

Year 5
Environmental Science

Water



Name: _____

Class: _____

Lesson 1: Where does water come from?

Resources and equipment needed:

- Large bowl
- Small mug
- Cling film
- Warm water

Key vocabulary

- **Water cycle:** the continuous movement of water on, above and below the earth's surface
- **Precipitation:** water that falls onto Earth – rain, sleet, snow, hail
- **Evaporation:** the process of water turning to water vapour when heated.
- **Condensation:** the process of water vapour turning back to water when cooled
- **Surface run-off:** water on the surface which travels into bodies of water
- **Aquifer:** underground stores of water

Lesson 2: How can we limit the damage caused by floods?

Resources and equipment needed:

- none

Key vocabulary

- **Climate:** the normal weather in a place
- **Climate change:** long term changes to the climate, cause both naturally and as a result of human actions
- **Global warming:** the gradual increase of average temperatures across the planet
- **Floodplain:** the land nearest to a body of water which is often flooded

Lesson 3: Why is clean water important?

Resources and equipment needed:

- large bowl
- mug or small cup
- cling film
- warm **salty** water

Key vocabulary

- **Sanitation:** clean living conditions eg toilets, taps for handwashing and clean water.
- **Desalination:** the removal of salt from seawater so that it is drinkable

Lesson 4: How much water do we use?

Resources and equipment needed:

- none

Key vocabulary

- **Cholera:** an infectious and sometimes deadly disease, causing vomiting and diarrhoea
- **Epidemiology:** the branch of science that explains how diseases are spread
- **Water-borne:** carried by water

Lesson 5: What are the uses and effects of water pollution?

Resources and equipment needed:

- none

Key vocabulary

- **Pollution:** the act of making something dirty or contaminated
- **Industry:** the work of making products from raw materials in factories
- **Agriculture:** farming
- **Pesticides:** chemicals used by farmers to control diseases in their crops and animals

Lesson 6: How do we get clean water?

Resources and equipment needed:

- Dirty water in a jug: water mixed with some soil
- Filter materials: a range such as filter paper, cotton wool, pebbles, sand, gravel, lentils, rice
- Large clear plastic bottle (1.5 or 2 litre)
- 1 glass of tap water
- 4 glasses of water, each with something different added in. eg salt, white vinegar, boiled water, tea/coffee, a soft drink or squash, white sugar (anything that changes the colour or smell).

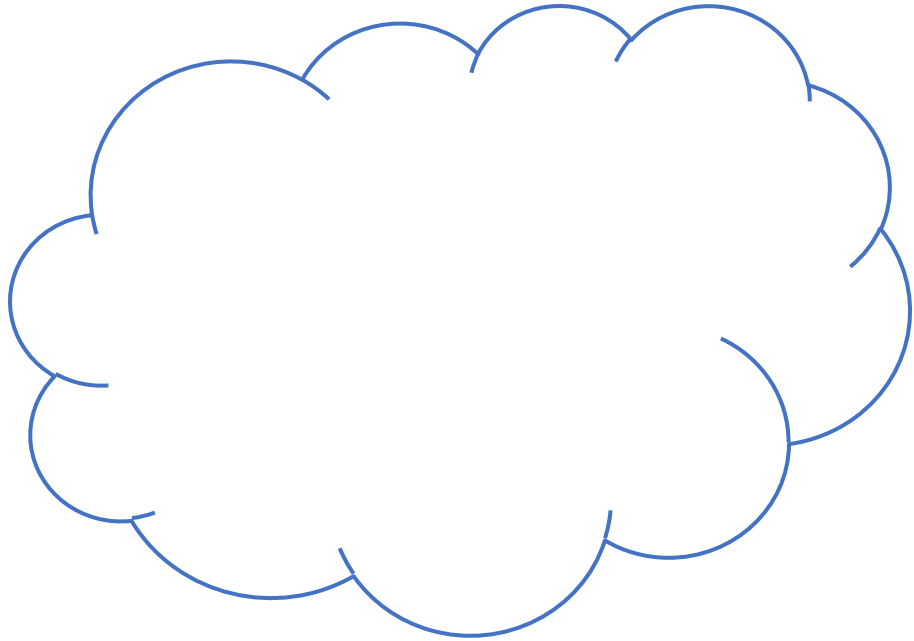
Key vocabulary

- **Screening:** The first part of the process in which screens remove large solids like stones, twigs and leaves.
- **Mixing Tank:** A vat in which a chemical is added to unclean water make the smaller solids (dirt) stick together for easy removal.
- **Sedimentation:** The process by which any remaining solids settle to the bottom of the tank and are collected and removed.
- **Filtration:** part of the process where the water is filtered to make it cleaner.
- **Chlorination:** The addition of chlorine to kill bacteria and make the water safe to drink.

