



Climate Resilient Hygiene: Key to Community Resilience

SUMMARY

Climate change and water scarcity can reduce the ability of people to maintain good hygiene and increases the likelihood of outbreaks and the spread of infectious diseases such as diarrhoea, cholera and dysentery. There is emerging evidence linking weather factors and diarrhoeal disease burden in the South Asia Region. This discussion paper covers three topics: hand hygiene, menstrual hygiene and food hygiene and considers how climate change affects vulnerable populations in households and, to a lesser extent, institutional settings (including schools and health care facilities). These three hygiene topics are considered as key interventions (supported by water and sanitation infrastructure) capable of reducing diarrhoeal disease, respiratory infections, and potentially reproductive tract infections, as well as addressing well-being, stigma, morbidity and mortality more generally, with UNICEF programming generally focussing on hand and menstrual hygiene programming.

Key learnings include the need to adapt all aspects of hygiene programming to ensure that hygiene services consider climate related threats and changes leading to more resilient communities and institutions. From the positioning of infrastructure, like hand washing stations, to the inclusion of climate and environment related messaging, hygiene programming needs to consider slow and fast onset climate related threats. The most impact of climate change on hygiene services is related to water availability (quality and quantity), supply chain of hygiene related items (e.g. soap) and behaviours (water saving techniques, multi-use of water, potential adaptation of key moments for hand washing). The below document charts out climate related impacts and adaptation opportunities for climate resilient hygiene for WASH and cross-sectoral programming.

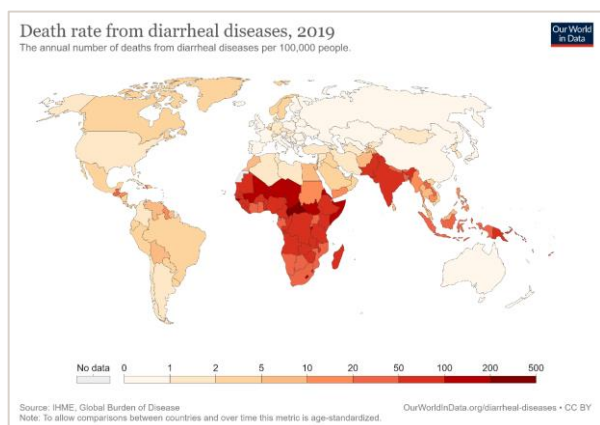
Background

The United Nations Intergovernmental Panel on Climate Change (IPCC, 2021) predicts that the South Asia region will see hotter weather, longer monsoon seasons and increased droughts as total global warming increases by around 1.5o C in the next two decades. Rising sea levels, warming temperatures in the Indian Ocean and flooding threaten the coastal areas of

Bangladesh, India, Pakistan and Sri Lanka, with coastal area loss, shoreline retreat and saltwater intrusion anticipated. The lowest lying country in the world, the Maldives, could be submerged. Landlocked Afghanistan, Bhutan and Nepal face rising temperatures, drought and glacial melt. Arid and semi-arid areas of Bangladesh, Sri Lanka and India face an increase in duration and intensity of droughts (Kugelman, 2021). Nearly half of South Asia's population (700 million people) has been

affected by at least one climate-related disaster in the last decade (Fallesen et al., 2019). India and Pakistan are ranked among the 20 countries most affected by climate change in the twenty-first century. The impacts of climate change fall differently based on existing inequalities and gendered roles and responsibilities, with marginalized or vulnerable groups more likely to be most affected (Water for Women, 2021).

Figure 1 Death Rate from diarrheal diseases 2019



Source: IHME, Global burden of disease

Climate change and water scarcity can reduce the ability of people to maintain good hygiene and increases the likelihood of outbreaks and the spread of infectious diseases such as diarrhoea, cholera and dysentery. Diarrhoeal disease deaths are already high in South Asia (see Figure 1 above). Climate change is expected to exacerbate diarrhoea outbreaks across the region (McCormick and Lang, 2016; WHO, 2019) and challenges to accessing sufficient water will potentially inhibit the practice of hand hygiene in areas significantly impacted by climate change. Hot, humid and wet weather, as well as fluctuation of temperature, makes the body susceptible to bacterial and viral infection. There is emerging evidence linking weather factors and diarrhoeal disease burden in the region. One study from Nepal suggests that additional climate change could increase diarrhoeal disease incidence across the nation, particularly in the mountain region (Dhimal et al., 2022).

Table 1: IPCC WGI Interactive Atlas: Regional synthesis of climate trends for South Asia

Coastal	Trend	Wet and dry	Trend
Relative sea level	↑	Mean precipitation	↑
Coastal flood	↑	River flood	↑
Coastal erosion	↑	Heavy precipitation and pluvial flood	↑
Marine heatwave	↑	Landslide	↑
Ocean acidity	↑	Fire weather	↑
Heat and cold		Snow and ice	
Mean surface temperature	↑	Snow, glacier and ice sheet	↓
Extreme heat	↑	Permafrost	↓
Cold spell and frost	↓	Lake, river and sea ice	↓

Source: <https://interactive-atlas.ipcc.ch/>

This discussion paper covers three topics: hand hygiene, menstrual hygiene and food hygiene and considers how climate change affects vulnerable populations in households and, to a lesser extent, institutional settings (including schools and health care facilities). These three hygiene topics are considered as key interventions (supported by water and sanitation infrastructure) capable of reducing diarrhoeal disease, respiratory infections and potentially reproductive tract infections, as well as addressing well-being, stigma, morbidity and mortality more generally, with UNICEF programming generally focussing on hand and menstrual hygiene programming.

Regional experience of hygiene promotion activities in South Asia

A range of hygiene behaviour change approaches are used by UNICEF, NGOs and governments in the region including long-standing participatory approaches such as Participatory Hygiene and Sanitation Transformation (PHAST); Children's Hygiene and Sanitation Training (CHAST); Self

Esteem, Associative Strengths, Resourcefulness, Action Planning, Responsibility (SARAR); Child-to-Child as well as Community-Led Total Sanitation (CLTS) and Community Approaches to Sanitation (CATS) and its nationally adapted versions (ie. Pakistan Approach to Sanitation - PATS). Theory-based approaches are increasingly used by a range of agencies including London School of Hygiene and Tropical Medicine's Behaviour Centred Design, Assess, Build, Create, Deliver, Evaluate (ABCDE) (WaterAid); Risk, Attitude, Norms, Ability, Self-

regulation (RANAS) (various); Wash'Em (ACF and others); Designing for Behaviour Change (DBC) (World Vision). There are also examples of behaviour change packages developed by the private sector (Unilever and Sesame Workshop) and implemented through NGOs such as Plan International. Often those are implemented in collaboration with UNICEF and/or UNICEF led sectors/cluster emergency response. Training on PHAST/CHAST continues in the region. Agencies, like UNICEF, use both participatory and theory-based approaches simultaneously.

