THE OVERLOOKED SOLUTION

Strengthening climate resilience through sanitation systems

Policy brief

July 2023

WaterAid

INTRODUCTION

Sanitation plays a vital role in building climate resilience. To maximise this, all sanitation systems should be resilient themselves. To achieve this, we need to move beyond infrastructure-focused interventions and take a systems-wide perspective along the entire sanitation service chain. However, to date, climate change impacts on sanitation systems and corresponding solutions have not had the attention or financing needed.

We need robust sanitation systems, that can quickly return to usual services when climate hazards cause disruptions and failures. Strong climate-resilient sanitation systems that are well designed, managed and resourced for long-term performance both minimise the risk of impacts from climate-related events and the vulnerability of communities due to health, environmental and economic disruptions.

If we are serious about climate adaptation, we cannot wait to address this critical dimension of climate resilience.

Climate-resilient WASH

Water, sanitation and hygiene (WASH) services and behaviours that continue to deliver benefits, or that are appropriately restored, within a changing climate context and despite climate hazards. Robust, sustainable WASH systems can improve resilience to climate change.[1]

Why is it critical to focus on sanitation?

- Sanitation systems need to be strengthened, so they can return to full operation more quickly when climate hazards cause system failures and service disruptions. We are already witnessing climate hazards, such as higher temperatures and flooding, impact sanitation systems, often reducing or stopping the delivery of vital sanitation services.
- Strong sanitation systems are essential for building broader resilience by protecting people and environments from pollution and disease outbreaks, like cholera. Climate-resilient sanitation services are better able to adapt to climate impacts, which ultimately increases the resilience of the communities using the services and of their surrounding environments.
- Sanitation adaptation and resilience measures have traditionally been overlooked in the climate sector, while the sanitation sector has similarly overlooked how climate hazards affect sanitation systems. To confront the impacts of climate change, both the climate and sanitation sectors need to work collaboratively and with other interconnected sectors to build true resilience.

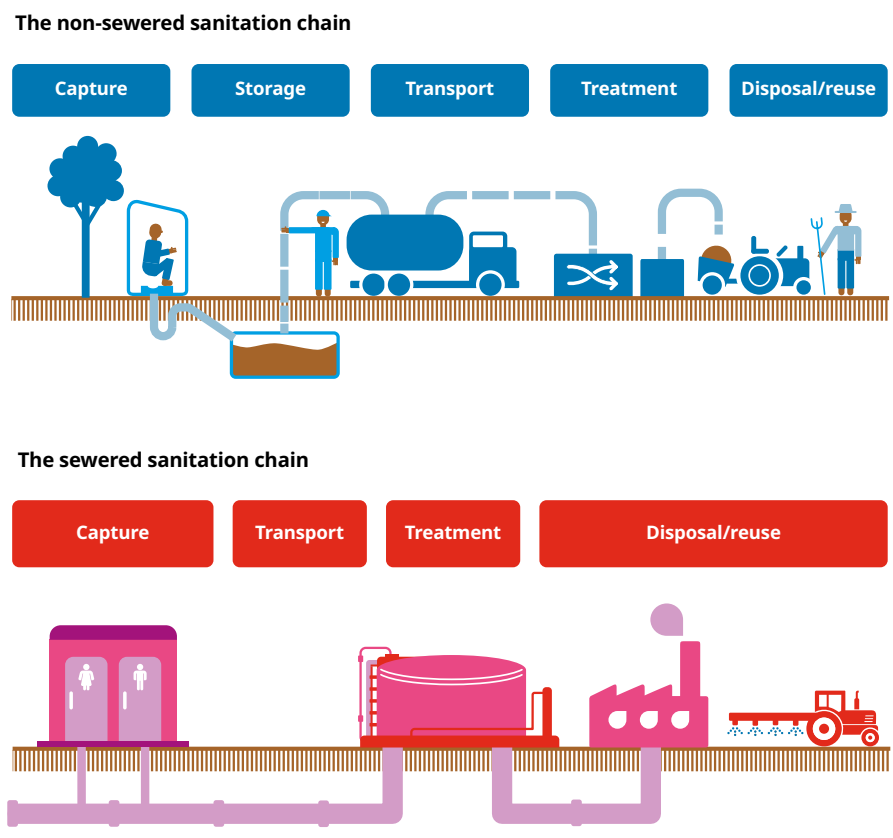
Sanitation for climate resilience

Many people don't have access to sanitation services that are fully functional and treat all waste. Over half the world's population use sanitation services that don't treat faecal waste.[2]

