



The 'Drop by Drop' Student Pack will help you in your Stop the Spread Challenge. It contains the information and worksheets you will need to get organised and plan your project.

## STOP THE SPREAD

This pack has been produced by Practical Action for Youth Grand Challenges in partnership with the CREST Awards scheme. CREST is a UK award scheme for 11-19 year olds recognising success, building skills and demonstrating personal achievement in science, technology, engineering and maths project work.

## DROP BY DROP STUDENT PACK

To enter the Youth Grand Challenges competition, supported by the Bill and Melinda Gates Foundation, go to [www.youthgrandchallenges.org](http://www.youthgrandchallenges.org)



# STUDENT PACK

## CONTENTS

- 1 Pupil notes: 'Drop by Drop' guide
- 2 Info Sheet: material costs
- 3 Worksheet: cost record sheet
- 4 Worksheet: designing your model
- 5 Worksheet: evaluating the work of others
- 6 Case Study: school children 'stopped the spread' in Kenya
- 7 Info Sheet: Why Sanitation Matters

Managed by:



Supported by:

BILL & MELINDA  
GATES *foundation*

# 1 PUPIL NOTES: DROP BY DROP GUIDE

Imagine you are charity workers working with a group of primary children in a school in Kenya to improve their general hygiene. Your task is to encourage them to wash their hands more frequently and to help them understand why this is important in reducing the spread of infectious disease in their community.

Your task is in two parts:

1. Design, build and test a working model that will collect rainwater that can then be used by pupils to wash their hands when in school.
2. Produce education materials on why hand washing is important in preventing the spread of infectious diseases in a format they will find engaging and learn from.

## Drop 1 - Getting organised

Decide on a team name. In your team decide who is going to have which role based on their strengths. Suggestions based on real STEM careers are Product Designer, Engineer, Science Researcher, Finance Manager and Science Communicator. In a small team one person may have two roles.

## Drop 2 - Researching

Researchers in your team should lead on finding out about some of the problems caused by poor hygiene and the importance of hand washing.

## Drop 3 - Designing your model

Work with the Product Designer in your team to draw an initial design for your model.

Key points to remember are:

- It must be able to both collect and dispense water
- It must use water efficiently (water is a scarce resource in Kenya)
- Think about how to avoid cross-contamination
- You have 125 credits. It is the Finance Manager's job to keep control!

## Drop 4 - Building your model

The Engineer in your team should lead on building your model according to your design. Remember you can redesign as you go along to improve your device.

## Drop 5 - Testing and redesigning

Test your model. If you can see how to improve your model then do so. Can you keep the same design but use cheaper materials? When you have a model you are happy with draw your final design.

## Drop 6 - Creating education materials for primary pupils

This is where the Science Communicator takes the lead. Decide on a way to communicate the importance of hand washing to 8-11 year olds in a way that will encourage them to do it! Be creative, think about a game, animation, poster, leaflet, play etc.

## Drop 6 - Sharing your work with others

Prepare to present your work to the rest of the class, imagine they are funders who might invest in your device. In your presentation, you will need to show your designs; demonstrate your model (by pouring water into it and showing how it could wash hands) and show the education materials you have produced for primary children. Look at the judging criteria to see what you will be scored on and plan your presentation accordingly.

## Drop 7 - Evaluating the work of others

Use the sheet provided to assess the other groups and their presentations. Remember to give constructive feedback - what worked well? What could be improved?

### What next?

- If you have used this challenge to work towards a CREST Discovery Award you can enter your work into the Youth Global Challenges competition
- Maybe you could choose the best design in your class, or ideas from several designs and use that to build a working hand washing device in your playground
- Get involved in the movement to help ensure the Global Goals are met by joining the campaign [www.globalgoals.org](http://www.globalgoals.org) and looking at Global Goals 3 and 6.

