Beyond access: Water quality from resource to user

Evidence brief

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WaterAid

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◀ Drishti, 14, and Rajeev, 18, the youth leaders, check quality of the water with operation and maintenance (O&M) members at an aanganwadi centre in Raghubir Nagar, New Delhi, India. March 2020.

This brief summarises the findings of an in-depth review of WaterAid's work, aimed at safeguarding water quality carried out in 2019–20.[1] 20 country teams participated in the review, which focused on water quality challenges encountered in different locations and the interventions deployed to address them.

The brief summarises WaterAid's key experiences but does not cover all possible approaches and solutions used or available.

The brief is aimed at:

- **Documenting WaterAid's past and current approach to safeguarding water quality (providing a high-level overview of solutions);**
- **Informing future policy and advocacy work on water quality;**
- **Informing future programmatic work aimed at providing sustainable and safe water supply in line with WaterAid's *Quality Programme Standards*.[2]**

Case studies on a range of experiences accompany this document and provide more detailed technical information.


WaterAid/Dennis Lupenga

▲ Water quality testing, Central Region Water Board, Kasungu, Malawi, September 2017.

Front cover: Water Hero Sharamon Nowshin Hriddhee testing water from a borehole to raise awareness of the right to water among young people and improve access to clean water in Khulna, Bangladesh. February 2020.

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1. Background: The water quality challenge

While progress has been made towards universal access to water, there are still 785 million people living without an improved water supply.

The United Nation's Sustainable Development Goal (SDG) 6, for universal access to a safe water supply, is seriously off track. **One in three people globally do not have access to a safely managed drinking water supply**,[4] with a strong divide between rural and urban contexts. In regions, such as sub-Saharan Africa's rural areas, only 13% of the population have access to safely managed drinking water (Figure 1).

The SDG 6.1 Joint Monitoring Programme (JMP) data demonstrates that water quality is often the limiting factor for achieving safely managed water.[4]

While water supply access is increasing, access alone is not sufficient to protect against disease and to reduce mortality. Water must be safe to drink.

This means addressing not only access, quantity and reliability of supply, but crucially water quality. **Water quality safeguarding relates to all 'improved' water supply, including JMP defined 'limited' and 'basic' service levels**, as they should 'have the potential to deliver safe water by nature of their design and construction'.[i]

Efforts must be made to **safeguard water quality, to avert the risk of public health impacts**.

A recent multi-country study of 428 'basic' rural water supply boreholes found that 72% were providing water quality compliant with the World Health Organization (WHO) drinking water quality criteria in dry season. The most notable constraint of the water quality was due to microbiological contamination[5] – particularly in rainy seasons due to run-off intrusion.

Water quality is defined through parameters that can be categorised in the following way:

- Physio-chemical parameters such as pH, dissolved oxygen.
- Geogenic (from local geology) chemical contaminants (for example, fluoride, arsenic, manganese, nitrate, iron and salinity).
- Anthropogenic (caused by human activity) microbiological contaminants (for example, harmful pathogens from faecal waste).
- Anthropogenic chemical contaminants (for example, nitrate and pesticides from agricultural run-off) or by-products from treatment (for example, Trihalomethanes).

The SDG 6 targets bring water quality issues at the forefront with:

- SDG 6.1 on drinking water services, defines 'safely managed water' as an improved source, accessible on premises, available when needed and free of microbiological contamination and key chemical contaminants in supply.[3]
- SDG 6.3 focuses on water resource quality and contamination prevention from human waste and other anthrophonic activities for ecosystem and human health.

i. The JMP definition of an 'improved drinking water source' is: 'Those that have the potential to deliver safe water by nature of their design and construction'. Available at: washdata.org/monitoring/drinking-water (accessed 25 Feb 2021).

The WHO provides global guideline standards for drinking water quality parameters,[6] however some national government standards for water quality parameters deviate from these. Some water quality parameters, such as microbiological contamination and high concentrations of arsenic and fluoride, can have serious adverse health effects on consumers and are considered high-risk.

In the countries where WaterAid works, some of the most common high-risk contamination sources to drinking water include:[7]

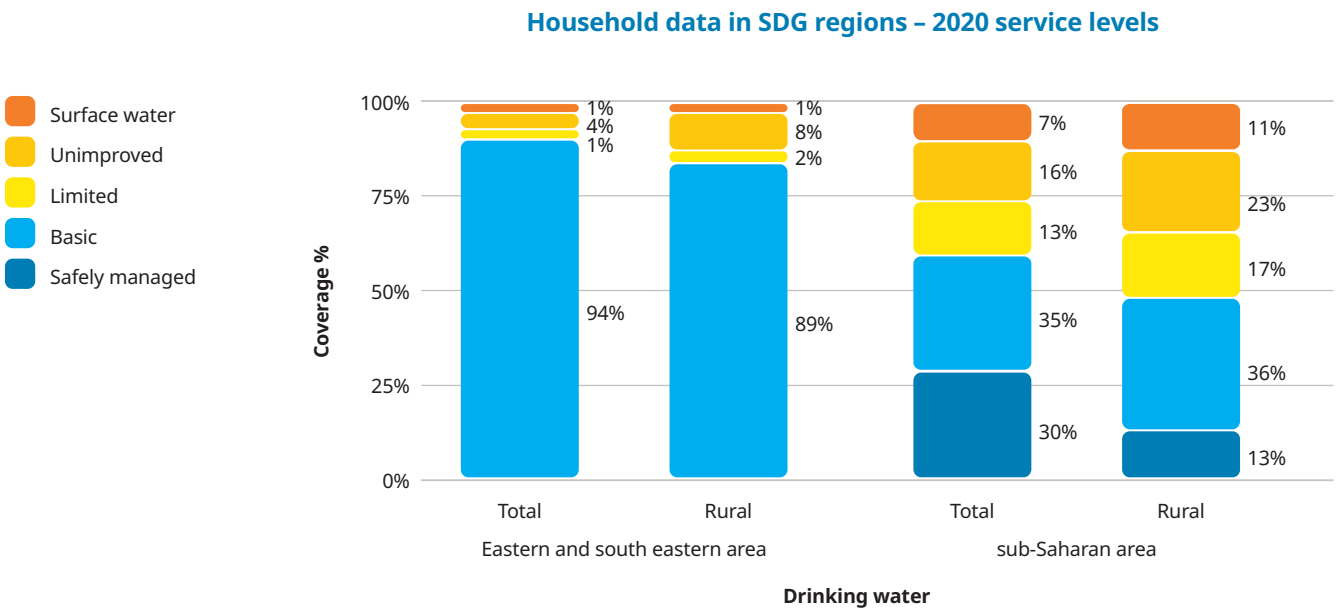
- Microbiological contamination from faecal waste run-off towards water sources or groundwater intrusion (particularly for shallow wells);
- Geogenic contaminants, particularly fluoride, arsenic, iron and manganese;
- Salinity from sea-water intrusion in coastal countries.