To ensure stronger water security and reduce pollution risk, untreated faecal waste must be accounted for and treated. To do so, the full sanitation system, including long-term operation and maintenance, regulations and capacity building must be considered.[3]

Globally, focus on sanitation has been on sewered or piped systems, but that is not enough. Around the world, over half of the people with access to sanitation services are using non-sewered systems, which means toilets that collect and store faecal waste in a pit or septic tank, instead of going through a piped or sewered system. Both types of systems (Figure 1) can meet safely managed service standards, related to Sustainable Development Goal (SDG) 6, and both can be climate-resilient.

Figure 1: Sewered and non-sewered sanitation systems



Sanitation system

"A context-specific series of sanitation technologies and services for the management of faecal sludge and/or wastewater through the stages of containment, emptying, transport, treatment and end use/disposal".[4]

Non-sewered sanitation system

"The technologies, infrastructure and services required to safely operate and maintain toilets which hold waste onsite for a certain period (e.g., containers, pits, or septic tanks) until emptied and transported for safe disposal or reuse".[5]

Sewered sanitation system

"Technologies, infrastructure and services required to safely operate and maintain toilets connected to a piped network or sewers".[5]

What is the difference between a service and a system?

Sanitation services refers to the part of the system that are outside the infrastructure throughout the sanitation chain, such as emptying containments and other maintenance.

HOW CLIMATE AFFECTS SANITATION

When it comes to the impacts of climate change on sanitation systems, and the consequences for communities and the surrounding environment, there are three key considerations: **the specific climate hazard and its resulting impacts on sanitation services, the vulnerabilities of sanitation users to these hazards, and the resilience of the sanitation system**. The following three sections go into depth on each of these considerations.

Kalabogi village is situated in the Sutarkhali Union at Dacop Upazila. The main type of toilet used here is the open air hanging toilet. Tidewaters overflow this area regularly and the recent super cyclone Amphan has destroyed most of riverside toilets. Dacop, Khulna, Bangladesh. August 2020.