Lesson 1: What is the Water Cycle?



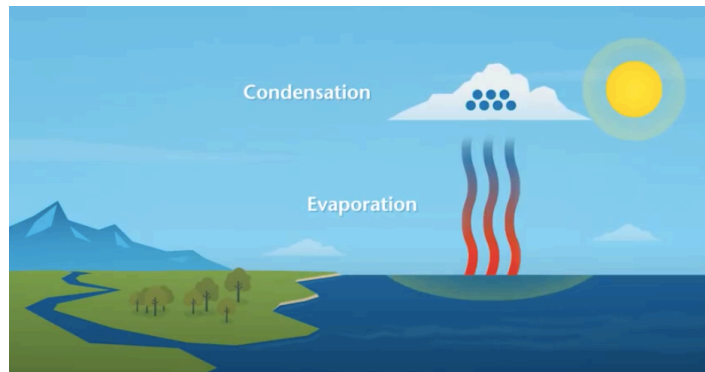
Part one: What would a world without water look like?



Where does water come from?



What is the water cycle?



<https://www.youtube.com/watch?v=zBnKgwnn7i4>



A water cycle experiment

Equipment

- large bowl
- mug or small cup
- cling film
- warm water

Method

1. Place the mug or small cup in the centre of the bowl.
2. Fill the bowl with water about 2/3 of the way up the cup (do not put water inside the cup).
3. Cover the bowl with cling film.
4. Place it somewhere warm for a few hours.
5. Observe after a few hours.

What can you see on the underside of the clingfilm?

What can you see in the mug? Can you explain what has happened?



Some of the water in the bowl has When the water vapour reaches the cling film, it has Condensed droplets then fall back into the mug, representing

Your diagram of the water cycle:



A large, empty rectangular box with a thin blue border, intended for drawing a diagram of the water cycle.

Lesson 2: Floods!



Part one: Quiz

Fill in the gaps to explain the water cycle. Use the word bank.

aquifers	clouds	condenses	evaporation
precipitation	precipitation	runs-off	water vapour

_____ falls from the sky, onto the land and seas. Most of the surface water _____ into bodies of water or underground _____ . As the sun warms the earth, some water turns to _____ through the process of _____ . As this rises into the colder air, it _____ forming _____ . As the clouds travel higher, they can hold less water. They therefore release some of their water as _____ .

Part two: climate change and floods



Earlier this year, the UK suffered several floods which came about because of extreme storms.

This video shows some of the effects of Storm Dennis:

<https://www.youtube.com/watch?v=qzkYGKZC4w0>



Why are these extreme weather events becoming more frequent?

- **Climate change** (or **global warming**), is the process of our planet heating up.
- Scientists estimate that since the **Industrial Revolution**, human activity has caused the **Earth** to warm by approximately **1°C**. While that might not sound like much, it is enough to have a significant impact on weather and wildlife across the planet.
- Unfortunately, rising temperatures don't just mean that we'll get nicer weather. The changing climate will actually make our weather more **extreme** and **unpredictable**.

In London, we are protected from flooding by the Thames barrier. The largest flood barrier in the world is the Oosterschelde barrier in the Netherlands. The Netherlands is particularly vulnerable to flooding because it is a very low-lying, flat land. In fact, large parts of the country used to be in the sea. The literal translation of Nether lands is lower lands. You can see more about this barrier here: <https://www.youtube.com/watch?v=cVdRMRumns>

Part three: how can we help?



It's great that we have the Thames barrier, but many towns and cities in the UK and the world do not have such protection.



We therefore need to think about how we can make floods less likely and if they do happen, how we can limit the damage they cause.

What actions can you think of?

Think about the following questions (and remember your Geography learning):

- Where should we build our houses, our towns and our cities?
- How can we make our gardens and our countryside flood-friendly?

Use these websites to help with your research:

- <https://www.bbc.co.uk/news/uk-25929644>
- <https://eschooltoday.com/natural-disasters/floods/flood-prevention-methods.html>
- <https://www.researchify.co.uk/>



How can we make floods less likely? <i>How can we tackle climate change?</i>	How can we protect ourselves? <i>How can we limit the damage from floods?</i>

Lesson three: Why is clean water important?