Table 2: Regional experience of behaviour change approaches for hand, menstrual and food hygiene

Approach	Afghanistan	Bangladesh	Bhutan	India	Maldives	Nepal	Pakistan	Sri Lanka
WASH'Em	x	x				x	x	
PHAST	x	x				x	x	x
CHAST	x	x		x		x	x	x
BCD/ABCDE		x		x		x	x	
RANAS	x	x		x		x	x	
School of 5		x		x		x	x	
CLTS/SLTS	x	x	x	x		x	x	
Mum's Magic Hands						x	x	
Child-to-Child	x	x				x	x	
SARAR						x		
SBC	x	x	x	x	x	x	x	x
CHC/SHC/Wi nS	x	x		x	x	x	x	
COMBI	x	x		x		x		
IBM-WASH		x						
SDAs		x				x		
Environmental Nudges		x				x		

Hand Hygiene

Table 3: Impact of future climate change trends for Hand Hygiene

Future changes	Impact on hand hygiene					
Heat and cold Increased temperatures, extreme heat						
Wet and dry Increased/heavy precipitation, flood, landslide, aridity, drought						
Wind Wind speed, severe windstorm, tropical cyclone, sand and dust storm						
Snow and ice Snow, glacier and ice sheet, permafrost, lake, river and sea ice, heavy snowfall and ice storm, hail, snow avalanche						
Coastal Relative sea level, coastal flood, coastal erosion						

Key = - broken facilities; - soap supply chains; - water shortage; - flooding; - water quality; ecosystems

Hand hygiene can help reduce colds and flu, respiratory diseases, typhoid, Hepatitis A, gastro-intestinal infections, skin and eye infections. In very hot and humid climates, people often want to wash hands more often with water, due to the feeling of having sticky or humid skin. However, three out of ten people in South Asia do not have access to a handwashing facility with soap and water present (JMP: washdata.org). The table below illustrates the impact of future climate change trends for hand hygiene.

Effects of climate change on hand hygiene

The following sections review the effects of climate change on the components of hand hygiene, which include: hand hygiene technologies, water supplies, greywater and soap, as well as behaviours, including modification of water use and priority times for handwashing.

Effect on hand hygiene technologies

Hand hygiene technologies can be grouped as:

- Improvised arrangements such as a jug and basin i.e., offering guests a wash basin and pitcher to wash their hands before eating (e.g., in Pakistan a lota and wash basin or an Aftaba (Ewer) in Afghanistan);
- Locally crafted devices such as Tippy Taps or leaky bottle;
- Plastic mass-produced purpose made devices e.g., a bucket with tap operated by foot pedal, elbow or hand (e.g., plastic bucket with a tight-fitting lid and tap, metal stand and plastic washbasin); [Happy Tap](#), [SATO Tap](#) etc.
- Conventional tap with/without a sink for single and multiple users (static or portable) connected to a piped water supply or storage tank

Figure 2: A girl washes her hands at a refillable Tippy Tap container at Jigme Losel Primary School in Thimpu, Bhutan



Source: © UNICEF/UNI201999/Lopez

Extreme weather events (such as heavy rain, landslides, floods, and cyclones) can destroy or damage hand hygiene facilities, disrupt the functionality of the facility or make it difficult for people with physical limitations to access facilities (Megaw, et al., 2020). They can disrupt the supply chains and services necessary to repair, replace and re-stock facilities. For example, storm surges cause erosion and mean that facilities become unstable; flooding can cause facilities to collapse; and sandstorms can bury facilities (Kohlitz and Iyer, 2021). Handmade or traditional facilities are more prone to break down however, variable rainfall, contamination or infrastructure failure also undermines the operations of facilities served by a piped water supply (Howard, 2010; Howard, 2016).

Figure 3: The plastic bottle used at the neck of the tube well means the individual will not require pumping the tube well repeatedly while handwashing



Source: © UNICEF/UNI101571/Sujan

Climate impacts do not just disrupt access to hand hygiene by affecting the functionality of the device and services – they also affect people's journey to wash their hands. This can be a particular problem for children, people with disabilities or older people (Kohlitz and Iyer, 2021; Megaw, et al., 2020). It further requires modification of behaviours and potentially even key moments for handwashing being promoted.

Rebuilding damaged facilities or purchasing new devices after extreme weather events can be difficult, particularly for those living in remote areas, who may be cut off from access to markets that provide products and services (Water for Women, 2021). Gendered social norms, such as men being responsible for decision making on household purchases or re-constructing damaged hand hygiene devices, can delay rebuilding, if they are absent (e.g., out-migration for work) or hand hygiene facilities have low priority. Continual loss of a facility has an impact on behaviour: in the context of limited resources and higher priorities to address (i.e., food security), the repeated damage or destruction of a hand hygiene device can lead to (at least temporary) fatigue/apathy such that households must be motivated to re-build (Kohlitz and Iyer, 2021; Megaw, et al., 2020).

Effect on water for hand hygiene

Hygiene interventions create demand for water. Connecting the handwashing station to a running water supply (as promoted in countries like India through the Jal Jeevan Mission) requires consideration of the available water resource. Around 1 litre of water is required for the recommended 20 seconds of hand scrubbing handwashing (WaterAid, 2020). Even in a context of abundant water resources, households can still face difficulties with handwashing. The Household Water Insecurity Experiences (HWISE) study cited issues with water availability, accessibility and quality as the main barriers to regular handwashing (Young, et al., 2019).

Water scarcity is a bottleneck to better hygiene outcomes. Promoting hand hygiene without an improved water service can be particularly problematic in areas of great water stress. Scarcity can be a result of resource limitations or accessibility constraints (Udas, 2017).

- Physical hydrological constraints: Households reliant on surface water, rainwater collection systems, springs or hand-dug/shallow wells have limited resilience to climate changes (UN Water, 2019).
- Access problem: Bottled water, water vendors or water trucking are options to augment water supplies but can be costly alternative water sources following extreme weather events (Howard et al., 2010; 2016).

Households in places experiencing prolonged shortage of water can turn to unimproved water sources or spend increased time collecting water because of infrastructure failure, contamination or water shortage at their primary water source. Where water supplies are limited, households typically prioritize consumption over hygiene (Elliott, et al., 2019; Oates et al., 2014).