### Useful Links

Global Goals campaign  
[www.globalgoals.org](http://www.globalgoals.org)

Information about Global Goal 6: Ensure access to water and sanitation for all  
[www.un.org/sustainabledevelopment/water-and-sanitation](http://www.un.org/sustainabledevelopment/water-and-sanitation)

Information about Global Goal 3: Health and Well-being  
[www.un.org/sustainabledevelopment/health](http://www.un.org/sustainabledevelopment/health)

Video - The Sustainable Development Goals Explained: Water and Sanitation  
[www.youtube.com/watch?v=LCKsU4bPFOQ](http://www.youtube.com/watch?v=LCKsU4bPFOQ)

British council resource on the spread of new infectious diseases and how we can stop them  
[www.bit.ly/2eDP4Wb](http://www.bit.ly/2eDP4Wb)

Unicef - Information about common water and sanitation-related diseases  
[www.uni.cf/2e3XNPR](http://www.uni.cf/2e3XNPR)



## 2 INFO SHEET: MATERIAL COSTS

You will need to buy materials to make your hand washing model. Each modelling material represents a 'real' material you would use if you were building a hand washing device in Kenya. These can be divided into:

- Locally sourced materials – these are available close to the school and in the village e.g. bamboo, plastic bottles, rope. You should aim to use as many locally sourced materials as possible as they are more sustainable
