

# Technology



WaterAid/Layton Thompson

WaterAid works with people living in poverty to improve their access to effective, reliable and affordable water and sanitation services.

To ensure that the benefits of these services are long-lasting we use a wide range of technologies that are low-cost, appropriate to local conditions and easy for communities to use, manage and maintain.



WaterAid/Layton Thompson

# Water

WaterAid works in both rural and urban areas to help communities gain access to safe water. Uncontaminated water sources, such as ground- or rainwater, are vital for successful projects in rural areas. In towns and cities, where there is often an existing municipal water supply, we work with our local partners to negotiate a connection to poorer, unserved areas and extend the networks if required.

## Groundwater

Groundwater is the most prevalent source of water. It is usually safe to drink as layers of earth filter out bacteria and other impurities. The simplest way to collect this water is with wells fitted with pumps.

### Hand-dug wells

Hand-dug wells are the most common method of extracting groundwater in rural areas of the developing world. Although restricted to softer ground, such as clay, sand and gravel, communities can often dig these wells themselves with supervision from our partners.

To protect the wells from collapse they are lined with concrete rings. Below the water table the lining is porous, allowing water to seep in and be stored for use. Above ground, a raised concrete cover stops polluted surface water from entering, while drainage channels and soakaways prevent puddles of wastewater forming.

### Tubewells

Although they don't retain as much water as hand-dug wells tubewells can be built more quickly, cheaply and safely as they are drilled by augering or sludging and require less lining material. Tubewells also

reach greater depths, however specialist tools and expertise are needed to sink them and they can only be built where the ground is soft.

### Boreholes

Where the water table is very low or where the ground is particularly hard, a borehole can be sunk using engine-driven augers and rock drills. Locating water requires a thorough hydrogeological survey which takes a lot of time, money and effort.



WaterAid/Layton Thompson

Drilling a borehole in Chiutika village, Malawi.



WaterAid/Kate Eshelby

Collecting water with a rope pump in Al Hamer, Ethiopia.

## Pumps

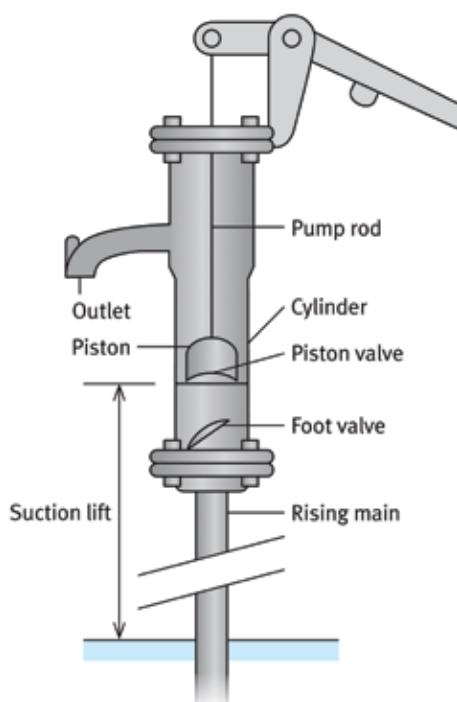
Millions of people across the world collect water using a rope and bucket from deep open holes in the ground. Although these traditional wells may seem like a simple water solution, the open top means that they are easily contaminated. In the rainy season waste often floods in and spreads disease. To prevent this from happening wells should be lined and sealed with a concrete cover and fitted with a pump.

### Handpumps

Handpumps come in a large variety of designs but WaterAid and our partners aim to use handpumps that are:

- Easy to repair – spare parts are available locally.
- Built from designs that are in the public domain.
- Approved by the country's government.

If a government's approved pumps are considered by WaterAid to be inappropriate, we will work with them to choose, introduce and approve the most suitable alternative.



A cross section of a handpump.

### Rope pumps

These pumps are relatively easy to manufacture and maintain locally. They use a long continuous loop of rope, with washers at regular intervals, which runs around a wheel at the top of the well and around a smaller roller at the bottom.

