

Technology brief

Appropriate technologies for sustainable and inclusive water, sanitation and hygiene

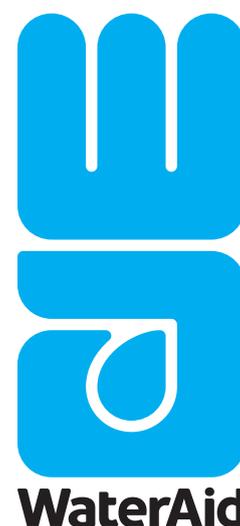


For more than 40 years, it has been accepted that just providing physical infrastructure for water, sanitation or hygiene will not result in a sustainable or inclusive service. Without an appropriate management model, ongoing finance and skilled maintenance staff, facilities will fall into disrepair. Without the participation of intended service users, particularly women, services and facilities may be inappropriate, unused or abandoned altogether. The infrastructure therefore needs to be suitable for the social, economic and natural context.

Hardware and software

Learning from the lessons of inappropriate technical solutions, there are two essential components of a successful water, sanitation and hygiene project. These are hardware (the physical infrastructure) and software (the social and economic aspects). These terms are also used in information technology. Every computer, smartphone or tablet requires programs, apps and operating systems to work. The correct software has to be used with the right hardware, or the computer will not work.

Software issues are not as tangible as hardware provision but are equally important. Since the 1980s, different aspects of software have been identified, such as social, economic and environmental issues. These are specialist topics in themselves, requiring expertise. A single professional could not be expected to carry out all the technical tasks, so adding all the software aspects to the technical role too is not feasible. A team comprising a range of individuals with relevant expertise is therefore required to ensure both hardware and software aspects are adequately covered in any water and sanitation project.



Increasing specialisation

On the technical hardware side, there are hydrologists, hydrogeologists, water chemists, hydraulic engineers, mechanical engineers, information scientists and civil engineers. The software side has hygiene promoters, behaviour change experts, epidemiologists, community management professionals, economists, monitoring teams and evaluators. There are people working on equity issues, making sure nobody misses out on the benefits of good water, sanitation and hygiene facilities, championing the human rights to water and sanitation, and advocating for women, people with disabilities and children, who can be neglected.

The different geographic contexts in which water, sanitation and hygiene (WASH) projects are delivered (for example, urban, peri-urban, rural, and emergency-relief settings) are also areas of specialisation, requiring people with specific expertise.

The range of people involved in inclusive and sustainable service delivery is not only divided by professional sector, but also along organisational lines. There are the project teams implementing the work – led by project managers, regulators checking the work meets national standards, and politicians and policy makers setting the direction of larger programmes. Campaigners lobby decision-makers and consultants advise on different ways of implementing projects, programmes and policies. Researchers and academics help generate the evidence needed to inform changes in both policy and practice.

The WASH system

The growing recognition that no one technology, single approach or type of expertise will achieve inclusive and sustainable WASH services has given rise to a focus on systems thinking and WASH systems strengthening.

We understand the **WASH system** to be **all the people, behaviours, policies, processes, resources, interactions and institutions necessary for delivering inclusive, lasting, universal access to WASH**. Much like an ecosystem consists of a biological community of interacting organisms and their physical environment, relevant literature sums up the WASH system as actors, factors and the interlinkages between them. A WASH system is more than the sum of its individual components. Flows of money, information, power and responsibility connect the various parts of the system. Barriers, bottlenecks and breaks in these connections weaken the whole system.

To identify weaknesses or barriers, WASH systems are often broken down into smaller component parts, for example, the actors (people and institutions), factors (processes, policies and resources), and interactions (behaviours; power dynamics; relationships; gender, cultural and social norms).

Improving the function of a single component or building block will have a limited impact if this does not have a positive impact on other building blocks or how they interact with each another. The connections are elements of the system in their own right, forming **linkages** that make each block dependent on the performance of other blocks.

WASH systems strengthening

Systems strengthening means understanding that WASH exists in complex systems with many component parts and within different social, economic, political and environmental contexts. It involves identifying and working to address the barriers in behaviours, policies, processes, resources, interactions and institutions that block the achievement of inclusive, lasting, universal access to WASH.

Responding to identified barriers in a WASH system often requires a diverse range of skills, partnerships and activities. Depending on what the barriers are, activities could include: building the capacity of service providers and local authorities; empowering marginalised people to demand their human rights to water and sanitation and shape the delivery of services; demonstrating service delivery models; carrying out research; influencing national policies, standards and processes; and convening and facilitating dialogue between relevant stakeholders.

