Ministry for the Environment
Manatū Mō Te Taiao

Preparing for and adapting to climate change.

Look ahead to the future.

Our climate is changing.

It will take a global effort to reduce the greenhouse gas emissions heating our planet. Along with reducing our emissions, it is essential we prepare for and adapt to climate change.

The way countries, communities and individuals respond to climate change now will determine the shape of New Zealand's future.

This booklet looks at how climate change is likely to impact on New Zealand and what we need to do to get ready. If you want to know more about how you can reduce your impact on the environment, check out another booklet in this series:

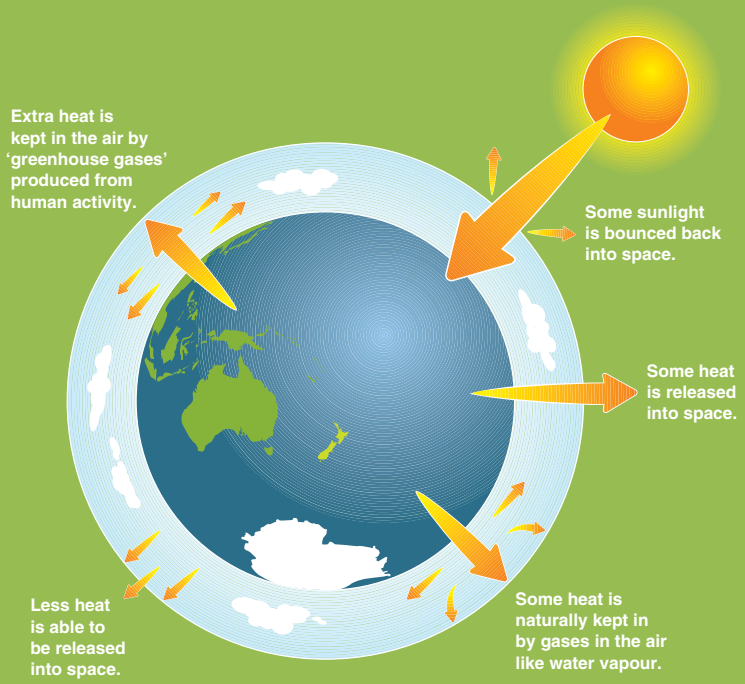
Taking action on climate change. Small acts. Big impacts.

What is climate change?

Greenhouse gases like carbon dioxide, methane and nitrous oxide act like the outside covering of a greenhouse, trapping heat from the sun. These essential gases make our planet a warm and habitable place (unlike Mars). Humans contribute to the production of greenhouse gases through activities like driving cars, burning coal, farming and cutting down trees. These activities are increasing the amount of greenhouse gases in our atmosphere, causing Earth not only to heat up, but to heat up at a faster rate than ever before.

This process is often called **'global warming'** but it is better to think of it as **'climate change'** because it is likely to bring about more extreme events – floods, storms, cyclones, droughts and landslips – rather than an increase in temperature alone. Every country will be affected differently but the one constant is a changing climate.

Let's take a look at the Earth



New Zealand's changing climate

Climate change could have significant impacts on our economy, environment and the way we live.

Climate change could have significant impacts on our economy, environment and the way we live – the effects of a warming planet and subsequent changing climate patterns are already becoming evident.

The impacts of climate change are likely to have different effects in different parts of New Zealand.

Climate scientists expect the Earth's average temperature will increase by between 1.4 and 5.8°C this century. In New Zealand, average temperatures are projected to increase about 1°C by the 2030s and about 2 to 3°C by the 2080s.

Under moderate projections, it is possible that sea levels will rise 30 to 50cm by 2100. Such a rise would lead to increased coastal erosion, flooding from storms, salinisation of freshwater, and drainage problems.

We can expect increased frequency and intensity of extreme weather events like severe storms, floods and droughts.