### Diesel or electric pumps

Where there is a high demand for water, and/or where the water table is particularly deep, diesel or electric pumps are used. The water is usually stored in tanks before being piped to tapstands. However, the fuel and the energy involved, and the specialist maintenance required, make these pumps expensive.

### Rehabilitation of wells and handpumps

It is often cheaper to rehabilitate old wells and handpumps than to build new facilities from scratch. Some WaterAid projects improve traditional unlined, uncovered or shallow hand-dug wells by making them deeper or wider, lining them and adding a sealed cover with a pump.

## Surface water supplies

### Spring protection

Natural springs can provide a clean supply of water when they are tapped and protected at the source. Water can then be collected there or, in gravity flow schemes, piped to storage tanks which can then supply tapstands in communities several kilometres from the source.

### Rainwater harvesting

If safely collected, rainwater can provide a source of cheap, pure water. Water is generally collected from pre-cleaned roofs,



WaterAid/Eva-Lotta Jansson

10 year old Bonifacio washes at a protected spring in Mozambique.

where it runs via guttering into a storage tank or jar ready for use straight away or during the dry season. Where water tables are dropping and wells often dry out, rainwater harvesting is increasingly used as an alternative.



WaterAid/Caroline Irby

Building a rainwater harvesting jar in Uganda.

## Urban solutions

In urban areas our partners work with poorer communities to help them negotiate with the local government or water authority to connect their area to the city's piped supply. Our partners, local people and service providers decide how connections, usually tapstands or household taps, are managed and how the money to pay water bills is collected. We also work with service providers to increase the number of connections to poorer communities.

# Sanitation

Given guidelines and a little technical help, families can build latrines for themselves at very low cost.

However, demand for sanitation services is generally lower than for water, as many people do not associate better sanitation with improved health. This is why WaterAid's projects include hygiene education which makes people aware of the importance of latrines and of how to use and maintain them effectively.

## Dry pit latrines

These latrines can be built quickly and easily by communities using local materials. They must be built above the water table so that sources are not polluted. The pit is lined and covered with a concrete slab, with either a hole for squatting or a pedestal.

## Ventilated improved pit (VIP) latrines

VIP latrines (see right) follow the same design as the dry pit latrine but have ventpipes to take smells away. The light at the top of the ventpipe attracts flies away from the latrine and a fly screen traps them.

## Pour-flush latrines

Where people clean themselves with water after using the toilet the latrine and pan are placed a few metres away from the pit and a pipe with a u-bend connects the two. A small amount of water is used to flush the pan and seal the u-bend, stopping flies and smells escaping from the pit back into the latrine.

## Composting latrines

Composting latrines turn waste into free, safe compost for communities to use. Two pits are used in rotation. When the first pit is full its contents are left to decompose while the second pit is used. By the time the second pit is full the compost from the first pit is ready to be dug out and used, and

the pit put back into use. Soil and ash are added after each use to control flies and smell and aid decomposition. In areas with high water tables, this latrine can be built above ground (a skyloo) to avoid groundwater contamination.

## Urban solutions

Many residents in urban areas do not have land rights for their homes or space to build latrines so WaterAid promotes the construction of communal latrine blocks. These either connect to cesspits that can



WaterAid/Marco Betti

Community members digging a trench for a new sewage pipeline in Gwalior, India.

be emptied by 'sludgesucking' machines or to existing sewers. Where people have land rights, we work with local suppliers and communities to find effective solutions, including community-managed pit emptying, small scale sewerage schemes connected to city sewers or local wastewater treatment systems (often using reedbeds).

