08-06-01 Building evaluation capacity in UNICEF and the UN system	38,833
08-09-06 Other # non-classifiable cross-sectoral activities	360,284
08-09-07 Public Advocacy	29,522

08-09-08 Engagement through media and campaigns	18,045
08-09-10 Brand building and visibility	57,821
09-02-06 CO Advocacy and communication	311
10-07-02 Management and Operations support from RO	4,534
10-07-12 Management and Operations support at CO	39,946
10-07-13 ICT capacity in CO	3,961
Unknown	1,407
Grand Total	9,525,024

Future Work Plan

The new Bangladesh Country Programme 2017-2020 follows a life-cycle approach and aims to promote a holistic approach to fulfilling children's needs across the different stages of the life cycle.

The key priorities for the WASH Programme during the 2017-20 Country Programme are:

1. Improving the quality, equitable access and sustainability of drinking water services in communities and institutions; and
2. Improving the quality, equitable access and sustainability of sanitation and hygiene services.

The key strategies to achieve these priorities are: (a) Evidence Generation, Policy Dialogue and Advocacy (b) Equity-responsive and Resilient Service Delivery and (c) Partnerships and participation.

To this end key activities in the future work plan include:

Evidence Generation, Policy Dialogue and Advocacy

- Targeted advocacy for the adoption, implementation and funding of the National Implementation Plan on Arsenic Mitigation in Water Supply and National Plan on Faecal Sludge Management
- Facilitation of development of national strategies and guidelines for operation and maintenance of WASH facilities, and for scaling up menstrual hygiene promotion in communities and institutions
- Research and development of low-cost water quality test kits and technologies for challenging hydro-geological contexts
- Conducting of an impact study of WASH interventions on nutrition, health, child protection and education outcomes, along with economic benefits
- Facilitation of the development and operationalisation of an integrated National WASH Management Information System, with age-, gender- and disability-disaggregated data
- Targeted advocacy for the actualisation by Government of high-level regional and global commitments such as Sanitation and Water for All
- Advocacy for scaling up of climate-resilient technologies; capacity building for climate- resilient institutions; and policy review for mainstreaming climate change adaptation in existing policies, plans and guidelines

Equity-responsive and Resilient Service Delivery

- Facilitate the adoption & implementation of scalable models & approaches like the 3 star approach & arsenic safe union
- Facilitate the adoption and scaling up of gender supportive innovations such as the school led arsenic testing concept & other innovations models for climate resilient gender and disability sensitive WASH services delivery in primary schools

Partnerships and Participation

- Strengthen intra sector and inter sector coordination & foster innovative partnerships at all levels; financing & engagement with private sector
- Empower primary school children in program area to manage menstrual cycles, drinking water and sanitation hygienically, & to change and reinforce social norms within their communities

Planned Budget for 2017

The planned budget for 2017 is US\$10,567,099 out of which \$4,128,054 (39 percent) is funded. The planned allocation according to programme area is WASH interventions for young children below five and their mothers (78 percent); children of primary school age (10 percent); Adolescents (10 percent). The planned major source of funding for 2017 is other resources (86 percent). Table 6 shows the breakdown.

Table 6: Planned Budget for 2017

Outcome Area 3: WASH Bangladesh Planned Budget and Available Resources for 2017				
Intermediate Result	Funding Type	Planned Budget ¹	Funded Budget ¹	Shortfall ²
1.3 WASH-Young children & mothers	RR	1,192,089	996,392	195,697
	ORR	7,060,010	1,764,294	5,295,716
	ORE		537,490	-537,490
2.1 WASH-B&G of pre-school age	RR	165,000	229,271	-64,271
	ORR	980,000	34,500	945,500
	ORE		18,000	-18,000
3.3 WASH-Adolescents agents of change	RR	70,000	174,337	-104,337
	ORR	1,100,000	323,521	776,479
	ORE		50,250	-50,250
Sub-total Regular Resources		1,427,089	1,400,000	27,089
Sub-total Other Resources - Regular		9,140,010	2,122,315	7,017,695
Sub-total Other Resources - Emergency			605,740	-605,740
Total planned for 2017		10,567,099	4,128,054	6,439,045

¹ Planned and Funded budget for ORR (and ORE, if applicable) excludes recovery cost. RR plan is based on total RR approved for the Country Programme duration

² Other Resources shortfall represents ORR funding required for the achievements of results in 2017.