More rain is likely to fall in the west of the country and less in the east. We can also expect more episodes of heavy rainfall and for westerly winds to become more prevalent with a greater risk of severe winds and storms.

There are likely to be decreases in the number of frost days in the lower North Island and the South Island, and a substantial increase in the number of hot days where temperatures exceed 25°C, especially in the north of the North Island.

Climate change impacts on New Zealand

Natural areas
- Species distribution changes
- Changes to/loss of habitat
- Increased pressure from pests, animals and plants

Drier
- Less rainfall
- Decreased run-off to rivers
- Increased evaporation
- Increased drought for already drought-prone areas
- Increased irrigation demand

Urban
- Warmer winters –> less cold-related illnesses
- Warmer summers –> increased heat stress
- Decreased electricity use in winter (less heating)
- Increased electricity use in summer (more air-conditioning)

Coastal
- Sea level rise
- Increased storm surge
- Coastal inundation
- Increased coastal erosion

Wetter
- Increased precipitation
- Increased intensity in weather events
- Increased flooding for already flood-prone areas
- Increased slips
- Increased soil erosion

Commercial forests
- Increased growth rates
- Increased geographic range
- Increased winds –> increased damage to forests
- Increased temperatures –> increased pests

Snowlines and glaciers
- Increased length and area of glaciers
- Rise in snowline
- Possible increase in snowfall
- Possible increase in avalanches

Cyclones
- Increased intensity –> increased wind, waves, storm surge and rainfall

Wind
- Increased westerly winds

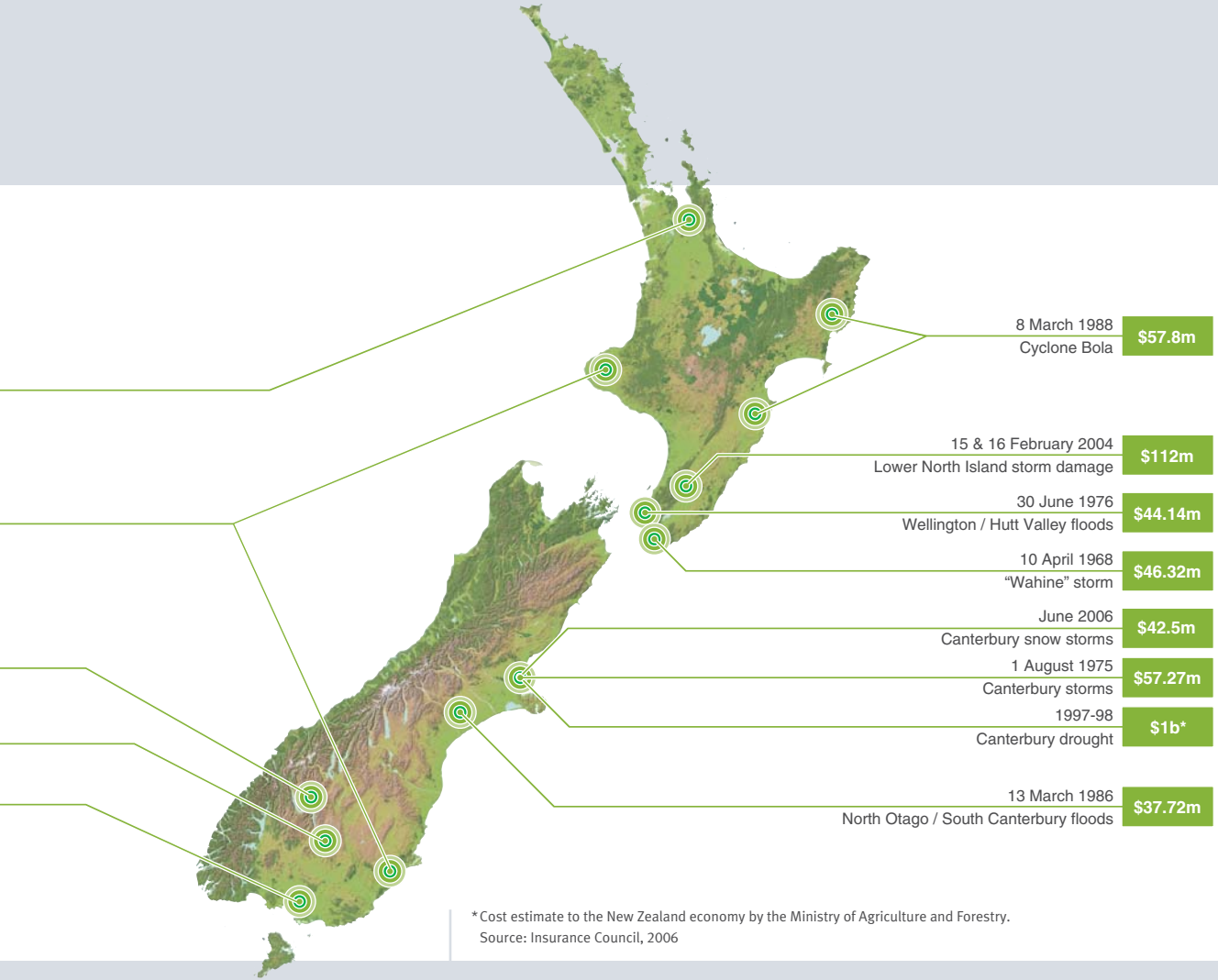
These are the likely impacts of climate change for New Zealand over the next century, based on expert reports and peer-reviewed scientific studies, published internationally and in New Zealand.

