Waterlines, 40:2, 107–114
<http://dx.doi.org/10.3362/1756-3488.20-00012>

Integrating sanitation and climate change adaptation: lessons learned from case studies of WaterAid's work in four countries

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Abstract: *The links between climate change and sanitation are frequently overlooked in the WASH sector. This paper examines experiences of WaterAid in Bangladesh, Burkina Faso, India, and Madagascar where there was some consideration of the impacts of climate change on sanitation. Climate resilience was often not considered explicitly, however, with work instead framed around weather-related threats that are now increasingly frequent and severe. In these case studies, sanitation and climate integration involved adapting on-site sanitation hardware to physical impacts on infrastructure, while some social aspects of climate resilience were also considered. Integration took place primarily at the project level, while climate change consideration seemed absent from wider planning and decision-making. Aside from these case studies, most of WaterAid's sanitation work does not seem to incorporate climate change. It is recommended that climate resilience is integrated into each stage of sanitation programming, with a more systematic consideration of its potential impacts.*

Keywords: climate change, sanitation, Bangladesh, Burkina Faso, India, Madagascar

Climate-resilient WASH has been defined as water, sanitation, and hygiene (WASH) interventions that 'continue to deliver benefits despite extreme weather and other climate induced hazards' (Casey and Newton-Lewis, forthcoming: 1). Currently, climate-resilient WASH discussions and practice remain predominantly focused on water. Climate change has, overall, not been mainstreamed into sanitation programming, with the relationship between climate change and sanitation largely neglected across the WASH sector (Mills et al., 2019; Dickin et al., 2020).

While the links between climate change and water may be more obvious, climate change also has several impacts on sanitation (Kohlitz et al., 2019). These include:

1. An increase in intensity and frequency of floods resulting in increased faecal sludge contamination, with associated health risks.
2. Increased incidence of water shortages leading to a decrease in functionality of water-based toilets.
3. An increase in intensity and frequency of cyclones, storms, and other natural hazards resulting in damage to sanitation infrastructure (e.g. latrines, pipes, and treatment plants).

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ISSN: 0262-8104/1756-3488

Despite these impacts, and while the need for climate-resilient WASH is increasingly recognized, climate change has yet to be mainstreamed into WaterAid's work on sanitation. In many of WaterAid's relevant framework publications, the relationship between sanitation and climate change is underexplored. This is the case for WaterAid's (2011) *Sanitation Framework*, in which climate change is only mentioned once. Similarly, in the more recent *Guidance on Programming for Rural Sanitation* (WaterAid, 2019a: 38), climate is rarely mentioned. However, the guidance does recognize disaster- or climate-affected or disaster-prone areas as one of several 'difficult contexts' that should be 'identified wherever possible so that effective implementation strategies and approaches can be developed'. In WaterAid's (2019b: 9) *Urban Framework*, it is explicitly recognized that 'poor WASH access makes urban populations more vulnerable to ill health and climate risks', yet the relationship between climate risks and sanitation specifically is unaddressed.

It is important, however, to go beyond these frameworks and understand what WaterAid is doing in practice regarding sanitation and climate change. WaterAid's experiences in relation to climate change and sanitation, based on case studies in four countries – Bangladesh, Burkina Faso, India, and Madagascar – do demonstrate some integration of climate change and sanitation.

Methodology

To identify relevant experiences, two strategies were used: a search on WaterAid's Project Centre for sanitation projects that mentioned climate change, and circulation of an email to WaterAid's sanitation e-group seeking information on work relating to climate change and sanitation.

To gain a deeper insight into the experiences identified, follow-up interviews were then conducted over Skype with WaterAid Bangladesh's Head of Programmes and WaterAid India's Head of Policy, and through email correspondence with WaterAid Burkina Faso's Project Coordinator and WaterAid Madagascar's Project Officer. Where available, final evaluation reports and impact assessments were analysed.