Part one: Quiz

1. The collective word for water that falls from the sky as rain, snow, sleet or hail is:

- a) evaporation
- b) run-off
- c) precipitation
- d) condensation

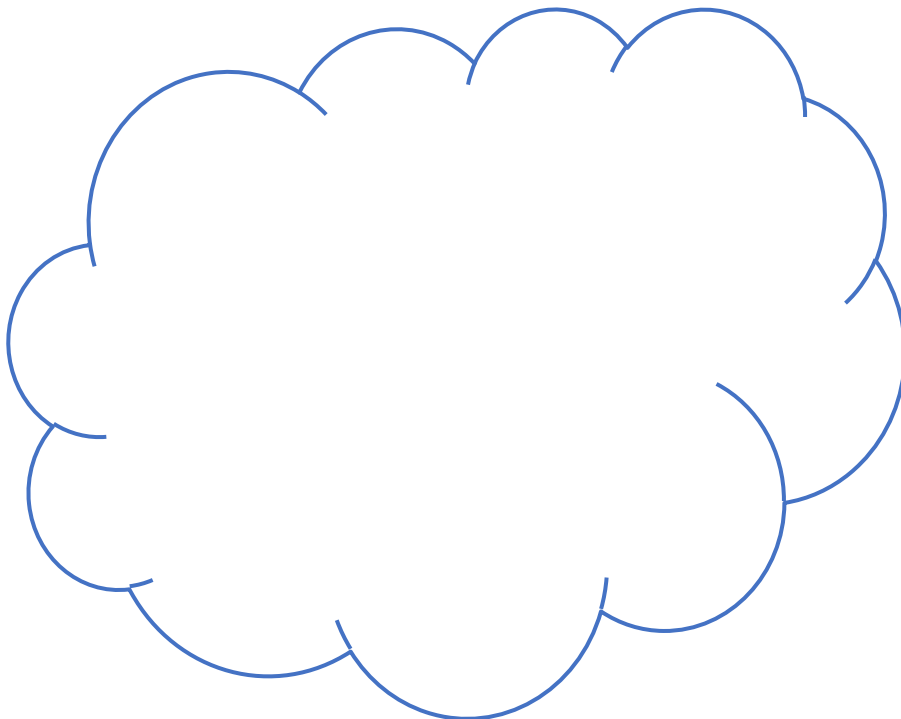
2. One of the things we could ask the government to do to prevent flooding is

3. One of the things we could do in our own lives to reduce the risk of flooding is

Part two: What do you use water for?



List all the different ways you have used water so far today



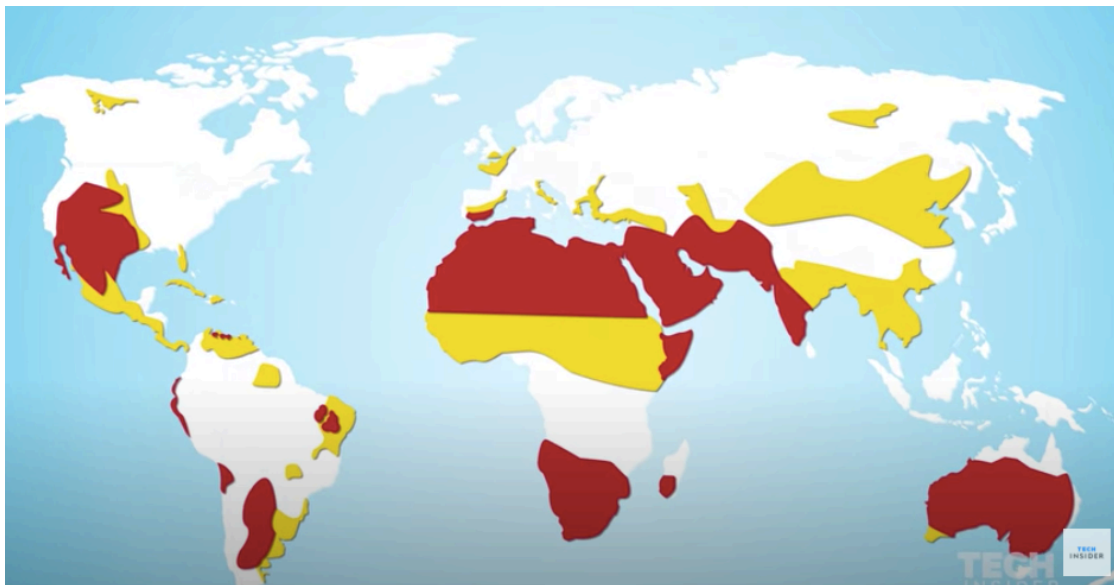
Part three: water scarcity

To do all of these things, we need clean water. We are lucky to have an abundant supply in this country, and in most of Europe. However, this is not the case for many parts of the world.