Flooding: Slow onset floods (standing water that accumulates over days or weeks) can rot wooden hand hygiene facilities such as Tippy Taps. Increased intensity of rainfall combined with human-driven deforestation can create flash floods and landslides, whereby fast flowing floodwater destroys facilities (Megaw, et al., 2020; Water for Women, 2021). Water in flooded areas can contain a wide variety of pathogenic organisms from sewage and other materials that could constitute a health risk. After floods, it can be important to dry out and sanitize the hand hygiene containers to prevent mould and fungal growth. Flood situations might further lead to diarrheal epidemics (AWD, Cholera, etc), which lead to an increased demand for handwashing and therefore an increased demand in water.

Water quality: Climate change and water insecurity can lead to increased contamination of water sources (i.e., faecal contamination, saltwater intrusion). Reduced groundwater quality is a concern for shallow protected wells. Handwashing with unsafe water may increase the risk of diarrhoea (McCormick and Lang, 2016), for instance, handwashing with water contaminated with high levels of E. coli is likely to transfer more E. coli onto hands than it removes (Verbyla, et al., 2019). Intensive handwashing with contaminated water can cause skin lesions that can lead to infections entering the bloodstream (Lemery, et al., 2015). In Bangladesh, one study (Luby et al., 2011) suggests effective handwashing seems contingent on the fact that only clean water was used during handwashing (i.e., water used did not introduce new bacteria). Another study in Pakistan (Luby et al., 2001), found that providing soap and promoting handwashing measurably improved mothers' hand cleanliness even when used with contaminated water; if hands are washed with soap, the quality of water may not be as important.

Effect on greywater

Handwashing water contains dissolved organic carbon, nitrogen and phosphate as well as

microbes (from soap, whatever dirt or undesirable materials are intentionally washed off the hands, but also traces of toiletries and skin cells) (Ziemba, et al., 2018). Untreated, this can directly and indirectly affect the resilience of ecosystems and their ability to withstand climatic changes. For instance, contamination of groundwater¹ through disposal of untreated wastewater (including greywater for improved hand hygiene) has impact on land and aquatic ecosystems.

Effect on soap

A range of products have been promoted and used in the region for hand hygiene including traditional options (e.g., soil), ash (promoted through WASH programmes, despite limited evidence for it as an effective measure), bar soap, liquid soap, anti-bacterial and plain soap, hand sanitizer and soapy water. When asked, people seem to use different soap products for different purposes – more often saving soap for handwashing after defecation and rinsing hands at other times. There are some inconveniences associated with bar soap (such as storage and contamination concerns). Access to hand sanitizer and liquid soap are more expensive than bar soap and reliable supply chains are more difficult to establish. Whilst certain abrasive substances for hand rubbing (e.g., ash) are effective, people find they can cause dry hands and rough/cracked skin (or exacerbate existing skin conditions), which could lead to infections, especially with manual work, where contaminated water is used.

Climate hazards can mean that access to urban centres or other places to purchase soap may not be accessible all year-round. Climate-related events can disrupt transport networks, affecting the last link of the supply chain i.e., making products available in the district town to the village shop/household in sparsely populated rural areas. Soap choice is also affected by water quality,

which can be affected by weather events – where water is hard and/or salty, it is difficult to get hands soapy enough.

Discussion of climate-related handwashing adaptations

Understanding local climate risks and selecting appropriate technology options less sensitive to these risks can reduce the vulnerabilities. The table below provides examples of physical impacts of climate change on hand hygiene impacts and possible adaptations.

¹ Liquid soap contains sodium dodecyl sulphate (SLS), fragrances and dyes might cause low to moderate aquatic toxicity.

BOX 1.

EXAMPLES OF CLIMATE RESILIENT HAND HYGIENE

Afghanistan: Siting of infrastructure outside flood prone areas, avoid handpumps/shallow boreholes; piped water supply systems (clean energy –solar powered and gravity fed water supply schemes); reliable water resources (deeper aquifers and springs which are long lasting), avoiding seasonal sources.

Bangladesh: Attention to innovative safe water technologies in hard to reach, saline prone and climate vulnerable areas as well as building the adaptive capacity of community on disaster/climate resilient water technology installation and operation and maintenance. Activities include Climate Resilient Water Safety Planning, technology innovation (rainwater capture, raised platform water points, solar pumping, managed aquifer recharge) and switch from groundwater to surface water. In Sylhet and Rangpur, 7,000 people have benefited from climate-resilient water points and 10 unions from a climate focused water and sanitation programme.

Bhutan: Water Safety Plans, seasonal storage, rainwater harvesting, efficient water usage and management as well as climate proofing water distribution systems (e.g., water saving faucets, heat pump for hot water systems to reduce energy consumption in monastic schools and nunneries).

India: Climate resilient WASH in water scarce areas in the Jal Jeevan Mission; flood resilient sanitation models to inform Swachh Bharat Mission as well as water conservation in coastal communities.

Maldives: Activities include the transportation of water resources to water stressed locations; rainwater harvesting, groundwater recharge and cost-effective desalination.

Nepal: Diversification of water supply in ‘water safe communities’ including rainwater harvesting, pond construction; water reclamation and reuse; and use of boreholes as drought intervention. Climate-sensitive costed WASH Plans have been developed in all 753 municipalities.

Pakistan: Ministry of Climate Change Clean Green Pakistan Movement has engaged Clean Green Champions to create a climate-resilient and gender responsive WASH programmes.

Sri Lanka: Groundwater management, climate SMART schools; managed aquifer recharge, climate-resilient Water Safety & Security Plans have been used in different climatic zones; as well as community-managed rural water supply schemes.

The potential for youth climate champions has been harnessed, as agents of change in their households and communities, to promote hand hygiene behaviour change and the importance of conserving and recycling water. In Bangladesh, the skills of young people have been incorporated into the Gen-U Skill Development Platform. In India, youth engagement approaches have been used along with digital modules.

Table 4: Physical impacts of climate change on hand hygiene

	Hand hygiene impact	Example of adaptation
Drought	Depleted water sources lead to use of unsafe sources or longer journeys to collect water.	Deep boreholes or increased water storage capacity. Targeted prioritisation of water for hygiene purposes. Use of low water use handwashing facilities
Flooding	Flooding contaminates water sources. Flooding makes it difficult to reach and use the hand hygiene facility.	Site facilities outside the flood prone area or construct them near the home. Secure water sources from surface runoff or site latrines far from the water points. Site mobile facilities near toilets and eating/food preparation areas, which can be moved in response to flooding
Cyclones	High winds damage or destroy facilities.	Construct stations from high quality building materials.
Sea level rise	Erosion from the coastline causing facilities to collapse. Water sources become salinized.	Relocate handwashing facilities further away from the coast, while remaining close to relevant locations such as toilets, eating areas etc. Relocate water points to further away from the coast.