Other nuisance parameters often observed, while determining lower direct risks to health, impact the operation of water supply (for example, low pH can cause corrosion of pipes) – leading to interruptions of safe water supply.

What causes anthropogenic water contamination at source, collection, transport and storage?

- Poor site selection of the water source.
- Poor site selection and management of latrines and other likely sources of contamination.
- Pollution of water resources – for example, from agricultural run-off and industrial waste.
- Poor design or construction of water sources (for example, lack of a well lining and/or cover, tank sealing, poor pipe connections).
- Deterioration or damage to structures (for example, cracks can be entry points for contaminants).
- Lack of hygienic behaviours, including water transport and storage modes, and sanitation knowledge and practice in households and communities.

Figure 1. SDG 6.1 safely managed water supply for Eastern and South Eastern Asia and sub-Saharan Africa (source: JMP, 2020).[3]



Some water quality risks are further exacerbated by **increased risks derived by the impact of climate change**. For example, more frequent flooding can lead to increased agricultural and residential waste run-off, as a non-point source (NPS) contamination of water resources.

Risks assessments to understand the possible sources of contamination and how these may enter the water supply are critical for assuring water safety.

Assuring safe water is complex due to:

- **Multiple scales and dimensions**
  From water catchment, single water supply systems, to household/institutional water access and storage;
- **Multiple water quality parameters**
  Possible combinations of geogenic chemical parameters to anthropogenic contamination due to uncontrolled waste release into the environment from households, agriculture and/or industry;
- **Temporal issues**
  Water quality can change rapidly between seasons, contamination events and in the transport and storage phase between source and point of consumption.

Safeguarding water quality presents more than just a technical challenge. It is also linked to **issues of the governance, management and policy enforcement** of both water services, water resources and sanitation services. It is dependent on many other sectors because, although the Ministry of Water and WASH and Health actors have key roles to ensure water quality supply and resources, other sectors such as waste management, agriculture and industry also impact water resource quality.

Low awareness of the public health impacts of poor water quality and lack of scientific understanding of water quality parameters – both from the perspective of the user and from different government department leads – can result in a lack of engagement and prioritisation of water quality, that contrasts with the attention given to assuring water supply access.

▶ The youth leaders, check the quality of the water at an aanganwadi centre in Raghubir Nagar, New Delhi, India. March 2020.

2. WaterAid's work on safeguarding water quality from resource to users

WaterAid works with households, communities, district authorities, water supply operators, national government and academia to safeguard water quality at all levels – from the water resource to the household.

WaterAid's approach to water quality, as part of its *Water security framework*,[9] includes **working across the water supply chain**, with a multiple-barrier approach.[ii,10] Along with demonstrating good practice, behaviour change approaches and the building of local capacity is applied, while influencing national policies and regulations. This is done within a broader context of WASH system strengthening, with a holistic consideration of water supply governance and financing aspects.

- **All water sources constructed or rehabilitated with WaterAid's support are tested for water quality** before they are handed over to households, communities and local authorities or operators, to ensure that there are no significant risks to health. This testing regime is one of the risk-critical *Quality Programme Standards* and is set out in WaterAid Country Programme water quality policies,[11] which are tailored to the specific water quality risks and national standards. WaterAid follows WHO guidelines for drinking water and adhere (as a minimum) to national standards – unless they are deemed to be too lenient.[6]
- Beyond the initial testing, WaterAid's **work and promotion of safeguarding water quality relies on a multi-barrier approach**.[iii] This approach includes sanitary surveys as an ongoing risk assessment tool, to monitor potential contamination hazards surrounding water sources, improve design of water supply systems combined with maintenance programmes and hygiene behaviour change programmes to minimise the risk of contamination at the point of consumption.[10] This aligns with water safety planning and is often part of a broader water security planning process.
- Examples from a broad spectrum of interventions, revealed by WaterAid's 2020 global review, are detailed in the following section.

▼ Beakers containing solutions are kept as Shailendra Kumar, 48, conducts tests to check the quality of water in the background in a District Water Lab, Gaya district, Bihar, India. June 2018.

WaterAid/Prashanth Vishwanathan

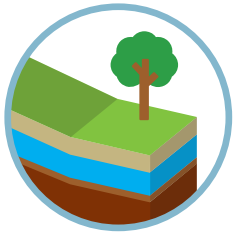
ii. With the water supply chain, we refer to the steps from source, abstraction, treatment, storage and distribution.

iii. The 'multi-barrier approach' considers the different threats to water quality from source to tap, and ensures there are barriers to eliminate or minimise impact. The approach recognises that while each individual barrier may not be able to completely remove or prevent contamination, and therefore protect public health, together the barriers work to provide greater assurance that the water will be safe to drink over the long term.

The graphic below presents water catchment and some of the key factors that can impact water resources and its quality, including agriculture, farming and the presence of latrines and industry. Within this, lies the water supply system, which is presented in the second graphic, showing the steps from water resources through to household access.