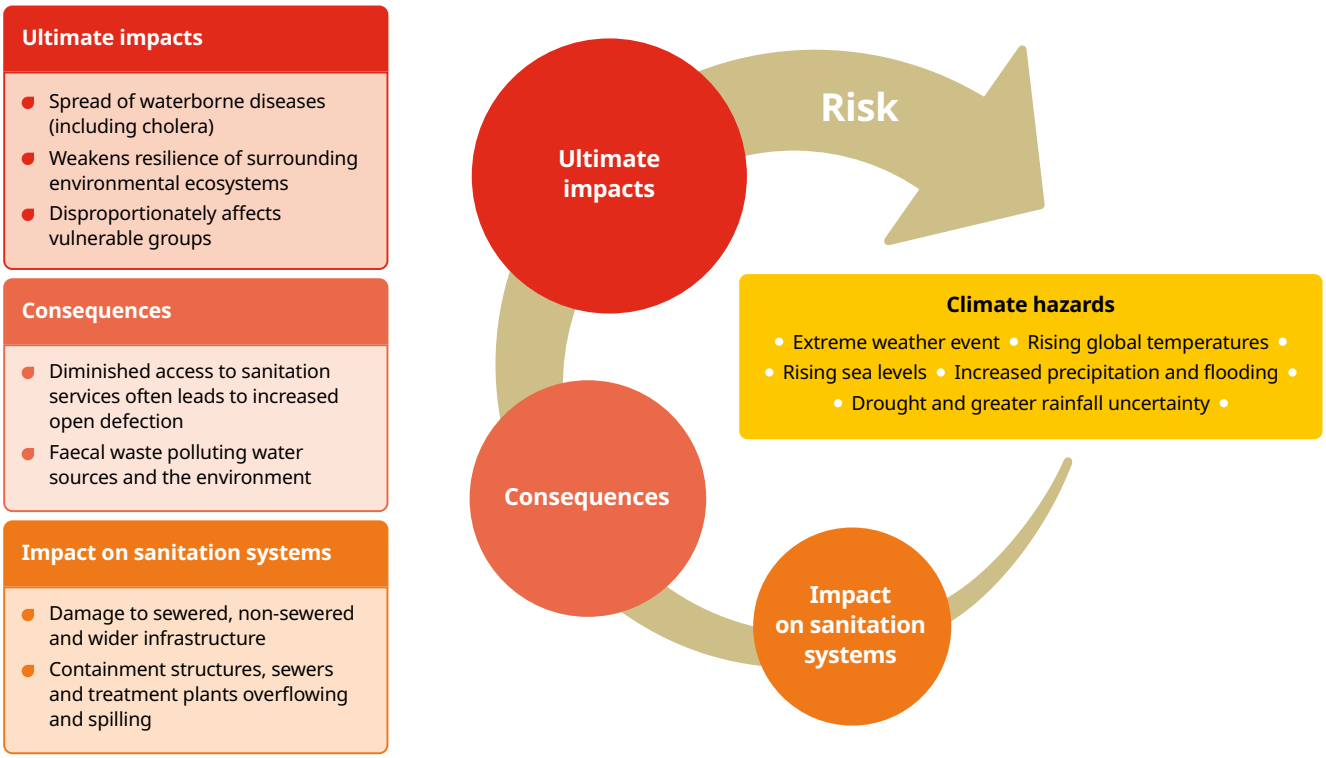
WaterAid/DRIK/Habibul Haque

1. CLIMATE HAZARDS DAMAGE SANITATION SYSTEMS, LEADING TO PUBLIC HEALTH CRISES AND ENVIRONMENTAL POLLUTION

Climate hazards can be slow-onset events such as higher temperatures or rising sea levels, or extreme events like cyclones and storms. These events can damage and disrupt sewered and non-sewered sanitation systems and cause overflows and spilling of faecal waste. As Figure 2 illustrates, these impacts on sanitation systems, have two key consequences: reduced use or availability of sanitation services, which leads to increased open defecation; and untreated faecal waste polluting water sources and the environment.

The ultimate impacts on communities are felt as serious public health issues such as disease outbreaks, like cholera and other diarrhoeal diseases; child mortality and stunting increase, and cognitive development decreases.[6] The whole community – even those with working sanitation services – are impacted because it takes just one community member without access to proper sanitation for waterborne diseases to spread.[7] There is also a negative feedback loop because higher temperatures cause waterborne diseases to spread more easily.

Figure 2: Examples of initial and cascading consequences of climate hazards impacting sanitation systems



Shabana lives with her husband and their son Argho in a coastal and flood prone region of Bangladesh. They use a climate-resilient toilet which does not overflow when tidewaters rise, reducing the spread of waterborne diseases. Khulna, Bangladesh. August 2020.

2. CLIMATE IMPACTS DISPROPORTIONATELY AFFECT VULNERABLE SANITATION USERS

Characteristics such as age, gender, ethnicity, health, geographic location, socio-economic status and pre-existing access to water and sanitation will influence how vulnerable people are to climate hazards and thus how well they are able to cope with (i.e., be resilient to) climate impacts. In particular, people who are already disadvantaged or experiencing marginalisation are more vulnerable to climate hazards, and hence carry a great burden in responding to the resulting impacts – which can further increase existing inequalities.[8]

The reality of cascading impacts is true for climate impacts in general and, especially, for impacts on sanitation systems. For instance, where there is only one accessible toilet in a community, a person with disabilities' climate risk is higher because of a potential single point of failure – there is no redundancy or backup support for those who can only access that single toilet.

Climate vulnerabilities linked to gender mean climate hazards on sanitation systems disproportionately impact women and girls. When toilets stop working or are destroyed by climate hazards, women, girls and gender minorities for whom it is more dangerous or culturally unacceptable to urinate or defecate in the open, struggle to find a safe alternative. They may have to travel further to find a toilet or wait until night-time for privacy to urinate or defecate in the open, exposing them to a greater risk of gender-based violence.[9]

Many will drink and eat less to reduce trips to the toilet, which will have negative impacts on their health. As Figure 2 illustrates, climate hazards like flooding can increase faecal waste contamination and the spread of diseases like cholera and diarrhoea. Women and girls are often expected to care for the sick, so the increased care burden falls disproportionately on them. Our *Gender equality and climate resilience* report has more examples of the gendered impacts of climate hazards on sanitation services.