Source: Adapted from Megaw et al., 2020.

People at the centre of programming

People (within households and institutions) will be exposed to climate hazards differently: women, men, children, older people and people with disabilities have different levels of resources and resilience to cope and adapt to climate impacts and different levels of power over decisions on how to use available resources to implement adaptations (Water for Women, 2021). The burden of hand hygiene workloads within households are likely to be unequal especially during climate extremes, i.e., who in the household takes on additional work for hygiene when the weather is hot and dry, or rainy and stormy; who is tasked with collecting water for hand hygiene during the dry season; who is responsible for making repairs to hand hygiene facilities and who maintains the paths and routes towards the facilities (Megaw, et al., 2020). Adaptions to respond to climate hazards should all have a gender and social inclusion component: participatory techniques (like mapping and transect walks) can be used to understand how droughts and floods affect the community members in different ways and a climate lens can be added to PHAST and CLTS. Whilst acknowledging that some communities have long been adapting to climate variability (WHO, 2019), the aim is to equip people with the capacity to cope in the short-term with the increasingly intense and unpredictable risks associated with climate change and help anticipate and plan in the long-term.

Adaptations to hand hygiene technologies

Facilities: There are three main ways that hand hygiene stations could be adapted to be more climate-resilient in the context of increased high-intensity rainfall, decreased rainfall, different types of flooding and tropical cyclones as well as other weather events (Megaw, et al., 2020).

- More robust facilities can be built with good-quality materials that are installed

properly to withstand high winds from cyclones or high water from floods.

- Simple, low-cost handwashing stations can be designed to be quickly repaired/rebuilt with local materials after an extreme event.
- Low water use technology: ready-made handwashing stations which limit water usage.

In some cases, traditional knowledge among local communities and households has long helped ensure hand hygiene devices are adapted to seasonal weather events and climate change. More recently, human-centred design has been used to engage communities in designing 'climate smart' solutions such as low-flow hand hygiene devices (such as a foaming soap dispenser with a water tap) that do not require direct access to a water point or options to reduce water waste or address water scarcity such as by rainwater harvesting for hand hygiene (WaterAid, 2020). The Sato Tap and HappyTap are examples of ready-made solutions in water scarce areas. As well as new types of devices, adaptations to existing facilities can increase the resilience of hand hygiene services to climate change such as by raising the height of the Tippy Tap device to withstand flood levels. However, when making these adaptations it is important to consider the trade-offs in terms of accessibility for certain groups or at different times, i.e., a raised platform for a waterpoint can reduce accessibility for people with disabilities or older people. There are also cost implications for making these adaptations, which can be a financial barrier for some.

Location: Understanding the different 'climatic zones' – flood-prone areas, drought-prone areas and coastal areas exposed to rising sea level – across a country can help to understand what options are appropriate for hand hygiene in those locations. At the local level, community mapping is an important way to identify local climate hazards, e.g., when it is very rainy, will the preferred location for siting hand hygiene facilities become flooded, waterlogged, exposed to

landslides or affected by storm surges (Leahy et al., 2020). Those responsible for hand hygiene facilities in public places or institutions can then consider scenarios for very hot and dry weather or very rainy and stormy weather and review where to site hand hygiene facilities (such as a group handwashing station installed at high-elevation areas) as well as the year-round sources for water (Leahy et al., 2020; Kohlitz, et al., 2020). Similarly, households can choose appropriate sites and technologies that are suitable for the local climate hazard context (e.g., a Tippy Tap built closer to home) and prepare when heavy rainfall is expected (e.g., moving the hand hygiene facility in flooding season) (Megaw, et al., 2020).

Figure 1: Handwashing alternatives



Source: *handwashing-alternatives-20200608-(1).pdf* (cities4health.org)

Adaptations to water supplies

Water source: Deep boreholes, combined with an overhead tank will often be the most climate-resilient water supply infrastructure (University of Surrey, 2010). The use of renewable energy sources (such as solar, wind, biomass and biofuels) for pumping systems can further optimize their resilience. Gravity fed water systems are similarly resilient (Howard et al, 2010).

Water storage: Improving water storage can increase handwashing rates. Boreholes with overhead tanks could result in services with a higher-level of climate resilience. In coastal areas affected by salinity, such as in Bangladesh, water storage facilities based on the rainwater harvesting and usage of reverse osmosis technology can provide safe water to communities (WaterAid, 2020).

Management practices: The impacts of a decrease or increase in rainfall can be partially offset by water management practices (Reynaert, et al., 2020). Operations and management of water supply facilities is a key factor in increasing the resilience of hand hygiene services. Improved operations of piped water supplies by utilities or small service providers are required together with personnel and financial resources (WaterAid, 2020). Community-managed water committees and households also require training to perform operational and maintenance tasks on water supply and handwashing facilities (including water (re-) filling, preventative maintenance and damage restoration) (WHO, 2019). Following a flood or other disaster, community management committees can also play a role in clean-up campaigns and mobilizing households, schools and others to reconstruct their hand hygiene facilities (Water for Women, 2021).

Multiple water supply sources: Diversification of water supply sources is vital to mitigating the impacts of water scarcity on hand hygiene services. For example, in the context of decreased rainfall, being able to access a nearby deep protected well can reduce overreliance on rainwater harvesting systems (Elliott, et al., 2019). Diversifying risk through use of multiple water supply sources increases the probability that there are water supply sources available to meet various needs and avoids depleting one source. The WHO (2020) also suggests that if clean water is not available, other options include drained rice water, river or sea water, laundry or dish water and water from boiled vegetables (see Figure 4 above).

Adaptations to greywater disposal

Efficient use of water resources and improvements to wastewater can “directly benefit ecosystems by reducing faecal contamination on land and in water, reducing nutrient loadings to streams and lakes, making aquatic and terrestrial ecosystems healthier” (WaterAid, 2021). Water recycling or downcycling (water reused for an application requiring lower water quality) is an option where soapy greywater from handwashing can be collected to flush toilets or irrigate crops (Reynaert, et al., 2020).