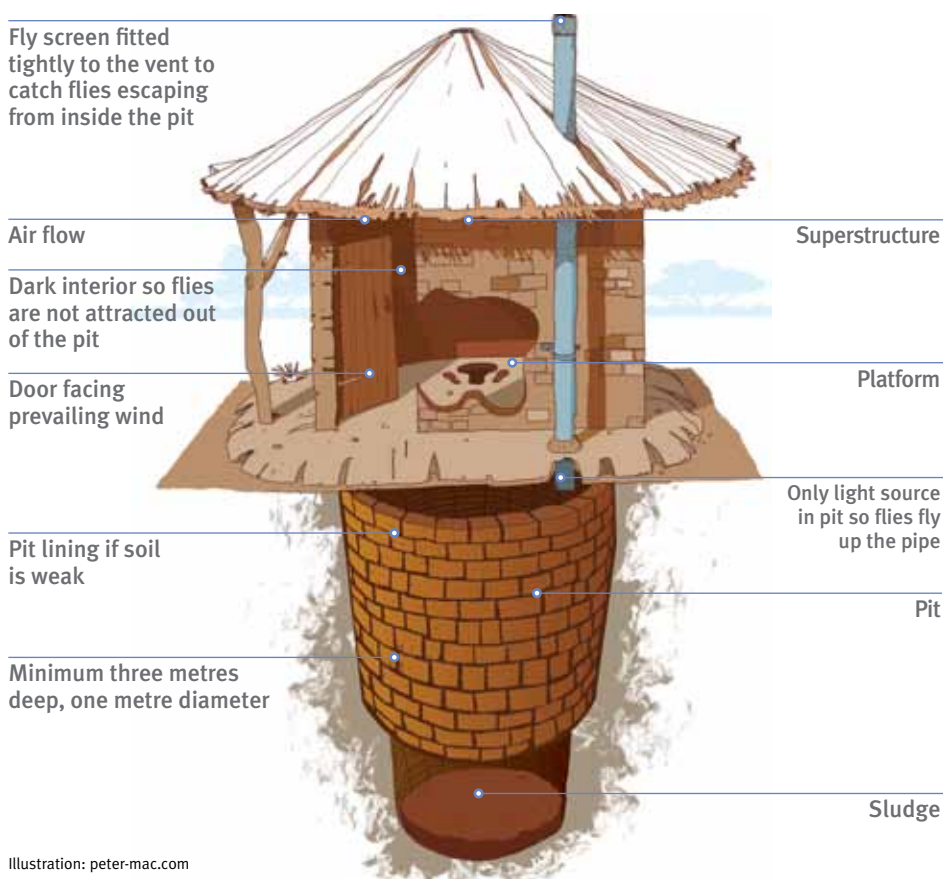


Illustration: peter-mac.com

A ventilated improved pit latrine.

# Water resource management

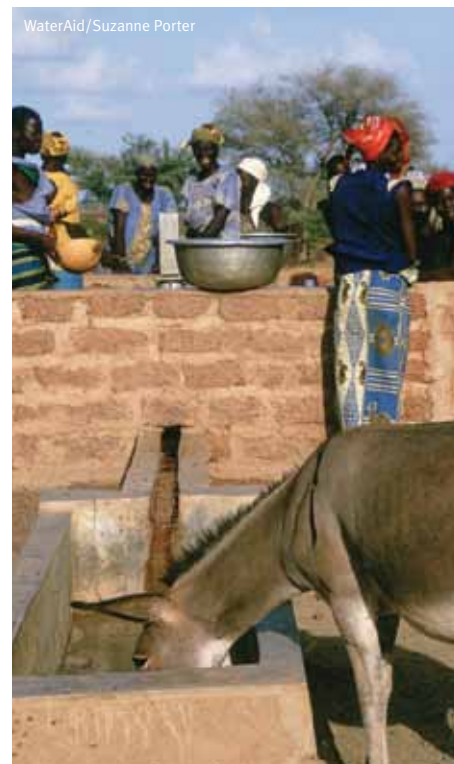
In many parts of the world, agriculture, industry, climate variability and over-population threaten the safety and availability of groundwater. To ensure the sustainability of water sources, and our projects, WaterAid promotes effective management of water resources.

Prior to starting a project the sustainability of the local water sources is investigated and the water quality is tested. This is particularly important in areas prone to natural arsenic or fluoride contamination.