Expression of Thanks

UNICEF Bangladesh would like to take this opportunity to acknowledge the valuable contributions from donors which are critically important to support policies, implement UNICEF programmes and to create a safe and enabling environment for the children of Bangladesh so that they are able to realize their full potential and enjoy an active and productive life with dignity.

We are grateful to our donors and partners for their continued and generous support without which we could not achieve the desired results for the children of Bangladesh. Particularly, flexible support in the form of thematic funds gives unique advantage to support the much needed work, like advocacy for legal reforms and other relevant initiatives, along with the provision of basic services like education and immediate protection.

We sincerely thank government agencies, National Committees, NGOs and other UN agencies for extending their support and collaboration to work in partnership for the adequate and optimal implementation of our programmes.

Annex: Case Study

CLIMATE RESILIENT WATER TECHNOLOGY

MANAGED AQUIFER RECHARGE (MAR): AN INNOVATIVE SOLUTION TO CLIMATE AFFECTED PEOPLE IN COASTAL AREAS OF BANGLADESH

Issue/ Background

Bangladesh is a fast-growing country in South Asia, with an estimated population of over 156 million people. It depends heavily on groundwater for domestic and agricultural use, and increasingly for industrial use. As a result of the expanding population and increased agricultural and industrial production, groundwater levels are declining rapidly in urban and rural areas. Although water is available over much of the country, its quality varies dramatically with some areas having high concentrations of arsenic, manganese, iron and salinity, in addition to bacteriological contamination. Additionally, climate change are more likely to cause sea-level rise, intensify drought periods, and increase the frequency of cyclones, thus putting a stress on the fresh and safe water supply.

Climate change directly affects water resources and water services for all economic, social and environmental functions that water supports; therefore, the impacts reach into many sectoral interest, such as health, tourism, agriculture and industry. Due to climate change, the shortage of safe drinking water is likely to become more pronounced in Bangladesh, especially in the coastal belt and the drought-prone areas of the northwest. The country's generally low-lying topography and location along the Bay of Bengal makes it vulnerable to frequent flooding due to cyclonic storm surges. Saline water over much of the coastal area creates a huge scarcity of drinkable fresh water and contributes to hypertension and is a significant health risk, particularly for pregnant women.

The coastal area of Bangladesh face significant challenges to access water in terms of quality, quantity, reliability and accessibility. Groundwater is saline, rainfall is variable, and fresh water reserves are contaminated due to cyclonic storm surges. Thus a huge scarcity of fresh and safe water has been experienced by sector actors having limited solution to overcome the situation.

Rationale

Along much of the coast, the inhabitants suffer from acute water shortages as groundwater from both the shallow and deep aquifers is saline, rainfall is variable, and fresh water reserves are contaminated due to cyclonic storm surges.

In monsoon, rainwater harvesting and few fresh water ponds are the only means of drinking water though those sources are heavily contaminated by bacteria. In dry season, fresh water bodies dry and no rainfall takes place.

The drinking water scarcity has been worsen due to climate change as the duration of monsoon is reduced and frequency of tropical storm is increased.

The experience garnered during Cyclones Sidr and Aila in 2007 and 2009, respectively, highlighted the need for safer, more reliable water sources that are resilient to disasters and the impacts of climate change. This was not merely due to lack of investment, but an absence of proven safe and sustainable technologies. The problem is especially acute here because all the groundwater is saline.

UNICEF has teamed up with scientists from Dutch company Acacia Water and Bangladesh's Dhaka University and Government of Bangladesh (Department of Public Health Engineering, DPHE) to address this problem. Together, they have devised a new system whereby rain water can be collected during the monsoon and then stored for later use underground. As it flows there, the drinking water



Figure 1: Frequent disasters in coastal Bangladesh

displaces the saline ground water, and can be pumped out later on, after the monsoon. This is the first time this technique has been tried in such an environment. The first test site was established at Assasuni, in Satkhira, close to the Indian border, in 2010.

Brief Description of the Project

The Concept of Managed Aquifer Recharge (MAR)

The application of the MAR concept is simple: water is collected from ponds and roofs and, after passing through a sand filter, is then injected into the shallow saline aquifer through a ring of infiltration wells, creating a lens of fresh water. After the turbidity of the infiltrated water has improved to an acceptable level, water can be abstracted using a standard hand pump yielding water of improved quality (reduced levels of turbidity, coliforms, iron and arsenic). Importantly for Bangladesh, storage of fresh water in the ground offers significant flood protection during the regular cyclonic surges and MAR systems provide safe water when other traditional sources have been damaged by the floods. Each scheme can serve several hundred people and can be easily maintained by community groups.

