

# Climate change

This think piece takes a high-level view of the dimensions of a changing climate including:

1. **The science:** the current position, levels of confidence and potential forecasts for the globe and New Zealand.
2. **Social impacts:** the impact on people in terms of societal change, health and consumer behaviour.
3. **Economic consequences:** the concerns of the financial sector both in terms of economic stability and future business positioning.
4. **Addressing the issue:** energy transition and political action required to mitigate climate change.
5. **The role for sport and recreation** in addressing climate change.

Rising global temperature, growing ocean acidification, more frequent forest fires, expanding desertification, decreasing biodiversity, and more destructive weather are symptoms of a changing climate.

Play, active recreation and sport will not be immune to the consequences of climate change, both directly – where and when activity can take place, and how people can participate – and indirectly, as local, national and commercial priorities and consumer behaviour change in response to climate change.

The play, active recreation and sport sector can play an important role in addressing climate change through reducing carbon emissions within its own industry and being used as a tool to educate and advocate. It has a vested interest in doing so.

This resource is part of a series which considers the changes and trends most likely to impact the future of the play, active recreation and sport sector and what we can do to best prepare for change.

## Summary implications

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<b>Demand for indoor facilities</b>	Disruption from extreme weather, water shortages for ground preparation and heat-stressed participants may see rising demand for indoor facilities.
<b>Viability of outdoor sports</b>	Water shortage will impact cost and viability of many sports (football, cricket, rugby, hockey, golf, etc). Temperature rise will bring new grass diseases and there will be heightened opposition to current chemical spraying. Increased costs will be passed onto participants heightening cost as a barrier to entry.
<b>Decline home advantage</b>	NZ will struggle to meet the increasing requirement for events to be ecologically sustainable given the high carbon footprint of flying to or from here.
<b>Rising tide</b>	Sea-level rise, salinisation of groundwater and erosion of land will impact leisure facilities dependent on coastal infrastructure and will impact ability to get insurance cover for facilities and events.
<b>Coping mechanism for mental impact</b>	Increased temperatures, extreme weather events, displacement of people, and the need to change consumption habits will all have significant mental health and wellbeing consequences. Opportunity for sport and recreation to position itself both as a constant and a coping mechanism.
<b>Pacific Islands more severely affected</b>	The impacts of a changing climate will be more severely felt by smaller Pacific Island nations. They may have fewer resources to devote to international sporting events in the future or may need more assistance to participate.
<b>New activities</b>	A shift to warmer winters may open up new opportunities for outdoor leisure time, though hotter summers will bring increased risks of heat stress.
<b>Anti-sport activism</b>	International sport travel may become a target for protest given high carbon footprint from flying.
<b>Climate refugees</b>	Climate impacts may drive both intra-Pacific migration and domestic migration within New Zealand, thereby disrupting communities.
<b>Leadership</b>	Opportunity for NZ sport and active recreation to reposition itself as leader in climate change, following lead of the UN launched sports for climate change.
<b>Local and central Govt. Priorities</b>	The all-encompassing nature of climate change impact will dominate local and national government priorities and resource allocation (e.g. upgrading critical infrastructure), at the expense of discretionary spend such as 'sport'.

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## The science

- Unsustainable patterns of production and consumption are undermining the ecosystem services that support life on the planet, leading to rapidly changing environments.
- The Intergovernmental Panel on Climate Change (IPCC) report October 2018, outlines the expected impacts of global warming of 1.5° above pre-industrial temperatures as compared to those for a 2°C warming scenario. Its findings are:
  - a. global warming is likely to reach 1.5°C above pre-industrial temperatures at some point between 2030 and 2052;
  - b. the impacts of a 1.5°C global warming scenario, while great, are significantly less than a 2.0°C global warming scenario;
  - c. in order to limit global warming to 1.5°C, greenhouse emissions must decline to 45% below 2010 levels by 2030, and must reach net zero by 2050;
  - d. such reductions are physically possible, but will require unprecedented transitions in all aspects of society; and
  - e. even if global warming is 1.5°C, we can expect consequences such as extreme temperatures; massive increases in frequency and intensity of precipitation, floods, droughts and other extreme weather events; sea-level rise; loss of coastal land; loss of species; an increase in ocean acidity; issues with food and fresh water availability; associated impacts on economic growth, health and wellbeing.
- In 2015 world leaders met in Paris and agreed on the central objective of keeping global average temperatures below 2°C higher than pre-industrial levels.
- Despite this, the world is currently on track to produce far more fossil fuels in 2030 than would be compatible with a 2°C pathway. [sei.org](http://sei.org)
- IPCC report: if governments immediately enact all policy changes agreed to in Paris, we'll probably still get a global increase of 3.2°C before warming stops. However, no industrial country is even close to enacting all the policy changes.
- NZ is the 50th highest producer of carbon dioxide at 7.7 metric tons per capita. We're behind the UK (5.6), but ahead of Australia (16.8), US and Canada (16.1), and China (8).

