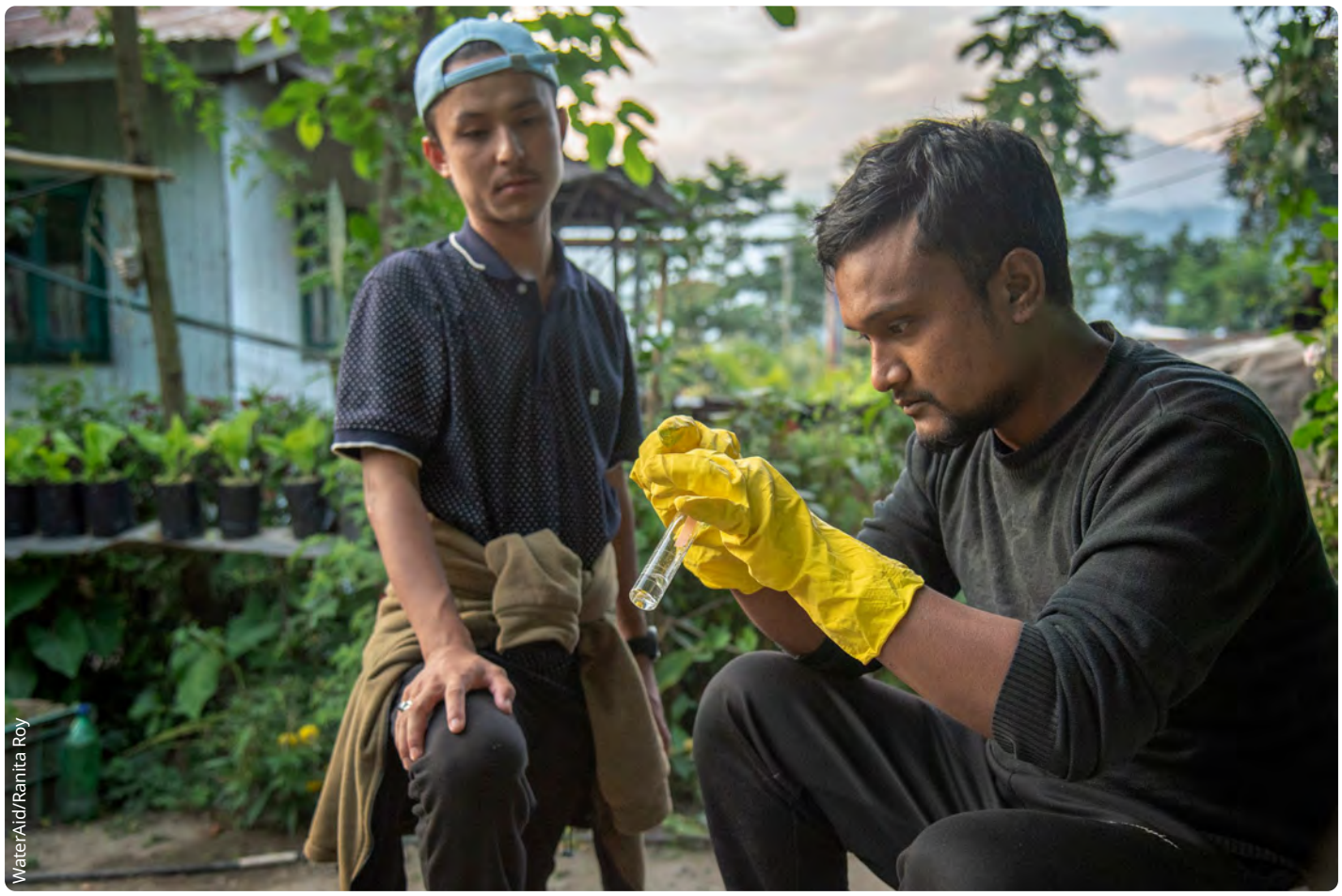


WaterAid/Ranita Roy

Boosting business: why investing in water, sanitation and hygiene pays off

Innovation, technology and climate-resilient water, sanitation and hygiene

Learning brief

WaterAid

Introduction

This learning brief unpacks the topic of climate-resilient water, sanitation and hygiene (WASH) and draws on practical experience and examples from the series of *Boosting business* pilot projects. The research is a first-of-its kind, measuring the return on investment and other business benefits of improving WASH services and behaviours in the workplace and employees' communities. Practical examples of climate-resilient WASH solutions are drawn from the projects based in Bangladesh and India, specifically.

In collaboration with Diageo, Gap Inc., HSBC, Twinings and ekaterra (which was part of Unilever when this project started), we aimed to measure the tangible impact of WASH investment in ten workplaces across four countries. These included tea supply chains in India and Kenya, apparel and leather supply chains in Bangladesh and India, and agricultural smallholder farmers in Tanzania.

This learning brief will demonstrate how three innovative climate-resilient WASH technologies – namely rainwater harvesting (RWH), spring protection and shed development, and evapotranspiration-based faecal digesters – have provided tangible benefits for the workplaces and communities in which they were installed.

Context

What is meant by 'climate-resilient WASH'?

Our working definition of climate-resilient WASH refers to:

> **WASH services and behaviours that continue to deliver benefits, or that are appropriately restored, within a changing climate context and despite climate induced hazards. Strong WASH systems can improve resilience to climate change.**[1]

This predominantly considers the resilience of people facing poverty and marginalisation, and WASH services and behaviours to rapid onset climate-related hazards and slow onset, long-term climate-related hazards.