This video highlights areas of water scarcity:

<https://www.youtube.com/watch?v=2QQszsz0C20>



One in three people do not have access to safe drinking water, two out of five people do not have a basic hand-washing facility with soap and water. Many of these people live in countries with high levels of poverty, making it hard for the governments to address the water scarcity challenge.



In 2015, The United Nations set 17 Sustainable development goals for the world:

“The Sustainable Development Goals are the blueprint to achieve a better and more sustainable future for all. They address the global challenges we face, including those related to poverty, inequality, climate change, environmental degradation, peace and justice. The 17 Goals are all interconnected, and in order to leave no one behind, it is important that we achieve them all by 2030. Click on any specific Goal below to learn more about each issue.”



ENSURE AVAILABILITY AND SUSTAINABLE MANAGEMENT OF WATER AND SANITATION FOR ALL



785 MILLION
PEOPLE REMAIN
WITHOUT EVEN
BASIC DRINKING WATER
SERVICES (2017)



2 OUT OF 5
PEOPLE
WORLDWIDE
DO NOT HAVE
— A BASIC —
HANDWASHING
FACILITY WITH
SOAP AND WATER
AT HOME (2017)

1 OUT OF 4

HEALTH-CARE FACILITIES
WORLDWIDE LACK BASIC
DRINKING WATER SERVICES
(2016)



BY 2030,
700 MILLION
PEOPLE COULD BE
DISPLACED BY
INTENSE
WATER SCARCITY

673 MILLION
PEOPLE (9% OF THE
GLOBAL POPULATION)
STILL PRACTISE
OPEN DEFECATION
(2017)

THE MAJORITY OF THEM
ARE IN **SOUTHERN ASIA**



2 BILLION PEOPLE LIVE
IN COUNTRIES EXPERIENCING
HIGH WATER STRESS

Part four: technological solutions



The problem isn't that there isn't enough water in the world. The problem is that 96.5% of the water is in the oceans, which means that it cannot be used for drinking. This is exacerbated by wasteful behaviours with our precious fresh water supplies.

However, hi-tech and low-tech solutions abound. **Desalination** is the process of removing salt from sea water. Salis is the Latin for salt, so desalination literally means "taking salt away from".



Let's have a go at some desalination!



A desalination experiment

Equipment

- large bowl
- mug or small cup
- cling film
- warm **salty** water

Method

1. Place the mug or small cup in the centre of the bowl.
2. Fill the bowl with salty water about 1/3 of the way up the cup (do not put water inside the cup).
3. Cover the bowl with cling film.
4. Place it somewhere warm for a few hours, ideally in direct sunlight
5. After at least three hours, take the cling film off. There should now be some water in the mug or cup (just like in our **water cycle experiment**). Carefully taste it. It should be warm but not salty!

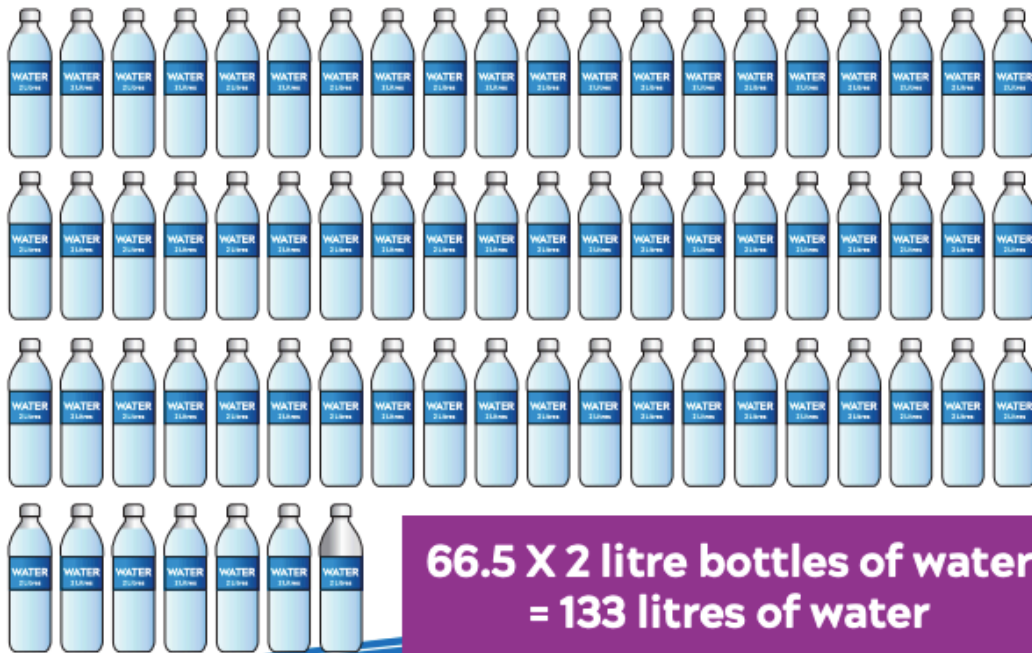
Lesson four: How much water do we use?