Case studies

Bangladesh

In Bangladesh, WaterAid's work considering the relationship between climate change and sanitation has largely taken the form of provisioning climate-vulnerable communities with disaster-resilient sanitation facilities. This is evidenced by one project targeting the disaster-prone coastal Dacope and Shyamnagar *upazilas* (regions). The project sought to increase provision of durable, disaster-resilient WASH facilities, including in over 100 schools used as shelters during disasters.

Above-average investment per sanitation facility of £8,000–10,000, compared to a regional average of around £5,000, helped ensure robust construction. This included use of heavier construction materials and importing of non-saline water to improve construction quality. The project also considered the problem of waterlogging caused by increasingly intense rainfall through use of raised toilet substructures, with ramps provided for people with disabilities.

Additionally, integrated into the project was a focus on inclusion, particularly the need to consider gender and age, demonstrating recognition that climate change does not affect all groups of people equally. The sanitation facilities installed were segregated by gender, addressing the issue of privacy for women and girls during disasters, and had provisions for menstrual hygiene management (MHM).

Following Cyclone Bulbul in November 2019, the infrastructure proved to be strongly disaster resilient. The project's success is evidenced by the data gathered in the impact assessment, shown in Table 1.

Table 1 Impact of Cyclone Bulbul, November 2019, on WaterAid's sanitation facilities constructed in Dacope and Shyamnagar *upazilas*

Impact	*Dacope*	*Shyamnagar*	*Total*
Number of WASH facilities overall	110	115	225
WASH facilities damaged by Cyclone Bulbul	10	17	27 (12%)
WASH facilities requiring repair ...	9	15	24 (11%)
... of which requiring **major** repair	0	4	4 (2%)
Damaged WASH facilities receiving immediate repair	7	2	9 (4%)
Number of sanitation facilities overall	24	54	78
Sanitation facilities functional after Cyclone Bulbul	24	51	75 (96%)

According to the same dataset, following the cyclone:

- only eight sanitation facility roofs were damaged;
- one septic tank was partially damaged;
- no damage was observed to tiles, taps, basins, railings, or ramps of sanitation facilities.

The fact that 96 per cent of latrines remained functional immediately after Cyclone Bulbul suggests the successful integration of disaster resilience into the design and construction of sanitation facilities. Damaged facilities were quickly repaired using operation and maintenance (O&M) funds. In addition, though cholera outbreaks are common in post-disaster situations, there were no reported cases of cholera among those who had used the facilities during the cyclone, further demonstrating its success and recognition of the non-immediate impacts of natural disasters.

Burkina Faso

In Burkina Faso, one WASH project that took place between 2017 and 2019 sought to improve the disaster resilience of vulnerable communities in the country's eastern region. Unlike the other cases studied, this project was explicitly framed around integration of climate change, including directly considering the impacts of climate change on sanitation. The sanitation component involved the installation of 52 ecosan toilets in six villages of Lalgaye commune, benefiting a total of 971 people (Sanwidi et al., 2019).

Ecosan technologies have been implemented extensively across Burkina Faso to meet its aim of universal toilet coverage (Dagerskog et al., 2020). Their use by WaterAid in this project was directly linked to climate change considerations. Firstly, ecosan toilets are dry systems that do not require water – this avoids the strain placed by water-based latrines on increasingly insecure water resources. Secondly, ecosan toilets are designed to recycle nutrients and create fertilizer for use in agriculture (Gupta, 2014). This helps to reduce the threat posed by climate change to Burkina Faso's heavily agriculture-based economy and workforce (FAO, 2014).

The success of ecosan projects should be judged not just on installation, but on sustainability (Dagerskog et al., 2020). WaterAid's project trained community members to construct the latrines themselves, as well as training households on their use, including extracting fertilizer, and on wider sanitation practices. Following their installation, no reluctance to the use of ecosan toilets was reported. Observations, including the latrines being well-cleaned, suggested that the systems received continued use after initial training. Communities also welcomed the ecosan fertilizer, which some community members reported to help relieve decreasing soil fertility, thus improving agricultural productivity.

