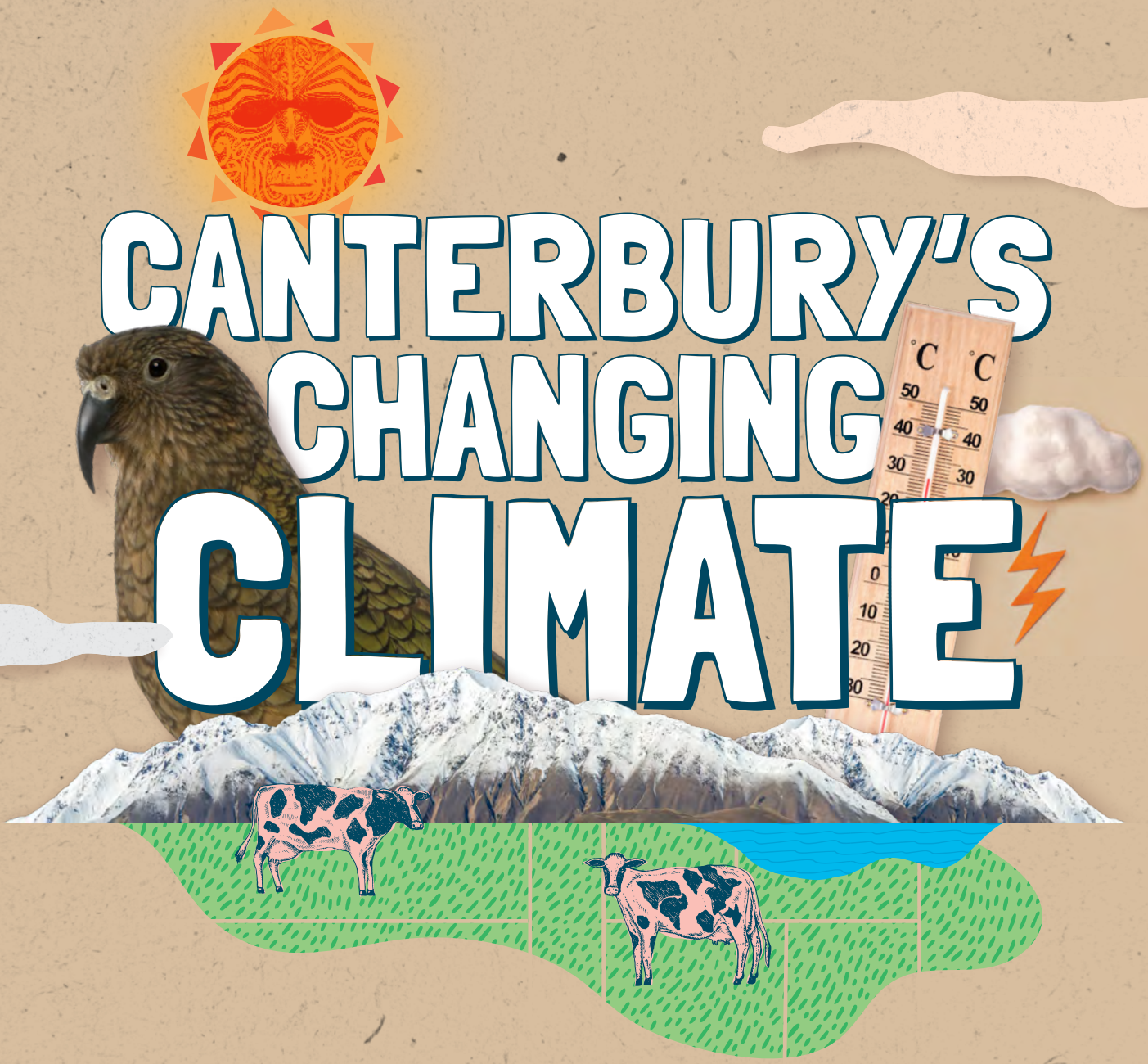
CANTERBURY'S CHANGING CLIMATE



HOT and sunny one moment, cold and wet the next – people say Canterbury can have four seasons in one day. Living here requires a keen eye for forecasting and a diverse wardrobe! Our weather is changeable at the best of times and the phenomenon of global warming is now added to the equation. We can be part of the solution to climate change issues. Learn more inside.

Environment Canterbury Regional Council
Kaunihera Taiao ki Waitaha

An educational resource for schools and communities

WHAT THIS BOOK IS ABOUT

How climate change is affecting Canterbury is what this booklet is all about. We investigate what it will mean for you, your family and friends, and the natural environment. More importantly, we explore what you could do about climate change and how you can prepare for its effects/impacts.

ThIS booklet will NOT deal with what causes climate change, the carbon cycle, international agreements like the Paris Agreement or the work of the Intergovernmental Panel on Climate Change (IPCC).

That information is well covered in various other learning resources like 'Climate Change: Prepare today, live well tomorrow' and the associated well-being guide.

For deeper learning programmes about sustainability, see the Te Kete Ipurangi website. The comprehensive resource Pūtātara helps schools and teachers incorporate sustainability and global citizenship across the curriculum.

Three broad principles underpin Pūtātara's learning programmes:

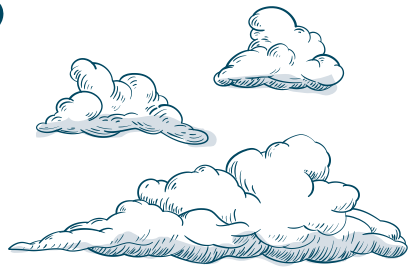
- *Place-based approaches:* Worldwide change, right where I stand
- *Participation for change:* I am the change I want to see in the world
- *Integrated, inquiry-based learning:* Inclusive by design, collaborative by nature.

Did you know?

The urgent, distinctive sound of the Pūtātara, or conch trumpet, is a call to action.

Treat this booklet as a supporting document providing useful information and tools in the Canterbury context.

WHAT ARE SCENARIOS TELLING US SO FAR ABOUT CANTERBURY?



The changing climate and the transition to a low-carbon future will present significant challenges and opportunities for Canterbury. The projected changes in climate for Canterbury have been researched for some time. Tackling climate change is a challenge but it's also an opportunity to clean up the country and secure our quality of life for future generations.

Our future climate depends on the amount of global greenhouse gas emissions in the atmosphere.

NIWA has used four scenarios, known as representative concentration pathways (RCPs), developed for the IPCC Fifth Assessment report and downscaled them so we can better understand what they may mean for New Zealand. We don't know, however, whether emissions will continue to increase at current rates (the RCP8.5 or 'business as usual' scenario) or whether there will be a concerted effort worldwide to reduce emissions (such as under the as the RCP4.5 scenario).

Climate scientists have used these two scenarios to look what might happen to Canterbury's climate over the next 100 years.

For more details on the scenarios and projections for Canterbury visit:
https://ecan.govt.nz/your-region/your-environment/climate-change/climate-change-in-canterbury/climate-change-projections-for-canterbury/

Hotter days

Temperatures are expected to increase on average between 0.7 and 3 degrees Celsius by 2090, with mountains warming the most. Over time, there could be 10 to 30 more days where temperatures exceed 25 degrees. This sounds great for going to the beach but possible flow-on effects could be the greater use of electricity for air conditioning.

Cost to the Coast

An increase in the number of storms and a rise in sea levels are likely to cause more erosion and flooding along Canterbury's coastal and low-lying areas. Preserving and restoring some of nature's own coastal protection such as coastal dunes and wetlands is important for protecting coastal areas from events like storms surges and sea-level rise. Lots of infrastructure, facilities and homes are located in this coastal margin.

All about air

Winter air pollution in Canterbury is exacerbated by using open fires or old style wood or coal burners to heat homes. Changing to clean heating options will improve Canterbury's air quality.

