

>> New Zealand's Environmental Reporting Series



# Our atmosphere and climate 2017

DATA TO 2016

AT A GLANCE

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## Our climate – top findings



**Around the world, greenhouse gas emissions from human activities are changing the atmosphere and climate. Although agriculture is New Zealand's largest emissions sector, road transport is one of the fastest growing, with emissions increasing 78 percent since 1990.**

New Zealand is experiencing the effects of past global emissions, and even if these emissions stopped today, many aspects of climate change would continue for centuries. The full extent of future global warming depends on the emissions added from this point forward.

- Global gross emissions of greenhouse gases rose 51 percent between 1990 and 2013, mainly due to people burning more fossil fuels for electricity generation, heat, transport, manufacturing, and construction.
- New Zealand's contribution to global greenhouse gas emissions is small (0.17 percent), but we have the fifth highest level of emissions per person of the 35 countries in the Organisation for Economic Cooperation and Development (OECD, 2017).
- New Zealand's gross greenhouse gas emissions rose 24 percent from 1990 to 2015, with most of the increase having occurred by 2005. Most of the increase came from road transport and agricultural production (largely from nitrogen fertiliser use and grazing animal excrement on managed soils, and livestock digestion).
- At the same time, our net greenhouse gas emissions rose 64 percent, as a result of increasing gross emissions and higher logging rates in production forests. Net emissions acknowledge the role of carbon sinks, such as growing forests, in removing atmospheric greenhouse gases but also adding them when forests are harvested and land use is changed.
- Agriculture emissions (mainly methane and nitrous oxide) made up almost half our greenhouse gas emissions in 2015, reflecting the important role of the agriculture sector in New Zealand's economy.



**In 2016, global concentrations of atmospheric carbon dioxide passed 400 parts per million. This is the highest level of carbon dioxide in our atmosphere in at least the last 800,000 years.**

- Atmospheric carbon dioxide concentrations have increased rapidly. Concentrations at Baring Head, near Wellington, increased 23 percent from 1972 to 2016, matching global trends.



**New Zealand's annual average temperature has increased by about 1 degree Celsius since 1909. This is in line with global average temperature increases, which are almost certainly the result of high levels of atmospheric greenhouse gases emitted from human activities.**

Although seemingly small, this warming represents a rapid increase over a century and is already affecting the natural systems on which we depend. Further warming is expected; how much depends on future global greenhouse gas emissions.

- 2016 was New Zealand's warmest year since at least 1909, and the five warmest years on record have occurred in the last 20 years.
- The number of frost days (below 0 degrees Celsius) decreased and the number of warm days (over 25 degrees Celsius) increased at around one-third of measured sites over the period 1972–2016.



**New Zealand's climate varies naturally, making it hard to discern trends from short-term observations. Alongside increased temperature, our data show trends at some sites for sunshine and wind.**

Our data show sunshine hours increased across New Zealand largely because of reduced cloud cover, and some locations experienced changes in seasonal rainfall and extreme wind and rainfall events. We need longer-term data to confirm if humans are contributing to these trends.



**Climate change is already potentially irreversibly affecting New Zealand's natural systems. We can expect more severe effects on the environment and our human systems as the climate continues to change.**

Climate-related changes to our oceans will continue for centuries and are threats to marine life, commercial and recreational fishing, Māori customary practices, and other cultural and recreational practices. Rising sea levels are threatening public and private coastal communities, infrastructure, cultural sites, and marine habitats. The decreasing volumes of our glaciers affect ecological and hydropower resources, and cultural and tourism activities.

- Changes to New Zealand's marine environment include:
  - the acidity of the subantarctic ocean off the Otago coast has increased since 1998
  - the average sea-surface temperature around New Zealand increased 0.7 degrees Celsius from 1909 to 2009, similar to worldwide increases (Mullan et al, 2010)
  - coastal sea levels have risen by 13 to 22 centimetres, depending on location, over the last century, consistent with global trends.

- From 1977 to 2016, it is estimated our glaciers lost almost 25 percent (13.3 cubic kilometres) of their ice volume.
- Since the 1972/73 measurement season, soils at one-quarter of measurement sites around New Zealand have been getting drier. The frequency and intensity of drought in drought-prone regions are expected to increase with climate change, with important implications for our primary industries.
- We do not yet have a detailed understanding of how the changing climate will add to the pressures faced by already vulnerable native flora and fauna. However, emerging evidence suggests it is already affecting some species and their ecosystems:
  - the sex ratios of North Brother Island tuatara are changing – there are now more male offspring in response to warmer nest temperatures
  - the numbers of invasive wasps have increased around the Nelson area because of increasing spring temperatures.
- If global greenhouse gas emissions continue unabated, we face further warming by the end of this century that will lead to high to very high risk of severe, widespread, and irreversible impacts globally (IPCC, 2014), with far-reaching implications for New Zealand.

## Ultraviolet sunlight – top findings



**New Zealand’s ultraviolet (UV) levels are naturally high in summer (December–February). UV sunlight can cause skin damage and some cancers, but some UV exposure is important for the production of vitamin D.**

Our high summer UV levels are partly caused by the naturally thinner ozone layer over New Zealand at this time, our clear air, and Earth’s orbit, which brings the Southern Hemisphere closer to the sun during summer. The ozone hole over Antarctica does not have a large effect on the concentrations of ozone over New Zealand or, therefore, on our UV levels.

- In summer, our UV levels are often classified as extreme, causing damage to fair skin in minutes.
- Australasia has the highest rates of melanoma in the world. New Zealand’s rates of melanoma for males increased from 1996 to 2013, but there was no obvious trend for females.
- Global production of ozone-depleting substances fell 98 percent from 1986 to 2015.
- The ozone hole, which forms because of ozone-depleting substances produced from human activities, has started to shrink and may cease to form by the middle of this century.

Read the full report on our website:

<http://www.mfe.govt.nz/publications/environmental-reporting/our-atmosphere-and-climate-2017>