

Water is Life

Teachers' Notes

Key Stage 2



Key Terms

Climate, Cyclone, Diffuse Pollution, Drought, Global Warming/Climate Change, Groundwater, Hydroelectric Power, Hygiene, Infrastructure, Open Defecation, Point Source Pollution, Pollution, Sanitation, Surface Water, Water Cycle

Learning Outcomes

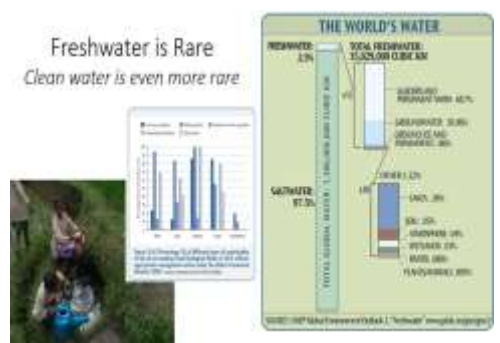
Terms in bold are defined in the Glossary

Through using this resource pupils will be given opportunities to:

- Learn how rare freshwater is and the many things it is needed for
- Understand why access to clean water is needed for health and well-being
- Learn how water is basic to producing food, providing power and livelihoods, and maintaining biodiversity
- Understand how sanitation differs in Madagascar and how this relates to water
- Learn how weather and climate change relate to water
- Understand the differences in the way water is used in Madagascar and Northern Ireland

Freshwater is Rare

- Although the surface of the Earth is nearly 2/3 water, 97.5% of that is sea water.
- Of freshwater, nearly 70% is locked in glaciers and over 30% in groundwater, leaving about 1/3 of 1% as 'surface' freshwater
- Of surface and groundwater, much is polluted from direct and indirect human impacts, varying greatly by country, pollutant and degree of contamination
- Groundwater is a major source for drinking water and irrigation around the world. However, in many areas it is being seriously depleted or polluted; climate change and weather patterns are making the problems worse
- Water is polluted by Physical (soil erosion, heat), Chemical (nutrients, inorganic chemicals, toxins from human use), Biological (bacteria, invasive species, decay)
- Point sources (sewer or industrial discharges, mines, leaching of soil concentrations of toxic elements such as arsenic), Non-point sources (agricultural chemicals and by-products, soil erosion, animal and human wastes), Airborne (combustion of fossil fuels, agricultural ammonia, acid rain)
- Northern Ireland's water is less polluted than many other countries, but still has >80% of rivers and lakes damaged by point source and diffuse pollution
- In Shanghai, China, 85% of the water in the city's major rivers was undrinkable in 2015, and 56% was unfit for any purpose
- It is often stated that one of the key reasons for wars in the future will be to secure access to fresh water



Water is YOU

- 65% of the human body is water – this varies with age (less as get older) and fat content; average: children 70%, 50% in females, 60% in males
- A 70 kg male has 42 kg = 42 litres water
- 2/3 is within cells, 1/3 is in blood and interstitial fluid
- In general adult men need to take in 3 litres per day, adult women 2.2 litres; some of this is in food
- It is a vital part of cells and organs, regulates temperature and pH, converts food to energy, transports nutrients and oxygen, flushes waste, acts as a shock absorber, forms saliva, lubricates joints
- A person can go for up to 3 weeks without food but probably only 3 days without water (highly variable depending on temperature and activity level)
- People should drink at least 2 - 4 litres of water per day, including water in food



Water is for Drinking—Globally

- UN estimates a person needs 50 litres per day to drink, prepare meals and for hygiene. Globally water consumption varies from 2 to 600 l/day. UK=150 litres/person/day.
- Approximately 3.5 billion people in 2025 will face water shortage issues, mainly due to polluted water
- Lack of safe drinking water and sanitation leads to cholera, malaria and diarrhoea.
- 15 million children under the age of five die each year from diseases caused by drinking polluted water; on average, 250 million people worldwide succumb to diseases related to water pollution each year
- 71% of the global population have 'safely managed' drinking water. 89% have at least a basic service – improved water within 30 min round trip to collect water; 844 million people lack this basic service
- 159 million people collect water directly from surface water, most in sub-Saharan Africa, 80% by women and girls
- Only very few countries pipe clean, drinking quality water to homes; in much of the world water for drinking and cooking is delivered in large bottles and the piped water is used for bathing, toilet flushing etc.
- Many people have to pay for drinking water, most between 2 and 5% of their income

By 2015, 181 countries had achieved over 75% coverage with at least basic drinking water services¹



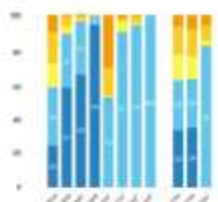
Access to Safe Drinking Water

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7 out of 10 people used safely managed drinking water services in 2015