Think back to Lesson 3, when you listed all the ways that you had used water. Now we're going to find out how much water each of these takes:

Activity	How much water is used?
Running the tap	8 litres per minute
Washing up in the sink	8 litres
Washing hands	3 litres
Taking a normal shower	8 litres per minute
Taking a power shower	13 litres per minute
Flushing the toilet (short)	4 litres
Flushing the toilet	9 litres
Dishwasher (per wash)	14 litres
Washing machine (per load)	50 litres

On average, each person uses 133 litres of water every day!



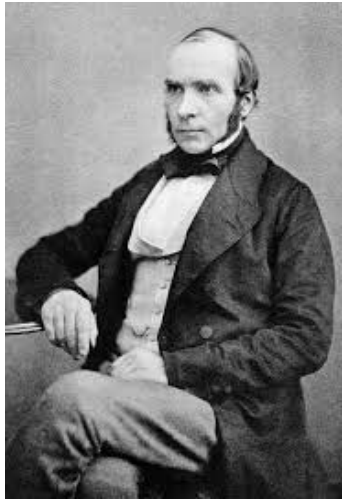
Activity	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	Total number of times in a week	Estimated water used	Total weekly water used
Running the tap									8 litres per minute	
Washing up in the sink									8 litres	
Washing hands									3 litres	
Taking a normal shower									8 litres per minute	
Taking a power shower									13 litres per minute	
Flushing the toilet (short)									4 litres	
Flushing the toilet (long)									9 litres	
Dishwasher (per wash)									14 litres	
Washing machine (per load)									50 litres	
Bath (full)									80 litres	
Cooking a meal									5 litres	



Write or draw the answers to these questions:

Which activity was done the most regularly?	
Which activity used the most water over the course of the week?	
What was the total amount of water you used over the course of the week? To work this out, add up the total weekly water use for each activity in your table!	

Part three: A clean-water story from history



For hundreds of years, a disease called **cholera** plagued Britain. Scientists thought it was carried through foul air, which they called “miasma”. However, a young scientist called John Snow believed that this theory was wrong.

In 1854 there was an outbreak of cholera in Soho. After careful investigation, including plotting cases of cholera on a map of the area, Snow was able to identify a water pump in Broad (now Broadwick) Street as the source of the disease. He had the handle of the pump removed, which meant that it could not be used. Cases of cholera immediately began to diminish.



Snow was the first scientist to understand that diseases could spread in dirty water. As a result of his work, the sewer system in London was built.

Snow is known as the father of epidemiology: disease tracing and tracking, which is still in use today.



Most scientists thought cholera was carried in the air **but** _____

John Snow saved hundreds of people’s lives **because** _____

John Snow worked out that dirty water caused disease **so** _____

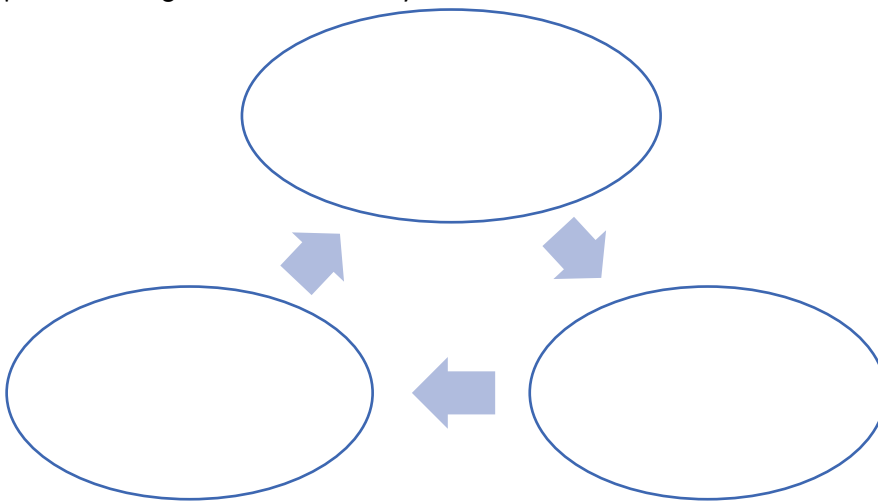
Lesson 5: Water pollution – chemicals, oil and plastics



Part one: Quiz

1. A main cause of increased **flooding** is **climate change**. This is because
 - a) climate change makes the world warmer
 - b) climate change makes our weather more extreme and unpredictable
 - c) climate change makes our air pollution
 - d) climate change reduces aquifer stores

2. Complete this diagram of the water cycle:



Part two: Why is plastic pollution a problem?