It is not an attempt to provide a comprehensive summary of all impacts for New Zealand but to provide an indication of potential impacts.

The cost of weather-related disasters 1968 – 2006

These are the top 13 weather-related disasters in New Zealand from 1968 to 2006, based on costs to the insurance industry resulting from claims. Costs are adjusted to March 2004.

$25.41m	1 April 1981 Thames / Coromandel / Paeroa floods
$34.24m	5 June 1980 Taieri / Otago / New Plymouth floods
$50.91m	1 December 1999 Queenstown Lake District floods
$54.65m	16 October 1978 Otago floods
$113.98m	1 January 1984 Invercargill / Southland floods



*Cost estimate to the New Zealand economy by the Ministry of Agriculture and Forestry.
Source: Insurance Council, 2006

Responding to climate change

Despite measures we take to reduce greenhouse gas emissions now, the levels of carbon dioxide already in the atmosphere are expected to continue to affect and change the climate over our and our children's lifetimes.

This means that as well as working to reduce emissions, we need to prepare for climate change and adapt to its impacts. It is important that both kinds of actions are taken. The risks of *inaction* will be far more costly to us than the cost of any action.

Without reducing our emissions, greenhouse gases in the atmosphere will continue to rise meaning the rate and extent of climate change is likely to be worse. And without proper planning, we will be more vulnerable to the impacts of climate change.

Preparing for and adapting to climate change will minimise the risks to New Zealand as well as maximise any opportunities arising from a changing climate.

The importance of action

While New Zealand's contribution to global greenhouse gas emissions is relatively small, our climate is affected by the emissions that the rest of the world produces. We therefore have a role to play in the worldwide effort to address climate change.