The sanitation sector has generally struggled to ensure the specific needs and voices of women, children and other climate-vulnerable people are adequately considered when realising the human right to sanitation for all. The sector has a long way to go to adapt to both climate hazards and user vulnerabilities. But the need to adapt sanitation systems to be resilient to climate change can become an opportunity to advocate for more inclusive services and participatory interventions.

3. CLIMATE-RESILIENT SANITATION SYSTEMS CONTRIBUTE TO STRENGTHENING BOTH COMMUNITY AND ECOSYSTEM RESILIENCE

The resilience of sanitation systems determines the severity of the impacts of climate hazards on these systems and the extent to which the impacts have broader cascading impacts on communities and the surrounding environment. Climate-resilient sanitation systems directly protect ecosystems and communities and build broader resilience in the face of climate change.

However, a lack of sanitation systems or sanitation systems that are not resilient to climate change have serious consequences for those same ecosystems and communities as outlined in Figure 2. Many people cannot access sanitation services that are fully functional and treat all the waste generated. Globally, 4.2 billion people use sanitation services that don't treat faecal waste.[2]

In the face of climate change impacts, this figure can increase if existing services are not adapted. Untreated faecal waste increases pollution and economic losses, weakens freshwater and coastal ecosystems, and reduces the health of communities.[10] Weak sanitation systems therefore reduce resilience and increase vulnerability for communities and freshwater ecosystems.

To ensure stronger water security and reduce pollution risk, untreated faecal waste must be accounted for and treated. This requires considering the full sanitation system, including long-term operation and maintenance, regulations and capacity building.[3]

Seema walks to the temporary toilet that was donated by WaterAid to her community after unprecedented flooding submerged their village. This is an example of how some adaptation measures may include temporary access during the rebuilding phase after a climate hazard. Badin, Pakistan. October 2022.

WaterAid/Khaula Jamil

OPPORTUNITY TO REDUCE EMISSIONS THROUGH SANITATION

In addition to adaptation measures, the sanitation sector needs to pay more attention to mitigating or reducing greenhouse gas (GHG) emissions. Despite a majority of the global population relying on non-sewered sanitation systems, there is a lack of GHG emissions data for these systems and for full sanitation service chains.[11,12,13,14,15] Emerging studies and evidence indicate these emissions have been significantly underestimated, particularly for methane, a powerful GHG.[16] In Kampala, Uganda, emissions across the sanitation chain are estimated to represent more than half of the city's total emissions.[17] Globally, pit latrines are estimated to contribute to 1–2% of current global methane emissions.[15,18,19]

Shifting to lower carbon-emission options and other actions to reduce emissions can help sanitation services mitigate their impact on climate change. Low carbon/GHG service options should be pursued where feasible without compromising health outcomes, or other risk factors that can affect vulnerability. For example, while it is currently estimated that open defecation has no emissions,[20] its adverse health and gender effects do not make it a feasible low emissions option.

