

World Water Day Education Pack



2020 Water and Climate Change





2020 World Water Day Education Pack

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What is climate change?

This year's theme for World Water Day is climate change and is supported by the United Nations (UN) water expert group on water and climate.

Here is a link to download a teacher resource on climate change:

https://nzcurriculum.tki.org.nz/Curriculum-resources/Education-for-sustainability/Tools-and-resources



Becoming future fit

Climate change is one of the largest challenges that Watercare faces as an organisation. Its effects can include temperature increases, drought, increased frequency of storm events and rising sea levels. Every aspect of our operations is potentially impacted by these effects right from the planning and design of our infrastructure, to the way raw water is sourced and treated, or how wastewater is processed and discharged.

To become future fit, we need to respond to the changing environment. In July 2018, Watercare was one of around 60 companies that launched the Climate Change Coalition which aims to promote business leadership and collective action on the issue of climate change. In early 2019, we launched our first Climate Change Strategy. We are embarking on a journey to operate a low-carbon company that is resilient to climate change impacts.

The strategy establishes two ambitious targets for emissions reductions from our operations which align with keeping the global temperature increase within 1.5 degrees Celsius.

- NetZero emissions by 2050
- Reduce operational greenhouse gas emissions by 45% by the year 2030.

We realise that we cannot solve this challenge on our own and we will need to work with other organisations to achieve our goals and inform our thinking. To become future fit we will collaborate across the Auckland Council family, enable our employees to develop solutions and work together with suppliers and customers. Auckland Council's draft Climate Action Framework (Te Tãuke-ã-Tãwhiri) outlines how they, and the wider Auckland community, can shape responses to the climate emergency facing the region. The draft is now closed for feedback and submissions are being reviewed.

Watercare has developed a climate change mitigation and adaptation strategy to guide the way we operate.

- We will increase our resilience by making sure that the location, design and operation of infrastructure projects includes flexibility and the potential to adapt to future climate conditions.
- We will reduce our emissions and operate a low carbon business, setting targets and establishing pathways to achieve net zero emissions.
- We will look again at how we deliver our major infrastructure programmes, requiring emissions to be considered as part of their design and operation.

Infrastructure (in this case) = the basic physical and organisational structures and facilities such as buildings, roads, dams, pipes and power supplies needed for the operation of the drinking water and wastewater business.



Watercare is at the beginning of its journey and will look to adapt and be flexible in the face of such a large challenge.

We have developed a work plan that consists of 14 portfolios across both adaptation and mitigation.



Reducing greenhouse gas emissions

Mängere Wastewater Treatment Plant

In the early 2000s, we significantly upgraded the Mãngere Wastewater Treatment Plant. This enabled us to replace the open-air oxidation ponds and sludge lagoons with land-based treatment, enabling the capture of methane and nitrous oxide emissions making biogas generation possible. This resulted in a long-term decrease in greenhouse gas emissions by approximately 80 percent. In 2013/14 the emissions were reduced by a further 12 percent.

Our three major emission sources remain:

- 1. Electricity used in treatment plants and networks for both water and wastewater.
- 2. Nitrous oxide and methane from wastewater.
- 3. Consumption of lime used for water treatment and wastewater sludge treatment.

There has been a steady reduction in emissions over the last five years.

How is Watercare addressing climate change?



Mãngere Wastewater Treatment Plant.

At our Rosedale Wastewater Treatment Plant we are building a thermal hydrolysis facility that will be completed in 2022. This will allow us to sterilise the biosolids from the treatment process creating beneficial waste products such as fertiliser. Thermal hydrolysis reduces the amount of lime needed in the wastewater process and this is a very good thing as the processes used to create lime can be detrimental to the environment.

Saving energy

Using resources effectively and reducing our environmental footprint is a continued focus for us and innovation plays a key role in realising this objective. We undertook several technology trials at our Mãngere Wastewater Treatment Plant. We are growing bacteria that help convert nitrogen in wastewater in a very efficient new way. This will significantly reduce our power demand and increase the energy we produce from biogas. These included a mini reactor growing anammox bacteria that can be used in our biological treatment process to reduce the use of oxygen and carbon. We have already saved 8GWh of energy in recent years through various improvements across our network and treatment process which in turn means we are using less electricity from the national grid, some of which is generated by burning fossil fuels.