Estimates of safely managed drinking water services are available for four out of eight SDG regions



Water is for Drinking—Madagascar

- Average consumption in Madagascar is 5.4 l/person/day; UN estimates 5 l needed to 'survive' and 80 l for a 'reasonable' life

- Madagascar ranks 6th worst in the world for safe water, with only half the population having access to clean water

- Over 11 million people do not have access to safe water; 66% of urban dwellers do, but only 15% of rural residents do

- Only 13% of the rural Madagascar population have access to improved drinking water on their premises

- Women and children spend up to 3 hours each day collecting dirty water from unsafe sources, a major cause of illness

- In urban areas, even the capital city, people often have to pick up drinking water from central depots, which often have bathing facilities

Access to Drinking Water – Madagascar
(% of population, 2000 and 2015)

	At Least Basic	Limited (>30 min)	Un-Improved	Surface Water
2000 All	37	2	21	41
2015 All	51	3	31	16
2000 Rural	25	1	24	50
2015 Rural	34	2	41	23
2000 Urban	69	3	12	15
2015 Urban	82	4	12	2

JMP-2017-tr-safely managed drinking water services.pdf



Water is for Drinking
- Madagascar



Recent UN Action in Madagascar

More than 139,000 people have gained access to safe water through the establishment of 104 new boreholes, 183m³ of trucked water and 550 water points rehabilitated by UNICEF, Government and partners. UNICEF has continued to support the National Nutrition Office and Ministry of Health, including through the provision of 9,000 boxes of ready-to-use therapeutic food, therapeutic milk and essential drugs; and the extension of the severe acute malnutrition (SAM) surveillance system. To date, 7,000 families with children suffering from SAM have received a WASH kit and awareness raising on the use of the ceramic filter and handwashing with soap. 550 water points have been rehabilitated, benefiting an estimated 100,000 people with clean water, including at schools and health centres; 104 new boreholes have been drilled and equipped with hand pumps, benefiting 24,550 people; and 3 new mid-level water supply schemes have been completed, benefitting 5,270 people. The construction of 16 boreholes and 8 mid-level water supply systems remain in progress and will benefit an estimated additional 20,500 people with clean water.

Water is for Health (cleanliness, hygiene and sanitation)

- In Least Developed Countries in 2015, 27 % of the population had basic handwashing facilities with soap and water, while 26% had handwashing facilities lacking soap or water. The remaining 47% had no facility.
- 27% of global population are connected to sewers which treat water. 13% use toilets with 'in situ' disposal (e.g. septic tanks). 2.3 billion people lack even a basic service.
- Improved facilities and sewers, and basic handwashing facilities, are more common in urban than rural areas – 90% of those using sewers were in urban areas
- 68% of people globally had (at least) basic sanitation in 2015; 4.5 billion people lacked safely managed sanitation services
- 892 million people practice 'open defecation'. Globally the number practicing open defecation dropped from 1229 million in 2000 to 892 m in 2015, but in sub-Saharan Africa the number increased due to population growth.

By 2015, 154 countries had achieved over 75% coverage with basic sanitation services

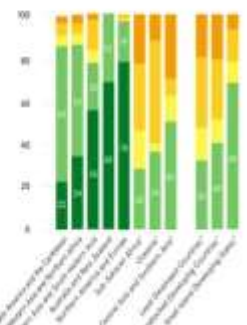


Access to Safe Sanitation
WASHdata

Two out of five people used safely managed sanitation services in 2015



Estimates of safely managed sanitation services are available for five out of eight SDG regions



Water is for Health—Madagascar

- Madagascar is in the bottom 3 countries as % of population with basic sanitation and is the lowest for proportion of population with safe drinking water
- Madagascar ranks 4th worst globally for sanitation; only 12% of people have access to improved sanitation facilities.
- Madagascar is the second worst country for open defecation – 43.9% in 2015; even higher than the 37.8% in 2000.
- Although the rate of open defecation globally has decreased, it has increased in Madagascar since 2000 due primarily to population increase
- SDG Target 6.2 – End open defecation by 2030



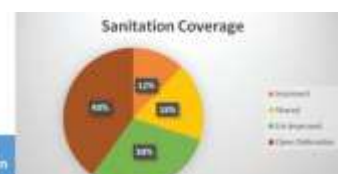
Water is for Health



Access to Sanitation in Madagascar (2015)

	At Least Basic	Limited (shared)	Unimproved	Open Defecation
National (Yr 2015)	10	14	32	44
Rural (2015)	6	9	29	55
Urban (2015)	16	24	37	23
National (Yr 2000)	5	7	51	38