There are several practical ways that climate-resilient WASH can be enacted to benefit households, communities and the workplace:[1]

- **More boreholes (back up supplies):** Groundwater is more resilient than surface sources – so boreholes will provide water in times of scarcity.
- **More storage (reservoirs, tanks, rainwater harvesting):** Greater storage can be factored into piped schemes and can be scaled up at industrial and household level.
- **Managed aquifer change:** Particularly in Asia. Activities – such as redirecting water across the land surface; adding irrigation furrows; or injecting water through injection wells[2] – that enhance groundwater recharge, make use of the natural storage offered by aquifers.
- **Contingency measures:** Local government and service providers need plans and finances in place to renew services and behaviours after shock events. This includes safeguarding water sources from contamination through spring protection and shed development measures.
- **Safely managed sanitation:** Increased pit emptying and safe disposal of faecal water can mitigate the risk of water supply contamination during flood events. Increased capacity wastewater treatment facilities can reduce the risk of them being overwhelmed.

1. WaterAid (2021). *Programme guidance for climate resilient WASH*. Available at: washmatters.wateraid.org/sites/g/files/jkxoof256/files/programme-guidance-for-climate-resilient-water-sanitation-and-hygiene.pdf (accessed 5 Sep 2022).
2. USGS (2019). *Artificial Groundwater Recharge*. Available at: usgs.gov/mission-areas/water-resources/science/artificial-groundwater-recharge#:~:text=For%20example%2C%20groundwater%20can%20be,the%20subsurface%20through%20injection%20wells (accessed 9 Sep 2022).

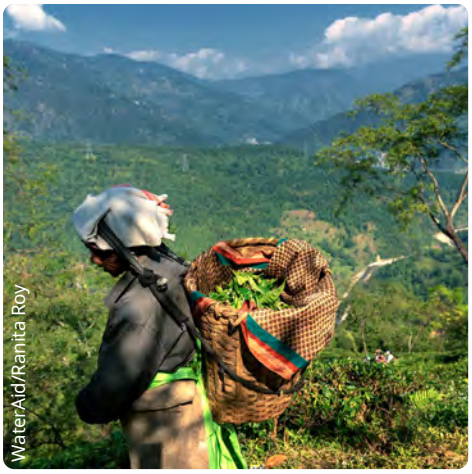
Why is climate-resilient WASH crucial for business?

In the workplace, climate-resilient WASH services help future-proof businesses by ensuring the longevity of the crucial facilities that keep workforces healthy and productive. The sustainability of water-intensive industries, like agriculture and apparel, are at risk due to the increasing prominence of extreme weather events. Workplace climate-resilient WASH solutions differ between sectors, geographies, and most importantly workplace settings, whether they are factory or field. Field WASH solutions often need to be designed and adaptable for less controllable environments.

The development of climate-resilient WASH solutions requires continuous innovation and technology. Throughout the *Boosting business: why investing is water, sanitation and hygiene pays off* pilot project, the following innovative solutions were designed and implemented:

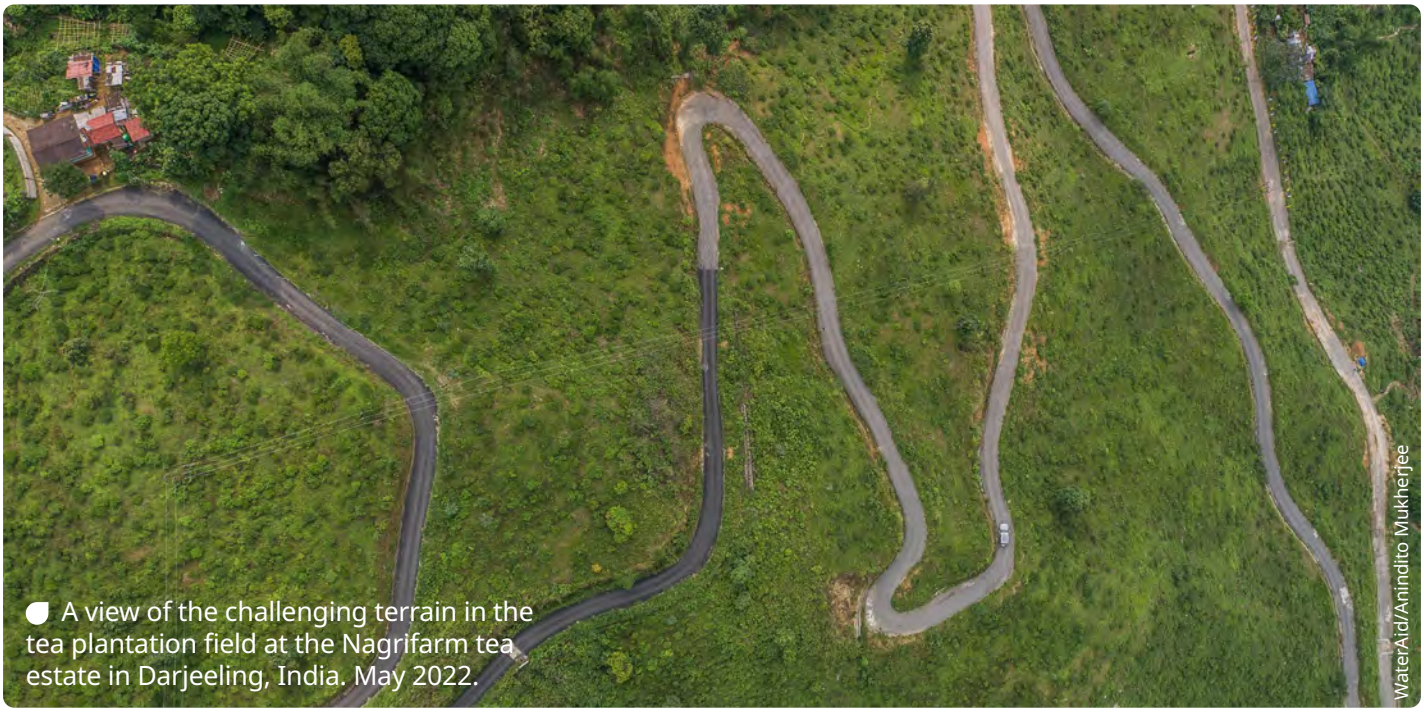
- **Rainwater harvesting** infrastructure provided a consistent water supply for operations and took the pressure off over-extracted groundwater in Bangladesh and India.
- **Spring protection** and **spring shed** development was designed and installed in Darjeeling, India.
- **Terrain-appropriate sanitation services** through the use of evapotranspiration-based faecal digesters were installed in Darjeeling, India.