Our aim is to achieve energy neutrality at our Rosedale and Mangere wastewater treatment plants, which are large energy users, by the end of 2025. This is part of our large-scale climate change mitigation programme and will enable our operations at these plants to be self-sufficient.

How is Watercare addressing climate change?

Renewable energy



Watercare chief executive Raveen Jaduram, Mayor Phil Goff and Mercury chief executive Fraser Whineray at Pukekohe WWTP.

In May 2019 we opened our first solar array at our Pukekohe Wastewater Treatment Plant. Its 400 solar panels can generate about 170 megawatt hours of energy per year, enough to power around 25 kiwi households for an entire year.

The panels help power a pump station, which sends wastewater piped from surrounding areas to the treatment plant. The array is currently one of the largest solar arrays in New Zealand.

The Pukekohe solar array will see a reduction of nine tonnes of CO_2 emissions annually (equivalent to the pollution from driving your car for five years).

Two more arrays are being installed at Wellsford Wastewater Treatment Plant and Redoubt Road Reservoir, Manukau.

How is Watercare addressing climate change?





Redoubt Road Reservoir complex solar array.

The Redoubt Road reservoir has a 142 kW solar array on its roof and a 225 kWh Tesla Powerpack battery. The solar array made up of 400 panels is generating 75% of the reservoir's energy needs and the Tesla Powerpack battery can store solar electricity generated in the day for use at night-time for up to six hours. The energy generated is 195MWh per annum which is enough to power the equivalent of 28 kiwi homes for a year. The main energy use at this reservoir is for power pumping water up to Redoubt High Reservoir from where it is transmitted to Auckland City.



A mock-up of the floating solar array in the pond at Rosedale Wastewater Treatment Plant.



Watercare's Rosedale Wastewater Treatment Plant will host New Zealand's first floating solar array. It will be able to generate enough power over a year to run the equivalent of 200 New Zealand homes for a year. Wastewater treatment is the most energy-intensive out of all our energy uses. The array will be used to supplement electricity from the grid. Solar installations like these will help us to achieve our energy neutrality targets.

These solar power projects are just one initiative in our mission to be a low-carbon organisation.

Adapting existing structures so they can operate if climate conditions change

Climate projections for Auckland also show that droughts will become more common and more severe.

In order to protect our water sources, we commissioned a new water treatment plant for Warkworth, with water supplied from a secure underground aquifer, instead of the at-risk Mahurangi River.

The new plant is a substantial investment and will double capacity and cater for growth in this fast-growing region. The supply is more sustainable as the bore provides a guaranteed supply, unlike the river, which ran low in previous years.



Warkworth Water Treatment Plant.



Climate change projections for Auckland indicate that extreme rainfall events will increase in severity. We experienced one such event in March 2017 when the Tasman Tempest storm event hit Auckland. The equivalent of two months' rain fell in 24 hours within the Hunua Ranges causing numerous landslips and depositing significant amounts of silt into our water storage lakes. The level of solids severely affected treatment processes at the Ardmore Treatment Plant. The learnings from this event are driving a number of initiatives to increase our resilience. These include the stabilisation of slopes in the Hunua Ranges catchment areas by ending the current commercial forestry operations and reverting significant catchment areas back to native forest (see below). In addition we have enhanced the treatment barriers at the Ardmore Water Treatment Plant through the installation of ultraviolet light disinfection, increasing the solids processing capabilities.

By adapting our operations in this way we are more resilient to these types of large storm events as they become more common in the future driven by climate change.

Tree planting

A major tree planting programme has been commencing in the Hunua Ranges. It began in July 2018 with 86,500 trees planted that season. A further 300,000 trees will be planted in 2019-2020. By 2048 we should have planted over three million trees. By regenerating the land with native trees, we will significantly reduce the slips in our catchment area. This will protect the water quality of the supply lakes and, ultimately, Auckland's water sources for decades to come.



Tree planting and regeneration in the Hunua Ranges.



Watercare sponsors Waikato RiverCare and Trees for Survival.

The Waikato RiverCare trust plants native seedlings along the river. Its aim is to implement an enduring programme to establish self-sustaining native plant-based communities in and around the lower Waikato River catchments. The Waikato River is one of Auckland's drinking water sources.