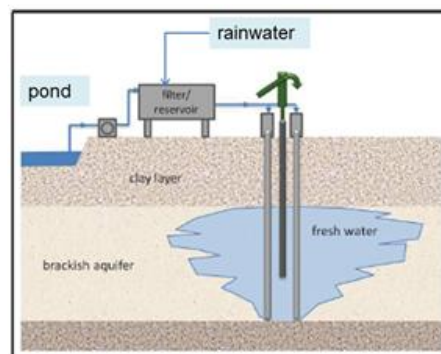


Figure 2: MAR technology concept

What has been done so far?

In 2009 UNICEF Bangladesh piloted Managed Aquifer Recharge (MAR) approach in coastal districts of Satkhira, Khulna and Bagerhat in partnership with the Government of Bangladesh (Department of Public Health Engineering, DPHE); University of Dhaka; Acacia Water and local NGOs. This was proposed as an Alternative, Cost effective and Climate/ Disaster resilient option to increase safe water access through better and appropriate use of existing water resources (surface and rain water).



Figure 3: MAR technology a solution in saline affected coastal areas

Managed Aquifer Recharge (MAR) systems were initially constructed at four sites expanded to a total of 20 sites by 2012 funded by UNICEF, UKAid, Aqua4all.

These initial schemes were successful; of the 20 sites constructed to date, 19 are operational and actively being used by the communities. At each operational site, a Water User Group (WUG) has been established and a caretaker from a local NGO is operating, maintaining and monitoring the MAR system under the technical direction of Dhaka University.

Based on the successful results of the piloting phase, between November 2012 to December 2013 an additional 75 MAR systems plus 7 research systems²⁷, were constructed in 2014 with funding from the

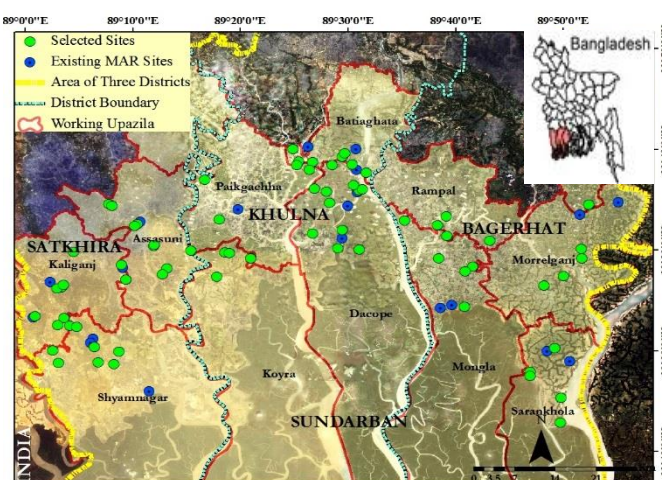


Figure 4: New 75 MAR system under scaling up

²⁷ Research schemes were constructed to assess the suitability of MAR systems to operate in thick clay areas, arsenic-affected areas and urban settings; five of these systems will be handed over to owners for their use.

Embassy of the Kingdom of the Netherlands (EKN). Seven NGO Partners were engaged to provide support during and after construction of the new MAR systems for community mobilization and awareness building.

Major Activities and Strategic Approach

Area selection

A series of GIS maps were generated using various parameters including water quality (arsenic, iron, manganese and conductivity), the occurrence of surface water, and groundwater levels, to highlight areas with acute water quality and quantity problems. The distribution of areas with poor water quality, deep water tables (in excess of 7.5m), which were more than 1km from perennial rivers, and areas with saline shallow groundwater have been collated and overlaid to define the target areas in Khulna division.

Site selection

The applicability and optimum performance of the MAR technique depends upon appropriate site selection, site-specific recharge techniques and regular monitoring with adjustments made where necessary. Hydrogeologically, the coastal aquifer system in Bangladesh is very heterogeneous, with significant changes in aquifer sediment evident within short vertical and horizontal distances, which results in highly variable hydraulic parameters.

Community Participation

Seven NGO Partners were hired to provide support during/after construction of MAR systems for community mobilization, awareness building and to develop effective operation and maintenance mechanisms in the communities. To address the issue of operation and maintenance, Water User Groups (WUGs) were established for each scheme, which importantly, comprised women-headed and poor households along with other vulnerable/underserved populations in the community for planning, implementation and operation and maintenance.