## What's changing?

### Increasing urgency of warnings

- Scientists warning of severe global impacts from climate change for more than three decades. Past 12 months: warnings increasingly strident. (Click [here](#) to see a rundown.)
- November 2019 letter released: "World Scientists' Warning of a Climate Emergency" [academic.oup.com](http://academic.oup.com)
- 28 countries representing 820 million citizens have declared a climate emergency. This includes NZ Councils representing 74% of the population. [climateemergency](http://climateemergency)

## Levels of confidence

- Increasing level of concern reflects growing confidence in underlying science. Scientists can now detect the influence of climate change on any single day of weather. [nature.com](https://www.nature.com)
- Climate modelling is continually improving with predictions of warming over several decades now possible. [sciencedaily.com](https://www.sciencedaily.com) New models showing carbon dioxide is a more potent greenhouse gas than previously understood. [phys.org](https://www.phys.org)

## Taking the current temperature

- NIWA's annual climate summary shows five of the past seven years have been among NZ's hottest on record.

## Ocean feeling the heat

- Over 90% of the warming is being absorbed by the world's oceans. Understanding this dimension to the climate challenge will be critical NZ's future.
- The storage capacity of the marine environment will continue to heat the environment even if humans achieved zero-carbon economies in the near future. [twitter.com](https://twitter.com)
- Ocean warming lifts sea levels by virtue of expansion. Warm ocean currents are helping to melt glaciers from the bottom up, both in Greenland and West Antarctica.

## Incoming tide

- Understanding the impact of warming on future coastlines continues to evolve. Research suggests the issue may have been previously underestimated.
- Rising seas could affect three times more people by 2050 than previously thought: 150 million are living on land that will be below high-tide line by mid-century. [nytimes.com](https://www.nytimes.com)
- Coastal communities must prepare for much more difficult futures than currently anticipated. [nature.com](https://www.nature.com)
- This is identified as a key issue for NZ communities in a report on NZ Communities and Climate Change. [motu.nz](https://www.motu.nz)
- Degradation of coastal environments and ecosystems are expected to adversely affect economic, social and cultural values across Māori society.

## New Zealand's forecast

- The best estimates of NZ temperatures are for an expected increase of about 1°C by 2040, and 2°C by 2090. However, temperature rise is expected to speed up. [mfe.govt.nz](https://www.mfe.govt.nz)

## The destructive effects of climate change act as chain reactions, triggering further warming

- Working out how severe impact of climate change is difficult, because climate change depends on so many different moving parts.
- There are complicated factors which warm the planet. Cascades are an effect of climate change that cause more effects and more warming in a destructive feedback loop.

## Social impacts

At the extreme, are concerns for the future of civilisation itself together with population migrations. Short of these dire predictions, a significant change to travel patterns and eating preferences would reshape the two most significant sectors of the NZ economy.

### What's changing?

#### An existential threat?

- 'Unprecedented' is a word frequently used to describe the current climate position. We may be being too conservative in our consideration of plausible futures. E.g. the director of the Earth System Science Center at Pennsylvania State University Michael Mann warns "We won't see the extinction of our species, but we could well see societal collapse." [theguardian.com](https://www.theguardian.com)

#### Climate change comes with a health warning

- Medical science progress from the past century could be wiped out in a single generation. As temperatures rise, the areas in which disease can take hold will increase.
- The WHO estimate there will be 250,000 additional deaths per year through malnutrition, malaria, diarrhea and heat stress between 2030 and 2050. [who.int](https://www.who.int)
- Its annual report on climate change and human health reported that a child born today could live in a world that's four degrees warmer than pre-industrial times, undermining the last 50 years of gains in public health and overwhelming the health systems. [wired.com](https://www.wired.com)
- Within the Asia Pacific region, an Australian study identified a range of impacts of climate change on public health. [gllham.org](https://www.gllham.org)

#### Rise of "gen less" movement

- Every new human is the equivalent of 58.6 tonnes of carbon emissions per year. Having one fewer child is 25 times more effective than the next most effective measure.
- As denialism of climate change fades, more and more people are seeing it as a real threat and may decide they don't want to add to the problem.
- Promotion of this individual centric approach is unpopular with national agencies who advocate that meaningful change can only be made through national policy change.