Figure 5: Water storage for toilet flushing



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Adaptations to soap use

In the context of low water availability and disrupted supply chains (especially in mountainous areas or island countries), soapy water (water and detergent powder) can support habitual handwashing by addressing water scarcity and is an alternative to bar soap or liquid soap. New products continue to be developed and tested in the region, e.g., the Supertowel, which is a fabric treated with a permanent antimicrobial bonding and has been designed as a soap alternative in emergency situations. When tested under controlled laboratory conditions it effectively removed non-pathogenic E. coli from pre-contaminated hands. The [Supertowel](#) is being test in India (Torondel, et al., 2021).

Purchasing soap is an opportunity to think about climate change. There is some evidence that liquid soap has ten times the carbon footprint of bar soap (Koehler and Wildbolz, 2009; Andrei, 2021). Switching from liquid soap to solid soap bars can reduce environmental impact – through less plastic packaging, less water and energy to produce it and because it is lighter to transport. Bar soap lasts longer and so that can also reduce consumption. The box below highlights several

BOX 2.

RECOMMENDATIONS TO SUPPORT RESILIENT HAND HYGIENE PROGRAMMING

Diversify water supply sources and improve water storage capacity to enable people in households, schools and health care facilities, public places and other institutions to maintain their hand hygiene practices.

Adapt hand hygiene behaviour change strategies to climate and water stressed areas.

Prevent deteriorating water quality through protecting water sources from contamination due to weather events.

Portable hand hygiene devices may be more resilient to floods and storm damage if they can be moved inside to prevent storm damage.

Foster a role for the private sector in bolstering the resilience of hand hygiene services, such as water-efficient/low-flow handwashing devices and promote the use of bar soap where appropriate.

Where hand hygiene is constrained, investigate additional strategies such as waterless hand sanitizers, personal protective equipment during activities that lead to hand contamination or other interventions to reduce the sources of hand contamination (Verbyla, et al., 2019).

recommendations for addressing climate resilient hand hygiene programming.

Menstrual health and hygiene

Table 5: Impact of future climate change trends for menstrual hygiene

Future changes	Impact on menstrual health and hygiene					
Heat and cold Increased temperatures, extreme heat						
Wet and dry Increased/heavy precipitation, flood, landslide, aridity, drought						
Wind Wind speed, severe windstorm, tropical cyclone, sand/dust storm						
Snow and ice Snow, glacier and ice sheet, permafrost, lake, river and sea ice, heavy snowfall and ice storm, hail, snow avalanche						
Coastal Relative sea level, coastal flood, coastal erosion						

Key = || - supply chain disruption; - disposal systems; - drying; - water shortage; - flooding; - water quality

Adequate menstrual hygiene refers to “Women and adolescent girls using a clean menstrual management material to absorb or collect menstrual blood, that can be changed in privacy as often as necessary for the duration of a menstrual period, using soap and water for washing the body as required and having access to safe and convenient facilities to dispose of used menstrual management materials. Menstrual health and hygiene (MHH) encompass access to accurate and timely knowledge; available, safe health services; sanitation and washing facilities; positive social norms; safe and hygienic disposal; and advocacy and policy” (UNICEF, 2020).

Although women and girls are referred to in connection with MHH here, it is recognized that people who menstruate include transgender, intersex and nonbinary people. Furthermore, the wider points also apply to baby nappies and adult incontinence products, as these are made of similar materials with the same absorbent function (both the single-use and the reusable alternatives).

Effects of climate change on MHH

The following sections review the impact of climate change on the components on menstrual hygiene, which include menstrual products, washing and drying reusable products, disposal and water supplies.

Effect on menstrual products

Preference for menstrual products reflects geographical, technological and behavioural contexts. Slow onset climate-related crises and sudden climate-related disasters including floods can have an impact on the ability to access commercial menstrual products (Shreya, 2016; United Nations Environment Programme, 2021). This could be due to supply chain disruption or social/financial constraints that affect affordability. For instance, climate-related events can disrupt transport networks, affecting the availability of products in village shop/household in sparsely populated rural areas. Or if girls are not able to go to school, they might not be able to collect their entitlement of free pads provided by the government’s pad distribution programmes. All of which has consequences for the person’s ability to access their preferred menstrual product or

change aspects related to their use, such as infrastructure requirements (access to running water and toilets), acceptability of use and frequency of changing the product (Durieux and Diaz, nd).

Effect on water for menstrual hygiene

Clean water is a fundamental aspect of safe and dignified menstruation (Rowley, 2021). Water is needed for (1) bathing during menstruation, (2) washing of reusable menstrual products like menstrual cloths and menstrual cups, and (3) washing hands after changing a sanitary product or handling menstrual waste is often promoted as a critical time for hand hygiene. Water shortages at home or at school make personal hygiene more difficult to maintain during menstruation. Hotter days, more rain and higher humidity can plausibly increase the risk of reproductive tract infection, making washing to prevent disease even more critical. Washing intimate areas with unsafe water may plausibly increase the risk of infections. Saline intrusion in coastal areas can make water unsuitable for bathing but also washing cloth including menstrual cloths, e.g., causing fabrics to become rough and chaffing skin. This can necessitate the use of single use MH products instead. Water scarcity can force choices about how water is used at the individual, household and community levels. With menstrual hygiene already insufficiently prioritized in many cases, this challenge could easily become even more problematic for women and girls in the face of climate-induced water shortages. Prolonged shortage of water affects the frequency and manner in which reusable menstrual products are washed and whether fuel is available to make it possible to sterilise them with boiling water. Prolonged rainfall or very windy weather can make it impossible to dry cloths in direct sunlight as recommended for hygiene reasons – drying and storing cloths in a dark or shady place (or using damp cloths) can lead to infections.

Effect on disposal options

Climate change may make conventional disposal options irrelevant, both those that are safe and hygienic (such as disposal in solid waste systems, incineration, composting or deep burial) or improvised (flushing products down the toilet, shallow burying of menstrual waste, throwing used products into drainage channels or open spaces). For instance, high-water table or heavy rainfall and flooding mean burial is not a viable option. Incorrect disposal of single-use menstrual products can exacerbate climate change if they block sewers or drainage systems, causing flooding and polluting freshwater and marine environments. Banning materials used for wrapping single-use products prior to disposal (such as plastic bags to wrap used pads, tampons and applicators) in response to climate concerns can have implications for dignity. Inadequate disposal options can result in the further stigmatization and marginalization of menstruating women and girls

Table 6: Adaptation future climate change trends for menstrual hygiene

CC	MHH impact	Example of adaptation
Drought	Use of unsafe sources or longer journeys to collect water for washing reusable products and personal hygiene.	Deep boreholes or increase water storage capacity.
Heavy rains/flooding	Contaminates water sources. Affects disposal of menstrual products. Prevents drying of reusable menstrual pads/cloths.	Alternative options for drying products and disposal in flood prone areas.
Sea level rise	Washing reusable products in saline water causes skin irritation.	Relocate water points further away from coast.