Trees for Survival.

Trees for Survival is an environmental education programme which involves young people growing and planting native trees to restore natural habitats by helping landowners revegetate erosion prone land, improve stream flow and water quality and increase biodiversity.

In New Zealand, forests offset nearly 30 percent of our greenhouse gas emissions. A regenerating forest can remove more than 8 tonnes of CO_2 per hectare per year from the atmosphere over the first 50 years.

These initiatives will help us to achieve two of our long-term targets, which are to reduce greenhouse gas emissions by 45 percent by 2030 and to reduce our carbon emissions to NetZero by 2050.

40:20:20 target

This target challenges our business to reduce carbon in construction by 40 percent by 2024; to reduce the cost to deliver our infrastructure programme by 20 percent by 2024; and to improve health, safety and wellness by 20 percent year on year.

While we continue to think and plan ahead, we are also challenging and improving the way we deliver infrastructure.

Our approach will include a focus on standard product designs, budgeting for carbon emissions, reviewing supply and build elements of infrastructure and re-imagining the way we engage. This will require new thinking and challenging the way we work to find safer, more sustainable and efficient solutions.

Electric vehicles



Watercare's fleet of new Electric Vehicles (EVs).

Watercare's vehicle fleet has grown from five to 30 new Electric Vehicles (EVs) in just under a year. Typically the old vehicles would use around 40,000 litres of fuel. The EVs will reduce our fuel costs by more than 600 percent and we'll be removing 45 tonnes of carbon dioxide from the environment.

Watercare's staff is encouraged to use public transport for short journeys to other council offices too.

New Zealand

Though New Zealand is a small country, individual New Zealanders have big carbon footprints. The average New Zealander emits over 16 tonnes of greenhouse gases every year – more than the average European – and over twice the average Chinese person's emissions. We are one of the 30 biggest per capita emitters in the world and our emissions are still growing.

What can we do?

Ways you can help - please refer to the poster for ideas on page 18

Interactive activities

Your carbon footprint is the amount of carbon dioxide released into the air because of your own energy needs. You need transportation, electricity, food, clothing and other goods. Your choices can make a difference.

Practice by playing 'Recycle This!' (https://climatekids.nasa.gov/recycle-this/)

Do I need to save water too?

People and animals in many parts of the world do not have clean, safe water to drink. As many more regions are hit by drought this problem will become even more serious. The sooner we start conserving water, the better off we all will be. Be aware of how much water you use.

Interactive games

https://www.watercalculator.org/education/

Water footprint lessons – six free interactive water footprint lessons for middle school and high school students.

https://www.watercalculator.org/save-water/

How to save water - some easy ways to shrink your water footprint.

https://www.bbc.com/news/science-environment-46459714

Climate change food calculator.

https://www.uen.org/climate/videos.shtml

A series of short videos that explain climate change and what we can do to slow it down. USA.

Each video comes with a teacher resource guide. Please note the measurements are in gallons rather than litres.

https://www.youtube.com/watch?v=wa58h4IJ6Hk

A climate change animation that gives you time to explain to children what is happening and how it is affecting the planet as there is no information, just sound effects and music.

<u>https://www.youtube.com/watch?v=H6uDiJng-uo</u> Climate change narrated by flying foxes – Australia style

https://www.youtube.com/watch?v=v8unGCTWUWI Climate change animation for primary schools

https://www.youtube.com/watch?v=9h7P8gWpolQ

Video on the effect climate change has on animals

https://climatekids.nasa.gov/offset/

Offset game Keep Earth in balance!

Carbon dioxide (CO_2) is a greenhouse gas. Too much of it in the atmosphere makes Earth too warm. In this game, you must balance CO_2 sources with CO_2 'sinks.' In other words, you must OFFSET all CO_2 emissions so that Earth will not become too warm. To "offset" means to balance out or make up for.

A source of CO_2 is anything that burns fossil fuel and produces CO2 as waste. CO_2 sources in this game include coal-burning power plants and gasoline-powered cars. A CO_2 'sink' is anything that takes CO_2 out of the atmosphere. The CO_2 sinks in this game are forests, because trees take in CO_2 and give off oxygen (O_2) .

http://energyhog.org/childrens.htm

Hog and seek game – find out where energy is wasted in each room and then beat the hog wasters by playing games against the clock.