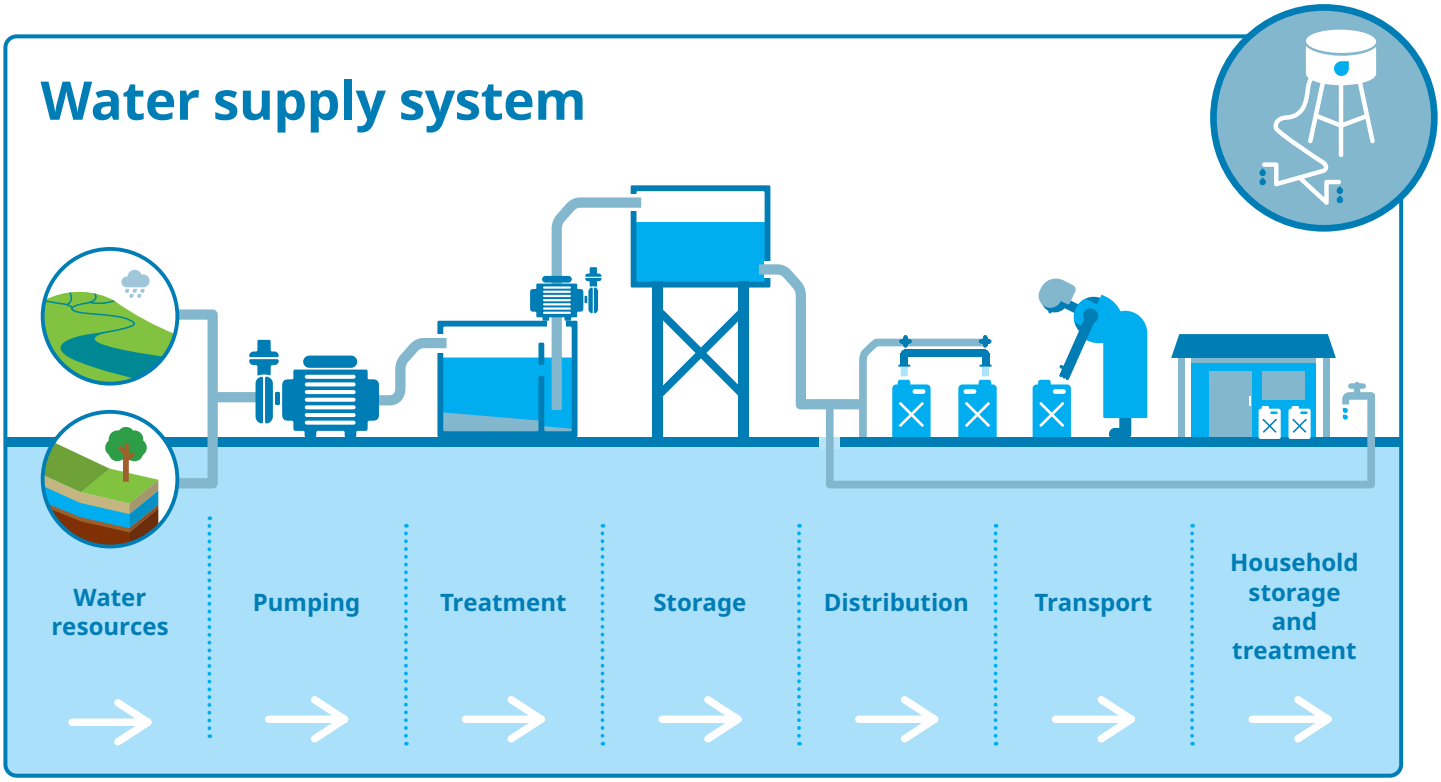
Water catchment

Surface water



Groundwater

Water supply system



2.1 Practice advocacy interventions in service delivery for water quality assurance

Overarching approaches

Water security planning

Water security planning is a process to address water resource risks at either the catchment, or local level. **WaterAid West Africa** have led the development and implementation of participatory Water Security Plans, providing a framework for achieving sustainable access to water for multiple uses – while maintaining healthy and diverse ecosystems in communities. Water quality risks are the key components of these plans, as high risks can derive from agricultural or industrial use of water resources or poor sanitation management. Water Security Plans include approaches to protect and improve water quality through improved hygiene and sanitation, source protection, the safe handling, storage and treatment of water, and water quality monitoring regimes.

WaterAid Ghana have supported local governments and partner stakeholders to develop water security planning in three districts through participatory processes. Water quality and quantity challenges for multiple water uses (domestic and livelihood) were identified – while also assessing requirements to maintain a healthy ecosystem with the context of climate change impacts and geogenic fluoride high concentrations. The outcome included a multi-year action plan, complemented by an investment and monitoring plan. This has then fed into the local government planning and budgeting processes in at least two districts.

WaterAid Pakistan have developed a Water Security Plan to assess the availability and sustainability of water resources in the Tharparkar District. Specific issues were identified to address water scarcity, and groundwater recharge from run-off has been introduced. This was complemented by improvements to decision making processes linked to multi-sector water allocations through a sub-basin collaborative planning approach. Long term water quality assurance was identified as a key challenge and linked to limited capacity for overall water scheme maintenance.

Water safety planning

Water Safety Plans (WSPs) are a preventative management approach applied to a water supply scheme to minimise the risks posed to drinking water quality and health from catchment to point of use. They are promoted by WHO[12] and provide a holistic approach to ensure safe drinking water for a water supply scheme through the prevention of water sources contamination, the treatment of water to reduce contaminants, and the prevention of re-contamination during storage and distribution.

WSPs are prepared with community members, who collectively identify contamination hazards at all stages of the water supply chain. Communities agree control measures to minimise the risk of contamination. The control measures are monitored periodically to ensure that they are working. Control measures may include catchment protection, source protection, ensuring water sources are well maintained, community-level water treatment, safe transport and storage of water, and household water treatment.