Enhancing the quality and sustainability of WASH infrastructure for employees in the workplace and their communities has a positive knock-on effect for the business and its supply chain resilience. Improved access to WASH, such as reducing the time needed to collect water and guaranteeing the quality of a water source, reduces illness and disease amongst employees, which then lowers absenteeism and enhances productivity.



WaterAid/Ranita Roy

Employees at the Barnesbeg tea estate, Darjeeling district, India. November 2021.



A view of the challenging terrain in the tea plantation field at the Nagrifarm tea estate in Darjeeling, India. May 2022.

WaterAid/Anindito Mukherjee

1 Rainwater harvesting and storage facilities

In a factory setting

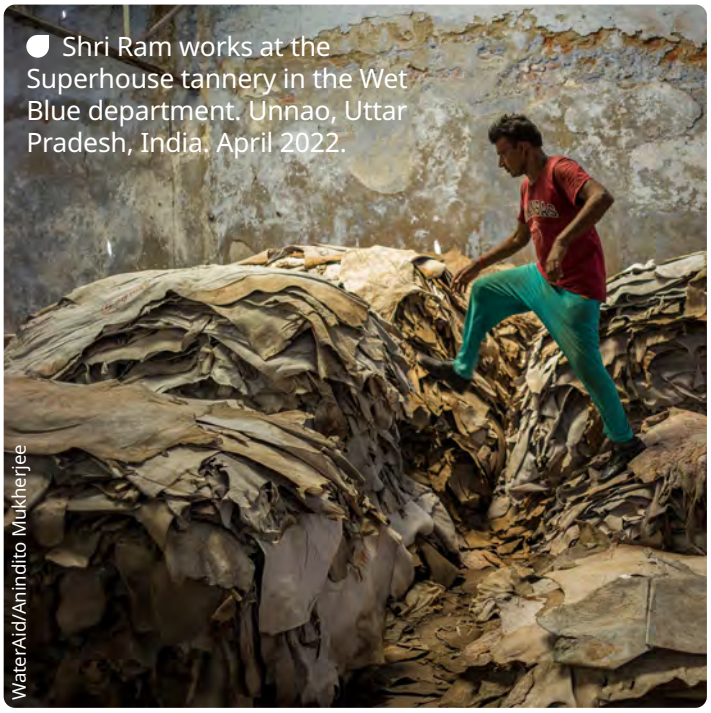
Leather tanneries – India

WASH gaps

The survey undertaken at the beginning of the project identified that only one of the three project tanneries (Kings International Ltd) had RWH infrastructure installed onsite. As such, gaps were identified at the Superhouse I and II tanneries, where groundwater was used in the tanning process as well as for drinking water. This provided issues as employees were drinking untreated groundwater that was possibly contaminated with chemicals. In Uttar Pradesh, where the Kings International Ltd and Superhouse tanneries are located, rainfall patterns have already been significantly affected by climate change. As incidences of weather extremes dictate changes in rainfall intensity and the duration and frequency of droughts and floods,[3] sudden shocks to groundwater will become more commonplace, resulting in the further contamination of unprotected sources.

Infrastructure solution

RWH infrastructure was installed at both Superhouse tanneries to improve the water quality and levels of water security. At one tannery, the harvested water provides additional supplies for the dyeing and washing of their products. The tannery has subsequently been able to make financial savings, as the harvested water contributes significantly to the 250 kilolitres of water used daily by the tannery. Whereas at the other tannery, RWH provides water for sanitation purposes to supplement the pre-existing water supply used for flushing toilets. This has improved the functionality and cleanliness of toilet facilities, leading to better staff wellbeing.



Shri Ram works at the Superhouse tannery in the Wet Blue department. Unnao, Uttar Pradesh, India. April 2022.