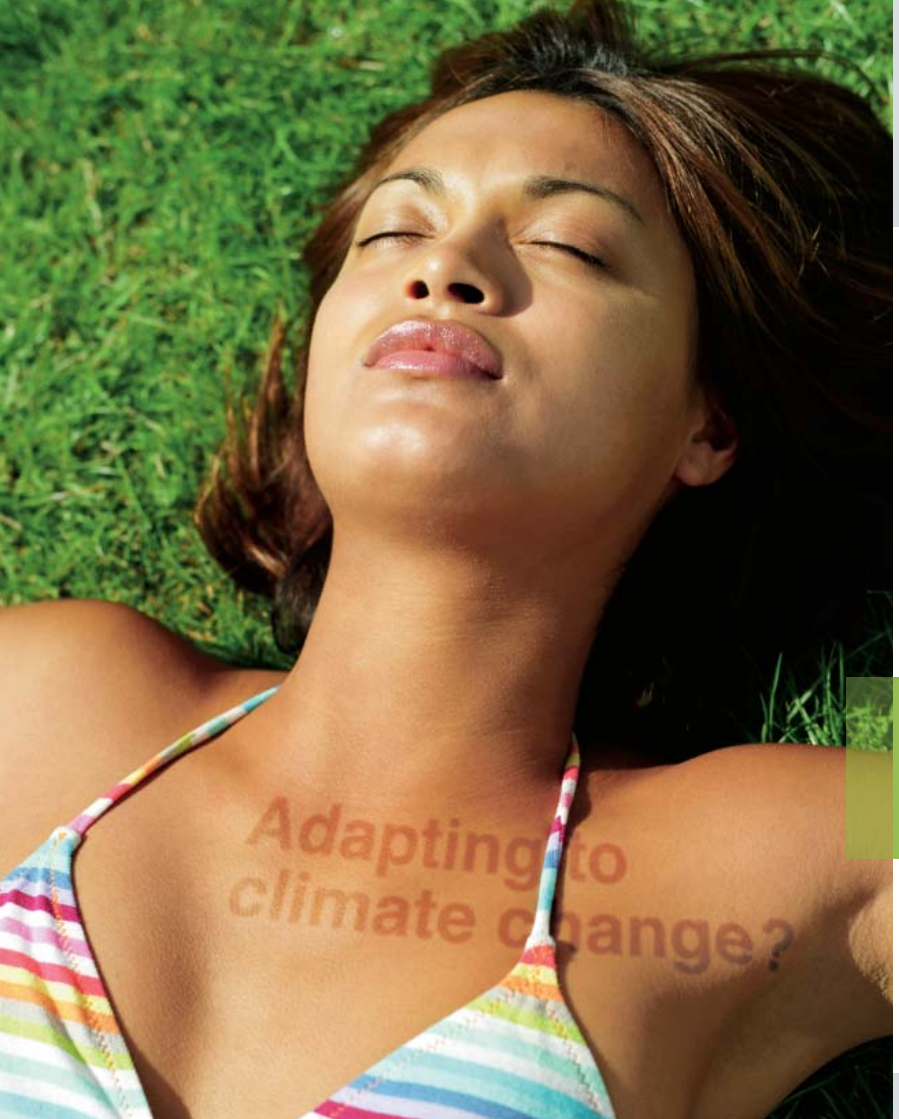
The government is committed to its international obligations to reduce emissions, and to continuing to influence the shape of international action on climate change for New Zealand's benefit. We also need to show we are taking responsibility to address climate change if we expect others to.

Ninety percent of New Zealand's population lies within 50km of our coast making us more vulnerable to climate change. Our coastal areas, roads, cities, towns, waterways and farms are all likely to be affected. We need to take action so we can be more resilient in our current climate and less susceptible to the future climate.

If we start preparing and adapting *now* we will reduce the associated risks brought about by a changing climate, and our communities will have greater resilience to climate impacts and extremes.

Forward planning is more effective and less costly than reacting to crises when they occur. It is like taking out an insurance policy for our future.

Preparing for and adapting to climate change will minimise the risks to New Zealand as well as maximise any opportunities arising from a changing climate.



Don’t just slap on a few extra factors. Climate change is about more than protecting your own skin.

Impacts and opportunities

While the adverse impacts of climate change are evident, there may also be opportunities arising from a changing climate, for example, the growth of different crops and the development of new ways to produce renewable energy.

In addition, effective planning can bring about benefits such as improved water quality and better management of scarce resources. Taking action to reduce greenhouse gas emissions will also bring other benefits. For example, improved energy efficiency means lower power bills, insulated houses lead to warmer homes and less winter-related illnesses, and regularly-tuned cars improve air quality and health.

