



Water is essential to our survival. Having clean water to drink is crucial for both humans and animals, and water is needed to grow crops. Being able to store it without it getting contaminated is also important, as is the role of water in good hygiene and sanitation to prevent the spread of infectious diseases.



Children playing at a water pump in Bangladesh



Nepalese man proudly stood outside his toilet built with support from Practical Action



Have you heard about the **Sustainable Development Goals (SDGs)** or **Global Goals?**

These are 17 Goals that were put together by global leaders from many countries around the world to **end poverty, protect the planet and ensure prosperity for all** by 2030.

To find out more about the Global Goals, you can watch a video about them here vimeo.com/181766755 and/or go to www.globalgoals.org

One of these, **Global Goal 6** is about having access to **clean water and sanitation**, so that shows how important it is in lifting people out of poverty. To find out why watch

this <https://www.youtube.com/watch?v=LCKsU4bPFOQ>

If we can't get clean water, or we can't clean the water we have, then we have a life threatening problem. Diseases carried by water kill millions of people every year. **2.5 billion people** (including just under one billion children) don't have basic sanitation – that's access to safe water and the means to dispose of body waste.

Targets for Goal 6 include:

- By 2030 achieve universal and equitable access to safe and affordable drinking water for all
- By 2030 achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls.

These are the targets that the use of STEM knowledge and skills can help us reach.

SOME IDEAS TO GET YOU STARTED

We hope you will do a lot of research yourself, looking at websites, videos etc. so that you get a clear picture of what is happening in the world before you start designing your Global STEM challenge. To help you we have some ideas and links to things you might like to look at - all related to water and sanitation. Don't feel you have to select one of these, what you do is up to you!

The main thing to keep in mind is how STEM skills can help deliver this Global Goal, either in Europe or a developing country.

Getting Water

How we get the water we need for drinking, washing, cooking and to water our crops is the first step in the process. In many countries this is the job of girls and women, so ways of making this easier and less time consuming really benefits them.

Rainwater harvesting

Your challenge could be around ways to collect rainwater in a specific country. You could look at a rainwater harvesting scheme like a hafir (a reservoir in Sudan), and as well as harvesting water think about ways to reduce the loss of water by evaporation or water seeping away. To find out more go to practicalaction.org/rainwaterharvesting-8



Improved flush toilets in a Kenyan slum

Cleaning it

Having clean water to drink is essential in preventing the spread of infectious diseases. There are lots of different ways water can be cleaned. Maybe your challenge could be about building a working model of some of these solutions.

Solar distillation

Solar distillation is one method used around the world to clean water. You could set an investigation into looking at which factors affect solar distillation. Is this an effective way of removing salts and dissolved metals? Could your challenge look at designing experiments to test that?

Have a look at these pages for information
http://www.appropedia.org/Solar_distillation

<http://practicalaction.org/water-distillation-1>

Filtering water

Water can also be cleaned using a filter, a method used a lot in the developing world. One idea for a challenge could be around making a water filter. You could encourage pupils to do a range of experiment to decide what materials make a good filter. Many filters in the developing world use sand and stones of different sizes. A challenge could also look at investigating what materials different types of filters remove from water. You will also need to think about whether the water from a filter pupils make would be safe enough to drink or require additional treatment.

Searching on the internet you will find lots of ideas on how to make a water filter to get you started.
<http://www.wilderness-survival-skills.com/how-to-make-a-water-filter.html>

Irrigation techniques and dams

Sand dams are also used to store large bodies of water. Your challenge could be about finding ways in which they are used and investigating ways to improve them and make them more effective. Would using woven grass or twigs in the middle of a sand dam make it work better? Could pupils design a test in the school lab to see if this worked? Maybe they could look at simple ways of testing how permeable rocks are?

For more information go to
practicalaction.org/irrigation-4

Water Pumps

Practical Action uses a variety of different pumps to get water from underground. These include treadle pumps, wind pumps, human powered water pumps and treadle pumps. You could look at these and see if designing a model of a pump would be a good idea for a challenge .

For general information on treadle pumps go to
practicalaction.org/treadle-pumps-2

There are all sorts of different types of pumps powered by humans, One interesting pump uses a bicycle! To see a video of this go to <http://bit.ly/paanspump>.

Another organisation have used play equipment to generate electricity in a fun way
<http://www.playpumps.co.za/>

Do you think designing a pump that could be used by children to lift water would be a good challenge?