- Imported materials – these will need to be transported from a town or city further away. Generally they cost more to produce and you have to pay for the transport into the village.

As an important part of your design you will need to balance the cost of materials with their quality and their impact on the environment.

### Budget

Your budget is 125 credits. Keep track of how much you are spending on your cost record sheet. Anything you use not listed on this sheet is free.

### Trading

Once you have bought materials you can't just give them back if you don't use them...so think carefully before you buy! If you do have material that you don't need you can trade with other groups.

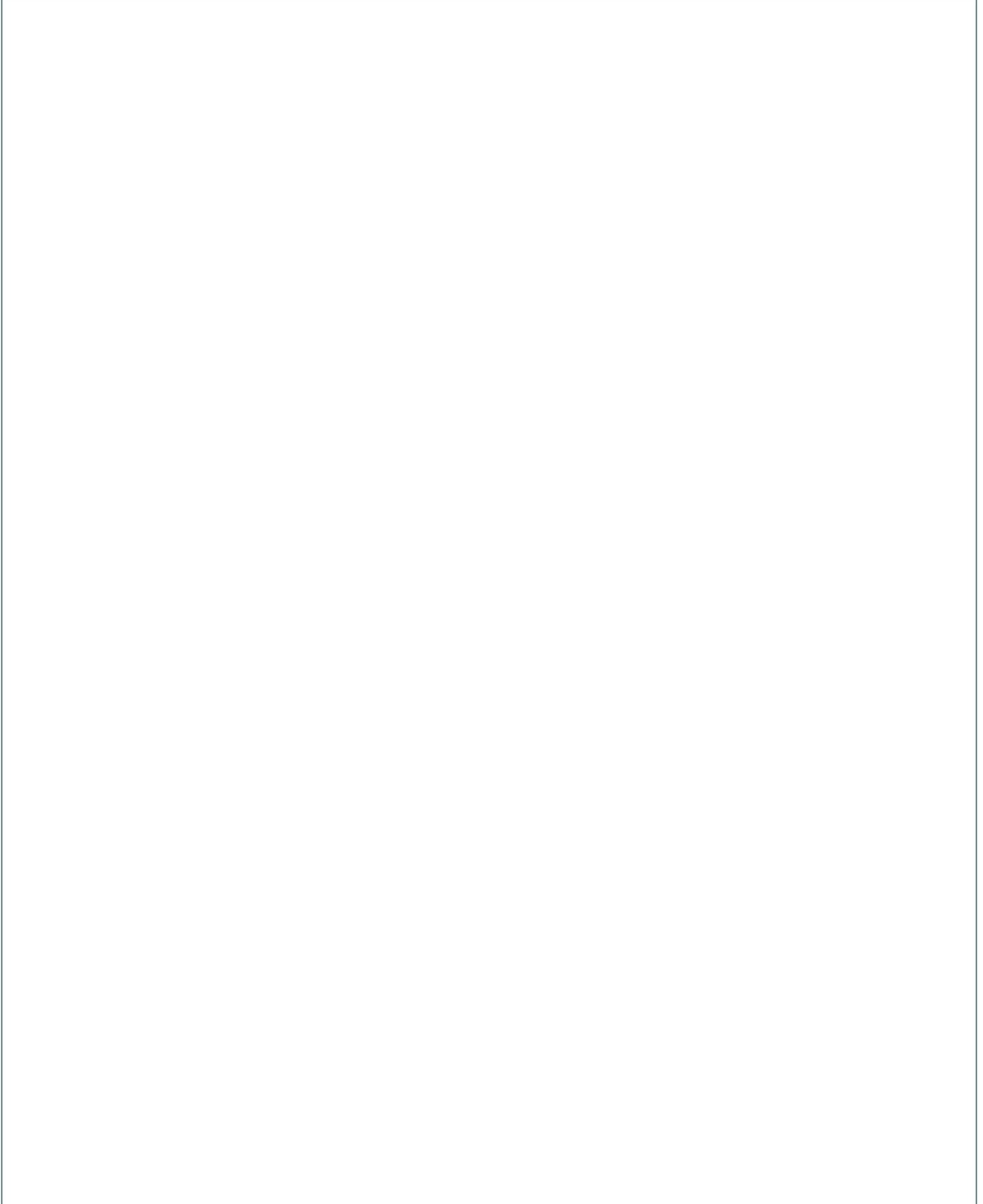
Locally sourced materials	Modelling equivalent	Cost per unit
Bamboo stick	Wooden skewer, lolly stick, straw	2 each
Rope	String	1 per 5cm length
Plastic/milk bottles	Plastic drinks bottles/milk bottles	free
Tape	Sticky tape/masking tape	2 per 5cm length
Bonding material	Blu Tack	2 per small piece
Glue	Glue	free
Imported materials	Modelling equivalent	Cost per unit
Steel pole - long	K'NEX - long piece (8cm or longer)	5 each
Steel pole - short	K'NEX - short piece (up to 8cm)	3 each
Connector	K'NEX connecting piece/paper clip/ split pin	2 each
Pulley	Pulley	10 each
Sheet of wood	Card	3 per 10cm <sup>2</sup> piece