Air quality could also improve if our climate becomes windier and if we need less home heating as temperatures rise. Fewer frosty and still days would mean less winter air pollution in urban areas.

Water worries

Storms may become stronger and more frequent, causing more floods and damage, which is expensive to repair. The region already spends a lot of money on flood protection but may need to do more. At the same time, the Canterbury Plains will likely be drier overall. This could mean an increase in demand for irrigation as rainfall decreases. As a result, there could be a need for winter water storage schemes to provide water for drier springs and summers. Farming practices would need to adapt to this.

Pesky pests

Cold weather helps keep pests at bay! Warmer temperatures could allow existing pest plants to spread further south or new ones to establish themselves. The range of animal pests is likely to increase. Ticks, mosquitoes and plant-sucking insects could multiply and spread diseases.

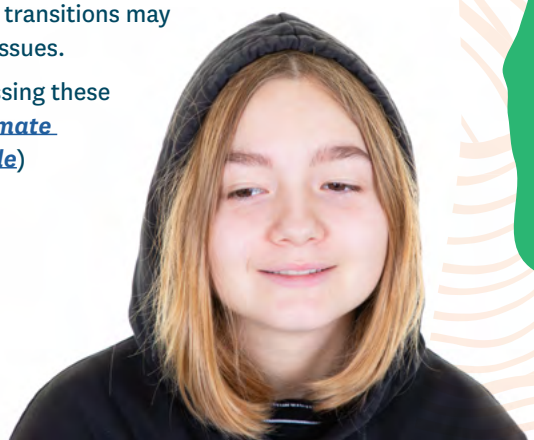
Energising energy

Climate change is strongly connected with energy use. Canterbury is one of the fastest growing regions and its energy use is continuing to increase, especially for transport. The need to reduce greenhouse gas emissions from transport is particularly important for Canterbury. Environment Canterbury encourages the use of alternative, low-carbon transport options such as cycling and public transport for staff and the community. Electric bikes, scooters and cars are also available for staff use during working hours to attend meetings in other parts of the city. Canterbury-wide there could be a greater development of alternative energy generation schemes like wind, solar and wave power.

Health Smart

It may be harder to keep homes cooler on those hot, hot days! More people may suffer from heat-related health issues particularly those with chronic diseases. There could be an increase in vector-borne diseases due to the establishment of new pest species. More frequent dry conditions may affect household water supply and so influence home hygiene regimes. Stress caused by climate disruptions and societal transitions may increase mental health issues.

(For support with discussing these issues check out the ***Climate Change Wellbeing Guide***)



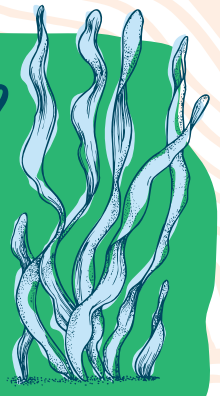
OPPORTUNITY KNOCKS!

Canterbury has the chance to become more energy efficient and use more sustainable energy sources. Farming will remain vital but will need to adapt to changing conditions by diversifying farm production practices.

See more details by checking out https://www.ecan.govt.nz/your-region/your-environment/climate-change/climate-change-in-canterbury/

Did you know?

65% of New Zealand's population lives within 5km of the coast. In Canterbury it is 36% of the population.



Shoreline ecology, public infrastructure, residential and commercial assets, community values and the future use of coastal-marine resources will be severely affected by changes to coasts due to sea level rise, and storm surge, and secondary effects such as erosion and flooding.

(Source: https://royalsociety.org.nz/assets/Uploads/Climate-change-implications-for-NZ-2016-report-web2.pdf)

HANMER SPRINGS

By 2090, winter rainfall is projected to decrease by up to 10 per cent in Hanmer with significant decreases in seasonal snow. It will also be windier with predicted increases in wind speed of between 5-10% above the 1986-2005 norm.

KAIKŌURA

One climate change threat Kaikōura residents don't need to worry about for a while is rising sea-levels! The 2016, 7.8 earthquake lifted the coastline's rocky platforms between 0.5 to 2m, whereas previously many parts of the Kaikoura coastline were vulnerable to coastal erosion and flooding.

OXFORD

Less frost inland and a longer growing season provides opportunities for different agricultural land uses. A number of the hill country rivers and streams will experience lower stream flow reliability, as it will be drier due to less rain. Predictions indicate winds will be stronger across the plains.

TEKAPŌ

It is predicted there will be more hot days and less rain. By 2090, there could be 6 to 26% less rain in Tekapō. Fewer frosty days and a longer growing season should create opportunities for a different land use.

CHRISTCHURCH CITY

Christchurch winter rainfall is projected to decrease by up to 12% by 2090. Increased westerly winds will mean higher rainfall in the mountains filling the alpine rivers that flow across the Canterbury Plains. The city's low-lying areas, particularly the lower Ōtākaro-Avon River and margins of the Avon-Heathcote Ihutai Estuary, will be vulnerable to increased flooding, and coastal erosion may increase by 20%.

AORAKI-MT COOK

By 2090 the number of snow days is projected to decrease by up to 30 days per year. There might be more rain in winter instead. Snow might also melt more quickly, particularly on lower slopes, which would make alpine rivers run higher and faster particularly in winter and spring.

TIMARU

South Canterbury is predicted to get warmer and wetter towards the end of this century. Low-lying areas such as Washdyke are likely to experience increased flooding, and it may become harder to open the Wainono lagoon due to sea level rise. Coastal areas already experiencing erosion may see an increased rate.

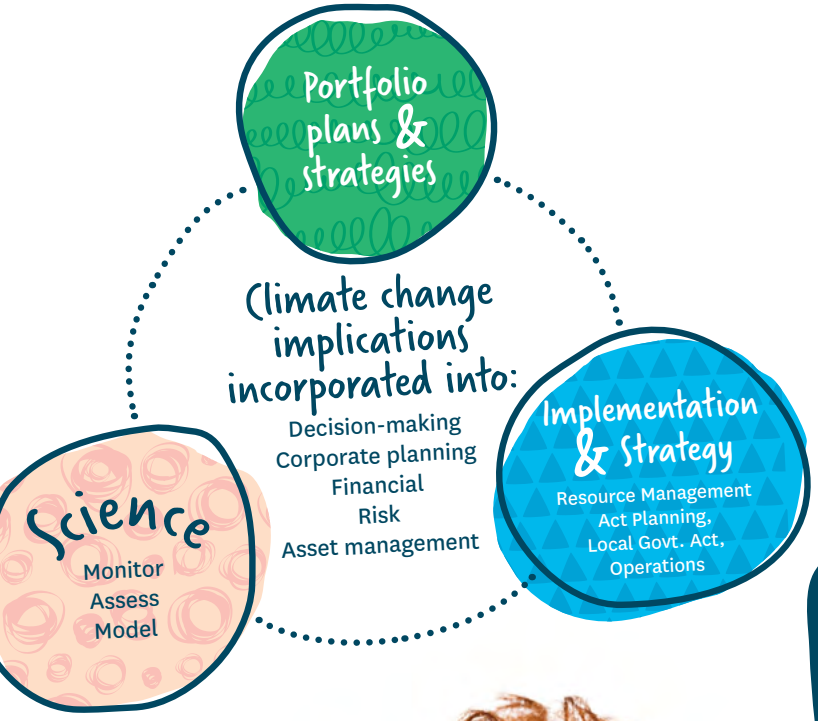
In this video, Justin Cope, Environment Canterbury's principal science advisor for natural hazards, explains how climate change will exacerbate many of the natural hazards we already experience.

https://vimeo.com/344510372 'Climate change: Prepare today, live well tomorrow' https://nzcurriculum.tki.org.nz/Curriculum-resources/Education-for-sustainability/Tools-and-resources

WHAT ROLE DOES ENVIRONMENT CANTERBURY PLAY?