<https://www.youtube.com/watch?v=ZBSFHf7KcU>

What are the sources and impacts of marine litter?

Increasing amounts of litter are ending up in the world's oceans and harming the health of ecosystems, killing animals and putting human health at risk. The solution lies in waste prevention and better waste management on land.

What are the sources and impacts of marine litter?



Litter ends up in the sea via rivers and sewage pipes or with wind. Litter from ships and boats often also accumulates in the ocean.



Vast patches of litter and small plastic particles are funnelled together by ocean currents. Litter also accumulates on the sea bed and on beaches.



About 10% of marine litter is discarded fishing gear, which often kills or injures marine animals and seabirds.



Many plastics break into ever smaller pieces, which can then enter the food chain.



Around 36% of the world's seabird species and many species of fish have been reported to ingest marine litter.



Use the information from the poster above to fill in the **Sources**, **Impacts** and **Solutions** sections in the **Plastics** row of the table below.

	Sources	Impacts	Solutions
Plastic			
Oil			
Chemicals			

Part three: Oil pollution



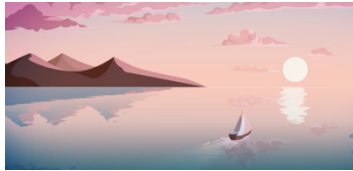
<https://www.youtube.com/watch?v=tsX08folMhY>

Part four: Chemical pollution

- Chemical pollution of water is caused by industry and agriculture. Chemicals, pesticides are washed into our waterways and can have a harmful impact on our wildlife.

- The products we use in the home can also have an impact – such as the type of cleaning products we use, single use plastics and toiletries.

Part five: the solution



https://www.youtube.com/watch?v=7S74zx_ebvw



Choose one of the sources of water pollution. Make a poster explaining to people how they can be part of the solution.

Lesson six: How do we get clean water?



Part one: Quiz

Match the words with their definitions:

Evaporation

A sustained period of no water

Condensation

Water that falls from the sky

Drought

The area of land prone to flooding

Sanitation

The process of water turning to vapour through heating

Precipitation

The process of water vapour turning back to water through cooling

Floodplain

Systems to ensure clean water and safe disposal of sewage

Part two: How is our water cleaned?



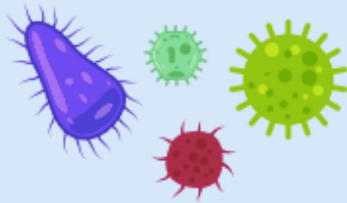
<https://www.youtube.com/watch?v=46bZkCEzHeY&list=PLyJiBXEcAN5ZMtas4S68rp24yOs5N-SMQ>



East Anglia is the driest part of the UK, receiving just of rainfall every year. This means that Anglian Water, the people in charge of the water supply, need to look after the water very carefully.

Water companies take water out of the water cycle from sources like reservoirs or deep underground stores and clean it before pumping it to our homes.

Before water is piped to homes, schools, factories and farms it must be treated and cleaned. It is treated for 3 reasons:



To remove germs and make it safe to drink



To remove small solid particles and make it clean



To remove any unpleasant smells

How do they ensure that there is enough water for everyone and that the water is clean?



<https://www.youtube.com/watch?v=0EzraAtUvhE&list=PLyJiBXEcAN5ZMtas4S68rp24yOs5N-SMQ&index=5&t=0s>

How do we clean the water?