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Water is Food

- Globally the main use for water is for agriculture and related activities (processing food, etc.)
- The amount of water needed to produce crops varies greatly,
- It takes 1,400 litres of water to produce 1 kg of wheat, 3,400 litres of water to produce 1 kg of rice and 15,500 litres to produce 1 kg of beef
- Nearly half of all water used in the US goes to raising animals for food
- As climate change causes droughts and these plus usage deplete groundwater reserves, growing food for an increasing population will become increasingly challenging



Water is Jobs and Industry

- In industrialised countries the major water use is industry
- Manufacturing
- Processing
- Washing
- Diluting
- Cooling
- Transporting
- Range of industries from petroleum refineries to food processing



Water is Tourism, Recreation and Leisure

Water is Power

- Dams for hydroelectric power are a major source of renewable energy globally
- Turbines - Flow, Wave, Current
- Marine and Freshwater
- New technologies constantly being developed suitable for various watercourses
- Disadvantages of Dams
- Flooding of vast areas of agricultural and natural land, homes, cities
- Loss of wildlife and biodiversity in flooded areas, but aquatic wildlife can benefit
- Silting up of dams leads to loss of utility over time



Water is Biodiversity

- Biodiversity NEEDS water
- Water is essential for all life forms, making up 60 to 70% by weight of all living organisms
- Animals are around 50 – 80% water; Plants have even higher concentrations of water at 90-95%
- Water is essential for photosynthesis, the basis of all food and life
- The distribution of all life on Earth is determined chiefly by the presence of water
- Biodiversity IN water
- Of all 'large' (not microscopic) organisms – some 1.5 million species – 80% live in the ocean, 15% on land and 5% in freshwater
- Aquatic animals have faced an estimated extinction rate five times more than that of terrestrial animals



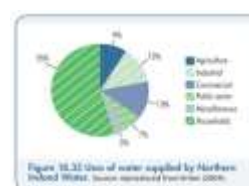
Water is Seasonal and Destructive

- Seasonal variation in water availability and abundance due to weather and climate
- Climate change leads to floods, droughts, sea level rise and increasing severity and abundance of storms
- 3 years of drought mean that Cape Town, South Africa, is facing a lack of water in April 2018. Residents will be allowed only 6.5 gallons per day
- Devastating droughts in Madagascar in 2014, 2015 and 2017 have left nearly one million people in the south of the country 'food insecure'
- On average Madagascar suffers from between 1 and 4 cyclones annually (the highest number in Africa), and each one affects up to 700,000 people, killing and injuring people and damaging infrastructure

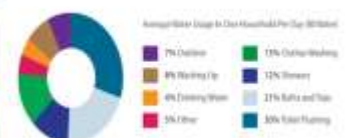


Water in Northern Ireland

- On average each of us uses 150 litres of water per day
- Flushing the toilet uses between 8 and 10 litres of water
- In Northern Ireland most of the water we use is from lakes and rivers; only 0.01% is from groundwater
- NI Water is the largest user of electricity in Northern Ireland, pumping and treating water and sewage
- Water is the 'traditional' way to get rid of 'waste products' – flush, dump in rivers, domestic and industrial – plastics, hormones, toxins
- 'Natural' purification by water bodies can no longer detoxify all the materials we flush away



Water in Northern Ireland



Tanakambana Secondary School

- Tanakambana Secondary School is in the Ikongo district. It is located southeast of Fianarantsoa town, and takes two days to get to, covering 397 km. GPS: 22° 03'47.54"S, 47° 28'46.98"E. 525 pupils and 21 teachers.



- Pupils at Tanakambana Secondary School previously fetched water from a river, which was visibly dirty and contaminated. The river water was also used for all washing purposes. The water was particularly turbid during the rainy and cyclone season. Many students suffered from diarrhoeal disease and malaria. In addition to the impact of sickness on attendance and results in school, the river was 100 metres from the school and so fetching water was time-consuming, taking 10 minutes to fetch 15 litres of water.

- Thanks to the generous support of St Ita's Primary School in Belfast through the Adsum Foundation, Tanakambana Secondary School now has access to safe, clean water on site

Ambalamanenjana Primary School

- Ambalamanenjana Primary School is located in the highlands of Madagascar in the Ambalavao district, 115km south of Fianarantsoa town. It is at least a 5 hour trip from Fianarantsoa town; a 1½ hour drive from Fianarantsoa on the main road, followed by a 2½ hour drive (more in the rainy season) to a broken bridge near Miarinarivo village, and another hour's walk to Ambalamanenjana Primary School. GPS: 22° 05'29.41"S, 47° 02'27.39"E. 172 pupils and 5 teachers. 110 villagers from 15 households use the primary school.