# 4 WORKSHEET: DESIGNING YOUR MODEL

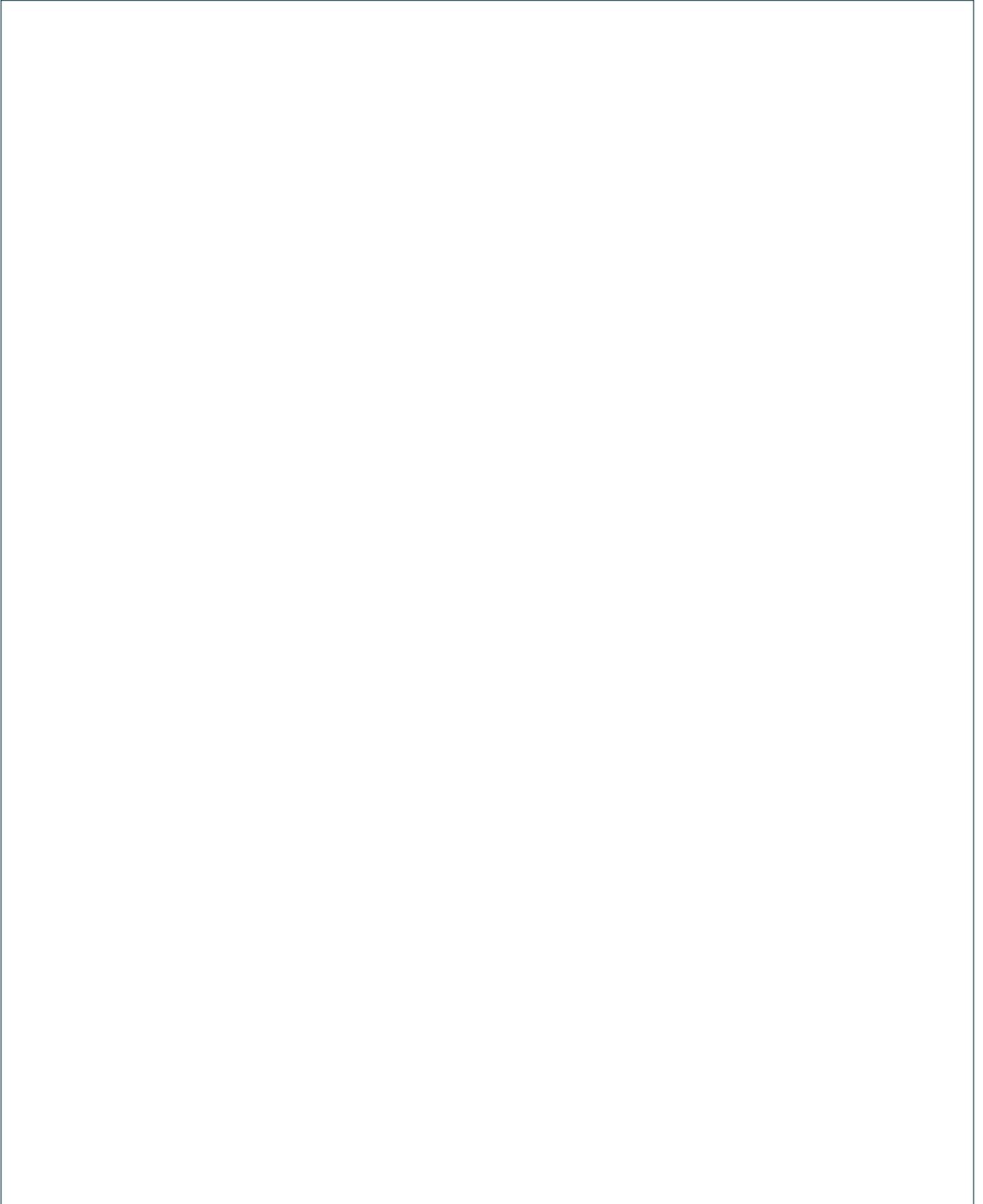
## Initial Design

Draw your initial design here. Remember to annotate, giving reasons why you chose certain materials or a particular shape or structure for your device.

A large, empty rectangular box with a thin black border, intended for drawing the initial design of a device. The box is currently blank.

**Final design**

Draw your final design here and annotate.



# 5 WORKSHEET: EVALUATING THE WORK OF OTHERS

Imagine you work for a charity that gives organisations funding for hygiene projects. You want to choose the best organisation and give them money to build hand washing devices in 10 primary schools and produce education materials for their pupils. To help you decide listen carefully to the presentations of other groups and think about how well they met the judging criteria below. Give them a mark out of 5, where 5 is the best.

**Teamwork** - Did they have different roles but still collaborate and listen to each other's point of view? Did most or all the team contribute?

**Research** - Before starting on the design did they do any research into the problems caused by poor sanitation? Did they put their research to good use by incorporating it into the education materials?

**Designing** - Did they produce a good initial design before they started building their hand washing model? Did they modify it after testing? Is their final design easy to understand?

**Model** - How creative was their model? Did they use sustainable materials where possible? Did they stick to the budget? How well did it do in the test?

**Education materials** - Think about what information they communicated and how they did it. Are the materials creative and engaging? Are they suitable for 8-11 year olds?

Group name	Teamwork	Research	Designing	Model	Education Materials	Total

The group you would give the funding to is .....

## 6 CASE STUDY: SCHOOL CHILDREN 'STOPPED THE SPREAD' IN KENYA



### Life in Mukuru

Mukuru is one of the largest slums in Nairobi, the capital of Kenya with a population of over 500,000 people. Most people living in Mukuru live in one-room houses made from corrugated iron sheets.

The water and sanitation facilities in Mukuru are very scarce. A recent survey found that only 11% of families had access to their own household toilet and that the majority of people used a community toilet, often shared with up to 1,000 other people. Hand washing facilities are even scarcer leading to poor hygiene and the spread of diseases such as cholera.