“The water quality here was not usable, so, because of infiltration of this natural rain water and pond water, we are creating a fresh water buffer underneath,” says Dr. Kazi Matin Ahmed, of Dhaka University’s Geology Department at Asasuni site, Satkhira. “So, three years ago, there was no source of drinking water here. Now, people are getting water from this well, and every day a few hundred people come here for their water for drinking purposes,” he adds



Figure 5: Measuring turbidity by caretaker

Knowledge, Attitude and Practice (KAP) survey and Capacity Building

A KAP survey was carried out at the existing sites to provide useful insight on sustainable management of the MAR systems as sources of drinking water in coastal areas. Capacity building tools including ‘MAR water safety plan’ were developed as a product of experiential learning; DPHE Engineers and contractors were oriented to implement and monitor MAR technologies under three districts and on-the-job practical training was organised for 11 groups of contractors at field level who were then able to use their improved skills to construct the 75 MAR schemes.

Construction of the MAR schemes

Once a potential site had been identified, the WUG was formed, orientation was provided and construction commenced. One MAR includes the component of recharge shaft; an infiltration reservoir (divided into 2 chambers – one for filtration²⁸ of the pond water and another one for storing filtered water prior to infiltration); Observation wells (4 to 5) and Infiltration wells (4 or 6 infiltration wells of different diameter filled with gravel bed).

²⁸ Filtration using two layers of sand of different size, with a Geojute cover on top of the sand filter

Routine O&M of MAR schemes

Regular cleaning of Jute canvas and upper part of sand filter is necessary to run the system smoothly. Periodic cleaning of Tube well platform and roof and Pond surroundings is also important. Manual for O&M and water safety planning has been developed and MAR caretaker has been oriented and trained on this.

Technical performance monitoring

To determine the effectiveness of the MAR schemes in terms of residence time, recovery rates and water quality, performance tests were carried out. Daily measurements of electrical conductivity (EC), turbidity, pH, water level and temperature were measured in each observation well, both inside and outside of infiltration well. In addition, the turbidity of the pond and filtered water were also measured on daily basis and records kept of infiltration and abstraction volumes. Measurements of arsenic and iron were measured on a weekly basis. Records of key parameters, e.g. EC and water level, were shared between partners on a daily basis (through SMS and databases) and plots generated to determine trends and to identify any issues.

Quality Control

To ensure the representativeness and accuracy of the data collected in the field, water samples were collected from each piezometer and infiltration well on a weekly basis to verify the field parameters, particularly the EC and chloride content of the water.

Resources Allocated

Embassy of the Kingdom of the Netherlands (EKN) funded the amount of US\$ 1.8 million for upscaling of MAR in severely saline affected Khulna, Bagerhat and Satkhira.

Results of the Project

Nineteen out of the twenty initial pilot MAR systems are providing potable drinking water and the monitored parameters e.g. chlorides, arsenic, iron are within the acceptable limits of Bangladesh standards for drinking water quality. All of the sites were handed over fully to user committees and no longer receive any support from external agencies. These 19 sites provided improved access to 11,000 people including 4,721 school children.

Seventy five new MAR schemes have been constructed by DPHE in 13 Upazilas of Satkhira, Khulna and Bagerhat districts. It is expected that all the sites will be ready for community use by the end of monsoon 2015 increasing access to 34,700 vulnerable people in the coastal areas.

Seven action research sites have been set up (three in coastal areas, two in arsenic affected areas and two in urban areas). Out of the seven, three are producing potable water and are fully functional and have increased drinking water access to 585 users.

Social assessment for acceptance, ownership and use of MAR System was carried out using Knowledge Attitude and Practice (KAP) surveys conducted by Drishti Research Centre in April 2014. The findings highlighted the need to use a people oriented approach attuned to the users' needs, social values, beliefs, perception and local demand. These study findings were used to develop approaches for the sustainable management of the MAR system as a source of safe drinking water in the coastal areas.

Eight technical documents have been produced by Acacia Water with contribution from Dhaka University, UNICEF and DPHE to use as tools for upscaling by government and sector partners.

Wider results / impacts of the project

The MAR has scope for a large scale impact in the Bengal delta areas challenged by climate change, environmental and social deprivations.

Improved year-round water availability

Water can be stored when it is abundant, for example during the monsoon, and made available for dry periods. This is a particular important advantage in areas with a pronounced dry season. The MAR systems increase thus the amount of (clean) water that is available throughout the year.