WaterAid Bangladesh have historically mainstreamed WSPs within its programmatic work, involving local community and government to perform risk assessments – identifying possible risks of contamination for water supply and planning preventative measures. They also developed context-appropriate information, education and behaviour change communications, which introduced the steps of the WSP – including hardware improvement, hygiene behaviour change and household contamination prevention measures.[13] To ensure scale up, the integration of the WSP within national policy was considered a key step.

In Nepal, the Government has endorsed the WSP approach and established a climate-resilient manual for both urban and rural water supply. **WaterAid Nepal** have been working primarily in rural areas and has extensive experience training water and sanitation user committees (WSUCs) and setting up WSP teams to support with the key steps of planning and

decision making. The WSP is also included as a key performance indicator for assessing WASH-resilient communities and as a tool to promote and ensure the sustainability of services. The following section presents WaterAid's experiences on the different steps of water safety planning.

Detailed steps

Water resource protection[iv]

Water resources are easily impacted by uncontrolled pollution and poor management. Approaches to prevent catchment and water resource contamination range from agricultural and farming run-off management, industrial and household waste treatment, and land management. These require multi-sectoral coordination and planning. WaterAid focusses on preventing contamination through safely managed sanitation and promotion of hygiene behaviour change interventions – while also collaborating with organisations and agencies to address contamination risks from other sectors.

- **Safely managed sanitation and wastewater management approaches** reduce the risks of ground and surface water contamination from poor latrine design and waste effluents. These vary considerably in countries and between rural and urban settings. They include demonstration and promotion of well-sited latrines, raised latrines where groundwater levels are high (or areas that are prone to flooding) and improvement of latrine designs and construction quality.

  In **Rwanda** and **Mozambique** the introduction of composting latrines have reduced the amount of faecal sludge (FS) for treatment, while allowing for effective reuse of the resource. Faecal sludge management (FSM) approaches – including emptying, transport and treatment – are a key preventative approach to avoid water contamination, particularly groundwater. A number of approaches have been implemented – for example, solar drying, co-composting as installed by **WaterAid Bangladesh**, or biodigesters for biogas production and rehabilitation of sewer systems in **Zambia**. To support improvements to FSM, and therefore reduce water contamination risks, shit flow diagrams (SFDs) are being introduced to support decision making and planning around FSM in several medium- to large-scale urban settings in different countries.

- **Catchment management plans** are key in supporting effective decision making between stakeholders and for multiple water users. These plans need to be developed in a participatory way with all sector stakeholders, in order to identify water resource contamination risks and prevention measures. In **Madagascar**, a holistic approach was implemented, including revegetation, combined with reviews of land use planning regulations with the authorities to improve water quality downstream of a catchment under strain from deforestation and agriculture.

  In **Bangladesh**, the ground water recharge strategy was influenced to ensure water quality standards were included in the National Managed Aquifer Recharge strategy. In **Nepal**, WaterAid supported community water resource management approach to ensure community engagement and participation in the decision making of water resource uses, allocation and contamination prevention. **WaterAid India** is also performing extensive research on groundwater recharge measures and water conservation interventions and its impact on water quality in Andhra Pradesh and Hyderabad, evaluating effectiveness of rainwater harvesting (RWH) structures.

iv. WaterAid's *Water framework* (2012) defines 'water sources (or water point)' as: a point at which water can be accessed. Sources considered to be 'improved' have been protected from contamination and include boreholes or dug wells capped with handpumps, protected springs, rainwater storage tanks, public tapstands or standpipes. Sources considered to be 'unimproved' include unprotected dug wells, unprotected springs, and surface water abstraction points on rivers, dams, lakes, streams, canals and irrigation channels. 'Water resource' is: the wider body of water upon which a water source depends. This could be rainwater, surface water (e.g. rivers, streams, lakes) or groundwater within an aquifer.

Water source protection

Water sources are at a risk of contamination if they are poorly sited, not protected adequately to avoid run-off intrusion, and if the materials for the abstraction of water are not well selected. WaterAid's approach is to demonstrate and advocate for best practice source siting, design and technology choices. Standards to ensure good water source protection are promoted through WaterAid's *Quality Programme Standards*,[2] while these are also adapted to local context and legislation. In some cases, water source protection is also delivered through rehabilitation of existing water supply to ensure it provides improved water quality.

- **Good siting for water supply** at the construction phase is key to avoiding a water resource with high-risk of contamination (for example, shallow aquifers with latrines close-by). Hydrogeological studies, review of existing borehole logs and site reports are generally completed to identify the best location and to understand the risks of high geogenic contamination (for example, from fluoride, arsenic, iron). Water quality testing is also performed before a new source (for example, a spring) is developed, or during the drilling and construction of new boreholes.
- **Infrastructure design** protects the water source from contaminated water intrusion (especially in wet seasons), sabotage or from animal access.[2,14] Wells and borehole casing, correct selection of screen and gravel packs for boreholes, sealing and wellhead security, and protection for springs – combined with trainings on cleanliness of areas around sources and regular maintenance – help protect the water sources further. **WaterAid Zambia** and **WaterAid India** have promoted the use of WaterAid's standard construction checklists with local governments and communities, to ensure the long term quality of source protection design and installations.
- **Improvements to self-supply infrastructure**, particularly ensuring protection of shallow wells with concrete seals and improved sources design. WaterAid Bangladesh provided extensive technical support in rural areas to the households with existing self-supply handpumps, along with supporting water quality testing.

Figure 2. Water with high iron content due to corrosion issues, Uganda.

This helped to improve the seal, platform and drainage systems of the water sources, reducing the risks of water supply contamination.

- **Technology, material selection and improvement** help to prevent water quality issues arising from material degradation. In Uganda, high iron content in water supply was leading to abandonment of improved water sources. **WaterAid Uganda** identified the root causes of the high iron content in the water supply due to the use of corrosive material for some galvanised iron pipes – coupled with the high acidity of the groundwater. With this evidence, WaterAid Uganda influenced changes to the national policies on technology and material selection for handpumps to address the issue at scale.