IN May 2019 Environment Canterbury declared a climate emergency. That meant the weaving of climate change considerations through all work programmes and decision-making of the regional council. A great deal of research and the writing of reports was done before that date by staff within various portfolios with the emphasis being on adaptation measures.

Environment Canterbury recognises central government's role in leading policy with respect to reduction of carbon emissions and other mitigation measures. Even though the regional council's focus is on adaptation many of our plans and policies will lead to reductions in emissions such as farming within limits, reducing transport congestion, managing industrial emissions to air and clean burning.



Much of what the regional council does with respect to climate change is collaborative. It works closely with Papatipu Rūnanga[1] as well as with Te Rūnanga o Ngāi Tahu and all the territorial local authorities (i.e. city and district councils) in the region. Working on climate change adaptation is a complex issue - some call it a 'wicked problem' - which has lots of uncertainties and no easy answers. As such it requires a great deal of cooperation and the sharing of ideas and ways of doing things. It means Councils working with and alongside businesses, farmers, and communities we're all in this together!

NIWA[2] scientists have provided a great deal of the downscaling of global climate models to the regional level, which means council staff can concentrate on what this means at a more local level and work on developing adaptation strategies and plans.

There are a number of key areas of work in which council staff are reviewing and reflecting on the latest trends, threats and opportunities. These areas include biodiversity and biosecurity as well as natural hazards and transport but there are other areas as well that will need attention as new issues arise. To find out about the adaptation work taking place across these key areas of work check out: *https://www.ecan.govt.nz* and search for 'Adapting to climate change'.

1 Papatipu Rūnanga exist to uphold the mana of their people over the land, the sea and the natural resources. There are 10 Papatipu Rūnanga in Canterbury

2 Taihoro Nukurangi - The National Institute of Water and Atmospheric Research

Check out the Sustainable Development Goals, particularly #13. Environment Canterbury's work meets a number of SDG 13 targets such as strengthening community resilience and adaptive capacity, as well as offering educational materials about climate change.

https://sustainabledevelopment.un.org/

NGĀI TAHU & CLIMATE CHANGE

Aotearoa's climate has varied significantly since Māori first arrived. Changes in practices and customs that are strongly influenced by weather are a key to tracing climate back through the centuries. Traditional Māori knowledge of weather and climate, and of associated activities, such as gardening and fishing, has contributed to our understanding of past climatic variations. Climate affects the winds, waves, and ocean currents, and influences which plants, trees, and birds are found in various parts of the country. It is the natural world that sustains people, physically, economically, and spiritually hence the well-being of iwi is deeply connected to the well-being of the environment.

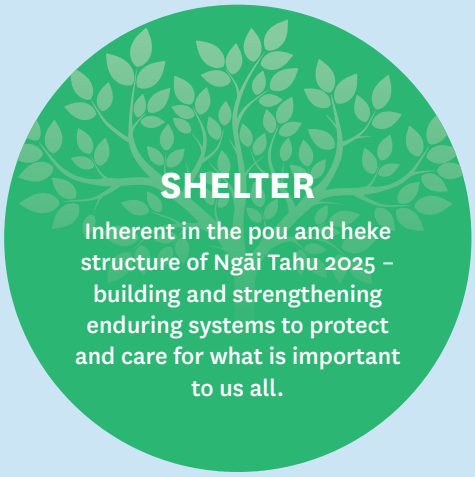
Through the generations, Māori have built up extensive knowledge of the local climate, from the character of local winds and rain to the forecasting of drier and warmer summers. This knowledge has traditionally helped them make important decisions, such as when is the best time to plant, farm, harvest, fish, and navigate. Climate change could have an impact on all of these activities. Mātauranga Māori has been of immeasurable value when coupled with the scientific understanding of climate change; how Māori coped with past climate extremes, such as floods and droughts, may help us adapt to future climate changes.

HERE in Te Wai Pounamu, Te Rūnanga o Ngāi Tahu has recognised the threat climate change poses to the deep relationship the iwi have with the natural world; landscapes, resources and taonga species will all be affected. There is a need to consider the impacts of climate change across a multi layered spectrum of rights and interests. In recognition of this, Te Rūnanga o Ngāi Tahu have responded to Government policy shifts in relation to climate change by demanding stronger action. They have also developed a tribal response in the form of He Rautaki Mō Te Huringa o Te Āhuarangi *[Climate Change Strategy August 2018]*.

In preparing the strategy, feedback from whānau was gathered via online surveys and marae based hui. A report from NIWA – Taihoro Nukurangi was commissioned with a specific brief that focused on places and taonga important to Ngāi Tahu. The "snapshots" provided an overview of the different impacts expected across the takiwā; Te Tai Poutini (the West Coast) may become wetter, while on the east coast Kā Pākihi Whakatekateka o Waitaha, the Canterbury Plains, will become drier. Of major concern was the impact for coastal communities and marae, and potential changes warmer oceans may have on kaimoana. Collective interests like culture and customary rights must be protected, and whanau and individual households may need support to navigate the inevitable changes that society will make.

Significantly, the strategy takes an inter-generational, long-term perspective; looking to the past to honour the knowledge of tūpuna and to the future for those yet to come. This intergenerational respect is captured by the whakatauki: Mō Tātou, Ā, Mō Kā Uri, Ā Muri Ake Nei (For us, and our children after us). It is about preparing now for what is currently known while also allowing for the emergence of new ideas and approaches over time. Tribal economies will need to pivot to meet the risks and opportunities climate change will present, whilst hapū and papatipu rūnanga will continue to find ways to ensure mana whenua can appropriately exercise their rights and rangatiratanga in a changing environment.

It is about making 'the most of opportunities, so that Ngāi Tahu Whānui have every chance to thrive even in the most extreme scenarios'.

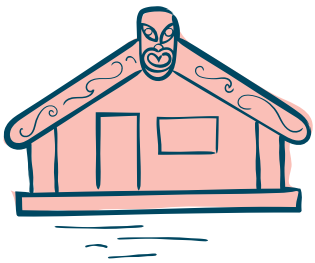


Te Rūnanga o **NGĀI TAHU**

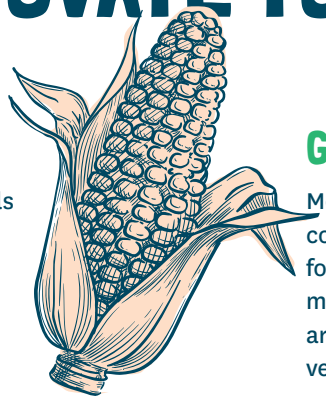
'The above circles are the interrelated concepts that helped shape the development of the strategy, Te Tāhū o te Whāriki. (Source: *https://ngaitahu.iwi.nz/wp-content/uploads/2018/11/Ngai-Tahu-Climate-Change-Strategy.pdf* , p6-7)

Activity:

If you have a relationship with your local marae, invite a representative of mana whenua to speak about climate change issues with you. Alternatively, arrange to visit a local marae to learn about actions they are taking to mitigate or adapt to to the impacts of climate change. You could also offer to help with an activity, such as a planting programme.



YOU'VE GOT TO INNOVATE TO MITIGATE



Plant Power

Alternative liquid or gaseous fuels are becoming more widely used as blends with fossil fuels. They can be used to fuel vehicles and generators and, in homes, can be used in some water heating appliances.

Biofuels are made mainly from animal or plant material. If produced sustainably, they are a renewable fuel source and produce less CO_2 than petrol or diesel. The two main transport biofuels are biodiesel and bioethanol. Biodiesel is a diesel substitute and bioethanol is a petrol substitute.