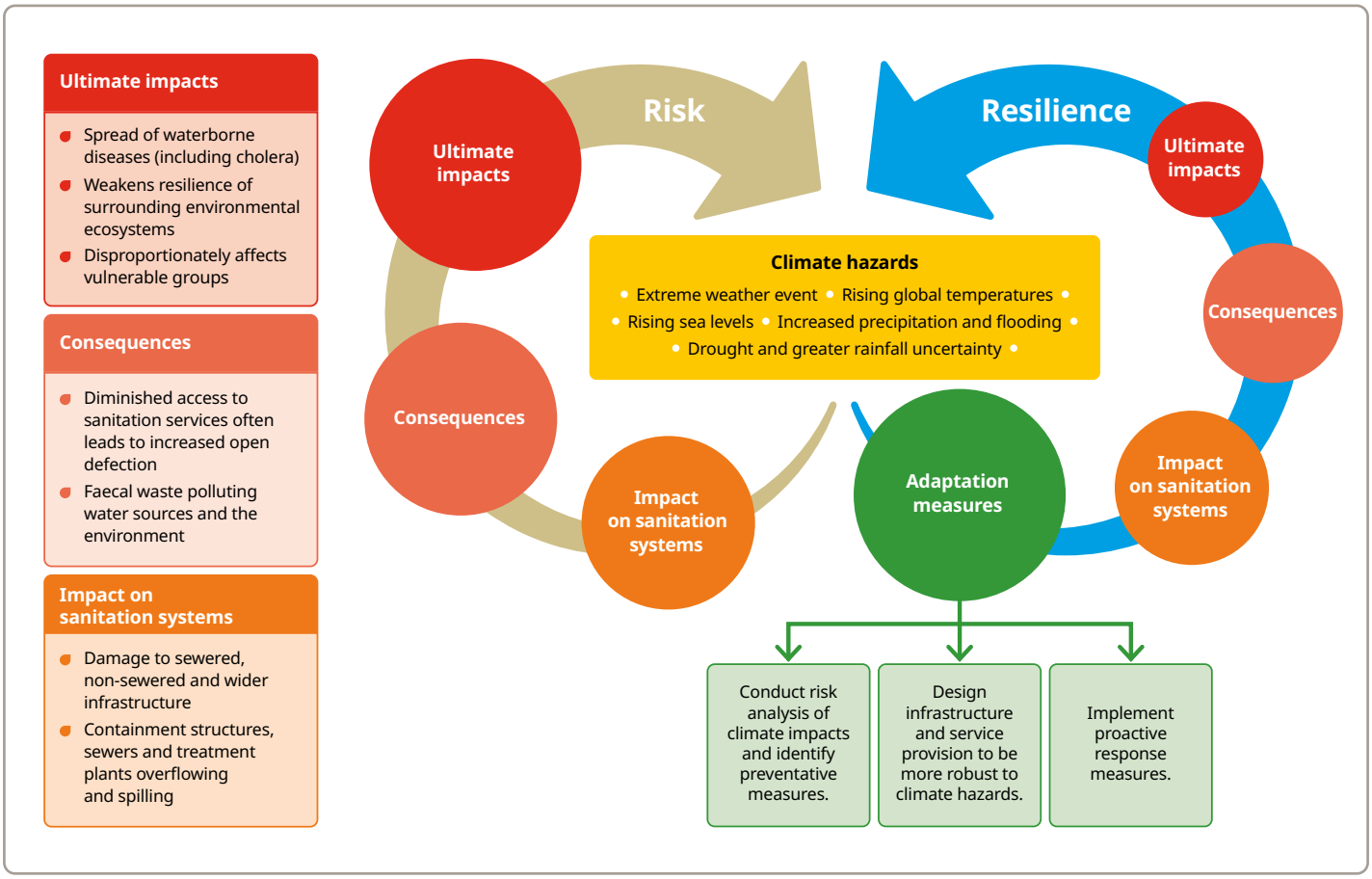
As with adaptation measures, mitigation efforts need to avoid a narrow focus on technologies and consider the system as a whole. For example, simple steps that substantially reduce sanitation emissions for non-sewered systems involve emptying pits and septic tanks more frequently – instead of waiting until they are full – and ensuring treatment processes capture methane for reuse. The reuse of sanitation by-products can reduce emissions by substituting them for imported products as well as having adaptation co-benefits.[21]

Hawa Mhando at a faecal sludge treatment plant constructed by WaterAid. This plant now protects water sources from potential contamination when floods hit – protecting the local community from waterborne diseases. Dar es Salaam, Tanzania. January 2020.

ADAPT SANITATION SYSTEMS TO INCREASE RESILIENCE

Sanitation systems can become more resilient to climate hazards through adaptation measures. When adaptation measures are introduced – thereby strengthening the resilience of the system – the consequences and ultimate impacts are greatly reduced; the difference that adaptation measures make is illustrated in Figure 3. Adaptation measures are needed for both sewered and non-sewered systems and in urban and rural settings. They need to approach sanitation from a service delivery perspective that emphasises long-term sustainability and robustness.