Improved water quality and reduced health risks

The advantage of groundwater storage is that it is largely protected from external pollution. The underground storage has therefore a low contamination risk, for example for diseases. Also, the microbiological quality can strongly be improved in comparison to e.g. the pond water due to the underground residence time of the water. If the desired underground storage can reduce the amount of surface water use, it can help to reduce the risk of waterborne diseases like for example diarrhoea.

Social Accessibility and user friendliness

User feedback within the beneficiary communities has suggested that users are happy with the taste (the water tastes like 'normal' water from the tube wells they used before they were abandoned due to salinity or arsenic). The technology is easy to use with minimum effort required, and water is abstracted using the traditional hand pump type.

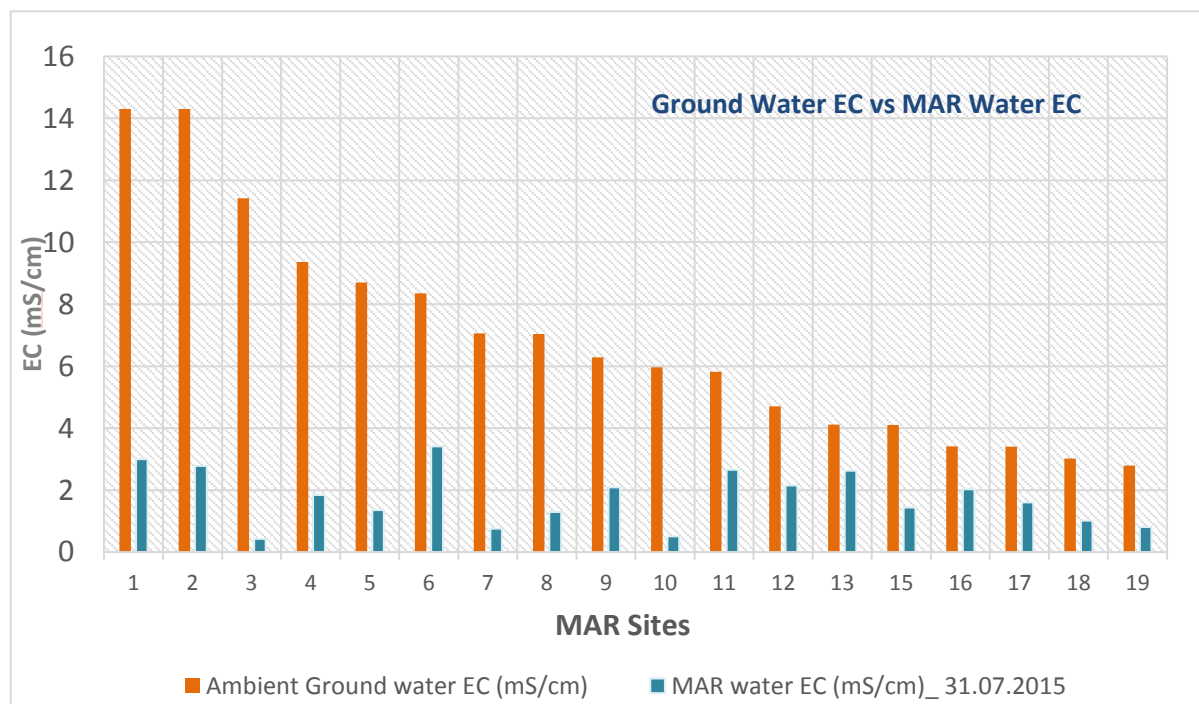


Figure 1: Reduction of EC (directly proportionate to chloride/salinity) from ground water to MAR water

Reduced Water collection time

Along extensive areas of the coast, safe water sources are located up to two hours walking distance from communities. Spending such an amount of time has had a demonstrated negative impact upon attendance rates of children at school, as well as limiting the time available for alternative livelihood

interventions and children's recreational activities. As the burden of collecting water falls mainly upon women and girls, interviews have indicated that MAR interventions have significantly reduced the time required to collect drinking water.

Cost-effective comparing to other technologies

The costs for MAR systems are competitive to the cost of other fresh water solutions that provide year round safe water in areas with saline groundwater, such as rainwater harvesting, reverse osmosis and water supply by a water vendor. MAR systems thus provide a cost effective solution. Unlike many other alternative technologies, most of the components of the system are locally available and furthermore, the operation and maintenance can be easily undertaken by local communities with costs borne by the community through tariffs collected.