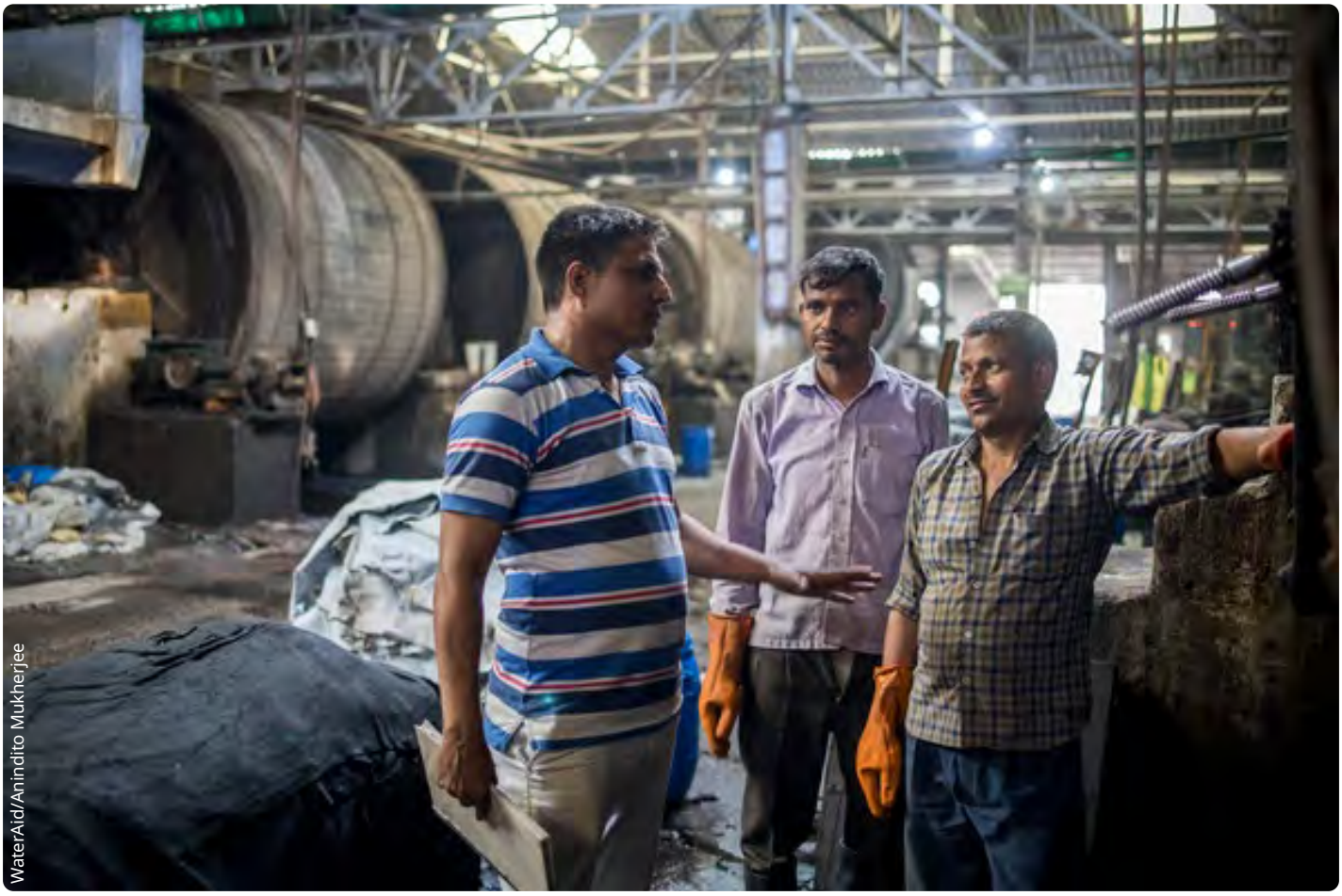
WaterAid/Anindito Mukherjee

Seasonal variances can also provide a challenge to the levels of water supplied by RWH. However, in the monsoon season, the Superhouse tanneries were able to make financial savings on the cost of boring due to the surplus supply. In the face of climate change, it is essential for the project to ensure the ongoing functionality of the infrastructure. As such, appropriate members of staff have been equipped with training to operate and maintain the RWH infrastructure.

Learnings

The financial savings made by the Superhouse tanneries are a testament to benefits of installing RWH systems. The seasonal variance of precipitation levels indicates the importance of adequate storage facilities to ensure the continued industrial and sanitary use of the harvested water.

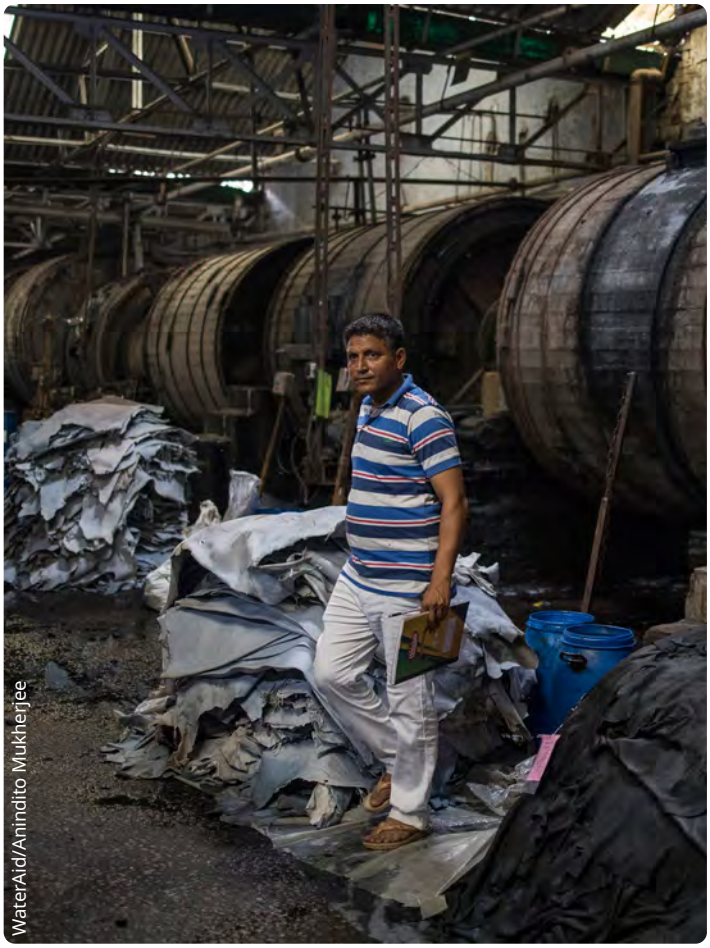
3. R K Naresh, et al. (2017). Climate change and challenges of water and food security for smallholder farmers of Uttar Pradesh and mitigation through carbons sequestration in agricultural lands: An overview. *International Journal of Chemical Studies*. vol 5, no 2, pp 221-236. Available at: chemijournal.com/archives/2017/vol5issue2/PartD/5-1-68-200.pdf (accessed 6 Sep 2022).