- **Sanitary surveys/sanitary inspections**[10] have been promoted as an important complementary measure to water quality testing. These help identify possible contamination hazards around water sources and the risk level associated with specific sources of contamination. **WaterAid Nepal** includes sanitary surveys as a key step in advance of the construction of water supply schemes – to help identify possible risks of contamination and to address them before construction.

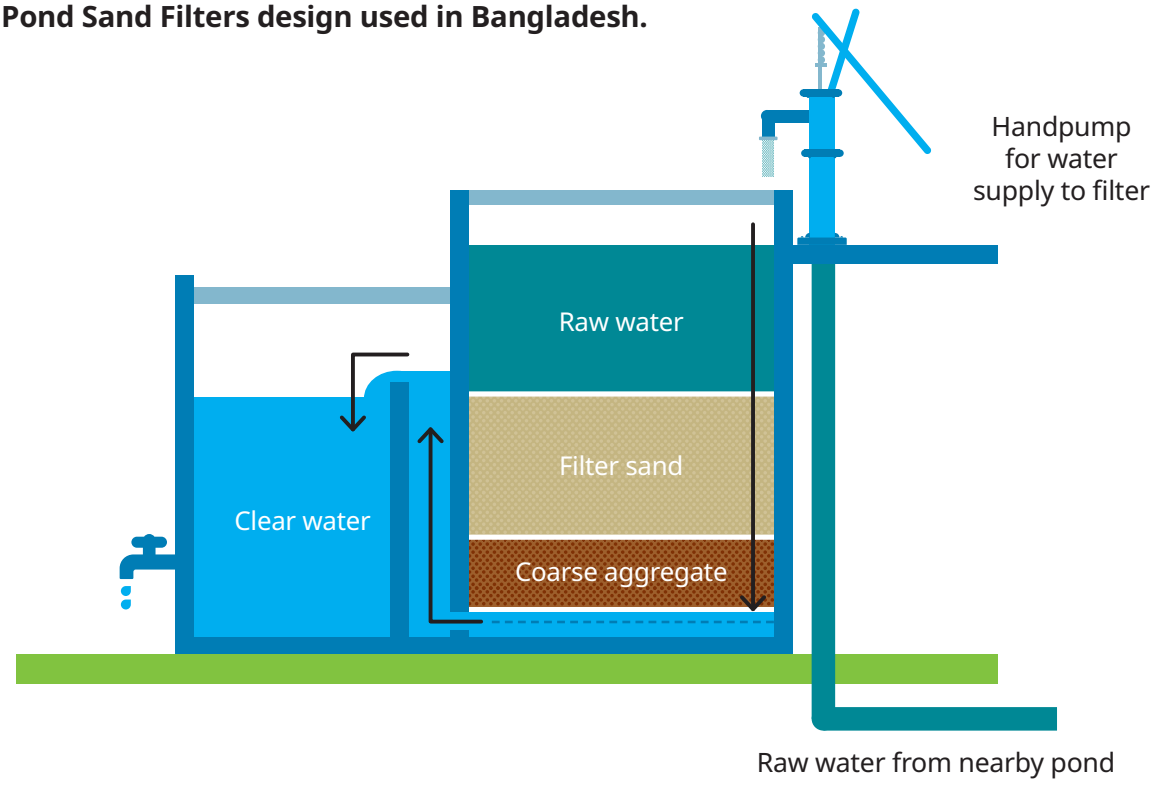
Bulk water treatment

Suitable water treatment processes and technologies are introduced, where necessary, to remove or reduce different contaminants in the water supply. Different treatment solutions exist depending on the type of contaminant – these are most commonly coagulation, so flocculation, settling, filtration and disinfection.

Disinfection with chlorination should be applied in all piped water supply networks to ensure residual disinfection capacity and to avoid microbiological re-contamination during distribution – for example, from leaks (which can be very common in intermittent water supply networks). WaterAid promotes the selection of the most suitable and sustainable solution for the local context and capacity, based on detailed feasibility assessments. These are required to evaluate local availability of spare parts, the development of the long-term operation and management (O&M) plans, maintenance plans (with use of Life Cycle Costing Assessments) and to assess the financial sustainability and local capacity.

- Different **filtration processes have been deployed in various contexts for removal of contaminants**:
  - **Slow sand filters** have been introduced as locally-managed treatment technology to reduce turbidity, microbiological contamination and chemical compounds. **WaterAid Myanmar** introduced slow sand filters as way to increase water quality in communities using pond water as the water supply. **WaterAid Bangladesh** has been largely introducing community-based Pond Sand Filters, particularly in coastal areas. These use a handpump to pump pond water to the inlet of a modified slow sand filter. **WaterAid Nepal** combines slow sand filters with aeration and iron removal process in Terai region where high iron concentrations are observed in groundwater.

Figure 3. Pond Sand Filters design used in Bangladesh.



WaterAid/HSBC/Drik/Habibul Haque

◀ Reverse Osmosis plants run by local women management groups in Bangladesh.

- **Reverse Osmosis (RO)** plants have been deployed in **Bangladesh** to address high salinity, arsenic and fluoride contamination, when alternative solutions were not sufficient. To secure the sustainability of the RO plants, the installation of these have been accompanied with the establishment of local management organisations, mostly run by local women, who oversee operation, fee collection and replacement processes.
- **Aeration and filtration processes, such as Arsenic Iron Removal Plants (AIRP)**, have been deployed in **Bangladesh** to remove high arsenic and iron concentrations. Extensive community consultation and O&M teams have been set up to ensure long term sustainability.
- **Chlorination** within piped water supply networks has been secured with deployment of different chlorination systems, particularly for those networks serving large numbers of people and healthcare facilities. **Madagascar** used electrochlorination powered by solar energy and controlled by free and residual chlorination measurements to ensure correct dosing.