#### The cause of hunger and malnourishment

- Climate change will impact the supply and demand of staples such as rice, wheat and maize that collectively makes up two-thirds of all human food consumption.
- UN estimates by 2050, the world will need twice as much food as today. Yet, for every degree of warming, cereal crop yields decline by about 10%.

#### People on the move

- The potential for future population displacements can be seen with 17.2 million new displacements associated with disasters recorded across 148 countries in 2018. [un.org](https://www.un.org)

- Unicef outlines a challenging future through its report 'For every child, every right'. [unicef.org](https://www.unicef.org)
- The World Bank estimates that 140 million people move within their countries' borders by 2050, creating a looming human crisis. With concerted global action this could be reduced by more than 100 million people. [worldbank.org](https://www.worldbank.org)

### Putting the brakes on travel (and tourism)

- The World Bank estimates that 140 million people move within their countries' borders by 2050, creating a looming human crisis. With concerted global action this could be reduced by more than 100 million people.
- Flying provides the biggest carbon footprint because burning fuel at higher altitudes causes the emissions to have a more harmful impact.
- Parliamentary Commissioner for the Environment notes the future of long-distance air travel as an "existential issue" for tourism industry. [pce.parliament.nz](https://pce.parliament.nz)
- Airlines are already registering concern. Air France CEO Anne Rigail identifies changing consumer sentiment driven by climate concerns as their biggest challenge. [vox.com](https://www.vox.com)
- Falls in domestic flight passengers noted among Nordic countries, Germany and the UK ([carbonindependent.org](https://www.carbonindependent.org)). Qantas is aiming for zero net emissions by 2050. [eneconomy.com.au](https://www.eneconomy.com.au)

### Confronting food choices

- Promoting reduced meat consumption for combatting climate change will likely intensify over coming years. Agriculture will need to respond.
- About 14.5 % of the world's green house gasses are calculated to be the result of (mainly industrial) livestock farming. [link.springer.com](https://www.link.springer.com)
- Approximately nine-tenths of beef's footprint comes from what happens on the average cattle farm. Cows release lots of methane, which is 25 times more harmful than CO<sub>2</sub>.
- Commentators predict that "lab-grown food will soon destroy farming – and save the planet" ([theguardian.com](https://www.theguardian.com)). NZ's agricultural sector will need to radically change.

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## Economic consequences

We are witnessing a step-change in climate-related business risk. Climate change is no longer a mere environmental concern: for many, it presents a material financial risk.

### What's changing?

#### Global financial crisis 2.0

- The global economy is still in a relatively fragile state post-GFC, with little capacity to absorb climate consequences that have massive financial implications.
- A report issued by an umbrella organisation for the world's central banks argues that environmental changes could cause the next financial crisis ([nytimes.com](https://www.nytimes.com)). This threat may now have been overtaken by COVID-19.

- New CDP report shows 215 of world's biggest companies see climate change as a threat likely to cumulatively cost them a trillion dollars within the next five years. [wired.com](http://wired.com)
- UN estimates that rising temperatures could lead to the loss of 80 million jobs by 2030, with developing countries worst hit. [reuters.com](http://reuters.com)
- National economies will feel the pressure with implications for both fiscal policy and budgets. In Australia it is anticipated to cost the economy billions. [abc.net.au](http://abc.net.au)

### Follow the money

- The increased understanding of future economic impacts is causing investors to realign their portfolios to low-carbon opportunities and insurers to re-evaluate risks covered.
- The CEO of BlackRock Larry Fink (with nearly \$7 trillion in assets under management), warned that financial risks of climate change dwarf any previous crisis he's experienced. [cnbc.com](http://cnbc.com)
- Insurers are warning that climate change could make coverage unaffordable ([thebulletin.org](http://thebulletin.org)). In New Zealand this issue is starting to become a real concern. [newsroom.co.nz](http://newsroom.co.nz)

### Eroding real estate wealth

- Changing stance of insurance market & funders will have direct consequences for NZ property owners as sea levels are expected to rise by 300–400 mm in next 30–40 years.
- MBIE estimates \$19 billion worth of buildings, 43,000 homes, 130,000 people, five airports, more than 2,000km of road and 48km of railway face higher levels of coastal risk exposure. Almost two thirds of New Zealanders live in areas prone to flooding and rising sea levels.
- LGNZ has analysed replacement value of local government infrastructure with sea level rise of 0.5m (\$2.7b), 1m (\$5.1b), 1.5m (\$8b) and 3m (\$13.3b). [LGNZ](http://LGNZ)
- Reserve Bank November 2018 Financial Stability Report observed some NZ insurers have begun adjusting their products & pricing to reflect emerging climate risks. [level.org.nz](http://level.org.nz)