In a WASH project, a systems strengthening way of working requires a diverse group of people, cutting across practice and policy teams, to work together towards shared objectives to unblock barriers that exist at multiple levels (from

local to national). Pausing to reflect, identify contextual changes and challenges, learn, and adapt project plans is central to a systems strengthening way of working. This helps to ensure challenges are overcome, opportunities to accelerate progress are identified, and planned activities remain relevant to the changing context.

Where is technology in the WASH system?

A strong WASH system is one that delivers sustainable and inclusive water, sanitation and hygiene services to everyone. The selection, installation and promotion of appropriate technology is therefore a critical component of any WASH system.

Technology is not an isolated component or building block, it has linkages with many other elements of the WASH system. For example, WaterAid, in addition to demonstrating good practice in the design and delivery of borehole-based water supplies, could also support governments to develop national standards to ensure high quality design and installation of all borehole-based water supplies across a country.



● The WASH system comprises the actors, factors and interactions/relationships that influence the achievement of inclusive and sustainable WASH.

WaterAid's technology briefs

A systems ways of working helps WASH professionals situate themselves within a complex web of actors, factors and interconnections that affect the achievement of inclusive and sustainable WASH. While WASH professionals will have specific areas of interest and expertise, they must keep in mind a broader perspective about how their work and the work of others interact in order to progress towards their shared goal.

Communication between these people is aided by mutual awareness of each other's role. Engineers will be engineers and economists will be economists. There is no expectation that engineers need to be gender experts, but they should be aware of a range of software issues. Conversely, gender experts are not employed to carry out technical designs, but if they do not understand or have an appreciation of the basic elements of WASH technologies then progress towards the goal of inclusive and sustainable WASH will be slow.

To highlight how the selection of different technology options is influenced by a range of socio-economic issues in the WASH system, WaterAid has revised its technology briefs.

These are deliberately short, accessible documents to benefit a wide audience:

- Technical professionals who need to be aware of the social and economic impacts of their designs on service sustainability and inclusion
- Socio-economic experts working in the WASH sector who need to know how technology choice can have positive (or negative) impacts on service sustainability and inclusion

The briefs are not design guides and they should not be used as such. The references provided contain the detail qualified technical staff need to design and construct suitable facilities.

The technology briefs have been designed as a series. Some are broad overviews (such as a comparison of different water sources), while some take a look at one specific type of technology (such as gravity water systems).

Each brief examines one physical aspect (technology/infrastructure) from a variety of perspectives: social, economic, environmental and management.

After reading the technology briefs, we hope you will have an overview of the important issues to consider before selecting and implementing a technology, in order to ensure it is appropriate and feasible for the context, and where to go to find detailed technical resources.

- Infrastructure can be made more inclusive by considering specific needs of community members (Uganda)



Learning from failure

In WASH projects with a direct service delivery component, poor siting, design and installation of WASH facilities and services are key drivers of poor sustainability and inclusion. While on the surface these issues may manifest themselves as technological failures, they can also be symptomatic of other weaknesses in the WASH system.

Weak links between engineers and those responsible for community engagement or financial planning can mean information engineers need is lacking or in the wrong format. Similarly, local authorities responsible for supervising the construction of new services or monitoring the status of existing services to inform remedial actions may have limited resources to fulfil these functions. The symptom may be inappropriate or failed services, but the cause is a wider system failure.

Since the 1990s, there have been many initiatives to increase engineers' awareness of a whole range of software issues, but, perhaps with the notable exception of WASH for people with disabilities, the need to promote technical issues to socio-economic experts has not been so prominent. A lack of awareness about other building blocks in the system weakens the linkages between them.



- Project staff discuss project with Satala community members, Niger

Useful resources

For more information on WASH systems, see:

Casey V and Crichton-Smith H (2020). System strengthening for inclusive, lasting WASH that transforms people's lives practical experiences from the SusWASH programme [online]. WaterAid. London, UK. Available at: <https://washmatters.wateraid.org/sites/g/files/jkxooof256/files/suswash-global-learning-report.pdf>.

For more information on sustainable livelihoods, see:

Ashley C and Carney D (1999). Sustainable livelihoods analysis: Lessons from early experience [online]. Department for International Development. London, UK. Available at: [www.shareweb.ch/site/Poverty-Wellbeing/resources/Archive files/Sustainable Livelihoods - Lessons From Early Experience, Caroline Ashley, Diana Carney 1999.pdf](http://www.shareweb.ch/site/Poverty-Wellbeing/resources/Archive%20files/Sustainable%20Livelihoods%20-%20Lessons%20From%20Early%20Experience,%20Caroline%20Ashley,%20Diana%20Carney%201999.pdf).

WaterAid is an international not-for-profit, determined to make clean water, decent toilets and good hygiene normal for everyone, everywhere within a generation.

Part of a series of WaterAid technology briefs available at www.wateraid.org/uk/technology

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