Background reading for older students

https://climate.nasa.gov/causes/

The causes of climate change.

https://skepticalscience.com/global-warming-too-hard-advanced.htm Information – Can we fix global warming?

https://aamboceanservice.blob.core.windows.net/oceanservice-prod/education/literacy/ climate_literacy.pdf

Slideshow – The essential principles of Climate Science https://climate.nasa.gov/faq/

Frequently asked questions about climate change

https://www.pmel.noaa.gov/co2/story/ Ocean+Acidification%27s+impact+on+oysters+and+other+shellfish Video – Ocean acidification's impact on oysters and other shellfish

https://www.nytimes.com/interactive/2015/11/28/science/what-is-climate-change.html Short answers to hard questions on climate change

https://www.youtube.com/watch?v=6SMWGV-DBnk Short video on ocean acidification

Teacher resources

https://kidsagainstclimatechange.co/lessons-for-teachers/

Climate change lessons for teachers

https://kidsagainstglobalwarming.files.wordpress.com/2015/07/ocean-acidificationexperiment.pdf

Ocean acidification experiment and lesson plan

https://kidsagainstglobalwarming.files.wordpress.com/2017/12/spreading-the-word-aboutclimate-change.pdf

25 ideas for spreading the word about climate change

https://skepticalscience.com/graphics.php

Teaching climate change with graphics. This website has graphics that you can use to make your own presentation and explanation for the students.

http://studyjams.scholastic.com/studyjams/jams/science/ecosystems/carbon-cycle.htm

Test your knowledge of the carbon cycle.

https://spaceplace.nasa.gov/greenhouse-gas-attack/en/#/review/greenhouse-gas-attack/ game.swf

Some gases in the atmosphere are called greenhouse gases, because they have a greenhouse effect on Earth. If not for any greenhouse gas, Earth would be too cold. But too much greenhouse gas can make it too hot.

Help Earth get rid of the excess greenhouse gases in the atmosphere

https://www.epa.gov/students/games-quizzes-and-videos-about-environment

Click on Recycle city – Explore recycle city to see how people of the town reduce waste, use less energy, and even save money by doing simple things at home, at work and in their neighbourhoods

https://insideclimatenews.org/news/23082018/extreme-wildfires-climate-change-globalwarming-air-pollution-fire-management-black-carbon-co2

Information on wildfires and effect on climate

Science learning hub

www.sciencelearn.org.nz

Click on climate change for numerous articles, videos and activities also click on weather, scroll down to find: Greenhouse gases – a video Ocean acidification – a video Antarctica and global climate change – article Disappearing glaciers – article Satellites measure sea ice thickness – article Dating ice cores – video Why study ice from Antarctica – video

Glaciers provide global climate puzzle – article

WEAR BLUE DAY in celebration of

World Water Day 22 March 2020

Please wear blue clothes to school on this day

Get your WEAR BLUE BADGE

from your teacher for a

\$ donation

towards





Climate change mitigation

What can I do to reduce the emission of greenhouse gases?

At home

Switch off lights when they are not in use.

Unplug electronics from the wall socket when they are not in use.

Run the dishwasher and washing machine only when they are full.

Wash clothes in cold water and dry them outdoors when possible.

Use LED lightbulbs. They use only 25% as much electricity and last ten times longer than incandescent lights.

Try to take shorter showers – 4 minutes or less.

When buying new household devices, consider how water and power efficient they are.

In the garden

Try having a meatless day each week. Red meat produces more greenhouse gas emissions than chicken meat, fruit, vegetables and cereals.

Plant your own vegetables and fruit trees.

Buy only the food you need and compost your kitchen scraps and garden waste. This saves it from going to a landfill site where it produces methane (a greenhouse gas) as it decomposes.

Plant a tree in your garden. Trees provide shade which has a cooling effect in towns and cities. They also remove carbon dioxide (a greenhouse gas) from the atmosphere.

Transport

Walk or cycle where you can. It's free, has the least impact on the environment and is good for your health.

If you replace your car, consider buying an electric one.

Use public transport.

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