Figure 3: Adaptation measures can increase resilience and reduce impact of climate hazards on sanitation systems, and the consequences on communities and the surrounding environment



In some cases, adaptation measures will have – or can be easily tweaked to incorporate – mitigation benefits. One example is the treatment and reuse of sanitation by-products, such as compost for regenerative agriculture and treated wastewater for industrial purposes.[21] This not only offsets costs, but also contributes to the circular economy, creating economic development and green employment opportunities.

Building resilience is not just about adapting existing sanitation systems. There are many people who are more vulnerable to climate hazards because they lack access to sanitation systems. Thus, expanding sanitation services must be prioritised and include climate considerations in planning, design and implementation to ensure resilience. Blending climate measures like nature-based solutions[i] with sanitation systems is possible but cannot neglect traditional sanitation considerations, such as methods to reduce diseases and protect people's health when using wetlands as part of wastewater treatment[21] to build resilience. Expanding sustainable, climate-resilient sanitation services is a wise and cost-effective way to build resilience to climate change for communities and ecosystems.[22]

As a first step, adapting sanitation systems – whether existing or being planned – requires a full risk assessment that accounts for potential climate hazards, the vulnerabilities of communities and ecosystems, and other location-specific aspects. This takes into consideration the cascading impacts discussed previously as well as the broader context, such as political-economy dimensions.

Adaption measures must be applied to all components of the sanitation system (Figure 1). Some adaptation and resilience actions, such as regular emptying of septic tanks and latrine pits, are about changing operation and maintenance strategies. Others focus on building redundancy into the sanitation system, such as alternative energy sources to operate pumps, and mechanical and heat components in faecal sludge treatment plants or using decentralised wastewater treatment systems. This redundancy offers backup options if part of the system is damaged by a climate hazard. Figure 3 provides a few examples of adaptation measures that can address climate hazards.

Another key aspect to consider is to ensure adaptation financing allows and drives quick implementation of adaptation measures, particularly in situations where sanitation infrastructure or products (e.g., toilet pans) need to be replaced or repaired for services to resume after a climate hazard. This financing can be put in place as part of climate emergency plans. These plans should include quick access to funding for repairs, sanitation products, and a skilled workforce.

More broadly, financing for these adaptation measures is critical. While locally-led adaptation measures are typically the most effective, they often cannot be implemented by local communities without financial support and capacity strengthening from the regional, national and international level. So far, little climate financing is making it through to WASH services. In 2020, the total global climate finance was US $575 billion, but basic WASH received just under half a billion US dollars (US $403 million).[23] Furthermore, almost all of that financing went to water, not sanitation services. This reality needs to dramatically change if we are to develop the climate-resilient sanitation systems needed to build resilience.

i. Nature-based solutions (NBS) use natural features like wetlands or forests as infrastructure to benefit communities and biodiversity and can either complement or replace traditional concrete infrastructure. NBS is gaining momentum as an option in policy circles for climate adaptation.

THE APPROACH

In considering the 'how' of adapting and strengthening[24] sanitation systems, there are three approaches that must be integrated based on the cultural and political context and local realities:

1. **Strengthening inclusivity through enhanced local participation**

2. **Connecting fragmented sector silos for area-wide resilience**

3. **Enhancing access to data and monitoring systems**

Nirere Esther, Hospital Cleaner, cleans a newly-renovated toilet next to the labour ward at Nzangwa Health Centre. It is critical for sanitation in healthcare facilities to be climate-resilient to ensure the safety of patients even after a climate hazard. Rweru, Rwanda. October 2018.

1. STRENGTHENING INCLUSIVITY THROUGH ENHANCED LOCAL PARTICIPATION

Strengthening inclusivity in climate adaptation using participatory approaches can shed light on previously 'unknown' challenges as well as enable the emergence of new, localised solutions, leading to more holistic and resilient policies, plans and implementation processes. Such efforts will reduce maladaptation (ineffective or even harmful adaptation efforts) and therefore should be funded by climate finance. These efforts must incorporate people who are experiencing marginalisation.

This can be done by following the Principles of Locally-led Adaptation[25] and engaging with communities in ways referenced in our system strengthening guidelines.[26] Local capacity building must include vulnerable groups, like women and girls, and ensure they understand how climate impacts will affect sanitation services to help determine the best adaptation solutions.