"Previously I had to walk for more than one hour to collect drinking water and I was always late in school. But this water at my school and near to my house saves my time. Now I can attend school on time."
Ismat Ara, Student of Class VII, Satkhira.

Resilient to disasters

The underground stored fresh water is protected from cyclones and the floods that often hit the region. The fresh water bubble is protected by the clay layer and not polluted when the area is flooded with contaminated water. Also the hardware can be designed to withstand natural disasters, making the MAR system resilient in cyclone and flood prone areas. The (underground) storage of water during peak events can reduce the amount of floodwater. Especially in cities and other areas with relative limited water storage opportunities, artificial infiltration into the ground, e.g. of water captured from the rooftops, can help to reduce peak flow.

The benefit of the MAR technology in rural communities in Bangladesh is not limited to its cost-effectiveness or its reliability, but importantly, must also consider that the technology enables safe water to be collected in an area where this is not possible under normal circumstances with positive social and health implications. Furthermore, the MAR systems provide a degree of protection from cyclonic flood inundations which occur regularly along the coastal zone.

Lesson Learned

Proper site selection is important for siting MAR systems to maximise their potential for improving water quality. The project found that the major criteria for site selection were demand for water, availability of other safe water options, top clay thickness, aquifer thickness, ambient groundwater salinity and fresh water pond and suitable roof for rainwater collection.

The modified design under action research has very good potential in future upscaling considering cost, ease of construction and maintenance and improved water quality.

Local materials can be used for site construction therefore it is more cost effective (no carrying cost and all materials are readily available) and easier to construct. This modified design was constructed at the later part of the project and was used in one out of the 75 sites. Its water quality efficiency is similar to the other designs.

Supportive institutional arrangements and community participation contribute to sustainability of the technology.

Conclusions and Way Forwards

The project found that MAR technologies are technically feasible and are socially acceptable especially in areas where fresh groundwater is not present and tube well technologies are no longer feasible.

Further initiatives have been taken to increase the use of the MAR technology, institutionalisation by inclusion in policy and relevant sector documents. Furthermore, to assess the cost-effectiveness of the different ownership models (private sector, NGO, government, school) and provide institutional capacity building support at national, sub-national and local levels. There is scope for increasing the scale of assessment of MAR technology as a tool for improving water quality and augmenting water quantity in flood prone areas and arsenic contaminated areas in the urban and rural contexts as well as its relevance to the agricultural sector.

For further scaling up, a detailed feasibility survey has been carried out for the site selection, in which in total 330 potential sites have been studied. The findings of the site selection were combined with spatial data in a GIS analysis to create a 'MAR feasibility map' for the three target districts. It indicates the areas with a high physical potential for the application of MAR systems and the areas with a high demand for fresh water. The maps are based on the soil characteristics and the salinity of the groundwater, and on the population density, the land use and presence of deep or shallow tube wells.

Annex: Donor Feedback Form

Title of Report/Project: WASH Thematic Report

UNICEF Office: Bangladesh

Donor Partner:

Date:

UNICEF is working to improve the quality of our reports and would highly appreciate your feedback. Kindly answer the questions below for the above-mentioned report. Thank you!

Please return the completed form back to UNICEF by email to:

Name: Sheema Sen Gupta, Deputy Representative UNICEF Bangladesh

Email: ssengupta@unicef.org

SCORING: 5 indicates “highest level of satisfaction” while
0 indicates “complete dissatisfaction”

1. To what extent did the narrative content of the report conform to your reporting expectations?
(For example, the overall analysis and identification of challenges and solutions)

5	4	3	2	1	0

If you have not been fully satisfied, could you please tell us what we missed or what we could do better next time?

2. To what extent did the fund utilization part of the report meet your reporting expectations?

5	4	3	2	1	0

If you have not been fully satisfied, could you please tell us what we missed or what we could do better next time?

SCORING: 5 indicates “highest level of satisfaction” while
0 indicates “complete dissatisfaction”

3. To what extent does the report meet your expectations in regard to the analysis provided, including identification of difficulties and shortcomings as well as remedies to these?

5	4	3	2	1	0

If you have not been fully satisfied, could you please tell us what we could do better next time?

4. To what extent does the report meet your expectations with regard to reporting on results?

5	4	3	2	1	0

If you have not been fully satisfied, could you please tell us what we missed or what we could do better next time?

5. Please provide us with your suggestions on how this report could be improved to meet your expectations.

6. Are there any other comments that you would like to share with us?

Thank you for filling this form!