New Zealand's main source of biodiesel is tallow, a by-product of the meat industry. Bioethanol is currently produced in New Zealand from whey, a dairy by-product. There is some work being done to look at alternative sources of bioethanol.

Caution! Biofuels are only a good alternative when produced by reusing a waste product. Clearing land to grow crops for biofuel can cause problems as it may reduce the land available for food production. Precious ecosystems are also destroyed when areas like rainforests are cleared to make way for biofuel crops.

The amount of water and energy (and associated CO_2 emissions) needed to harvest, process, and produce biofuel is also significant. It is important to carefully consider all of these aspects when looking at biofuels as a viable alternative to fossil fuels.

Want to know more? Contact a local biofuels company like Green Fuels – they may have someone who could come to speak to your class.

Going Electric!

More and more individuals and companies are considering electric vehicles (EVs) as an alternative to fossil fuel powered vehicles. Whilst EVs are often a bit more expensive to purchase initially, their running costs are estimated to be seven times cheaper than petrol vehicles. That's like paying just 30 cents per litre for fuel!

On top of money in your pocket, EVs reduce carbon dioxide (CO_2) emissions by 80% - a huge help if our country is to reach its carbon emission reduction targets. As EV technology improves alongside the charging infrastructure more people and companies will switch to electric.

Environment Canterbury has started to buy or lease electric vehicles to reduce emissions. It also has a fleet of e-scooters and e-bikes for staff to use.

If you're a family with an electric vehicle you could join Flip The Fleet network, a community project that brings people together around electric transport options in New Zealand.

Where to next? Could Hydrogen be our low carbon fuel?

Hydrogen is the simplest, lightest and most abundant element in the universe, making up more than 90% of all matter. As a gas it is odourless, tasteless, colourless and non-toxic and has a high energy content by weight – nearly three times that of petrol.

Could hydrogen transform New Zealand's energy and transport sectors as we make the transition to a low carbon economy? New Zealand is one of several countries investigating whether there is a place for hydrogen within their energy systems and economies. In 2018 we signed a Memorandum of Cooperation with Japan to collaborate in the development of hydrogen for the benefit of both our nations.

Many see hydrogen as the automotive fuel of the future. An organisation called the *Hydrogen Council* estimates that by 2050 such vehicles will account for at least 20 percent of the world's total vehicle fleet. Here in New Zealand we only have demonstration hydrogen vehicles on the road but how many could be on our roads by 2050?

Hydrogen vehicles fuel more rapidly than EVs with a long distance driving range comparable to petrol and diesel cars. They also provide a smooth, quiet driving experience and emit only water vapour as exhaust.

Many people express concern about the safety of hydrogen vehicles but advances in technology such as the carbon-fibre compressed hydrogen storage tanks of the vehicles have made them just as safe as traditional petrol driven vehicles. As with any new technology there is the down-side; producing hydrogen gas for fuel is energy intensive and therefore making it an expensive option at this stage.

For further information check out:

Hydrogen NZ, a collection of organisations supported by the Government: *https://www.nzhydrogen.org/* and this 2019 Ministry for Business, Innovation & Employment discussion paper:

https://www.mbie.govt.nz/dmsdocument/6798-a-vision-for-hydrogen-in-new-zealand-green-paper

An article on producing hydrogen from a science writer *https://www.explainthatstuff.com/fuelcells.html*

Why not share?

Owning your own car is expensive. Yes, it is convenient having a car in your own garage you can jump into at any time but there are many attached costs - petrol, regular maintenance, parking, and insurance. Peer-to-peer car sharing can spread those costs among several people; it also allows people who cannot afford their own vehicles access to a car.

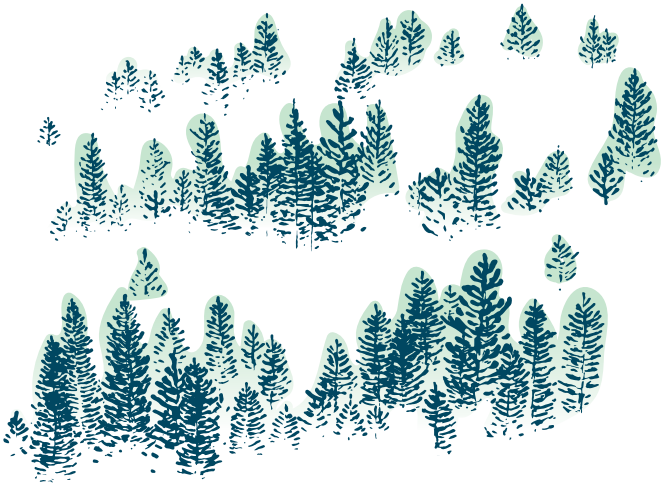
Car sharing takes more cars off the road. People who frequently use car sharing often end up selling their own car and also use more active modes of transport, like biking and walking. In many European countries car sharing is common either at a neighbourhood level or through a company. It is different from car hire in that you can rent by the hour, you have reserved parking locations, and few pick-up or drop-off constraints. Availability of vehicles, however, is not guaranteed to match your time requirements. But for people who just need to go to the supermarket, a doctor's appointment, or visit a friend across the other side of town, car sharing can mean you can plan your travel arrangements.

To find out more about car sharing and other possible benefits, google 'community car sharing nz'.

Emissions Trading Scheme

The New Zealand Emissions Trading Scheme (NZ ETS) is the Government's main tool in delivering emissions reductions and helping our country achieve its emissions budgets and 2050 target. The scheme aims to encourage people to reduce greenhouse gas emissions by putting a price on emissions. The idea is that if you charge polluters for their emissions they will be more likely to take action to reduce them. An ETS creates a financial incentive for:

- businesses to reduce their emissions
- landowners to earn money by planting forests that absorb carbon dioxide as the trees grow.



For more information about NZ ETS visit *https://www.mfe.govt.nz/climate-change/new-zealand-emissions-trading-scheme/about-nz-ets*

EVERYDAY SUPERHEROES

WE need to think proactively about what we can do as individuals and places from harm. We need to think not only of our own families, homes and communities but of people elsewhere in the world and of future generations. The most important thing to remember is that everything and everybody is connected. We are one big planetary system; what happens in the ocean reflects and affects what happens on land. The most important thing is to remember that everything is connected. We are one big planetary system. What happens in the ocean reflects and affects what happens on land.

As we manage the issues facing our environment we need to be open to new ideas and approaches as we plan for the long-term. Humans have had an amazing capacity over time to solve difficult problems through innovation and ingenuity. As we tackle the problems climate change throws at us we will have to be collaborative, resourceful, clever and thoughtful in order to generate new ideas and approaches.

"Never doubt that a small group of thoughtful, committed citizens can change the world. Indeed, it is the only thing that ever has."

Margaret Mead

Let's get started!

In your classroom create a Wonder Wall of Words to do with climate change. When you come across a word or a phrase you are not sure of, or have a burning question, write it out, add it to the wall then find out as much as you can about the word, phrase or question. Share the learning - add what you find out to the wall.

Wonder walls are built at the beginning of a unit and are kept alive throughout the learning. They keep ideas, concepts and questions visible and share the learning.

Some terms to get you started:

adaptation
carbon footprint
mitigation
offsetting
carbon neutral
emissions
carbon sequestration

Are you ready for the challenge?

While there is little doubt that we need to reduce our greenhouse gas emissions, we should remember that climate change is part of the bigger issue of unsustainable living.

Living sustainably means living smarter. We need to work together to reduce our emissions and our impact on the environment as a whole, as part of a more sustainable lifestyle.

The action we take every day counts – everyone can help make a difference.