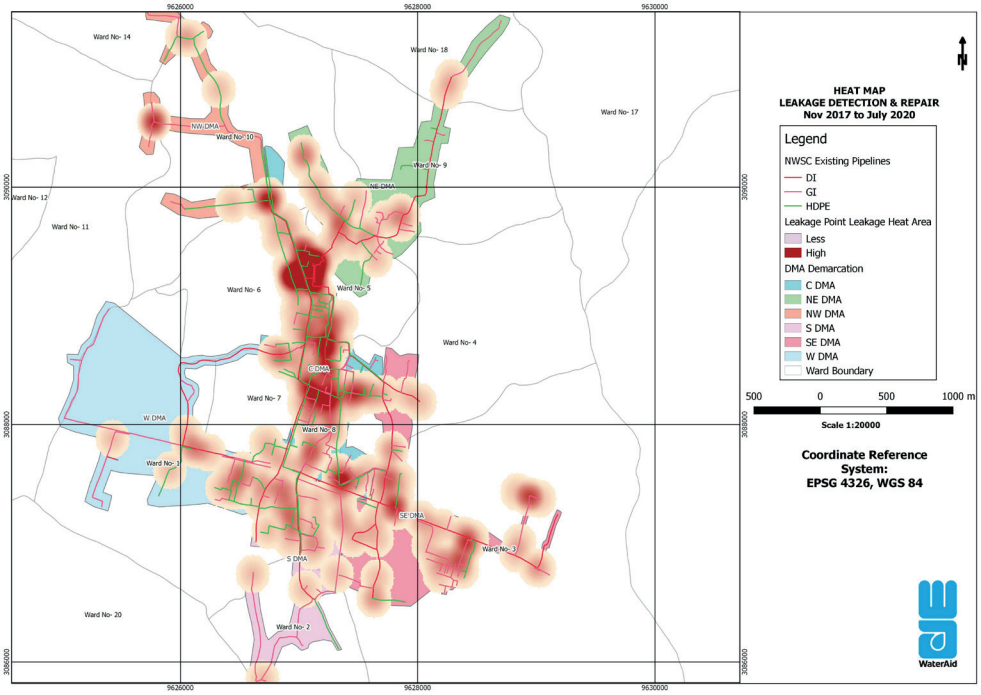
WaterAid/WaterAid Mali

Figure 4. SE FLOW onsite chlorinator tested in Mali.

▼ Moïse, 29, and Toky, 33, technicians working inside the water treatment chamber. Firaisantsoa Imanga village, Tsiroanomandidy district, Madagascar. June 2018.

WaterAid/Ernest Randriarimalala

Figure 5. Heat map of leakage detection and repair needs in Lahan, Nepal.



WaterAid/Nepal

Distribution via piped network

Ensuring water quality throughout the distribution network requires:

- Residual chlorination in water supply;
- Assessment and repair of pipeline leaks (with hygienic working practices);
- Reduced turbidity (for example, flushing out storage tanks regularly);
- A continuously pressurised system to avoid pressure changes that facilitate intrusions and leakage creation (if possible).

WaterAid Nepal has worked with the Nepal Water Supply Cooperation (NWSC) in Lahan to improve management of the intermittent pressurised water supply network. This allowed for improvements in the pressure management of the system and for the identification of further improvements needed to increase contamination prevention.

Household water treatment and safe storage (HWTS)

Water re-contamination can occur during collection, transport and storage from the main source supply to households. WaterAid's work on hygiene behaviour change aims to identify risk points and promote hygienic behaviours, which can help ensure safe water use through visual cues, nudges and prompts to remind behaviours. Attention to affordability of household's storage and treatment technology is also key to ensure equitable access.

- **Promotion of safe water transport and storage behaviours** are based on detailed formative research that provides insights into motivations and challenges of local communities' behaviour changes. This includes the transport and storage of water, in clean containers with lids, and separation of storage for treated water for drinking and other uses.
- **WaterAid Burkina Faso** have delivered a household water storage improvement programme (CQI) through a community participatory process. This involved making improvements to the design of household water storage containers, which resulted in improvements to water quality parameters in household stored water.

- **WaterAid Malawi** have created videos with messages to motivate and promote the use of closed containers and household water treatment options, to address the key challenges observed around post-collection re-contamination.
- **Point of use water treatment (household or institutions)**, including chlorination, boiling, filters, solar disinfection (SODIS) and filtration. These treatments are to be introduced where microbiological or other priority chemical contamination is over the maximum acceptable concentration, and centralised water treatment is not effective or appropriate to the context. However, household water treatment often requires extensive follow-up, so this should be implemented as part of a behaviour change programme.

  Also, institutional policy and regulation around household water treatment is still weak and supply chains to ensure long-term availability and affordability of produces need to be ensured. To address issues with centralised fluoride treatment works shortfalls, **WaterAid India** tested and supported the scale up of different household water treatment solutions for fluoride reduction, including clay-based filters and Nilogon filters. These were selected following a detailed comparison of different sustainability factors, such as local financial and technical viability.

In cases of emergencies, WaterAid have also supplied and promoted the use of household chlorination solutions and safe water storage containers to respond to temporary changes in water supply quality.

WaterAid/

Figure 6. DelAgua portable water quality testing kit.


WaterAid/Jordi Ruiz Cirera

◀ Jerry cans ready to be filled up with clean water from a flexible water tank in Patamana, Manaure, La Guajira, Colombia. March 2017.

Figure 7. Performing field test E-coli testing with Aquagenx compartment bag tests in Myanmar.

2.2. Practice advocacy interventions that strengthen the WASH system for water quality assurance

Demonstration of best practice service delivery needs to be accompanied with interventions that **strengthen the overall WASH system**. This is key in ensuring effective **planning, regulation and monitoring** processes are in place for **long-term, sustainable and safe water for all**. In relation to the key functions that impact water quality, WaterAid have focused on the following activities:

- Supporting **national governments to set up national policies and standards** for water quality in water supply, where these were non-existent or needed updating.
- **Strengthening capacity of local and national government and other service providers to perform routine water quality monitoring.** This includes supporting the provision of testing equipment in district government facilities, and the establishment and/or strengthening of laboratories' capacity to perform regular testing of high-risk parameters. For example, in **Madagascar** and **Ghana**, WaterAid have advocated and supported the integration of routine water quality monitoring in national and sub-national sector budgeting and planning processes, along with community development plans.

