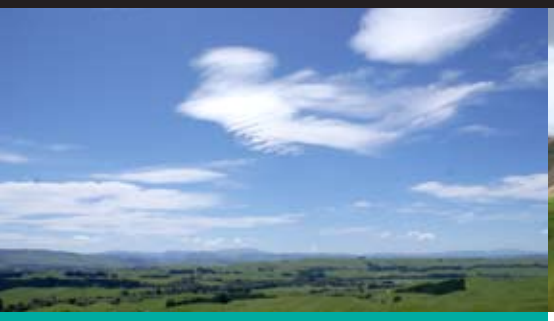
Factsheet 1: Climate Change



These fact sheets contain information shared through discussions with 20 Hawke's Bay farmers during the 2008/09 season.

What is climate change?

- Climate change is a significant and persistent change in climate or its variability. Climate has changed over millennia, and will undoubtedly continue to change in future, due to natural processes.
- The scientific theory that humans could change global climate had its beginnings in the 19th century.
- Unlike many scientific theories that are tested under control conditions in the laboratory, the theory that human activity is resulting in climate change is being played out beyond our control in the earth's biosphere.
- The evidence is mounting that human activity is changing the global climate.
- New Zealand climate, like the global climate, has warmed over the past century, and this trend is expected to continue for at least the next century.
- The only final proof of climate change will be after significant changes have occurred.

Key facts about climate change

(for more information see http://www.mfe.govt.nz/issues/climate/about/key-facts.html)

1. Global variations in temperature are strongly linked to variations in the amount of greenhouse gases in the atmosphere, principally carbon dioxide.
2. The earth is getting warmer and other changes in climate are occurring.
3. There is increasing evidence of effects on natural systems.
4. Levels of greenhouse gases in the atmosphere have increased as a result of human activities and will continue to increase in the absence of measures to reduce emissions.
5. Natural factors, such as volcanic activity and changes in solar radiation by themselves, cannot account for the changes in climate that are now happening.
6. The effects of climate change will continue beyond the 21st century.

March 2010

7. The climate system is very complex and there are still uncertainties about future climate changes, especially the magnitude of global warming and sea level rise, and regional differences.

What scientists are doing

Scientists around the world are monitoring, measuring, modelling and analysing all manner of changes. These changes include:

- increases in atmospheric carbon dioxide and other greenhouse gases.
- increases in temperature and frequency of extremes such as heat waves.
- melting of snow and mountain glaciers.
- ice melt from Greenland and Antarctica.
- rising sea levels.
- increased intensity and duration of droughts.
- changes in rainfall patterns.
- effects on Arctic and Antarctic ecosystems.
- warming of lakes and rivers.
- earlier timing of spring events such as bird migration.
- longer growing seasons in some regions and shorter, more drought affected, growing seasons in others (such as the Sahelian region of Africa).

Responses to climate change

There are two main responses to climate change, mitigation and adaptation.

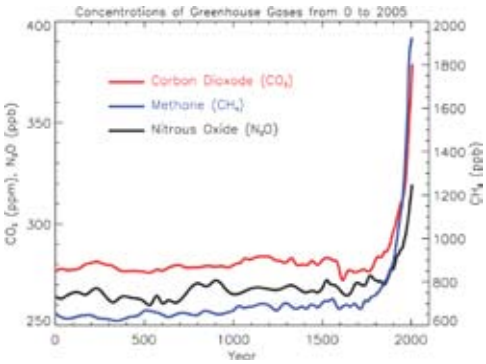
Mitigation relates to actions to reduce or offset emissions of greenhouse gases. Effective mitigation will require international cooperation and action. While some action is being taken, emissions of greenhouse gases are continuing at a level that will lead to significant climate change.

Adaptation involves actions to deal with the effects of climate change. The extent to which we need to adapt will depend on international actions to reduce emissions, and on the rate and extent of climate change that we experience.

Pragmatic farmers and growers tend to see mitigation and adaptation responses as ways of making their businesses more resilient and sustainable (see Fact Sheet 4 for a useful summary of this).

What do you believe?

Regardless of what the science says, for many people 'seeing is believing.' Increasing numbers of farmers and growers are experiencing changes in weather patterns. They are reading and responding to the climate signals, as they are to economic, market and consumer signals.



Atmospheric concentrations of important long-lived greenhouse gases over the last 2,000 years. Increases since about 1750 are attributed to human activities in the industrial era. Concentration units are parts per million (ppm) or parts per billion (ppb), indicating the number of molecules of the greenhouse gas per million or billion air molecules, respectively, in an atmospheric sample. *IPCC 2007* **www.ipcc.ch**

"There's plenty of information out there now saying that the potential through climate change is for more droughts, more wind, perhaps heavy rainfall events. That's enough to work to. A lot of people will say that's all rubbish and if they choose to go another way then good luck to them. Maybe they're right, but I'm taking information as well as what I see going on in the world and making my decisions."

"Climate change means to me the change in how our rainfall is spread across the year and in the way that it occurs now. That's as a farm view, and as a world view climate change means 'Mans greed'."