Discussion of climate related MHH adaptations

Understanding local climate risks and selecting options less sensitive to these risks can reduce the likelihood of negative coping strategies. The table below provides examples of physical impacts of climate change on MHH impacts and adaptations.

People at the centre

Climate-related shock and stress could worsen 'period poverty', for those already vulnerable. Adolescent girls'/women's voices and perspectives are often invisible within climate strategies – a better understanding of their experience of menstruating, as well as access to clean water, female-friendly sanitation and safe period products. Plans should be informed by their MHH choices (Luo, 2021; Kings, 2019).

When acute or chronic, climate-related events lead to displacement. Women can be especially vulnerable, resulting in increased negative experiences when having to adapt to new menstrual management practices, lack of pain relief or changes in living conditions (in closer proximity to others without the necessary privacy for changing, washing and drying menstrual materials). Menstrual products and support items such as soap, underwear, torches and wash basins are often distributed in dignity kits. For new menstrual products, recipients must learn how to use or dispose of them (Maknun, 2017; Mullins and Nagel, 2017; VanLeeuwen and Torondel, 2018).

MHH behaviour is strongly influenced by context, prevailing social norms and attitudes such as the acceptability of the different menstrual products and their disposal. During the slow or sudden onset of climate-related disasters, social norms and stigma that impact MHH often become more entrenched. This could make it difficult to discuss menstruation, hygiene and more sustainable ways

for women to manage their menstruation (Karmakar, 2021).

Adaptations to menstrual products

Climate change can affect the health and well-being of women and girls because of disruptions to menstrual supplies. Resilient supply chains (of products and materials) are required to buy or make products. Consumer awareness and concern over the environmental impacts of single-use menstrual products is growing.² Across the South Asia region, start-ups have launched sustainable menstrual products that are locally made with locally sourced raw materials (such as bamboo or banana fibre, or cotton) with reduced packaging/transport requirements and lower environmental impacts than commercial options. Such products are often free from plastic, eliminating the use of fossil fuel energy to process plastic for production (Albrizio, 2021; Kearney, 2021; WEN, nd).

Given that reusable menstrual products are increasingly available, adaptations are needed so that these items can be hygienically washed and dried. One example used during monsoon rains/floods in Bangladesh is attaching the clothes to an upturned basket (kacha — large cane baskets used to carry vegetables from the field and to the market) to dry cloths over the embers of a fire (House et al., 2012). Reusable menstrual products have higher up-front costs but save costs over time.

MHH is now more routinely integrated into sanitation programmes: for instance, in the CLTS process, pre-triggering can be used to 'break the silence' on MHH with community leaders, traditional birth attendants and others. Discussion on MHH is usually undertaken separately to the main triggering activities. Most activities related to MHH are included during the follow-up phase, when there is more time for discussion. There is

² <https://www.greenthered.in/>

limited documented experience on how a climate lens has been added.

Adaptations to water supplies

Hardware interventions including female-friendly water and sanitation facilities (with attention to space, privacy, location, distribution, disposal and access of water) can offer a comfortable space to deal with menstruation. As noted, boreholes, combined with an overhead tank will often be the most climate-resilient water supply infrastructure (University of Surrey, 2010) as well as diversifying risk through use of multiple water supply sources.

Adaptations to disposal options

Menstrual waste disposal is typically a challenge in low resource settings. Alternatives to shallow burying or landfill must be found in the context of erosion, higher water tables or flooding. Disposal options should be safe, hygienic and sustainable. Products are increasingly available that are biodegradable and compostable or else reusable (reusable menstrual cups, reusable pads and period underwear).

The incineration of absorbent hygiene products has a higher potential climate impact (i.e., greenhouse gases emissions) than landfill disposal and alternatives are being sought. In India, solid and liquid waste management is a major component of Swachh Bharat Mission-Gramin and sustainable options are being investigated for disposal of menstrual waste.

Box 4 below highlights several recommendations for addressing climate resilient menstrual hygiene programming.

BOX 4.

RECOMMENDATIONS FOR MENSTRUAL HYGIENE AND HYGIENE

A 'girl-centred' approach is required when responding to climate-related crises, for instance using girls' clubs, life skills workshops and safe spaces to discuss necessary adaptations to menstrual health and hygiene to overcome increased barriers related to climate change and discriminations faced by some girls.

During climate change responses, look for opportunities to shift stigma and social norms on MHH that impacts women and girls, while mitigating for any potential backlash.

Raise the awareness of governments supplying and/or subsidizing menstrual products of the environmental impacts of non-compostable, disposable and single-use products, with advocacy for the least environmentally detrimental option and indicating what alternatives are available (e.g., cloth pads and menstrual cups).

Similarly, provide consumer guidance to increase their knowledge about the use, disposal and environmental performance of menstrual products³

³ <https://maldives.un.org/en/114104-young-people-maldives-defying-one-time-use-pads>

Food hygiene


















Food hygiene refers to those behaviours that reduce microbial contamination and growth and protect from food-borne illness caused by microorganisms (Biran, et al., 2012). Food hygiene promotion covers a range of practices including: hand hygiene before food preparation and handling, safe food storage, avoidance of contaminated foods, adequate cooking and reheating, cleaning of kitchen surfaces and utensils, and handwashing before eating or feeding children (Gautam, et al., 2017). Climate change threatens food hygiene by increasing the likelihood of foodborne pathogens (Climate and Health Alliance, 2018; FAO, 2020). Weather conditions (such as heat or rain, or with seasons of the year, such as summer or winter) are correlated with diarrhoeal pathogen transmission






and/or the ability of pathogens to cause foodborne illness (Chao et al., 2019):

- Rainy or monsoon months: Shigella, campylobacter, norovirus, and cryptosporidium;
- Prolonged high-temperature seasons: salmonella and giardia;
- Hot and humid weather: *V. cholerae*;
- Winter or cool/dry seasons: rotavirus.

Climate-related weather changes will further exacerbate the risk of foodborne disease. It is also expected to contribute to malnutrition indirectly, through impacts on diarrhoeal disease, which can have long-term effects such as stunting and impaired cognitive development (FAO, 2020). The table below illustrates the impact of future climate change trends for food hygiene.