While this level of success is rare across ecosan projects elsewhere, this example demonstrates a means of directly integrating climate change into sanitation projects using appropriate technologies. The wider WASH project also involved educating beneficiary communities on the impacts of climate change, and its findings will be used to scale-up initiatives across Burkina Faso (Sanwidi et al., 2019).

India

WaterAid India has not prioritized the relationship between sanitation and climate change in the same way as water and climate change, yet some of its work on sanitation does link to climate change. This work takes place in the context of the national Swachh Bharat Mission (SBM), which sought to achieve universal toilet coverage in India. Over 100 million toilets were reportedly constructed in rural India during SBM between 2014 and 2020 (Department of Drinking Water and Sanitation Ministry of Jal Shakti, 2020), but not enough attention was paid to their quality and suitability. A survey conducted by WaterAid India (Raman et al., 2017) found that only 33 per cent of toilets installed were both safe and sustainable in the long term, while 31 per cent were considered unsafe, and technologies used for the substructures were not appropriate for challenging geographies. A follow-up study focusing on such geographies found that in one flood-prone region with a high-water table, 16 per cent of SBM toilets were single-leach pits, while 12 per cent were twin-leach pits (WaterAid, 2020). Where climate change will increase flooding and water table levels, the use of these technologies is unsuitable as it increases the risk of groundwater contamination.

Post-SBM, the Government of India has a strategy that includes the retrofitting of toilets, to which WaterAid India is providing advisory support. This is expected to help minimize the impacts of climate change on sanitation. At the district level, in Samastipur, Bihar, WaterAid India organized a 'Solution Conclave' on terrain-appropriate sanitation technologies. This involved identifying challenges posed by current sanitation technologies and the potential solutions to these, while facilitating discussions with local stakeholders on a strategy for the adoption of safe and appropriate technologies (Raman and Singh, 2019).

While WaterAid India observed a high toilet coverage across surveyed households in Samastipur, it also noted a lack of climate-resilience in most areas. Issues arising in flood-prone areas with high water tables are listed in Table 2, with several recommendations made.

Table 2 Findings and recommendations of Solution Conclave on sanitation in Samastipur, Bihar

Technology issue	*Implications*	*Recommended solutions*
Pits filled after flooding	Dysfunctional toilet	Raising substructure height Alternative, appropriate technologies (e.g. ecosan)
Poor disposal of faecal sludge post-flooding	Soil and water contamination	Establish mechanism for faecal sludge management Alternative, appropriate technologies (e.g. ecosan)
Toilets constructed on riverbank below water level	Waterlogging, blockage, water contamination	Raising substructure height Building raised community toilets for use during floods
Leach pits dug too deep	Water contamination	Seal the bottom of the pit using non-porous material

WaterAid India also made recommendations for the construction of new toilets regarding location selection, including the need to check flood levels and seasonal water tables and to adapt the technology choice accordingly. These adaptations will help make the infrastructure resilient to floods and avoid contamination of high water tables.

WaterAid India is planning to support the district government to develop and implement a post-SBM strategy: preparing a manual on terrain-appropriate retrofitting, training masons, and exploring financing mechanisms for households. The experience in Samastipur and other districts will be documented to advocate for the replication and scale-up of such initiatives across India (Raman and Singh, 2019).

Madagascar

Across Madagascar, the impacts of climate change are already being felt in the form of enhanced natural hazards, including cyclones (that in turn cause floods), as well as droughts and bush fires. WaterAid Madagascar's efforts in relation to climate change and sanitation have therefore focused mainly on preventing the undesirable impacts of these events on sanitation by strengthening the capacity and awareness of both beneficiary communities and local authorities. This work takes place across Madagascar at the project level, in both rural and urban areas, and in small towns.

At the community level, WaterAid provides advice on the construction of sanitation infrastructure that is resilient to climate hazards. Given that most beneficiaries will not have a strong understanding of the relationship between climate change and WASH, WaterAid also raises community awareness of environmental protection using local community agents, with the aim of ensuring long-term sustainability of projects.