WaterAid/Anindito Mukherjee

Case study

The installation of the RWH structure has generated major benefits for the Superhouse tannery business. Mohammad Shoaib, a Supervisor at Superhouse, explained that tanneries are **"a water-intensive industry; we need water in every process. We use 250 kilolitres of water every day and all of this is groundwater, which we access by boring."** In the last monsoon, the rainwater that was collected could be used for processing the hides, thereby saving on the boring of water. Mohammad went further to explain how RWH **"saved us the cost of [extracting groundwater through] boring and was therefore beneficial for both the company as well as the environment."**



WaterAid/Anindito Mukherjee

Mohammad Shoaib is a Supervisor at the Superhouse Tannery. Unnao, Uttar Pradesh, India. April 2022.

Ready-made garment factories – Bangladesh

WASH gaps

The study at the start of the project indicated inefficient water use at the Fakir Fashion factory in Dhaka through the over-abstraction of groundwater to dye and wash clothes. This resulted in insufficient supplies of domestic water for households in the area, who rely on the same groundwater source. More generally, groundwater in Bangladesh has been over-exploited to meet the demands of a fast-growing population; and climate change is already posing a threat to its quality. Rising sea levels means groundwater sources can be contaminated with saltwater, which results in greater costs to treat the water.[4] The vulnerability of groundwater therefore demonstrates a need to consider an alternative, sustainable water source across Dhaka.

Infrastructure solution

Through the pilot research, it was evident that a RWH structure should be installed at Fakir Fashion to provide significant environmental and communal benefits, whilst also offering cost savings in terms of water supply and treatment. As such, a RWH system with a catchment of 7,432m^2 was installed. This project made use of the roof of the factory to construct the extensive RWH system and stored the water in a dedicated catchment building.

This new cost-effective approach to water resource management meant less treatment of the rainwater was required. Moreover, the RWH system easily met the high levels of water required for operational use, which was equivalent to the drinking water needs of approximately 10,000 households (more than 43,000 people) for a year.

The 8,999m^3 of rainwater captured over the project period was stored and used throughout the production process, dyeing and washing of clothes. From May 2020 to June 2021, total cost savings amounted to $9,102, exceeding initial estimates of $8,300. These savings came from a lesser demand to pay for the supply and treatment of water. Beyond the financial savings, the Fakir Fashion factory is now prepared for more extreme and longer lasting droughts thanks to an increase in storage provisions.

The rainwater harvesting system at Fakir Fashion has helped reduce the factory's dependency on groundwater. Narayanganj, Bangladesh. October 2021.

Learnings

The softness of the water provided through RWH, along with the increased consistency of water supply, contributed to the reduction in operational costs for Fakir Fashion. Rainwater naturally has lower levels of magnesium and calcium – demonstrated by the discovery that the rainwater harvested by Fakir Fashion was 20mg/l as opposed the groundwater levels of 120–130mg/l – and as such, does not require treatment prior to use. It has since been realised by Maher Abdullah AL, former CEO of Fakir Fashion, that thanks to RWH they **"can use this water in [their] dyeing houses that do not need particular chemical treatment."**

Fakir Fashion is an example of how installing climate-resilient WASH solutions can contribute to factories receiving environmental and social certification and allows them to comply with legal environmental standards. Since the pilot project began, Fakir Fashion have now been certified as a 'green plant' according to the United States Green Building Council.

4. Asian Development Bank (2022). *Securing a Sustainable Water Resource for Dhaka*. Available at: adb.org/results/securing-sustainable-water-resource-dhaka (accessed 6 Sept 2022).

In a field setting

Tea estates – India

WASH gaps

RWH plays in important role in meeting water needs at household level within both the Barnesbeg and Nagrifarm tea estates in Darjeeling. With the amount and distribution of rainfall in Darjeeling already erratic throughout the year and the region highly sensitive to increasing climate variances,[5] pre-existing WASH infrastructure is endangered by levels of rainfall that were unprecedented when it was designed. To mitigate this, it is essential that regions dependant on RWH for water have adequate storage facilities that can provide an uninterrupted water supply year-round. Whilst 73% of households practiced some form of RWH to collect water for cleaning, handwashing, cattle feeding and gardening purposes, baseline surveys found that as many as 20% of households had less than 100 litres of storage, with only 22% of households able to store more than 500 litres of water. The high levels of dependency on RWH across both tea estates can be attributed to 75% of households needing two to three trips a day to collect water when the baseline study was undertaken.

Sabinay Shankar, a resident of the Barnesbeg tea estate, works on the water supply line for his house. Darjeeling district, India. November 2021.