Table 6: Impact of future climate change trends for food hygiene

Future changes	Impact on food hygiene				
Heat and cold Increased temperatures, extreme heat					
Wet and dry Increased/heavy precipitation, flood, landslide, aridity, drought					
Wind Wind speed, severe windstorm, tropical cyclone, sand and dust storm					
Snow and ice Snow, glacier and ice sheet, permafrost, lake, river and sea ice, heavy snowfall and ice storm, hail, snow avalanche					
Coastal Relative sea level, coastal flood, coastal erosion					

Key:  - food preparation/handling/feeding;  - storage;  - flooding;  - water quality;  - water shortage

Effects of climate change on food hygiene

The following sections review the impact of climate change on the components on food hygiene, which include: food preparation, food handling cooking and reheating, storage, feeding and water supplies.

Effect on food hygiene

Climate change can lead to greater contamination of food stuffs with foodborne pathogens, requiring more rigorous **food preparation** (Whitworth, 2020; FAO, 2020). For instance:

- Excess rainfall and flooding can contaminate crops such as leafy vegetables with pathogens, requiring more thorough washing and cooking.

- Climate change exacerbates algae blooms, which can concentrate in shellfish and some fish, increasing the risk of gastrointestinal diseases.
- Flooding can engender increased fungal infections in cereals and other crops.

Climate change could reduce the availability of fuel, for example if combined with human-driven deforestation which can create flash floods and landslides, or if firewood is scarce following a wildfire. Shortage of fuel increases the likelihood of insufficient time for **cooking and reheating** of food, encouraging the proliferation of pathogens and leading to foodborne illness (Whitworth, 2020; FAO, 2020).

BOX 5.

CASE STUDY ON FOOD HYGIENE

Nepal: Interventions have been designed using formative research and behaviour-centred design (ABCDE) principles to promote behaviour change on safe food storage, reheating before serving food to infants, hygienic preparation, processing and serving are needed (Gautam, 2017).

Women might cook a meal once a day, which is then re-heated for breakfast or an evening meal (Islam et al., 2013). Pathogens grow quickly in food, especially in hot climates and will not be killed unless the food is properly re-heated (Islam et al., 2013; Gautam et al., 2017). Similarly, where fuel, ingredients or money for cooking are in short supply, households might prepare large batches of food which are then stored until needed. Long gaps between meal preparation and feeding, coupled with inadequate re-heating, contributes to

Discussion of climate-related food hygiene adaptations

Climate change may heighten the occurrence and virulence of foodborne pathogens

food-borne illnesses (Climate and Health Alliance, 2018). With climate change, prolonged warmer seasons, ambient temperature changes and relative humidity affect conditions for storage. Storage can have an indirect impact on food hygiene. For instance, after floods, wet paper labels on canned foods or packaged food can harbour bacteria and moulds, resulting in foodborne disease outbreaks (Duchenne-Moutien and Neetoo, 2021). Warmer temperatures in summer and milder winters may increase the abundance of pests such as insects and rodents which can spread foodborne pathogens and damage food, making covering cooked foods increasingly important. Lack of sanitation increases the risk of environmental contamination (FAO, 2020).

Effect on water supply

Water availability affects the hand hygiene of people who handle food: water scarcity might be a cause of inadequate handwashing before **food handling** or insufficient washing of food before preparation and cooking. Climate-related water scarcity also impacts hand hygiene before eating or **feeding infants** (Biran et al., 2012). A limited or unsafe water supply for washing cooking utensils can also lead to insufficiently clean pans, utensils and surfaces, which are a potential source of contamination.

Slow onset floods (standing water that accumulates over days or weeks), flash floods and increased intensity of rainfall can spoil food, affect food storage as well as fuel for cooking – wet firewood is more difficult to light and less efficient (FAO, 2020). Climate change can lead to increased contamination of water sources, which has an impact on food preparation. For instance, saltwater intrusion can affect cooking times and taste of cooking items such as beans.

Table 7: Examples of the effects of climate change on food hygiene impacts and possible adaptations

	Food hygiene impact	Example of adaptation
Drought	Use of unsafe sources for cooking or longer journeys to collect water. Insufficient water for safe food preparation.	Deep boreholes or increase water storage capacity.
Heavy rainfall and flooding	Flood water can contaminate food stuffs. Spoiling stored food. Wet fuel for cooking.	Prioritize promotion of food hygiene in flood prone areas. Ensure access to affordable energy sources to enable poor households to store and prepare food safely.
Increased ambient temperatures	Foodborne pathogens grow quicker at higher temperatures.	Promote cool and dry food storage. Affordable technical innovations to keep food cool and slow down the activity of bacteria.

People at the centre

Changes in temperature, precipitation, poor storage facilities and other environmental factors will all make food-borne infections more likely with a changing climate (FAO, 2020). It is important to ensure people become more aware of the risks of improper food handling because food pathogens often have no impact on the taste, smell and appearance of food (Climate and Health Alliance,

⁴ Such as boiled rice, lentils and so forth used for complementary feeding.

2018). Attention to food hygiene is of particular benefit for children aged between four and six months,⁴ older people and those with chronic illnesses. Foods prepared under unhygienic conditions are likely to be a major risk factor for diarrhoeal diseases and associated malnutrition and other hazards that pose health risks (Chao et al.,2019).

Adaptations to food hygiene

Climate-related changes in weather will increase the difficulty of cooking and storage of food in the household. Increases in temperature, humidity and extreme weather conditions – influenced by climate change – will affect the ability of many bacterial foodborne pathogens to survive and/or grow. WASH hygiene promotion activities typically include attention to handwashing with soap before food preparation and feeding. CLTS can trigger action to improve food hygiene. For instance, during the triggering event a community is often asked “what happens when flies sit on their or their children’s food and plate?” (Kar and Chambers, 2008). Furthermore, construction of drying racks is often promoted as part of the criteria for achieving an open defecation free community. Adding a climate lens to food hygiene includes increased awareness of regular food hygiene behavioural actions and vigilance when cooking, reheating and storage within households (Biran et al., 2012):

- *Food preparation*: handwashing with soap before food preparation and before eating or feeding children as well as maintaining the cooking temperature;
- *Food handling*: reducing cross-contamination between cooked and raw food, maintaining proper kitchen hygiene such as cleaning surfaces and using clean utensils to cook/serve food;
- *Storage*: monitoring the temperature of stored food and covering cooked food;

- *Feeding:* washing both hands with soap before feeding a child with attention to complementary food hygiene to reduce risks for infants.