New access to clean, fresh water for Bolivian school girls





Storing it

In some cases when we access water we use it straight away, e.g. when using a water pump to wash our hands. Mostly however water has to be stored.

Rainwater harvesting

You may want to base your challenge around different techniques used to store water, and the issues with each. Investigations could include how to minimise loss of water by evaporation. Why not consider designing a storage tank that could be used in your school, or in another part of the world using locally sourced materials. You could first research information on different types of tanks such as the pumpkin tank used in Bangladesh, the Brick dome tank or the cement mortar jar.

For general information on rainwater harvesting go to practicalaction.org/rainwaterharvesting-8

Dams

There are lot of designs of dams which are used to store water. Your challenge could include looking at different designs and considering the effect different rock and soil types have on the way water escapes from dams. Other things include looking at the best way to minimise loss of water through barriers, dams and earth walls. Perhaps this could be tested in the lab scientifically?

<http://practicalaction.org/dams>



School children in Kenya benefitted from improved water access and clean toilets installed by Practical Action

Water and hygiene

Washing in clean water is an important part of preventing the spread of infectious diseases. These are diseases caused by the spread of bacteria and include things like colds, food poisoning and cholera.

Hand washing

A challenge around hand washing could start by researching what diseases are transferred by poor hygiene, and go onto how hygiene could be improved either in your own school or in other places around the world. Maybe the main challenge could be around building a model of an outdoor hand washing station either in your school or in a country like Kenya where water is scarce and needs to not be wasted.

Facts and figures on the importance of hand washing: <http://www.cdc.gov/handwashing/why-handwashing.html>

Sanitation

A good sanitation system is important both to reduce the spread of diseases and for human dignity. In many parts of the world schools don't have toilets and as a result older girls don't attend at certain times of the month, which damages their education and life choices.

It's a bit of a 'yuck' subject but you could design a challenge around building a working model of a toilet system for a particular country, taking into account locally available materials and reducing the amount of water needed to a minimum.

There are ideas for different toilets here <http://practicalaction.org/improved-toilets-3>



This dam in Sudan was built with help from Practical Action. It provides water to 1500 farmers.



Useful links

UN Global Goals – Water and Sanitation

<http://www.un.org/sustainabledevelopment/water-and-sanitation/>

Information about Global Goal 6: Ensure access to water and sanitation for all

Global Goals – Water and Sanitation

<http://www.globalgoals.org/global-goals/clean-water-sanitation/>

Information on Global Goal 6 and how to get more involved in the global goals

Facts about water

www.bit.ly/40-shocking-facts-about-water

Interesting facts and statistics on water.

Technical briefs from Practical Action

<http://practicalaction.org/technical-briefs-schools-water-and-sanitation>

Information on solutions around water and sanitation

Technical briefs from Practical Action

<http://practicalaction.org/technical-briefs-schools-agriculture>

Information on solutions around agriculture

Videos on water

www.practicalaction.org/videogallery

Videos from Practical Action highlighting issues around water in the developing world. Look at both agriculture and water and sanitation.

Worldometers

www.worldometers.info

Basic 'real time' data including data on water.

WATERAID

www.wateraid.org

Information about the challenges of water and sanitation.

Centres for Disease Control and Prevention

https://www.cdc.gov/healthywater/wash_diseases.html

Information about global WASH-related diseases and contaminants.

Unicef

http://www.unicef.org/wash/index_wes_related.html

Information about common water and sanitation-related

WaterAid

<https://www.youtube.com/watch?v=iubwubzgu3o>

A video on why water, sanitation and hygiene

Video explaining Global Goal 6

<https://www.youtube.com/watch?v=LCKsU4bPFOQ>

The Sustainable Development Goals Explained: Water and Sanitation

Case study

<http://practicalaction.org/realising-the-right-to-total-sanitation-in-nakuru-slums>

Total sanitation in Nakuru slums, Kenya

Practical Action: health and hygiene education

<http://practicalaction.org/health-and-hygiene-education-1>

Practical Action

<http://practicalaction.org/water-distillation-1>

Water distillation – turning salty water into drinking water

Practical Action

<http://practicalaction.org/urban-water-sanitation-waste>

Information about Practical Action's work on urban, water, sanitation and waste services.

Videos

<http://practicalaction.org/videos-water-sanitation>

Videos showing some of Practical Action's solutions



Young girls from Sudan carrying water from the pump to their homes