Luckily, there are heaps of things that you can do to produce less carbon dioxide, use less energy, and save money at home!

Do you know how? Test yourself on the following quiz and find out.

DO YOU...?

A	or B		
shower for a long time? (say up to 10 minutes)	*take a quick shower in 3 minutes?*	1	
walk, bike, or bus to school?	*get driven by car to school?*	2	
get driven to school but you share the ride with friends?	*get driven to school but you don't share?*	3	
refill your water bottle or drink water from the fountain?	*buy a drink in a bottle or can?*	4	
pack your lunch in your lunchbox?	*buy pre-wrapped food?*	5	
re-use waste paper by using the clean side to doodle on?	*use clean paper to draw or doodle on?*	6	
put paper, plastic (correct numbers), and glass in the recycling bin?	*put paper, plastic, and glass in the rubbish bin?*	7	
usually play outside after school?	*usually watch tv or play on computer/smart phone?*	8	
put on a sweatshirt when it gets a little chilly?	*turn on the heater as soon as the temperature drops?*	9	
check the windows are closed and draw the curtains when it gets really cold?	*turn the heater up to high?*	10	
only turn on the lights you need when it gets dark?	*turn on lots of lights in the house?*	11	
turn off the light when you leave an empty room?	*leave the light on when you leave an empty room?*	12	

WHAT WAS YOUR SCORE?

Count up all the 'A's & 'B's you got...

10–12 'A's: ***Fantastic*** - you are a climate crusader! Keep up the great work and try to help another person reach this level.

7–9 'A's: ***Good on you*** - you are getting there. Now think of what you can do to improve your score.

6 or fewer 'A's: ***Hmmmm*** - you're not there yet. Try to think of two things you can do to improve your score. In another week's time try and change another two behaviours and you'll be on your way!

GOING DEEPER

Reducing our impact on the environment will not only help us today, it will help those who come after us. The actions we take to reduce emissions will help improve our air and water quality, help protect land from erosion and flooding, and maintain biodiversity.

Using energy more efficiently means paying less for electricity, gas, and petrol. Using cars less improves the air quality and our health, and using better insulation in our homes means we stay warmer and don't get sick as often.

Let's look more closely at **eight** simple things we can do everyday to reduce our impact on the environment, reduce our carbon emissions, and live more sustainably.

1. Take the bus

When someone opts to ride a bus rather than driving a car or taking a taxi, greenhouse gas emissions are reduced. The more people on a bus the fewer vehicles emitting polluting emissions, particularly if the buses are electric or fueled by biofuels! The benefits go beyond emissions reduction as reducing the volume of cars on our roads also relieves traffic congestion. With fewer people driving, fewer accidents and fatalities tend to occur. Environment Canterbury is responsible for public transport in partnership with local councils.

Good urban design alongside well-designed public transport services can help ensure mobility, livability, and sustainability in cities.

2. Get active

Use the power of your feet and try walking to school a few times a week; you can even pick up your friends along the way to make a walking school bus – a bus with legs! This is a project that the whole school community can take part in.

Canterbury is a great place for cycling. Not only does cycling use renewable energy (human power), it's also fun, cheap, and keeps you fit and healthy! Many councils are now providing cycling infrastructure that makes cycling safer and easier.

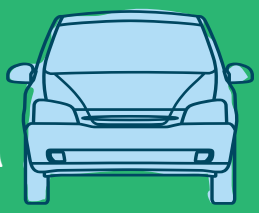
Christchurch City Council began development of 13 major cycle routes across the city in 2013 in response to a community desire for more travel choice and safer cycling options after Christchurch's earthquakes. The Council saw cycling as a way to address climate change, create healthier communities and reduce congestion.

3. Share the ride

Car-pooling is also a good idea. Talk to friends or neighbours to see if you can share the cost of one car instead of five! There are a number of apps that make this easier such as the Government's SmartTravel - see what others you can find. Another alternative is having community cars. A community car is a car that a community – rather than an individual – owns, maintains, and uses, saving on overall costs.

Did you know?

Around 18% of New Zealand's greenhouse gas emissions come from transport so choosing another way to get around can make a big difference!



(Source: www.mfe.govt.nz)

4. Be energy-wise

One way to reduce your energy use at home is to use energy-efficient light bulbs. According to the EECA, LED lights use about 85 percent less power than incandescent bulbs, meaning an 85 percent reduction in carbon emissions. An LED bulb can save you between $100 and $300 over its lifetime.

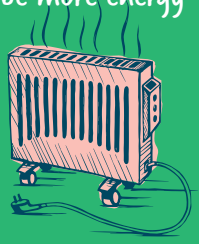
Turn off power to things you don't need. While many modern appliances use much less power in standby mode than old ones, they are still sucking up power. It can account for almost 10 percent of your power bill. Save money by turning off when not in use.

A great way to make use of our amazing sun is to put solar panels on your house. This will change the sunlight directly into electricity and thereby heat your water and save you money!

Other simple things you can do include insulating your home, taking shorter showers & line-drying your clothes.

Did you know?

Ngāi Tahu established a district heating scheme in their Pita Te Hori Centre development, a complex of two five-storey offices blocks opposite the Christchurch City Council offices. The heating network is designed to be more energy efficient than standalone systems. To find out more read this Press article entitled 'How the Christchurch district energy scheme works' (2017).



Check out these interactive charts from *ecotricity* on carbon emissions per fuel source.

https://ecotricity.co.nz/news/carbon-knowledge/

YOUR GUIDE TO SUSTAINABLE LIVING

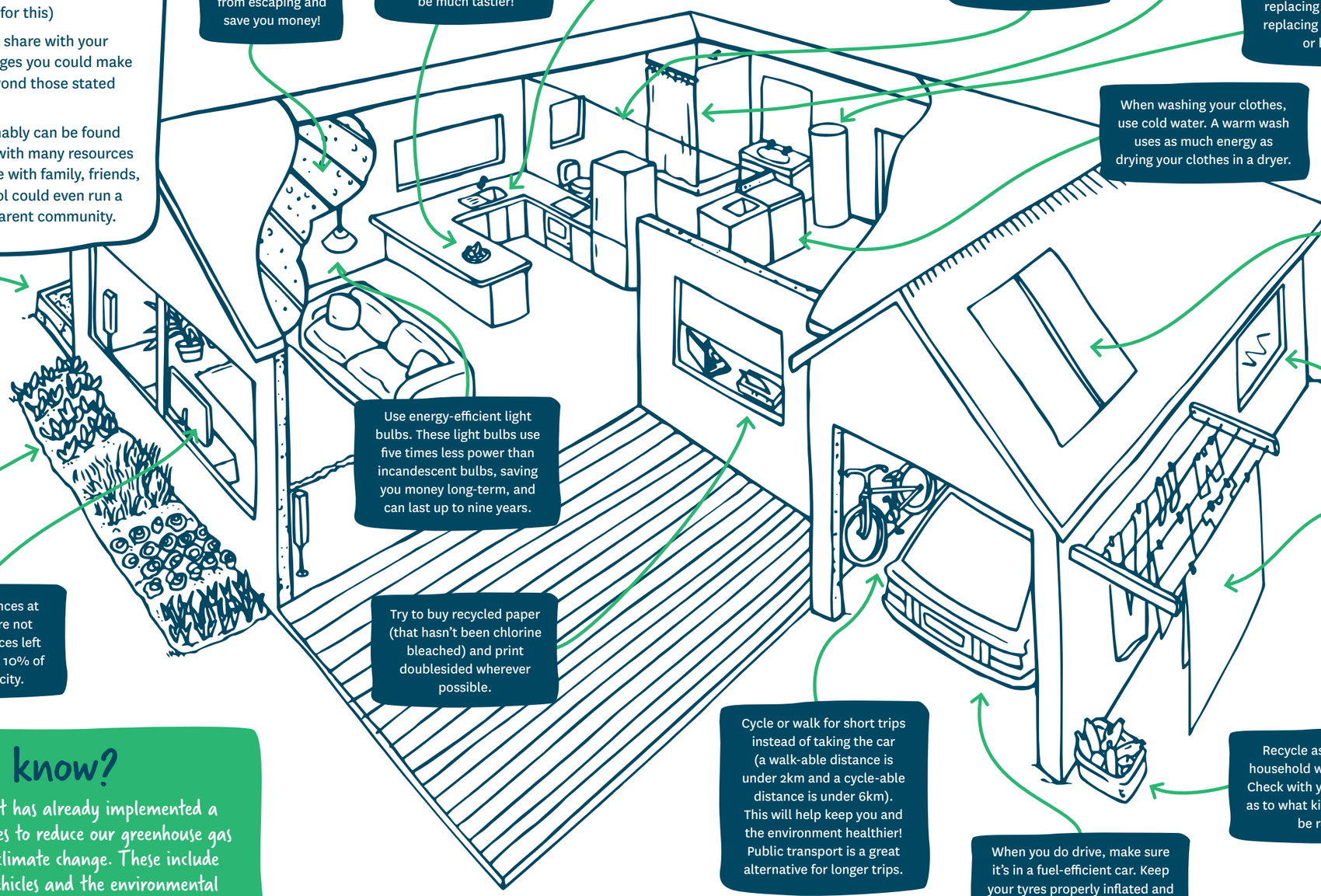
Activity:

Look at this picture and write down:

- what you currently do
- what you could start doing now
- what you could start doing in six months' time
- what you can't do (give a reason for this)

Take a copy of this picture home to share with your family. Discuss together what changes you could make as a family. What other actions beyond those stated here could you do?

More helpful ideas for living sustainably can be found on the *Future Living Skills* website with many resources available for free download to share with family, friends, schools and community. Your school could even run a Future Living Skills course for the parent community.



Insulate your ceiling and walls. This can stop heat from escaping and save you money!

Try to buy your fruit and veges locally and organically where possible.This will reduce the amount of energy used to transport your food, supports local producers, and they will be much tastier!

Turn your hot water cylinder thermostat down so that the tap water temperature is 55°C. This not only saves energy, it's also much safer.

Ventilate bathrooms and kitchens to outside, to remove steam - dry air is easier and cheaper to warm than wet air, and you reduce mould too. Modern extract fans are power-efficient and can be run on delayed auto-switch off.

Avoid products made form PVC. PVC produces harmful toxic chemicals during its manufacture and disposal.

Check your hot water cylinder. If it's warm to touch it probably needs insulation wrap. Whatever you spend on insulation will be paid back in energy savings within a year. If you are replacing your cylinder, think seriously about replacing it with a solar water heating system or hot water heat pump system.

When washing your clothes, use cold water. A warm wash uses as much energy as drying your clothes in a dryer.

Installing a solar water heater could provide you with all the hot water you need and save a huge 75% off your hot-water bill!

By doubling glazing a window with clear glass, you can halve the heat lost through a singleglazed window of the same size and shape.

Dry your clothes outside as often as possible – it's free and effi cient! Clothes dryers are among the most energy-hungry appliances.

Recycle as much of your household waste as you can. Check with your local council as to what kinds of things can be recycled.

When you do drive, make sure it's in a fuel-efficient car. Keep your tyres properly inflated and your engine tuned to maximise efficiency.

Cycle or walk for short trips instead of taking the car (a walk-able distance is under 2km and a cycle-able distance is under 6km). This will help keep you and the environment healthier! Public transport is a great alternative for longer trips.

Try to buy recycled paper (that hasn't been chlorine bleached) and print doublesided wherever possible.

Use energy-efficient light bulbs. These light bulbs use five times less power than incandescent bulbs, saving you money long-term, and can last up to nine years.

Compost your organic waste (food scraps and garden waste); this is great for your garden. Or use your council green bin. Organic waste in landfill creates methane (a greenhouse gas)

Grow your own veges. They'll be the freshest and most environmentally friendly food you'll ever eat!

Turn off your appliances at the wall when you're not using them. Appliances left on standby use up to 10% of household electricity.

Did you know?

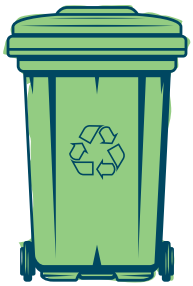
The New Zealand Government has already implemented a number of policies and measures to reduce our greenhouse gas emissions and to prepare for climate change. These include improving fuel efficiency of vehicles and the environmental performance of appliances, increasing standards for building insulation, and encouraging renewable energy.

5. Waste less

Most of the things we do everyday create some sort of waste.

Here are some ideas for reducing waste:

- Try to buy products with less packaging, such as loose fruit and vegetables. The production of packaging releases greenhouse gases into the atmosphere. Take your own recyclable or cloth shopping bags to the supermarket.
- Recycle paper, glass, tin, and plastics whenever you can. Recycling helps reduce emissions as it takes less energy to recycle something than to make it from scratch.
- Compost your food scraps – at home and at school! This will help feed your garden as well as reduce the methane gas emissions from landfill waste. To find out more about how food waste contributes to carbon emissions check out *Love Food Hate Waste NZ*.



6. Buy local:Be ethical

There's lots to think about when we're out shopping. As consumers we have a lot of influence on producers as well as on the choices our peers make.

What are the carbon miles on the food you buy each week? What food in your diet contributes the most carbon emissions? What is the water footprint of your food and clothing? Where were your clothes made and by whom? Could you recycle, upcycle, trade-in, share your clothes, toys, furniture? Could you grow your own food, preserve, share excess or contribute to a community garden?

All food has a carbon footprint. This *UK based calculator* will give you some idea of your diet's carbon footprint.

Check out your food footprint. All food has a carbon footprint as explained in this Stuff article from August 2019, How much does diet impact the environment?

This article from the UK provides a simple calculator to give you some idea of your diet's carbon footprint.'

Build connections 7.

It is really important that communities work together alongside councils and government agencies to develop responses to climate change impacts. There are lots of initiatives already active in our communities.

In some parts of New Zealand communities have joined the Transition Towns project, an international grassroots movement that brings people together to explore how we can respond to the environmental, economic and social challenges arising from climate change.

In Greater Christchurch groups interested in growing and sharing food knowledge joined together to create Edible Canterbury's Food Resilience Network. These grassroot organisations believe communities can build local resilience by tapping into the innovation and ingenuity already present to come up with positive solutions to address problems as they arise. They also aim to foster community spirit and belonging while living within local planetary means.

Maybe there is a Transition Town, Eco Community or Food Resilience project near your neighbourhood or schools. If there is, perhaps ask a representative to come in to speak to the class or arrange a visit to a project site to learn more about what they do.

For more background visit:

Transition Towns: *http://www.transitiontowns.org.nz/*
Canterbury's Food Resilience Network:
https://ediblecanterbury.org.nz/our-story/
Greater Christchurch Partnership:
https://greaterchristchurch.org.nz/projects/resilient-greater-christchurch/
Love Food-Hate Waste:
https://lovefoodhatewaste.co.nz/

Care for the dunes 8.

Natural features such and sand dunes and coastal wetlands provide natural protection from coastal hazards and erosion. Restoration and protection of natural systems plays an important part in preparing and protecting coastal areas from climate change events like storms, floods and sea-level rise. Looking after our dunes and wetlands has other benefits too, such as maintaining our beaches, protection of coastal biodiversity and landscapes as well as the preservation of archaeological and cultural sites on the coast. They also serve to protect homes and businesses built in coastal areas. *Contact your local council or your local coast care group to see if there are any dune restoration projects that you could get involved in.*

BE PREPARED TO ADAPT!