Infrastructure solution

To overcome these challenges and improve the retention rate of the water harvested through RWH, the project focussed on increasing the levels of household water storage. At the project end, this increased across the tea estate, with 95% of households having at least 100 litres of storage capacity installed. Increased storage capacities have enabled households to counter-balance extreme weather patterns – particularly in the drier months of November to February – and provide a buffer in times of water scarcity.

Learnings

As Darjeeling is a high precipitation region, it was important to develop a project intervention timeline based on weather conditions and seasons. It was essential in this case, for example, to keep the rainy season of May to September in mind, as well as festivals and the picking season, to ensure that infrastructure interventions could be completed to a high standard.

In addition to the notable household benefits a more consistent water supply can bring, the increased capacity of RWH infrastructure ensured increased productivity during extreme weather events. It was observed that even during unfavourable weather conditions, such as drought, the 27%-point increase of productivity compared to the baseline conditions persisted.

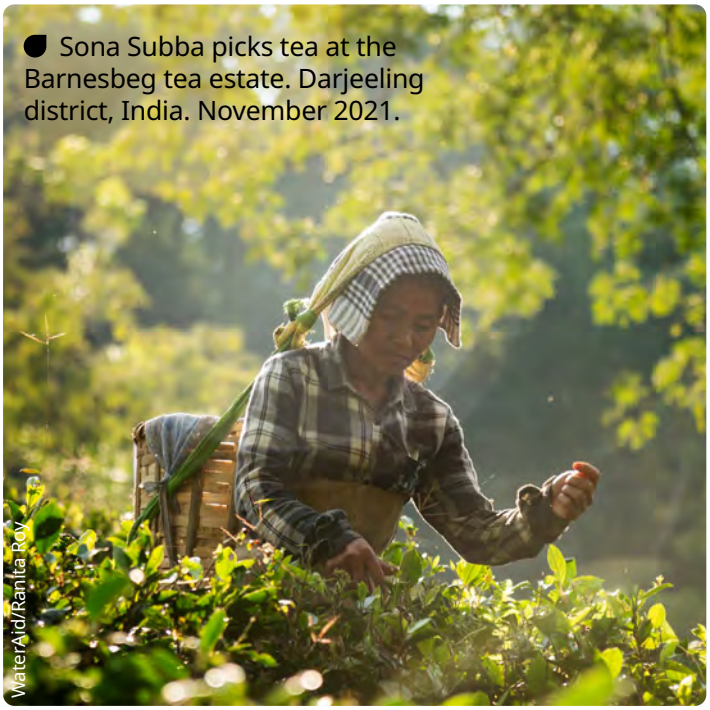
5. Kumar P, Brewster C (2022). Co-production of climate change vulnerability assessment: A case study of the Indian Lesser Himalayan region, Darjeeling. *Journal of Integrative Environmental Sciences*. 1-26, pp 4, 9. Available at: tandfonline.com/doi/full/10.1080/1943815X.2022.2033792 (accessed 6 Sep 2022).

2 Spring protection and spring shed development

Tea estates – India

WASH gaps

In areas with high rainfall, a crucial aspect of climate-resilient WASH is to ensure that water sources are protected against contamination by pollutants in surface water runoff. This is no different for Darjeeling. As touched on above, the increasingly unpredictable and heavy rainfall patterns can cause issues for WASH infrastructure, including the quality of water gathered from springs. During the pilot project in the Barnesbeg and Nagrifarm tea estates, the baseline surveys identified that 19% of households were collecting water from unprotected springs as a primary source of drinking water. These open and unprotected springs are at high risk of contamination, especially during instances of extreme weather or proximity to exposed sanitation facilities. Whereas, in drier summer months, the lack of water in the springs meant the communities could often spend days without water.



Sona Subba picks tea at the Barnesbeg tea estate. Darjeeling district, India. November 2021.

WaterAid/Ranita Roy

Infrastructure solution

To offer greater security to these exposed springs, the pilot project installed spring protection and engaged in spring shed development. The aim of these activities was to "prevent contamination, improve access or both".[6] In three instances throughout the pilot project, once in the Barnesbeg tea estate and twice in the Nagrifarm tea estate, spring protection was installed to protect the water source from contamination. In turn, this improved the access and quality of water for 77 employees at the Barnesbeg tea estate and 276 at the Nagrifarm tea estate. This meant working with local residents to construct a concrete platform around the spring with a large storage tank. This acted to protect the spring from fallen leaves, muddy runoff from the rain as well as other possible contaminants. This was supplemented through the building of water recharge mechanisms as means of spring shed development – two springs at Barnesbeg and one at Nagrifarm – enhancing the quality and sustainability of 1,690 people's water source.

Learnings

It was evident through the project that involving the local community in the construction of the climate-resilient WASH infrastructure enabled more comprehensive measures. In the Barnesbeg tea estate, for example, many houses received a piped water supply for the first time. However, the suggestion of reinforcing the Bhaladunga spring in the Tinacre village came from involving a community leader in the consultation process. This subsequently mobilised the community to contribute their labour to the project so that the spring would remain a viable alternative water source.

6. WaterAid (2021). *Technology Brief: Protected Springs*. Available at: washmatters.wateraid.org/sites/g/files/jkxoof256/files/2022-04/Protected%20springs.pdf (accessed 7 Sep 2022).