In institutions, WaterAid's work involves building climate-resilient (which includes cyclone-resistant) sanitation facilities. There is no standard model, with design instead adapted to the surrounding environment. In addition to the use of anti-cyclonic standards, in flood-prone land and coastal areas with high water tables, elevated toilet blocks are used, and pits are sealed to avoid contamination of the water table. Gender and accessibility considerations are also incorporated (privacy, MHM, access for people with disabilities). The sanitation blocks have been reported to remain usable following natural hazards.

Conclusion

As of early 2020, WaterAid has yet to clearly articulate the integration of climate change and sanitation in its guidelines and to embed it into its programming work. The cases studied represent 'islands of integration', demonstrating consideration of the impacts of sanitation on climate change, particularly in terms of disaster resilience. In most cases, climate-resilient sanitation was not considered explicitly, with projects instead framed around adapting to existing weather-related threats, which are now increasing in frequency and severity due to climate change. Climate change considerations also appear to be in different stages of development: while in Madagascar disaster-resilience is already employed in projects across the country, findings from localized projects in both India and Burkina Faso are planned to be scaled-up in the future.

As is the case with most sanitation programming in the sector (Dickin et al., 2020), climate-resilient adaptation by WaterAid has largely taken the form of optimization of hardware to adapt to the physical impacts of climate change on sanitation infrastructure. This includes improving the disaster-resilience of sanitation facilities, ensuring continued toilet functionality, and preventing groundwater contamination from substructures. Approaches identified, whether recommended or directly implemented, include:

- improving construction quality of facilities to enhance disaster resilience;
- using dry toilets in water insecure areas;
- raising substructure height and/or using sealed substructure options to avoid groundwater contamination in rainy seasons or following flooding;
- raised community toilet facilities for use during floods;
- using composted faecal waste as fertilizer to combat increasing climatic strain on agriculture.

While attention has mostly been paid to the physical impacts of climate change, particularly in response to natural hazards, the case studies do demonstrate some consideration of its social aspects. This includes recognizing that climate change does not impact all social groups equally, evidenced by gender and accessibility considerations in Bangladesh, alongside the targeting by all case studies of climate-vulnerable groups located in geographically challenging regions. In Madagascar and Burkina Faso, awareness of climate change was also raised within beneficiary communities.

An important area for future programming that seemed to be overlooked was the need to address increasing climate uncertainty due to climate change. This would involve adapting conventional risk management systems to the increasing difficulty in predicting climatic changes. Continual monitoring of climate systems, for example, can be used to anticipate potential damage to sanitation infrastructure (Dickin et al., 2020). Some evidence of consideration of uncertainty, however, is demonstrated by WaterAid India's recommendation that seasonal water tables and flood levels be monitored, and that technologies are adapted accordingly.

Furthermore, WaterAid's integration of climate change and sanitation has largely been concentrated at the project level, with its broader consideration at the strategic planning and decision-making levels not as evident. Making climate resilience an objective in decision making (regarding priorities, internal capacity investments, geographical focus) could lead to better integration at the project level in terms of encouraging a more systematic inclusion of climate considerations in project planning. Taking it into account at strategic planning stages could also reveal opportunities beyond project implementation, such as influencing climate adaptation, monitoring, and targeting of sanitation investments.

Finally, despite these successful case studies, most other projects found on WaterAid's Project Centre did not address the impacts of climate change on sanitation. While many projects focused on climate-resilient WASH, it appears that sanitation aspects were not considered in most cases, suggesting the need for better integration. Where the impacts of climate change on sanitation are considered, as evidenced by the case studies above, this is often framed in relation to one-off natural hazards. Rather than equating climate-resilience simply with disaster-resilience, solutions should consider the range of impacts of climate change on sanitation, such as more routine water shortages and rising water tables. Sanitation programming should therefore seek to integrate considerations of all potential impacts of climate change on sanitation at every stage, from planning to evaluation.

Acknowledgements

We would like to acknowledge the contributions of the following for their inputs: Aftab Opal, WaterAid Bangladesh; Barry Djibril, Burkina Faso; V.R. Raman and Kanika Singh, WaterAid India; and Jacob Ramifehiarivo, WaterAid Madagascar.