If greenhouse gas emissions are not reduced, levels in the atmosphere will keep rising and the speed and extent of climate change is likely to be worse. If we don't plan properly for this, we will be more at risk of the effects of climate change.

We can reduce the impact of climate change if we act now and work together. Being prepared for and adapting to climate change will reduce the risks to New Zealand's environment, communities, and individuals.

Agriculture on the Canterbury Plains will be changed by climate disruption; there will be a need to adapt and diversify. A warmer average climate will increase opportunities for a greater range of crops that could be grown for the market. There could be a reduction in the numbers of dairy cows as farmers shift to a production model of producing less with a greater value. Rising temperatures and reduced annual average rainfall will, however, contribute to growth in demand for water for agriculture, which could see rising interest in enhanced water storage alongside greater improvement in irrigation efficiency. Carbon sequestration through tree planting, land use diversification and building soil carbon are some the actions farmers can take.

See what you can find out about what adaptation and mitigation measures are happening in agriculture in your local area.

What can you do?

Preparedness is just as important as taking action to tackle climate change. You have already read about or investigated what changes are likely to take place, now we need to make sure we are ready for these.

Civil Defence's job is made a lot easier when people are aware of and prepared for extreme events and natural disasters. You will feel most comfortable and safe by being prepared with survival kits and learning techniques for coping with different situations.

You've probably already got a family survival kit sorted. The *Get Ready* website has lots of useful information to help you prepare. If a Civil Defence emergency is declared it means the hazard is threatening to become a natural disaster. Here in Canterbury the Canterbury Civil Defence Emergency Management Group will open an Emergency Operations Centre (EOC) to coordinate any response to an event, and work with trained community volunteers in the affected area to manage the situation.

Activity

Personal survival kit

Brainstorm with your class what you think you would need if a major climate change disaster did strike, for example, a major fire or flood or cyclone. Think about essential survival items you would need if you had to leave your house in a hurry. Here are some items to get the discussion started:

List your top three items and tell the rest of the class why you chose these things. Would you take all of these items? Why/why not? What other things would be useful to include in your list? Why would you take these things?

ACTIVITIES

DISCUSSING THE ISSUES

Photo credit to Gary Easterbrook

Mia Sutherland, who was a Year 13 student in 2019 wrote a series of guest editorials for the Christchurch Press. In this article entitled, 'Why you should take action on climate change', she exhorts us to "change your lifestyle to reduce your negative impact on the environment because I want a future I can look forward to."

https://www.stuff.co.nz/environment/climate-news/112939231/why-you-should-take-action-on-climate-change

1. **Read** her editorial as a class and discuss some of the things she suggests you could do. Do you think the power lies with individuals to make a difference or should governments enforce stronger legislation to protect the environment and its citizens?

2. **As** Mia outlines, the effects of climate change will have an impact on all aspects of our day-to-day life. Brainstorm what aspects of life you think could be affected by climate change. Think about your family, friends, home, and school. You could draw up a table and record your ideas. Discuss your reflections with family or friends.

3. **Choose** ONE aspect of your life that would be affected and record this by taking photos or quick sketches to capture what climate change will mean for you. You could post these images on the classroom wall or school hall, incorporate them into a poster to use for discussion, or talk to other classes about issues related to climate change.

4. **Take** the exploration of this aspect further; think about what you can change and what action you can take. Discuss this as a class or with your family at home. See whether you can come up with one or two actions you can take to tackle climate change now and into the future. These actions could also be incorporated into a poster display at school or in the local library that may influence others or get them thinking about the issues.

ROLE PLAY

There are many different issues and possible solutions associated with climate change. Now it's time for you to delve deeper into some of these.

Role-playing is simultaneously interesting and useful as it emphasizes the 'real-world' side of desicion-making. It challenges players to deal with complex problems with no single 'right' answer, understand different perspectives and to use a variety of investigation or analytical skills.

Activity:

Divide the class into small groups with each group taking one of the roles outlined.

Each group discusses its position on climate change, greenhouse gas emissions, behaviour change, and so on, and maybe does some further research. One person from each group then takes part in the class role play.

You will have to decide what the scenario is, for example, a demonstration, a council meeting, or a community gathering. The debate topics on the next page may also help with this activity.

Roles:

Scientists – You monitor changes in the climate and greenhouse gas emissions in the air. Your main job is to make sure everyone knows what climate change is, what causes it, and why.

Environmentalists – You want to increase awareness about the issues associated with climate change and think that behaviour change is the best way to tackle this. You are interested in renewable energy, such as solar power, and you want the council to take a lead role in this.

Concerned citizens – You want your town to be a clean, safe place for your children. You like using your car around town but understand that change is necessary and that there are benefits to public transport and being more active by cycling and walking more often.

Low income representative – You are concerned that many alternatives to fossil fuels are expensive, for example, installing solar panels, insulating your house and bus passes. You believe people on low incomes will be hit the hardest and will need some kind of assistance to put things like this in place.

Business person (for example, representative from an energy company or airline) – You are concerned that the messages being sent to people are that they should stop all driving and/or flying. You are aware of the issues relating to climate change and think that you can find a balance between reducing greenhouse gases and travelling.

Student – You are concerned that climate change is going to impact your long-term future plans for travel and having a family, and that not enough is being done by our government.

Elderly person – You are quite happy to use less power and get the bus around town. You feel warmer winters would be better for your health. You'd like to compost and recycle but it's not easy where you live; you feel the council should do more to help with that type of thing.

Parents with children – You are concerned about the impact that climate change may have on you and your family. You think it will cost more to get your family around using the bus (and it will take much more time) and it will be harder to fly and visit Granny and Grandpa during the school holidays.

Farmer – You are concerned that climate change will have a dramatic impact on what and how you farm, and have already adapted some farming practices. You're also concerned that more people are choosing to eat less meat and have reduced their intake of dairy products when both these industries are so important to New Zealand's economy.

Elected member(s) [used only if running a mock council meeting]: You are really interested in what the people attending the meeting have to say. Your role is not to take a position but to ask probing questions or to seek clarification of those presenting ideas. Listen respectfully, take notes, ask questions and review what you have heard.

CLASS DEBATE

Engaging in formal debating improves your speaking skills. As a debater, you develop critical thinking skills and learn how to clearly structure and present an argument.

Useful NZ resource on setting up a debate

http://www.debating.org.nz/wp-content/uploads/2006/08/NZ-Schools-Debating-How-to-Debate-Guide.pdf

Activity:

Choose a topic for a class debate.
Suggestions:

- That electric and hybrid vehicles are a real solution to climate change.
- That the New Zealand Emissions Trading Scheme is the best method we have for reducing carbon emissions.
- That the real costs of climate change – economic, social, environmental, and cultural - have not been accounted for.
- That environmental 'taxes' are blunt instruments.
- That international agreements like the Kyoto Protocol and the Paris Agreement are our only hope.
- That keeping global temperature rise at 1.5 degrees or less can be achieved.
- That government should instigate more regulations and penalties to encourage people to reduce their greenhouse gas emissions.
- That developing countries should be exempt from measures to combat climate change.
- That vegans and vegetarians should actively pressure their friends to change their dietary habits.
- That the world changing what they eat has great benefits for us as a country.
- That climate change is the greatest threat facing humanity today.
- That alternative energy can effectively replace fossil fuels.
- That the best way to combat climate change is for individuals to reduce their carbon footprint. OR That individual behaviour change should be prioritised over offsetting greenhouse gas emissions.
- That Greta Thurnberg could not have done what she did if she lived in NZ!
- That political leaders have a responsibility to make a difference.
- That schools should be empowering young people to take action for climate change.
- That politicians should listen to the voice of young people when it comes to developing solutions for climate change.
- That changing what we produce as a country will make us all better off.
- That working together to solve climate change will bring us closer together.
- That one person can make a difference in solving climate issues.
- That there are huge benefits to New Zealand-Aotearoa from leading to reduce carbon emissions.
- That putting a price on carbon emissions will prove an efficient strategy to curb these emissions.
- That the price charged for any goods and services that have a negative impact on the community must include the hidden costs.