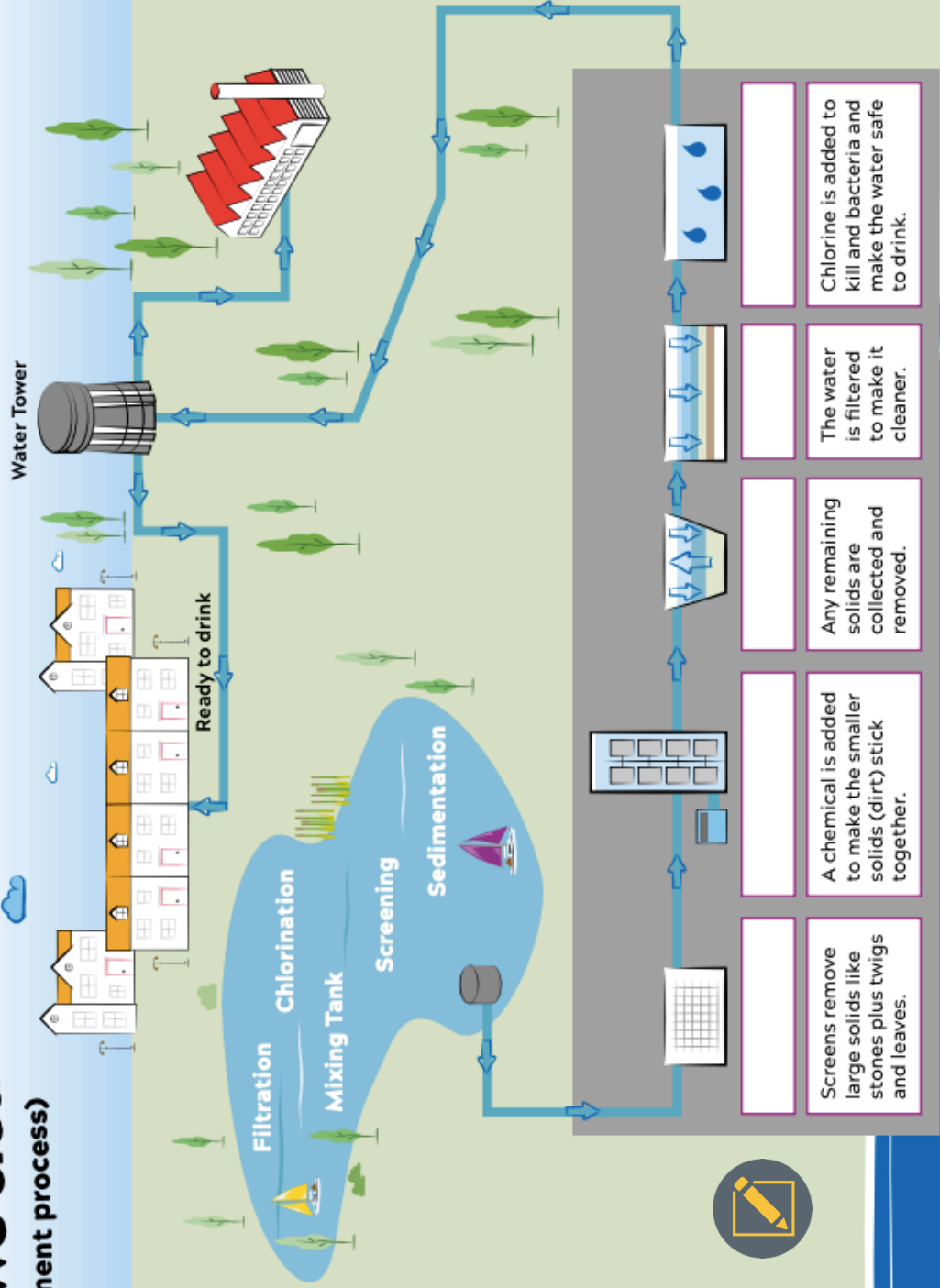
(The water treatment process)

Making water safe to drink

Anglian Water borrows water from the environment and cleans it to make it safe to drink.

None of us would like to drink water straight from the river, so we use a special process to clean it at one of our water treatment works.

Can you write the names of the process on the diagram? (The words you need are in the lake).



Screens remove large solids like stones plus twigs and leaves.

A chemical is added to make the smaller solids (dirt) stick together.

Any remaining solids are collected and removed.

The water is filtered to make it cleaner.

Chlorine is added to kill and bacteria and make the water safe to drink.

Part three: Water cleaning experiments

Experiment 1: Filtration



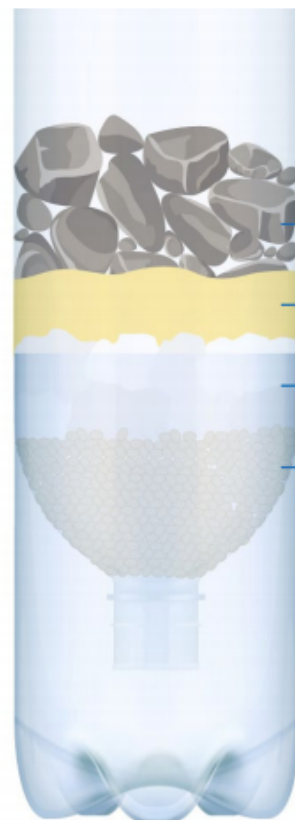
A filtration experiment

Equipment

- Dirty water in a jug: water mixed with some soil
- Filter materials: a range such as filter paper, cotton wool, pebbles, sand, gravel, lentils, rice
- Large clear plastic bottle

Method

1. Prepare the funnel: cut the water bottle into two parts, about 2/3 of the way up the bottle
2. Turn the top third upside down and place it inside the bottom two thirds
3. Put your filter materials into the upturned part of the bottle
4. Pour in your dirty water
5. What do you see after 2 minutes? After 30 minutes? After 2 hours?