We also train local people to monitor and manage their own water sources effectively.

We promote the use of different sources for varying purposes – safe water from water points for drinking, water from rivers or ponds for washing clothes, cleaning houses or for livestock. In water-scarce regions we have started to use simple groundwater recharge methods such as sub-surface and sand dams.

To prevent the contamination of water sources latrines are built an adequate distance away and all tapstands and handpumps feature drainage to prevent the build-up of stagnant water. This run-off often feeds into vegetable gardens or is used for livestock. We also encourage our partners to monitor drinking water quality regularly.



WaterAid/Suzanne Porter

A donkey drinks at a trough filled by run-off water from a pump in Yaké, Burkina Faso.

# Maintenance of projects

Alongside our partners we help people set up, manage and maintain their own water and sanitation facilities. When communities are involved in the development of their local facilities they feel ownership of them, helping to ensure projects do not fall into disrepair.

In most WaterAid projects a water and sanitation committee is formed as a starting point. Designated roles such as chair, treasurer, caretakers and hygiene educators are drawn from the community and training is given. The treasurer is responsible for collecting each household's contribution towards the maintenance of water sources or, in urban

situations, water and sewerage bills, while caretakers look after water points or latrines.

In projects where local people pay per water container, a water point attendant is appointed. In urban areas this is a full time job with regular wages, in rural projects people often work on a voluntary basis.

In order to ensure long-term permanent services in rural areas, WaterAid is training local mechanics to fix more complex problems. In some areas these mechanics are part of the local government staff, while in other areas they are local private entrepreneurs.



WaterAid/Marco Betti

Ram Kanthi is part of an eight-woman handpump mechanic team in Mahoba district, India. "We women used to face many difficulties with our water. The handpump used to break down and we had to rely on the men to fix it. We learnt to repair the pumps so that when they break down we can fix them as quickly as possible. Now the men come to us and ask us to repair the handpumps!"

**£6**

could pay for a bag of cement in Nepal

**£17**

could pay to rehabilitate a handpump in India

**£45**

could pay for a composting latrine in Uganda

**£300**

could pay for a school sanitation block for 300 children in Bangladesh

**£1,535**

could pay to protect a spring for 300 people in Madagascar

Visit [www.wateraid.org/technology](http://www.wateraid.org/technology) to find out more about the technologies used in WaterAid's projects, download our technology notes and explore low-cost latrines with our toilet technology flipbook.

See rope pumps, composting toilets, rainwater harvesting and more in action at [www.wateraid.org/video](http://www.wateraid.org/video).

**Martin Ouedraogo** is a rope pump manufacturer in Ouagadougou, Burkina Faso.



WaterAid/Mark Bushnell

Martin was trained and supported by WaterAid to build rope pumps. He now employs five local people in his small workshop and keeps the cost of the pumps low by using easily available materials – pistons are made from pieces of broken plastic chairs which are melted down and moulded to shape.

“My feeling about this design, this rope pump, it's very good technology and it's easy for me to make. The output, the water yield, is satisfactory for me and also for the communities. Now with the rope pump they have access to safer water and a reduction in diseases related to water. Whenever I go to the communities where I have been able to install this technology they say, 'Ah this is the man who helped us.'”

**Bedana Begum** helps people build latrines in her village of Mochmoil and surrounding villages in Bangladesh.



Charlie Bibby/Financial Times

Bedana is known in her area as a 'barefoot engineer' – a community member who works with local people to develop and promote low-cost latrine technologies.

“We have told our neighbours to build latrines so we are 100% sanitised. I have faced resistance in my counselling, but many of the people who have resisted then came around. When I helped them to start digging latrine pits, they were amazed. I told people it should be their sons digging and they said no, he is educated, he should not be digging. But then they were so ashamed to see me digging on my own, they joined me.”

**WaterAid**

WaterAid transforms lives by improving access to safe water, hygiene and sanitation in the world's poorest communities.



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