Watch this video about the cholera outbreak in Mukuru:

[www.youtube.com/watch?v=Rv7hITWp0zI](http://www.youtube.com/watch?v=Rv7hITWp0zI)

### Improving health and hygiene

In 2007, a project organised by the development charity Practical Action and Nairobi's City and Water and Sewerage Company was set up to improve the health of people living in Mukuru. The project aimed to:

- improve the water supply and build new toilet blocks and washing facilities
- deliver training for a health campaign to promote good hygiene practice.

### The health campaign

The health campaign targeted over 2,500 young women and 4,000 school children living in Mukuru. The main messages were around the proper use of toilets and the importance of hand washing after a toilet visit.

In the eight schools that were targeted, the trainers used the Child-to-Child approach. This method is based around children gaining understanding of the main health issues that affect their community then develop their own ways of sharing the health messages to encourage other children and their families to take action.

The school children involved in the Child-to-Child training developed a range of creative ways to communicate their health messages including the use puppets and developing songs, plays and posters.

The children involved in the project continue to wash their hands to prevent the spread of disease.

---

The challenge now is to reach more people in Mukuru with similar projects. Find out more about Practical Action's Water and Sanitation Projects [www.practicalaction.org/water-and-sanitation](http://www.practicalaction.org/water-and-sanitation)

# 7 INFO SHEET: WHY SANITATION MATTERS



© UN Photo / Kibae Park

## CLEAN WATER AND SANITATION: WHY IT MATTERS

### What's the goal here?

To ensure access to safe water sources and sanitation for all.

### Why?

Access to water, sanitation and hygiene is a human right, yet billions are still faced with daily challenges accessing even the most basic of services.

Around 1.8 billion people globally use a source

of drinking water that is fecally contaminated. Some 2.4 billion people lack access to basic sanitation services, such as toilets or latrines. Water scarcity affects more than 40 per cent of the global population and is projected to rise. More than 80 per cent of wastewater resulting from human activities is discharged into rivers or sea without any treatment, leading to pollution.

## 6 CLEAN WATER AND SANITATION



Water scarcity affects **more than 40 percent** of the global population and is projected to rise.

# INFO SHEET CONT.

## What are the effects of this?

Water and sanitation-related diseases remain among the major causes of death in children under five; more than 800 children die every day from diarrhoeal diseases linked to poor hygiene.

Proper water and sanitation is a key foundation for achieving the Sustainable Development Goals, including good health and gender equality.

By managing our water sustainably, we are also able to better manage our production of food and energy and contribute to decent work and economic growth. Moreover, we can preserve our water ecosystems, their biodiversity, and take action on climate change.

## What would it cost to correct the problem?

A study by the World Bank Group, UNICEF and the World Health Organization estimates that extending basic water and sanitation services to the unserved would cost US\$28.4 billion per year from 2015 to 2030, or 0.10 per cent of the global

product of the 140 countries included in its study.

## What would it cost if we don't correct the problem?

The costs are huge—both for people and for the economy.

Worldwide, more than 2 million people die every year from diarrhoeal diseases. Poor hygiene and unsafe water are responsible for nearly 90 per cent of these deaths and mostly affect children.

The economic impact of not investing in water and sanitation costs 4.3 per cent of sub-Saharan African GDP. The World Bank estimates that 6.4 per cent of India's GDP is lost due to adverse economic impacts and costs of inadequate sanitation.

Without better infrastructure and management, millions of people will continue to die every year and there will be further losses in biodiversity and ecosystem resilience,

undermining prosperity and efforts towards a more sustainable future.

## What can we do?

Civil society organizations should work to keep governments accountable, invest in water research and development, and promote the inclusion of women, youth and indigenous communities in water resources governance.

Generating awareness of these roles and turning them into action will lead to win-win results and increased sustainability and integrity for both human and ecological systems.

You can also get involved in the World Water Day and World Toilet Day campaigns that aim to provide information and inspiration to take action on hygiene issues.

To find out more about Goal #6 and the other Sustainable Development Goals, visit:

<http://www.un.org/sustainabledevelopment>



**SUSTAINABLE DEVELOPMENT GOALS**  
17 GOALS TO TRANSFORM OUR WORLD