After two minutes I saw

.....

After 30 minutes I saw

.....

After two hours I saw

.....

Experiment two: Water testing

Here's Neil from Anglian Water to explain experiment number two:



<https://www.youtube.com/watch?v=OW7NqUq9InI&list=PLyJiBXEcAN5ZMtas4S68rp24yOs5N-SMQ&index=6>



A water-testing experiment

Equipment

- 1 glass of tap water
- 4 glasses of water, each with something different added in. eg salt, white vinegar, boiled water, tea/ coffee, a soft drink or squash, white sugar (anything that changes the colour or smell).
- **Be careful to use things that are safe to drink and no-one in your family is allergic to.**
- Someone in your home to be the tester

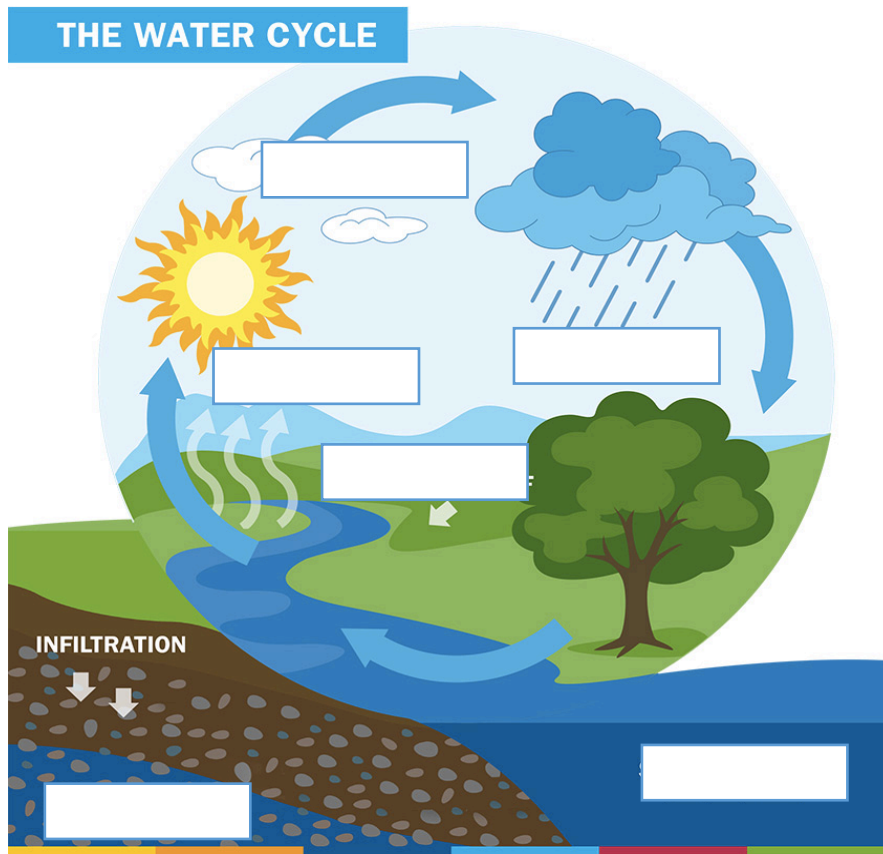
Method

1. First, ask your tester to hold each cup or glass up to see if there is any colour change.
2. Next, ask your tester to smell each cup or glass and see if you can guess what is in there.
3. If the tester can't tell what is in the glass, tell them to try tasting it by dipping the top of a clean finger into the liquid and tasting it. The tester should, by the end of this activity, be able to work out which is the cup/glass with just water in it and what is in each of the other 4 cups/glasses.



Lesson Seven: Assessment

1) Label the different parts of the water cycle:



2) An increase in extreme weather events such as storms is caused by

3) Name three things we can do to protect ourselves from flooding

.....

.....

.....

4) What is desalination?

5) Why is desalination needed?

.....

6) Name three things causes of water pollution

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7) As a result of our learning this term, are you going to make any changes to your lifestyle?

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