SPREAD THE WORD!

SPREAD THE WORD!

Raising awareness of environmental issues is also a great way to make a difference.

Choose an issue that's relevant to you and your community, explore this further, and use key points to design a poster or a meme. Think of a catchy slogan and image for this poster or a meme. It could be put up in the school hall, staff room, or your local library.

You could also write a short story, poem, or play about tackling climate change. Include actions that people can take to make a difference. This could be shared with junior students at school.

SPREAD THE WORD!

SCENARIO PLANNING

A possible activity for senior secondary or tertiary students.

Read the article from the Fast Company magazine entitled *'This map shows where people on the coasts will flee to once sea levels rise'*

The research suggests that by the end of 21st century sea-level rise in the USA won't only affect people living on the coasts – as homes flood in Florida and New Jersey, it may trigger mass migration inland, potentially making housing more expensive and jobs harder to find in other areas.

If sea level is to rise along the Canterbury coast by 50cm by 2070 or 1.0m by 2120 (RCP8.5 - 'business as usual' scenario) consider where people may have to move to within Canterbury.

Working in teams organise yourselves into an advisory panel of urban planners and engineers and draft up a paper for your council to consider. In it you will offer projections as to:

- ***where people may need to move from and where they might choose to resettle***
- ***how urban growth in those new areas will need to be planned for***
- ***how arable land for growing food crops & animals may be protected.***

The reports and resources listed below will provide you with more background information to help you in you plan for the future.

Two reports released in 2019 by NIWA and the Deep South National Science Challenge revealed data about how many New Zealanders, how many buildings and how much infrastructure could be affected by extreme river and coastal flooding from storms and sea-level rise. Visit *https://www.deepsouthchallenge.co.nz/* to view the reports.

The article ***Climate of Unrest*** suggests that the engineering profession will play a central role in preparing New Zealand for this potential future, shoring up defences against flooding and coastal erosion, adapting cities and infrastructure, and rethinking design. They also know collaborating with other disciplines – planners, ecologists, urban designers etc - is vital for adaptable design.

Environment Canterbury has just concluded a 10-year work programme to bolster the flood defences of greater Christchurch and surrounds. The Waimakariri Flood Protection Project involved the upgrade of 35km of primary stopbank and the construction of a 25km secondary stopbank, increasing the design flood capacity to 5,500 cumecs and 6,500 cumecs respectively.

Fast Company: *https://www.fastcompany.com/90455314/this-map-shows-where-people-on-the-coasts-will-flee-to-once-sea-levels-rise*

Climate of Unrest: *https://www.engineeringnz.org/news-insights/climate-unrest/*

https://www.stuff.co.nz/environment/climate-news/115192761/river-flooding-in-canterbury-potentially-most-damaging-in-nz#comments

Waimakariri District Council hazard map *https://waimakariri.maps.arcgis.com/apps/webappviewer/index.html?id=a1508164fb474825bd34c34eebfadc46*

https://apps.canterburymaps.govt.nz/KaikouraNaturalHazards/

Canterbury maps will be a useful resource for this activity and possible Greater Chch UDS *http://www.greaterchristchurch.org.nz/*

Flood risk under climate change: *https://www.deepsouthchallenge.co.nz/news-updates/new-reports-highlight-flood-risk-under-climate-change*

This scenario activity could be adapted to meet the assessment criteria for AS91734 Education for Sustainability 2.5: Develop a collaborative response that promotes a sustainable future, in relation to a current issue.

RUNNING A SCHOOL AUDIT: CARBON FOOTPRINT OF YOUR SCHOOL

LEARNING OBJECTIVES

- To gain an understanding of what a carbon footprint is
- To quantify the school's carbon footprint.
- To identify what can be done to reduce the school's carbon footprint.
- To learn how carbon is emitted and calculated.
- To design and conduct an action project related to carbon emissions.

A Carbon Footprint describes how much carbon dioxide a person (or entity such as a school) releases over time. Assessing your school's carbon footprint is a way to measure the impact your school's activities and behaviours have on the environment. The more energy, paper, and other supplies your school uses, the bigger your school's footprint or impact.

What is a carbon calculator? A carbon calculator measures the amount of carbon dioxide, CO_2, we contribute to greenhouse gas emissions. The carbon calculator is used to assess climate change because it is a heat-trapping gas that stays in the atmosphere anywhere from decades to thousands of years, and over time increases global temperatures. When we understand how our actions affect the environment we can take steps to make better decisions and better choices.

If you would like your class to record the carbon footprint of your school the two options below may prove useful.

- ***Visit carbon measurement and offsetting specialists Ekos https://ekos.org.nz/school-calculator and register your school to begin the process of mapping your footprint***
- ***Toitu Envirocare has free tools and resources useful for individuals and households wishing to reduce their emissions https://www.toitu.co.nz/ Your will need to register and have necessary information, such as electricity bills, on hand.***

Check out what Palmerston North's Ross Intermediate did to measure their school's carbon footprint. They worked with Ekos to go carbon neutral in 2019 and helped develop the carbon calculator specially for schools.

https://www.stuff.co.nz/manawatu-standard/news/117945697/pupils-do-the-sums-on-emissions-with-new-carbon-calculator

LINKS TO USEFUL RESOURCES

Christchurch City Council's Learning Through Action team offers an engaging programme in which students will investigate how we can respond to climate change.
https://ccc.govt.nz/the-council/learning-resources/learning-through-action/list-of-programmes/climate-change-kaitiakitanga/

NIWA was tasked with preparing a report for Environment Canterbury. The full technical report can be downloaded from this page:
https://ecan.govt.nz/your-region/your-environment/climate-change/climate-change-in-canterbury/climate-change-projections-for-canterbury/

NIWA's 'Stuff for students' on climate change:
https://niwa.co.nz/education-and-training/schools/students/climate-change/

Ministry for Environment: Likely impacts in your region
https://www.mfe.govt.nz/climate-change/likely-impacts-of-climate-change/how-could-climate-change-affect-my-region/canterbury

Agriculture emissions and climate change, Ministry for the Environment
https://www.mfe.govt.nz/climate-change/climate-change-guidance/agriculture-emissions-and-climate-change

Gen Less; EECA's platform to inspire New Zealand businesses and consumers to live a climate-friendly lifestyle:
https://genless.govt.nz/

United Nations Sustainable Development Goals: Climate Action
https://www.un.org/sustainabledevelopment/climate-action/

Youth Engagement and Education services

We offer a range of facilitated school programmes and educational resources on natural resources and their sustainable management. Environment Canterbury also produces general information and resource material, such as pamphlets, brochures and booklets, many of which are free. If you would like to join our education mailing list and receive our quarterly Pīwakawaka newsletter email *education@ecan.govt.nz* or contact Customer Services on 0800 324 636.

Environment Canterbury: what we do

Environment Canterbury is your regional council. We manage a number of activities under six portfolios for the Canterbury region.

- Air quality
- Biodiversity and Biosecurity
- Freshwater Management
- Climate Change, Hazards, Risk and Resilience
- Transport and Urban Development
- Regional Leadership

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Environment Canterbury Regional Council
Kaunihera Taiao ki Waitaha

E20/8067