### Primary sector facing a stressful future

- The exact impacts of a changing climate on New Zealand's primary industries are likely to be significant.
- Some regions will become better suited to growing crops and producing goods than others; e.g. increased rainfall can result in erosion and reduced land productivity. [mpi.govt.nz](http://mpi.govt.nz)
- Future drought may be the climate change impact with biggest impact on our economy. 2018 report estimated economic losses of \$720m from droughts between mid-2007- 2017.
- Massive amounts of heat being absorbed by world's oceans will impact NZ's aquaculture industries. [nature.com](http://nature.com)

### Infrastructure costs

- In urban areas, heat waves and sea level rise will increase repair and upgrade costs for infrastructure such as transport, water and waste. Electricity supply and demand will be affected by warmer temperatures and changes in rainfall.

# Addressing the issue

The evidence highlights the need for change, and an apparent acceptance across sectors that there needs to be action. What is less appreciated is the transformation required to avoid the worst climate scenarios.

## What's changing?

### Energy transition

- Whether the global community can reduce the emissions sufficiently is fundamentally dependent on the speed of energy transition away from fossil fuels.
- The International Energy Agency (IEA) reports that despite overwhelming evidence of carbon-fuelled climate change, oil is so entrenched in the modern world that demand is still rising by up to 1.5% a year. [reuters.com](https://www.reuters.com)
- In their Global Oil Supply and Demand Outlook to 2035, McKinsey anticipates that demand growth will hit its peak in the early 2030s. [mckinsey.com](https://www.mckinsey.com)
- International Renewable Energy Agency report: "No country has put itself in a better position to become the world's renewable energy superpower than China." [forbes.com](https://www.forbes.com)

### Going carbon negative

- In the absence of active constraints on fossil-fuel emissions, a focus will be needed on carbon dioxide removal operations. [washingtonpost.com](https://www.washingtonpost.com)
- Tree planting is an obvious choice for carbon drawdown, but scientists caution it will never be a substitute for decreasing fossil fuel emissions. [climate.nasa.gov](https://climate.nasa.gov)
- Radical actions are being proposed, such as solar geoengineering to reflect incoming sunlight & cool rising temperatures. [sciencedaily.com](https://www.sciencedaily.com)
- But geoengineering approaches have considerable risks. [sciencenews.org](https://www.sciencenews.org)
- Despite this, some governments are turning to geo-engineering to protect their populations. [reuters.com](https://www.reuters.com)

### The circular economy

- Efforts to tackle climate change have focused on a transition to renewable energy, complemented by energy efficiency. These measures can only address 55% of emissions. The remaining 45% comes from producing products we use every day. [Circular Economy Tackles Climate Change](https://www.circular-economy.com)

### Navigating the politics

- Imperial College London reports an upheaval in lifestyles as only way to meet UK Government's target to cut carbon emissions to net-zero by 2050. Warning significant shifts in policy are needed to keep public onside. [bbc.com](https://www.bbc.com)
- The NZ Government's Climate Change Response (Zero Carbon) Amendment Act carries a similar level of ambition to the UK Government's goal. [mfe.govt.nz](https://www.mfe.govt.nz)



- The Act's implementation will require challenging political questions – such as whether economic growth is compatible with an ecologically finite planet. [science.sciencemag.org](https://www.sciencemag.org)
- The Government's wellbeing focus is drawing international attention as the first Western country to take an active step to potentially address this question. [huffpost.com](https://www.huffpost.com)
- Alongside the Zero Carbon Bill, the Government has announced major reform of the NZ Emissions Trading Scheme.

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## The role for sport and recreation

- Climate change is already having a huge influence on sport and recreation across the world. It is the number one issue for members of Aotearoa Recreation.
- Sport and recreation is not just a victim of climate change; it is also a net contributor through greenhouse gas emissions linked to travel, energy use and other forms of consumption.
- Sport has a unique ability to demonstrate leadership and undertake systematic efforts to promote greater environmental responsibility.

### What's changing?

#### Feeling the effects

- A recent study shows that by mid-century, almost half of the past Winter Olympics host cities would likely be too warm for outdoor Alpine sports.
- The Climate Institute [report](#) on the threat of climate change to sports in Australia. One particularly compelling example is the Australian Open.
- A similarly motivated [report](#) shows how climate change is impacting sport in the UK.

#### Taking the lead

- In December 2018 the [Sports for Climate Action Framework](#) was launched to meet the goals of the Paris Climate Change Agreement.
- Representatives of the global sports industry, working with UN Climate Change, created the Framework to drive sports emission reductions and engage millions of fans in the effort.
- The International Olympic Committee and UN Climate Change have cooperated to produce [publications](#) to assist sport to combat climate change.