- Pupils at Ambalamanenjana Primary School previously fetched water from a traditional spring, which was visibly dirty and contaminated. People surrounding the school used this water for all washing purposes (people, clothes, dishes). The water was very turbid during the rainy and cyclone season. Many people suffered from diarrhoeal disease and malaria. Being the main water fetchers in the household, children are particularly affected by sickness. This impacted negatively on their school attendance levels and overall results. In addition, the traditional spring was 200 metres from the school and so fetching water was time-consuming; women and children would take 20 minutes to fetch 15 litres of water.

- Thanks to the generous support of Ulidia Integrated College in Carrickfergus through the Adsum Foundation, Ambalamanjane Primary School now has access to safe, clean water on site



Activities KS2

PDMU, ICT & Science and Technology

- Organise two teams to compete against each other to mime as many different uses as they can think of for water i.e. brushing teeth, washing dishes, toilet flushing, cooking, etc.
- Research the difference between hand pumps and rain water harvesting systems.
- Record a short video for your school's website / facebook page to encourage your school community to reduce water use/wastage.
- Research some new technologies that could be used in Madagascar to improve sanitation and increase access to clean water
- Compare amount of water used for agriculture, industry and domestic purposes across the world. Why does this vary so much?

Language and Literacy

- What makes water unsuitable for human use? Salt (sea), pollution, toxic plants or animals, inaccessible (aquifers). Research and explain some of these (essay, infographic, play, etc.)
- Write a diary account for a child living in a village which has just benefitted from a new well being installed. Compare her/his use of water to yours.
- Design a poster that discourages water wastage at your school.
- Arrange a beach or riverside clean up. Publicise it to the school, making the differences between local and Madagascar water usage clear
- Organise a fundraising bake sale (or other event) to raise money to go towards the building of a well in Madagascar, e.g. through Adsum Foundation

Drama and Music

- Write and perform (perhaps for the school?) a play demonstrating the problems of water access in Madagascar. Compare to water usage in Northern Ireland.
- Write a poem, story or play that shows how the lack of abundant, clean water impacts on people's lives
- Using musical instruments, create your own class interpretation of the noise a cyclone may make.

Numeracy

- Record the usage of water during a typical day. Calculate how much water is used for different activities by each student, the class, the whole school, etc.
- Select one of the tables, figures or statistics from the lesson. Use those figures in different ways than that presented to demonstrate how different numerical presentations make information more accessible
- Research and prepare an infographic on the amount of water needed to grow and process your food. Compare different diets, e.g. vegetarian vs. meat eater

Some Useful Websites and Further Reading

- WHO and UNICEF 2017. Progress on Drinking Water, Sanitation and Hygiene. <https://washdata.org/>
- <https://www.washwatch.org/en/countries/madagascar/summary/statistics/> The data on WASHwatch is sourced from a variety of organisations including GLAAS, JMP, UNICEF, WHO, SACOSAN, SWA, and the UN
- JMP-2017-tr-safely managed drinking water services.pdf
- <http://www.theglobaleducationproject.org>
- <http://www.wateraid.org>
- <https://www.worldwatchinstitute.org>
- World Economic Forum - <https://www.weforum.org/>
- World Resources Institute - <http://www.wri.org/>

Glossary of Key Terms

Climate – weather conditions in a wide area over a long period.

Climate Change/Global Warming – the gradual increase in the overall temperature of the earth's atmosphere caused by greenhouse gases and other pollutants.

Cyclone — large scale air mass rotating around a centre of low pressure. Tropical term for hurricanes and tornados, characterised by high winds, usually rain and often leading to major disruption and destruction.

Diffuse Pollution – pollution arising from land use activities that are dispersed across the water body catchment. Individually the activities may have little impact, but wide ranging multiple activities can lead to build up of toxic materials. Distinct from Point Source Pollution.

Drought – a long period of very low rainfall, leading to a shortage of water and often negative impacts on vegetation.

Groundwater – water held underground in soil or pores and crevices in rock.

Hydroelectric Power – electricity generated from moving water. Traditionally using water held in dams being released over turbines to generate electricity, but new techniques capture motion of tides and currents.

Hygiene – practices related to cleanliness and maintaining health and preventing disease.

Infrastructure – basic physical and organisational structures and facilities needed for society to function (roads, buildings, power, water).

Open Defecation – defecating and urinating outside, in the open environment.

Point Source Pollution – release of toxins from a single, identifiable source into air, water or soil. Includes heat, noise and light pollution as well as chemical.

Pollution – presence or introduction into the environment of a substance which has harmful effects (on the environment, on human health).

Sanitation – conditions relating to public health, especially providing clean drinking water and adequate sewage disposal.

Surface Water – water collected on the surface of the ground. Includes lakes, streams, rivers, reservoirs etc.

Water Cycle – cycle of processes by which water circulates between oceans, atmosphere and land, including precipitation, drainage, evaporation and transpiration.