Hawke's Bay climate change

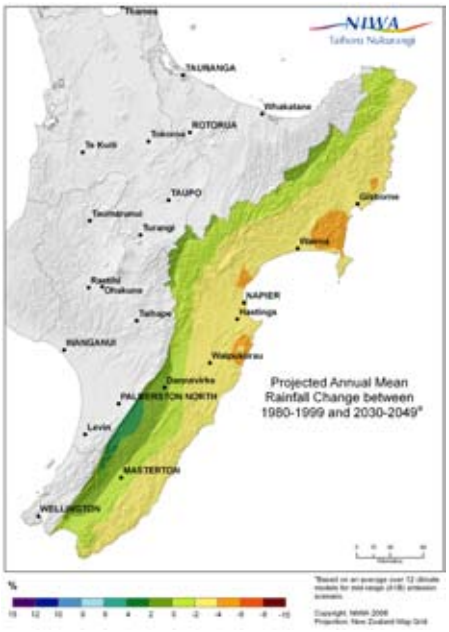
Hawke's Bay could warm by about 1°C by mid-century and more than 2°C by late this century. Scenarios suggest that temperature increases will be highest in summer and autumn, with less warming in spring. Annual rainfall is likely to decrease overall, dominated by 10–15 percent less rain in winter and spring. In contrast, summer could become up to 10 percent wetter, although this is less certain.

Key effects

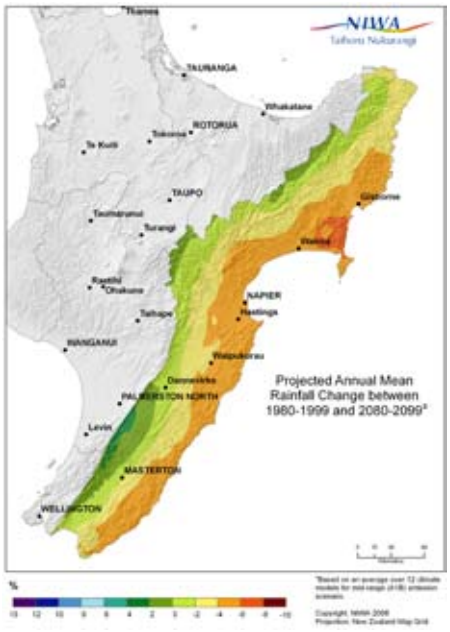
- A longer growing season and reduced frequency of frost.
- More frequent hot, dry, summer conditions and potential for more frequent heat waves.
- Lower rainfall and increased evaporation over the growing period, and likely increased drought frequency and severity.
- Decreased runoff into rivers and thus reduced river flows, on average. Uncertainty over rainfall changes in the western ranges means uncertainty about changes in runoff and river flows in the river catchments that extend back into the ranges.
- Depending on changes to weather patterns, there could also be the possibility of an increase in frequency and intensity of high rainfall events. Together with drier average conditions, this could lead to increased problems with erosion and flooding.
- Westerly winds are likely to become more persistent in spring and summer.
- Low lying coastal areas will increasingly be at risk of inundation from sea-level rise or more prone to salt water intrusion. The extent of this will depend on the amount of sea-level rise.

"I work on the assumption that our weather events are going to get more dramatic, we're going to have more droughts, we're going to have more weather bombs."

The maps show the projected trend in annual-average rainfall that could be expected by 2050 and 2100, compared to the average for 1980–1999.



2050: Eastern regions of the North Island are likely to receive less total annual rainfall on average by mid century, but with considerable seasonal variations.



2100: Annual rainfall is likely to decrease by about 5 percent by late century along the coast, with less decrease inland. Seasonal variation will be high.

Likely impacts and opportunities include:

- With drier conditions on average, increased drought frequency, and potentially more wind in spring, there would be a reduction in pasture productivity. These impacts will be greatest in drier parts of the region.
- The expected drier average conditions, combined with possibly more intense rainfall at times, will increase the erosion and flood risk of most hill country farms. Windier springs could also increase the potential for wind erosion.
- Changes in pasture composition are likely, depending on grazing management.
- There could be greater problems with animal health and pests and diseases. Increased heat stress could also be a factor over time.
- The risk of fires in rural areas may also increase, with potentially severe effects.
- Changes in pests and diseases will occur, with the likelihood of more weed species and subtropical pests and diseases invading over time, possibly requiring new pest management approaches.
- Security of water supply is likely to be the greatest issue in the future. Drier average conditions, together with increased growth in demand for water, are likely to place increasing pressure on available water resources.
- Changes in rainfall, with the possibility of more extremes of wet and dry, will lead to consequences for local and regional infrastructure. This includes land drainage, flood protection, community water schemes, culverts and bridges, erosion control, farm dams, water reticulation and irrigation.

Written by:
Gavin Kenny, Alan Porteous

Produced by:
Earthwise Consulting Limited
709a Duke Street
Hastings 4120

Tel: 06 870 8466
www.earthlimited.org

Funded by:
Sustainable Farming Fund
PO Box 2526
Wellington

Phone 0800 008 333
www.maf.govt.nz/sff/

Hawkes Bay Regional Council
Private Bag 6006
Napier 4142

Tel: 06 835 9200
www.hbrc.govt.nz

EARTHWISE CONSULTING

HAWKE'S BAY
REGIONAL COUNCIL

Sustainable Farming Fund
Ministry of Agriculture and Forestry
Te Manatū Ahuwhenua, Ngāherehere