3 Evapotranspiration-based faecal digestion

Tea estates – India

WASH gaps

Prior to the pilot project intervention in the Barnesbeg and Nagrifarm tea estates in Darjeeling, it was found that sanitation facilities seldom consisted of more than a makeshift pit dug by the landowner. They often provided high levels of odour pollution and posed a threat to children and animals as they were frequently only covered with sheets of fabric or bamboo. The contamination of nearby water sources due to these pits will become more likely with the increase in climate shocks.

As precipitation levels become more erratic and extreme and the likelihood of flash flooding increases, faecal sludge poses a greater threat to unprotected water sources. Consequentially, without intervention, communities facing similar risks to those on the Barnesbeg and Nagrifarm tea estates are exposed to a greater possibility of infrastructure damage and waterborne diseases.

Infrastructure solution

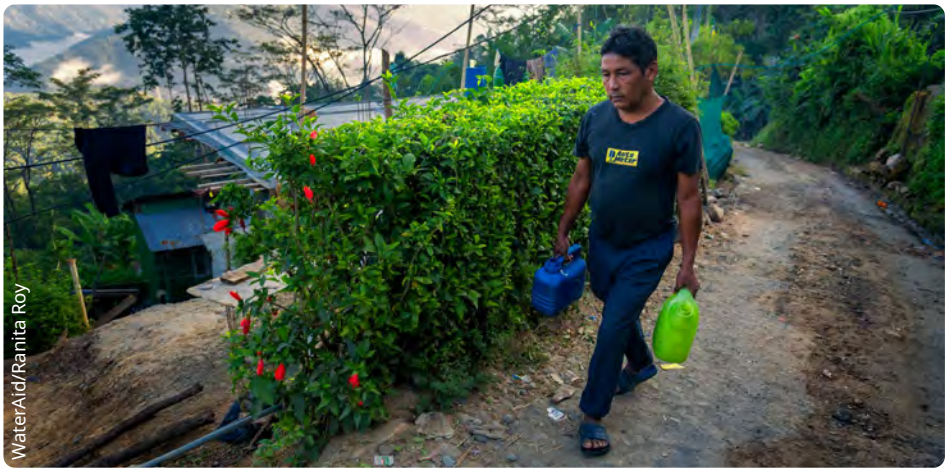
Due to the high probability that nearby water sources would be contaminated due to the rudimentary construction of these pits, the pilot project retrofitted household toilets in both tea estates with evapotranspiration and biodigester-based faecal digesters. These faecal digesters offer in-situ faecal sludge management, predominantly through aerobic digestion and to a lesser extent anaerobic digestion, allowing for a system that does not emit waste. In addition, the systems produce nutrients that can benefit the crops being grown above the infrastructure.

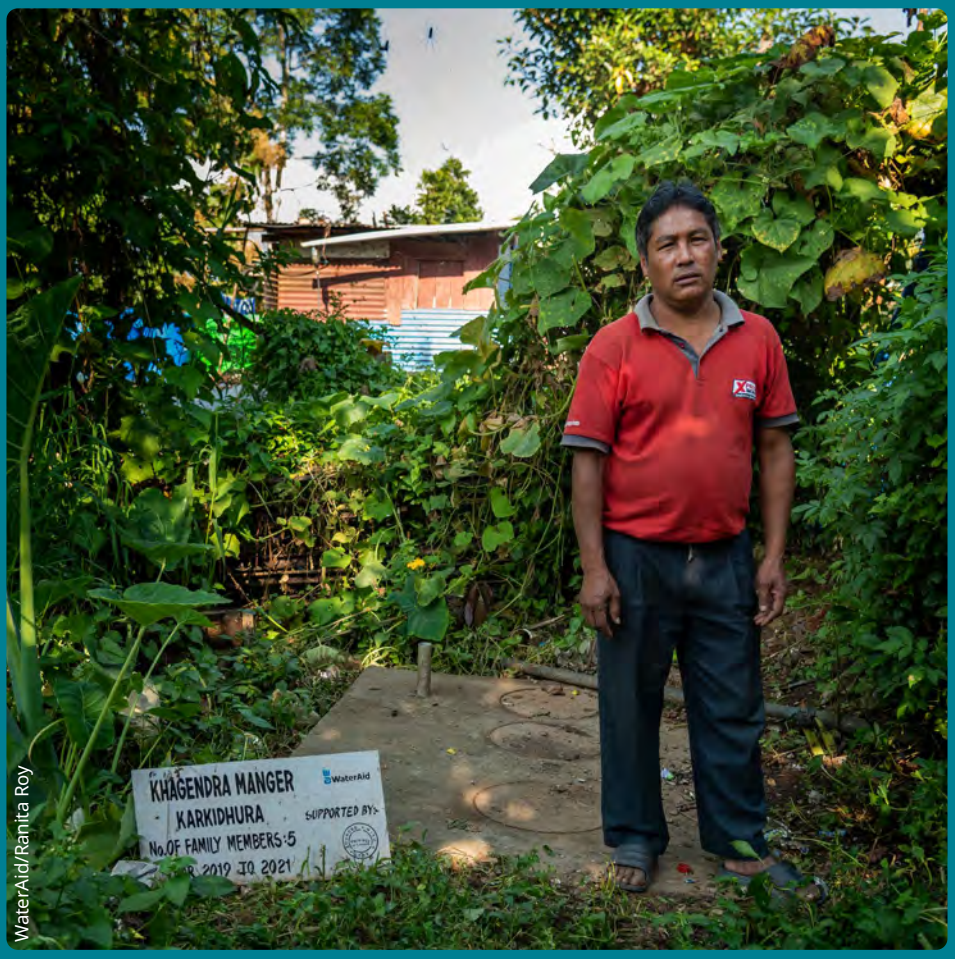
Learnings

At the time of writing, eight toilets have been completed with a further 37 at different stages of their construction – serving 227 people in the local communities. The difficult terrain in Darjeeling means that it can be challenging to develop a good infrastructure. As such, it was essential that pre-existing designs of evapotranspiration and biodigester-based faecal digesters underwent terrain-appropriate modifications. It is recommended that appropriate surveys are undertaken prior to the commencement of construction as to ensure the facilities' longevity and continued use.