The impacts of climate change will affect different sectors of our economy. These changes may be positive or negative, depending on how we manage or prepare for them.

Energy

Warmer winters will put less pressure on electricity and heating supplies. Increasing rainfall in the Southern Alps could increase electricity supply because of higher levels in our major hydro lakes. However, smaller east coast hydro lakes may have less inflow, and in the summer more electricity may be needed for air conditioners.

Agriculture and forestry

Agricultural and forestry productivity may increase in some areas because of fewer frosts and the fertilising effect of elevated carbon dioxide concentrations in the atmosphere. A change in climate may also lead to the production of new commercial crops.

On the flipside, increased drought and other extreme weather events (such as storms and floods) will have a high financial cost, particularly in areas already affected by such events. Higher temperatures could also cause problems for crop production such as kiwifruit which require cold winters for fruit development.

More forest fires are also likely in drier eastern areas of the country.

Biosecurity and native species

Communities may enjoy the health benefits of warmer winters (and lower heating costs). However, hotter summers may increase the risk of heat stress. Sub-tropical diseases may also become a problem if carrier insects – such as mosquitoes carrying the Ross River virus – become established.

Rising average temperatures are likely to lead to the wider establishment and spread of new and/or existing pest plants, increased abundance of existing animal pests and greater survival of a range of insect pests.

Increasing temperatures are also likely to have an effect on our indigenous species, which are expected to respond by beginning to shift to more suitable climatic zones.

Water and rainfall

Snowlines are expected to retreat, changing water flows in associated rivers, particularly in the South Island.

Heavy rainfall is likely to put pressure on drainage and stormwater systems. Erosion and landslips from more frequent and intense rainfall as well as flood events may increase road maintenance costs, but fewer snowfalls during winter could save such costs in some areas.

Infrastructure

More frequent extreme weather poses risks to major infrastructure such as buildings, roads, water, sewerage, electricity transmission and communication systems. Sea level rise and increases in storm surge, for example, are likely to endanger our coastal developments. However, costs can be avoided or reduced by taking sensible steps to factor in future climate when routinely replacing or upgrading such infrastructure.

What can you do to prepare and adapt?

Ask yourself these questions:

- **If you are buying or building a house, think about how climate change may affect your home over the next 50 years. Is flooding an issue now? Will it increase in the future? Is erosion a concern? Is the site stable?**
- **What is your community doing to adapt to climate change?**
- **Are key roads you use at risk from flooding, landslips, heavy snow or wind events?**
- **Do you live in a community with a potential water supply issue? Or water quality problems?**
- **Does your community contain natural ecosystems that are sensitive to climate?**

If you answered 'yes' to any of these questions, talk to your council about your concerns or talk to someone in the adaptation team at the Ministry for the Environment.

You can also help New Zealand take action on climate change by living sustainably: make your house more energy efficient and take a look at your regular mode of transport – what can you do to cut back emissions?

Find out how climate change is expected to impact on your region. Plan for and minimise any risks relevant to you and your family.

As a biologically-based economy, New Zealand is particularly vulnerable to a variable climate. Being prepared for climate change will ensure the viability and competitiveness of industries that depend on a stable, equable climate.

Farmers may want to modify their farming practices to reduce potential impacts arising from climate change. For example, farmers can change how they use their land, farm different stock types, change when and how they graze stock, and provide catchment protection to enhance the resilience of their farms.

A number of projects supported by the Ministry for Agriculture and Forestry's Sustainable Farming Fund are already helping the agriculture sector adapt to climate change. Examples of projects include water enhancement programmes such as irrigation, dry land management and diversification into new plant species.

On-farm strategies

Over the past 50 years, Hawkes Bay farmers Philip and Robyn Holt have created a farm development strategy to enable them to cope with the effects of climate change and to increase their farm's resilience.