References

Casey, V. and Newton-Lewis, V. (forthcoming) *Climate-resilient WASH*. London: WaterAid.

Dagerskog, L., Dickin, S. and Savadogo, K. (2020) 'Return to learn: recommendations from revisited rural ecosan projects in Burkina Faso', *Waterlines* 39: 1, 61–72 <https://doi.org/10.3362/1756-3488.19-00008>.

Department of Drinking Water and Sanitation Ministry of Jal Shakti (2020) *Swacch Bharat Mission – Gramin* [online], New Delhi: Government of India. <https://sbm.gov.in/sbmreport/home.aspx> [accessed 17 March 2020].

Dickin, S., Bayoumi, M., Giné, R., Andersson, K. and Jiménez, A. (2020) 'Sustainable sanitation and gaps in global policy and financing', *npj Clean Water* 3: 23 <https://doi.org/10.1038/s41545-020-0072-8>.

Food and Agriculture Organization (FAO) (2014) *Country Fact Sheet on Food and Agriculture Policy Trends: Burkina Faso* [pdf], Rome: FAO <http://www.fao.org/3/i3760e/i3760e.pdf> [accessed 26 February 2020].

Gupta, A. (2014) 'EcoSan toilets – an alternative to conventional sanitation in vulnerable locations' [blog], 12 September, London: WaterAid <https://washmatters.wateraid.org/blog/ecosan-toilets-an-alternative-to-conventional-sanitation-in-vulnerable-locations> [accessed 17 March 2021].

Kohlitz, J., Willetts, J. and Gero, A. (2019) *Discussion paper: Climate, Sanitation and Health* (draft) [pdf], Geneva: World Health Organization <https://www.who.int/water_sanitation_health/sanitation-waste/sanitation/sanitation-and-climate-change20190813.pdf> [accessed 21 June 2020].

Mills, F., Kohlitz, J., Carrard, N. and Willetts, J. (2019) *Considering Climate Change in Urban Sanitation: Conceptual Approaches and Practical Implications* [pdf], The Hague: SNV <https://snv.org/cms/sites/default/files/explore/download/20190212-climatechange-ushhd-learningpaper-web.pdf> [accessed 21 February 2020].

Raman, V.R. and Singh, K. (2019) *Solution Conclave on Terrain Appropriate Toilet Technologies: Samastipur, Bihar*, New Delhi: WaterAid (unpublished).

Raman, V.R., Muralidharan, A., Srivastava, P. and Hueso, A. (2017) *Quality and Sustainability of Toilets: A Rapid Assessment of Technologies under Swachh Bharat Mission – Gramin* [pdf], New Delhi: WaterAid India <https://www.wateraidindia.in/sites/g/files/jkxoof336/files/quality-and-sustainability-of-toilets.pdf> [accessed 17 March 2020].

Sanwidi, M., Kafando, A., Djibril, B. and Zoungrana, T. (2019) *Projet 'Efforts de préparation aux catastrophes pour soutenir les communautés vulnérables au Burkina Faso' Evaluation Finale*, Ouagadougou: WaterAid (unpublished).

WaterAid (2011) *Sanitation Framework* [pdf], London: WaterAid <washmatters.wateraid.org/publications/sanitation-framework> [accessed 27 May 2020].

WaterAid (2019a) *Guidance on Programming for Rural Sanitation* [pdf], London: WaterAid <washmatters.wateraid.org/sites/g/files/jkxoof256/files/guidance-on-programming-for-rural-sanitation.pdf> [accessed 21 February 2020].

WaterAid (2019b) *Urban Framework* [pdf], London: WaterAid <https://washmatters.wateraid.org/sites/g/files/jkxoof256/files/wateraid-urban-framework_0.pdf> [accessed 21 February 2020].

WaterAid (2020) 'Improving sanitation safety and sustainability: learning for retrofitting based on findings from a study in six vulnerable terrains of India' [PowerPoint presentation], 9 January 2020 (unpublished).