Below: Pramit Subba washes dishes with running water. Barnesbeg tea estate, Darjeeling district, India. November 2021.

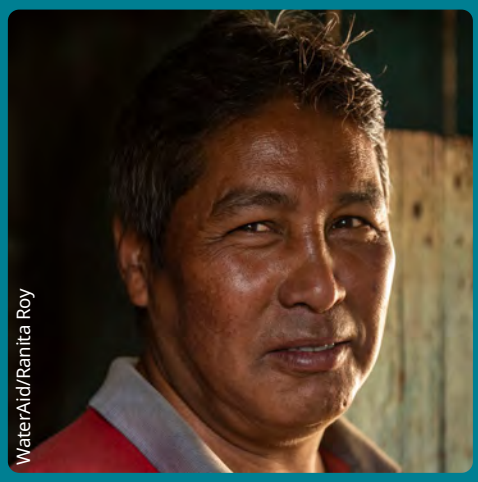
Right: Khagendra Manger collects water in plastic containers. Barnesbeg tea estate, Darjeeling district, India. November 2021.





WaterAid/Ranita Roy

Khagendra Manger, Driver at the Barnesbeg tea estate, now has a biodigester sewage tank at his home. Darjeeling district, India. November 2021.


WaterAid/Ranita Roy

Case study

The steep, stony terrain of Darjeeling is often complemented by the pots of begonia, nasturtium and other flowers, adding to its picturesque nature. However, as Khagendra Manger, a driver employed at the Barnesbeg tea estate, recognises **"it looks very nice on the surface, but it is very tough to develop good infrastructure here."** Historically, the challenges presented by the terrain have caused sanitation problems for Khagendra and his family, who would have to use pits covered with bamboo, scaffolding and mud. **"All the waste from the toilet would go into one of these pits. I would keep them loosely covered with bamboo and plastic. When a pit would fill up, I'd simply dig another pit."**

These pits would emit foul smells and posed a safety risk for children and animals. Moreover, digging pits in the stony mountain was extremely labour intensive and Khagendra could not afford to hire help. He was also concerned that they would **"soon run out of space for more pits."**

The pilot project selected Khagendra's house to construct a biodigester sewage tank in March 2021. The new tank has been designed to compost all faecal matter and to emit no foul odours.

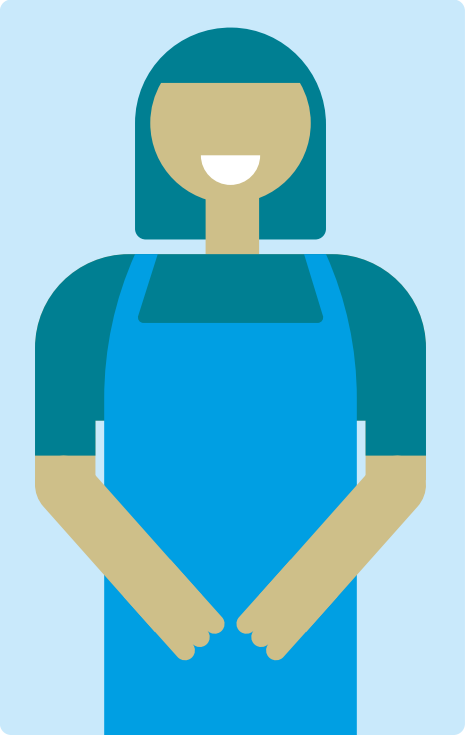
WaterAid India provided Khagendra with the designs for the new sewage tank – which cost about Rs8,000 ($100) and took three weeks to construct. Khagendra is happy with the new system, **"this is a very good design, and the concrete cemented walls ensure that all the sewage is contained within,"** he says. His wife, Sangeeta, agrees: **"not only has the smell completely gone, but the cover on the tank has made it much safer."**

Both believe they have created a legacy for their three sons. **"The biodigester pit will ensure that not only I, but they, will also be free from the tension of digging soak pits and worrying about sewage disposal,"** Khagendra says.

Conclusion

Climate change is making life harder for communities and businesses already struggling to access clean water, decent toilets and good hygiene. Climate-resilient WASH at home, in the community and the workplace helps to improve the resilience of employees and businesses to the impacts of climate change. Climate-resilient WASH interventions should be designed based on robust assessments of localised climate risks and respond to the needs identified during consultation with the people being served by the projects.

This project has demonstrated that investing in climate-resilient WASH infrastructure offers co-benefits beyond creating infrastructure that can withstand climate change. It offers learnings for businesses to cut operational costs, promotes business and workforce resilience, increases productivity and contributes to improving the health and living conditions of employees.



Front cover image: Ujwal Biswa, Water Quality Tester, and Manish Subba, Field Coordinator, test the quality of water at the Barnesbeg tea estate. Darjeeling district, India. November 2021.

Everyone, everywhere has a human right to water, sanitation and hygiene – at home, in the community and at work.

Acknowledgements

This learning brief would not have been possible without:

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Authors: WaterAid UK.

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