Adaptations to water supply

WASH infrastructure including water and sanitation facilities can improve food hygiene. For instance, improving water storage can increase handwashing rates. Climate-resilient water supply infrastructure can also reduce the transmission of foodborne pathogens. Diversifying risk through use of multiple water supply sources increases the probability that there are water supply sources available to meet food hygiene needs. Improving sanitation reduces the risk of faecal contamination of food.

Box 6 highlights several recommendations for addressing climate resilient food hygiene programming.

Considerations for other climate resilient hygiene behaviours

Face washing is promoted as part of the WHO Surgery, Antibiotics, Facial cleanliness, and Environmental changes (SAFE) strategy to eliminate trachoma around the world. Trachoma is a blinding infectious disease that can be spread from person-to-person through eye-seeking flies or contaminated fingers (WHO, 2022). Nepal is the first country in the region to be validated by WHO as having eliminated trachoma, but the infection remains in other countries in the region. Facial hygiene practices may vary seasonally since they are dependent on water availability together with the availability (i.e., disrupted supply chains)/affordability of soap. In the context of low household water and soap availability, face washing is unlikely to be prioritized/possible. Alternatives such as soapy water could be promoted in the dry season or rainwater collected during monsoons. Hygiene promotion activities

BOX 6.

RECOMMENDATIONS FOR FOOD HYGIENE

There are still knowledge gaps and further research is needed to fully understand the magnitude and consequences of climate changes for food hygiene.

Attention to food hygiene should be integrated into national plans for climate mitigation and climate adaptation strategies.

Formative research can identify the main sources of contamination of cooked and raw foods, and how climate change accentuates them.

Promotion of climate resilient food hygiene practices can be embedded using a behaviour-centred approach in nutrition and WASH programming as well as existing community structures (community-based women's and caregiver groups).

Integrate climate change into a hazard analysis and critical control points (HACCP) approach for food safety.

Greater investments in the capacities of WASH programme implementers for climate resilient food hygiene together with stronger collaborations among all relevant stakeholders to manage public health risks.

Beyond households, attention to climate resilient food hygiene is also required in institutional settings: street vendors/markets, schools, early childcare centres and health care facilities.

could also address misperceptions around the amount of water needed to wash faces (eyes and nose in particular) year-round.

Oral hygiene: In rural areas across the region, children have poor oral hygiene (Ullah et al., 2022; Phurpa et al., 2020) and limited resources/services for oral health care. Lessons can be learned from the Fit for School approach (Philippines, Cambodia, Laos, and Indonesia) that includes daily tooth brushing with fluoride toothpaste as a group activity in schools, using a water saving technology. Turning the tap off between rinses when brushing teeth can also save water. Dental hygiene campaign to promote water saving might also include 'dry' toothbrushing in some circumstances.

Conclusion

- This discussion paper reviews the importance of adapting to climate change for hand, food and menstrual hygiene. Countries in the South Asia region are facing increased frequency and magnitude of climate-related events. Weather hazards can disrupt WASH programmes and threaten the sustainability of WASH services. Climate change could significantly reduce progress towards Sustainable Development Goal (SDG) 6, preventing some households from achieving first-time access to safely managed WASH services and resulting in others sliding down the service ladders. In addition, climate change is increasingly displacing people, requiring temporary, semi-permanent and permanent hygiene options. More climate-resilient hygiene services necessitate reducing water usage, diversifying water supply sources and developing greater water storage capacity, together with attention to supply chains and last mile distribution of products, improved technology options and better management practices. Especially securing a reliable water supply is critical for all three hygiene practices (Biran et al., 2012).

Areas for further research

There are a number of the open-ended questions the sector still needs to address, including:

- The effect of climate-related shocks and stress on period poverty;
- More detailed understanding around climate resilience for food hygiene
- Numbers of people losing access to hand hygiene facilities due to climate change (or just even just flooding);
- Required investment to create climate resilient hygiene solutions;
- Investigate how ritual ablution practices (such as those in Islam) are maintained during water shortages/extreme weather events and apply such strategies to hygiene practices.

BOX 8.

CHECKLIST FOR A CLIMATE RESILIENT HYGIENE PROGRAMME

- Context-specific participatory climate assessments: Use scientific data, community mapping tools, facilitated household and community discussions, as well as climate adapted Water Safety & Security Plans and Sanitation Safety Plans or community-based adaptation (Mitlin and Dodman, 2011) to support climate resilient hand hygiene, including a special focus on the most at risk geographical areas and populations.
- Programme financing: Ensure budgets are available for hygiene resilient parts of programme as well as plans for resource mobilization to support for further work.
- Climate resilient hygiene programming: Hygiene services, products and behaviour change must be designed to be resilient to seasonal variability/extreme weather events (i.e., dry season) and quickly recover after an extreme event (e.g., reducing water use in drought prone areas). Recommendations include:
 - Adapt participatory and theory-based approaches to behaviour change promotion with a focus on climate resilient practices;
 - Advise households on how to reduce water use during periods of water scarcity;
 - Promote options to increase water storage during periods of flooding;
 - Market engagement to strengthen supply chains for the manufacture, storage and distribution of hygiene products including robust hand hygiene devices, soap and menstrual absorbents (see section boxes).
 - Capitalize on synergies with existing climate-related programmatic efforts, Disaster Risk Reduction (DRR) in water-related disasters, and water-resource management.
- Risk matrix: Climate-related risks to the planned programme results are considered in the results framework and impacts of climate and extreme weather events, and preventive measures have been incorporated.
- M&E: Integrate climate resilient hygiene in data collection, tracking, analysis and reporting.
- Research and evidence to produce new, cutting-edge technical knowledge that can be used to guide programme interventions.
- Capacity assessment: Expertise, skills and capacity to develop, implement, monitor and manage hygiene components of the programme to increase their resilience to climate-related disruptions to hand hygiene services.
- Partnerships: Expanded partnerships with climate organizations to develop regional and national agendas, building capacity of implementing partners for climate resilient hygiene including service authorities and service providers (national or regional utilities and private operators).

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UNICEF's water, sanitation and hygiene (WASH) country teams work inclusively with governments, civil society partners and donors, to improve WASH services for children and adolescents, and the families and caregivers who support them. UNICEF works in over 100 countries worldwide to improve water and sanitation services, as well as basic hygiene practices. This publication is part of the UNICEF WASH Learning Series, designed to contribute to knowledge of good practice across UNICEF's WASH programming. In this series:

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