  While **WaterAid Ethiopia** have influenced local governments to include water quality testing in the long-term district strategic plans. **India** has adopted approaches to both strengthen the capacity of local laboratories, while also introducing complementary water quality testing through the community volunteers field test approach. In **Nepal**, WaterAid have been building the capacity of a public utility to monitor water quality in a more regular and systematic way. Results are now shared in project co-ordination meetings with the local government to inform improvements in remedial actions.
- When routine monitoring was not present, WaterAid have been advocating and supporting the **integration of water quality indicators into different national WASH monitoring processes**. **Myanmar** has promoted use of water quality indicators in their national rural water supply monitoring. They have also demonstrated how to integrate routine testing of key high-risk water quality parameters into government-led monitoring processes and included in the Management Information System (MIS), with use of simple field test kits (Palintest and Aquagenx CBT tests). Water quality data sharing is also being promoted as a way to support sector coordination.
- **Building communities' understanding of water quality issues and complementing**

the authorities' community-based water quality monitoring. In **India**, to address a gap in monitoring by service authorities, WaterAid have promoted community-led water quality monitoring using field-test kits. Over 3,000 sources have been tested using this approach, increasing awareness of the impact of high contaminants presence on health within communities. Furthermore, **WaterAid India** is building capacity of community members and government to create participatory Village Action Plans that evaluate the current status of water supply, and the sustainability of water sources.

WaterAid Nigeria have supported community involvement in water quality monitoring in Benue state through the use of field test kits – with a particular focus on identifying contamination from livestock and local activities. In case of high-risk activities, WaterAid Nigeria provided recommendations on local improvements to water management.

- **Strengthening sector coordination and integration of water quality**, particularly when responsibilities for water quality assurance and water resource protection lie within different ministries, such as health and water. In **Ethiopia**, as a result of the 'Ethiopia 20 Towns Project', there is strengthened coordination between utilities, town administrations and Health Departments – impacting water quality surveillance and resource preservation. In particular, the creation of the WASH urban management forum, has helped develop a platform for information sharing and multi-stakeholder problem solving – including on water quality and land management around sources.

2.3 Policy advocacy interventions that strengthen WASH systems for water quality assurance

To complement the practice advocacy work, WaterAid supports improvements to national and global policies and frameworks to address water quality risks. In particular for:

- **Establishing and strengthening institutional arrangements** that impact on water quality assurance. This includes setting up and strengthening the capacity of water user associations, establishing multi-stakeholder task forces and district water boards, and promoting the development of roles and responsibilities for water quality assurance. **WaterAid Madagascar** and **WaterAid Nigeria** have recently supported the creation and strengthening of national water quality monitoring policy, along with clarifying roles and responsibilities. This has helped to address gaps observed in authorities' capacity in water quality issues and to re-activate the water quality thematic working groups (in Nigeria).
- **Supporting development of (or improvements to) national policies that safeguard water quality. WaterAid Uganda** has channelled the outcome of the research around water supply technology material selection through the existing Joint Sector Review. This evidence sharing has influenced the national guidelines and policies review, leading to a reduction in water contamination risks.

WaterAid Bangladesh have influenced the Government to include water quality standards for groundwater recharge in the National Managed Aquifer Recharge strategy and to develop the FSM Institutional and Regulatory Framework.

WaterAid Tanzania have influenced national-level policy on high-risk contaminants, with reduction of fluoride national standards from 4mg fluoride/litre water to a lower concentration, in line with WHO international standards of 1.5mg fluoride/litre.

- **Advocating for increased WASH finance to address financing gaps at national and sub-national levels for safe and sustainable water supply.** As part of wider WASH financing advocacy work for sustainable services, WaterAid generated detailed evidence of long-term water supply operation costs. This includes minor and major maintenance and replacement costs, technical support costs (such as water quality testing, WSP activities, local government staff time and expenses) required for assuring safe water supply, in-line with life cycle approaches. This aims to address some human resources and technical capacity shortfalls for testing and follow-up remedial action.

3. Gaps in policy and practice

WaterAid's review identified several areas where more targeted policy and practice work could be undertaken to ensure the safeguarding of water quality.

3.1 Key opportunities for practice advocacy:

- **Addressing the long-term sustainability of technical solutions.** Prior to the implementation of technology, a greater focus on robust feasibility assessment is required. These assessments should include:
  - Technical suitability and capacity (spare parts availability, local technicians etc);
  - Long-term costing (including minor and major maintenance, replacements and direct support) – in line with the life cycle costing approach;
  - Financial sustainability (looking at affordability and finance sources);
  - Selection of an appropriate management model.

Feasibility assessments are often rushed or disregarded due to political pressure to introduce specific solutions or donor funding associated with technologies. When complex solutions (for example, more advanced water treatment technologies aimed at removing arsenic, iron or fluoride) are implemented, the lack of proper feasibility assessment leads to risks of poor sustainability and equity of safe water supply services.

- **Supporting the scaling up of good practice.** While good practices for water service provision or treatment are being introduced, there is often a **limitation in the capacity and resources available to scale up and institutionalise successful** processes, methodologies and models – or to **influence the policy or regulatory changes necessary**. Stronger links between programmatic evidence and policy and advocacy work at the national-level are necessary to ensure field-level successes and lessons learned can be scaled and used to influence future policy and practice.

- **Highlighting the funding gap**. In line with the broader WASH sector funding gap, **funding for the assurance of safe water supply is lower than needed**. Budget for infrastructure maintenance and replacements, routine water quality testing and follow-up actions to ensure safe water supply for all by local service providers is limited.