Their strategy includes planting trees on 20 percent of the farm – 10 percent for commercial forestry and the remainder for stock shelter and shade, fodder and erosion control.

As part of their ongoing on-farm catchment protection work, they have constructed two large water-harvesting dams with more than 7,000,000 litre capacity.

The Holts have also introduced a more flexible stock policy including a change to Perendale X sheep, a return to Angus cattle (due to their hardier nature) and the farming of goats for weed control.

The farm is widely recognised as an invaluable example of how to tackle the challenge of water shortages and drier conditions, which are predicted to become more prevalent in the future due to climate change.

Further information about the Holts is provided in *Adapting to climate change in eastern NZ* by Dr Gavin Kenny, available from:

www.earthlimited.org/accenz.html

Left: New Zealand farm. Right: Philip Holt on his farm in the Hawkes Bay.

Councils in action

Under the Resource Management Act, councils are required to consider the effects of a changing climate on their communities and to incorporate climate change into existing frameworks, plans, projects and standard decision-making procedures. A climate change perspective is now integrated into activities such as flood management, water resources, planning, building regulations and transport.

A number of local authorities are already improving stormwater management, flood controls and coastal erosion in their areas. For example, Kapiti Coast District and North Shore City Councils have stormwater projects under way, and coastal inundation work by Rodney District and Hawke's Bay Regional Councils is assessing the potential effect of storm-driven surge and rising sea levels on low-lying property.

A number of local authorities are already improving stormwater management, flood controls and coastal erosion in their areas.

Stormwater planning

As a low-lying coastal area, the Kapiti Coast is susceptible to the impacts of climate change such as storms and flooding.

Faced with this challenge, the Kapiti Coast District Council is incorporating climate change adaptation measures into many of its plans. For instance, in stormwater infrastructure planning, the Council is considering the predicted effects of climate change such as increased flooding, ponding and how groundwater is affected.

Other adaptation initiatives include integrating a climate change perspective into the Council's draft Coastal Strategy, incorporating a sea level rise component in flood modelling for the region, and organising the annual Kapiti Garden Show which focuses on sustainable water use.

Kapiti Coast District Council has started planning for climate change to protect its beautiful coastline.

Sand dune restoration

Community volunteers in the Bay of Plenty have planted nearly 300,000 native dune plants at the region's beaches, improving the resilience of coastal systems to storms and erosion.

Sand dune restoration is an increasingly important and even critical task in the face of predicted climate change such as floods and sea-level rise, as dunes provide natural protection from coastal hazards and erosion. Effective action to reduce our vulnerability has become a priority in many areas.

The dune restoration programme, called Coast Care Bay of Plenty, is a community partnership project co-ordinated by Environment Bay of Plenty and its District Council partners.

Before

After

Volunteers plant native dune plants on a beach in the Bay of Plenty. Sand dune restoration helps protect our coastlines from storm and erosion.

The government's response

Preparing for and adapting to climate change is a key focus for the government.

To help New Zealand build its resilience and plan ahead, the government is building partnerships with local government, engineers, the insurance industry, and the agriculture sector.

The immediate focus is on programmes related to water and coastal issues, the maintenance of public infrastructure such as transport, telecommunications and energy supply, and primary production (ie, agriculture – including fostering appropriate land-use development and planning).

The government also supports and encourages industries and communities in vulnerable sectors and regions to engage in early planning.

For more information about other government initiatives related to reducing greenhouse gas emissions or improving New Zealand's environmental sustainability, please refer to another booklet in this series: **Understanding climate change. Get a grasp of the facts.**

Or visit:
www.climatechange.govt.nz

Preparing for and adapting to climate change is a key focus for the government.

Find out more

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This booklet is one of a series on climate change. Other titles include:
- **Understanding climate change. Get a grasp of the facts.**
- **Taking action on climate change. Small acts. Big impacts.**

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