2. CONNECTING FRAGMENTED SECTOR SILOS FOR AREA-WIDE RESILIENCE

Adaptation measures for sanitation systems cannot be designed in isolation. Sanitation is interconnected with sectors such as housing, urban planning and solid waste management. Sanitation impacts food and water security (through safe wastewater re-use), health (reduced spread of waterborne diseases), gender (reduced care burden, more equal access), education (reduced dropout rates due to good toilets in schools), and water supply (protection of surface and groundwater resources). Thus, building climate resilience for the sanitation sector must happen in collaboration with all these sectors to achieve impactful, resilient outcomes.

Collaborating and strengthening institutional aspects can result in preventative maintenance and form part of critical national adaptation efforts.[27]

Juma Ngombo is pit emptier for the Newanga Usafishaji Mazingira Group. They use manually operated pumps called 'Gulpers' to empty the faecal sludge from pits and septic tanks in Temeke, Dar Es Salaam, Tanzania. March 2021.

3. ENHANCING ACCESS TO DATA AND MONITORING SYSTEMS

To identify the right responses to climate hazards and estimate the cost of providing climate-resilient sanitation services often depends on gathering and monitoring the right data. Current data on climate and sanitation is largely infrastructure-based and only available for sewered sanitation systems in high-income countries. This creates a barrier for low- and middle-income countries to establish an evidence-based rationale and thus a case for accessing climate financing.

It also makes it more difficult to identify and create cost estimates for the most appropriate adaptation measures for sanitation systems. Bringing together a diverse range of data – including local and traditional knowledge, as well as scientific – through inclusive engagement, could be one way of countering these challenges. Additionally, data needs to be integrated from a range of sectors like climate, sanitation and water security.

More financing and capacity building around data gathering and monitoring is needed at both national and local levels to create the right adaptive solutions.

Kamlesh Taank has been cleaning dry latrines and going door-to-door collecting waste for the past 35 years. Improving pit emptying services is a key adaptation measure for non-sewered systems, and has the potential to improve working conditions for workers like her. Loni, India. August 2021.

RECOMMENDATIONS

Climate adaptation efforts need to acknowledge and prioritise the role sanitation systems play in building resilience. Sanitation policies and planning need to prioritise climate risks and ensure climate resilience and sustainability of sanitation systems across the chain. The *call to action to ensure access to climate-resilient sanitation services for 3.6 billion people by 2030*, backed by organisations such as UNICEF, WHO, WaterAid and others, was released at COP27 in 2022. It sets out a robust series of actions and recommendations for all stakeholders, from governments and donors to the private sector, that can make a difference.

Here are our top recommendations to prioritise sanitation in climate policies and financing and to ensure collaboration across sectors is effective in building climate resilience for sanitation systems, communities and the surrounding environment:

1. National governments must ensure that climate policies and plans (e.g., Nationally Determined Contributions and National Adaptation Plans), **financing, climate policies, implementation and monitoring systems include sanitation** and vice versa. These policies and plans must also be integrated with other sectors, such as agriculture, urban planning and health.

2. Governments, development partners and donors must **allocate more climate finance to sanitation, ensuring sanitation service sustainability** and climate resilience. This means moving away from an infrastructure-only focus and considering the implications of climate on the long-term performance of all aspects of the sanitation service chain.

3. Governments, development partners and donors must strengthen participation of communities, particularly groups who are vulnerable. **Engage all groups of communities in adaptation policy design and implementation** to ensure adaptation actions respond to their needs and are sustainable and resilient.

Dagitu and her elder sister Gedam are happy to see there is new accessible toilet at their school. When building climate-resilient toilets, the needs of all users should be considered to ensure they are inclusive, accessible and user-friendly. Amhara, Ethiopia. November 2018.

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Suggested citation: WaterAid (2023).
The overlooked solution: strengthening climate resilience through sanitation systems.
WaterAid: London, UK.

Acknowledgements

With thanks to lead authors Kathryn Pharr and Thérèse Rudebeck with key contributions from Andrés Hueso González and Maya Igarashi Wood. Along with the reviewers and contributors to this paper in alphabetical order: Tara Bartnik, Sue Cavill, Lucy Graham, Helio Guiliche, Nighat Immad, Laura Kohler, Ella Lines, Caroline Maxwell, Adnan Ibne Abdul Qader, Jenny Wells.

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