- **Highlighting the data gap.** Water quality data collection and management at scale is weak, and in some cases non-existent, leading to a gap in response to water quality challenges or inequalities of access. As observed in other recent research,[15] in most countries' national databases of water quality testing results, groundwater quality from drilling records are not present – and data from different sources is not collated consistently.

  This hinders capacity for long-term evidence-based decisions around water supply. Gaps in water quality data are also highlighted by the UNICEF and WHO JMP, which reports that a large number of UN member states are still unable to report on safely managed drinking water, often due to the lack of nationally-representative data on water quality.[16]

- **Addressing low testing capacity.** Properly equipped laboratories or rapid, low-cost in-field water quality testing methods are often not available, particularly in rural areas. While laboratory testing is still

the main approach used, this is associated with complexity, cost and delays, particularly in contexts where the laboratory is far away or lacks reliable electricity. This often results in non-representable water quality testing results, particularly for microbiological contamination.

Alternative field test kits, such as simple presence/absence tests (H2S vials), can be unreliable. However, more accurate tests, such as the Del Agua or Wagtech membrane filtration, are relatively expensive, time-consuming and need to be done very carefully to avoid cross-contamination of samples.

- **Investing in community awareness.** Low community awareness of water quality can lead to them choosing unimproved water supplies based on perception. Along with preference of taste, temperature, colours or the location, and the lower cost of the water sources against improved water supply.

▼ Souleymane Diallo, 56, trainee water mechanic, in Samabogo, Cercle de Bla, Segou Region, Mali. April 2018.

WaterAid/Guilhem Alandry

3.2 Key policy and advocacy opportunities

- **Addressing the political prioritisation gap between water supply access and water quality.** Despite the inclusion of water service levels (including water quality) in SDG 6 targets and monitoring, increasing coverage and extension of water supplies is still being given more attention and funding than improvements and long-term assurance of service levels.

- **Supporting consensus-building and coordination across sectors.** Being a multi-sectoral issue, different ministries are responsible for the different components of the water quality chain: from water, health and environmental government bodies. This requires extensive coordination efforts and clarity on roles and responsibilities, which is often lacking.

- **Advocating for improved regulatory performance.** Experiences from WaterAid's Country Programmes provide many examples of poor policy enforcement. This includes gaps in regular testing and no penalties for failing to report or non-compliance with water quality standards.
For FSM, regulation around water resources protection and contamination prevention is often not enforced. Lack of active or funded regulatory bodies hinders capacity to implement policies and ensure compliance. More research on the changes required to strengthen the performance of regulators is required.

4. Call for action

To realise universal and sustainable access to safe water, there needs to be increased political prioritisation, investment and effort targeted at water quality. Presented below, are some of the key call for actions identified from this global review of water quality.

For national and local governments, and local service authorities:

1. National governments should champion **water quality as a human right**[17] **and a public health issue**, and make the **political and financial commitments** necessary to meet this challenge.

2. Incentivise compliance with water quality standards by setting clear national and sub-national targets. This should aim to **shift incentives beyond increasing coverage rates only**.

3. **Support clarification of roles and responsibilities** and strengthen coordination between Ministries for water quality surveillance.

4. **Strengthen the role of regulatory bodies**, recognising the variety of forms these take, to enforce water quality policies and standards. Regulators should be empowered and resourced to take punitive actions against breaching of water quality standards in water supply and waste discharge.

5. Increase and ring fence **dedicated financing** for safeguarding water quality, particularly for surveillance, routine water quality testing and infrastructure maintenance. This also requires adequate technical and human capacity to perform such functions.

6. Ensure that **sustainable solutions** are introduced – with a focus on **finance and technical sustainability**. Feasibility assessments should be undertaken with consideration to local capacity maintenance, life cycle costing and affordability. Appropriate management models need to be introduced to increase the likelihood that results last.

7. Strengthen the **water quality data MIS** for water quality data consolidation and sharing. Data is captured, analysed and presented in a way that decision makers can use.

8. Support **awareness raising in communities and households** around water quality at the point of collection by increasing engagement and transparency around water quality data. Promote active participation in water safety planning and community/users water quality perception feedback mechanisms.

For other sector practitioners and international NGOs, including WaterAid:

1. Practitioners should **share (or support the sharing of) water quality data within an accessible national database** to inform future decision making.

2. **Demonstrate good practices that can be scalable and sustainable.** This requires completion and publication of **feasibility and sustainability assessments** of safe water supply solutions and technologies. These assessments should cover financial, technical, human capacity and environmental feasibility.[v] Furthermore, solutions introduced should be accompanied by the strengthening of service providers, authorities' and communities' capacities to operate and manage water supply, and safeguard water quality.

3. **Strengthen the WASH system's functions related to regulation, planning and financing of safe water supplies.** Support fully **costed planning and monitoring** of safe water supply. Support **sector coordination** within and between different ministries (e.g. water and health), and other sector actors, and facilitate the clarification of roles and responsibilities related to water quality assurance. If required, support the development of water quality-specific technical platforms and data management systems.

4. Support communities in **demanding their rights for water quality and encourage awareness of the financial contributions** required, that can contribute to water quality assurance.

For all, to advocate:

1. **Raise public, government and donor awareness of water quality problems and their causes**, and encourage the uptake of relevant policy interventions, including those listed in this brief. Highlight the responsibilities and obligations of governments and service providers to ensure safe water under the human rights agenda and use this to hold them accountable.

2. To achieve consistent water quality for disease prevention, integrate **water safety planning** and regular testing.[18] These activities should fall **within a broader water supply management approach and holistic water security plans**.

3. **Equal priority** is to be given to **water service levels**, such as water quality provision and contamination prevention, as much it is to increase coverage rates. This is necessary to **ensure quality of water supply service and public health**.[19] **Increased prioritisation needs to be followed by more funding** allocations to address current gaps that hinder safe water service delivery.

v. See example of technical feasibility approaches at: technologyapplicability.wordpress.com/ (accessed 25 Feb 2021).

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