



Climate Change

New Zealand College of Public Health Medicine Policy Statement

Policy statement

The New Zealand College of Public Health Medicine (NZCPHM) recognises climate change as a serious emerging risk to global public health, development and equity.

Climate change is almost certainly already contributing to the global burden of disease and premature death, with larger health impacts expected over coming decades. These potentially catastrophic health impacts disproportionately affect developing countries, and the most disadvantaged and vulnerable within all countries. Aotearoa New Zealand will not be insulated from these consequences.

In New Zealand, Māori, Pacific, vulnerable, and lower socioeconomic populations are at risk of disproportionate health impacts from climate change. Therefore climate change also has serious implications for health equity in New Zealand.

New Zealand's location in the Pacific and its reliance on the global economy mean that beyond direct climate-health impacts, adverse impacts on the determinants of health are likely, along with new health and social pressures from migrant populations arriving in New Zealand.

The NZCPHM has a responsibility to ensure the public health and equity consequences of climate change are understood, to lead in preventing and preparing for those consequences, and to promote the substantial population health gains that can be achieved from appropriate climate change action.

Climate, health and equity are inseparable. Addressing climate change should be an essential component of health policy. Similarly, health and equity outcomes must be key priorities within climate change policy.

The College calls for public health medicine leadership and rapid action to address climate change from members at personal and professional levels – alongside health professionals, organisations, society and governments, in New Zealand and worldwide.

Key messages

1. Human-caused climate change is a serious and urgent threat to health and health equity globally and in Aotearoa New Zealand.
2. Globally, leading health threats include water and food insecurity with malnutrition, extreme weather events, and changing patterns of infectious disease.
3. As a result of climate change, New Zealand will face many adverse impacts on health, with disproportionate health impacts for Māori. There will be new health and social pressures relating to climate migrant and refugee populations arriving in New Zealand and flow-on effects from changes in the global economy.
4. Without rapid and sustained global action to reduce greenhouse gas emissions (particularly from fossil fuels), the world will breach its carbon budget and may experience high levels of warming (4-6°C by 2100) that render many populated areas of the world unable to support human health and wellbeing.
5. Well-planned action to reduce greenhouse gas emissions can bring about substantial health co-benefits and will help New Zealand address its burden of chronic disease.
6. Public health medicine professionals call for strong and urgent action on climate change that improves population health, accords with Te Tiriti O Waitangi (The Treaty of Waitangi), and creates more equitable, just and resilient societies in New Zealand and worldwide.

Purpose of this statement

This substantive statement replaces the NZCPHM's brief policy statement adopted in June 2012¹.

The New Zealand College of Public Health Medicine (NZCPHM) recognises climate change as a serious, potentially catastrophic emerging risk to public health¹ and health equity². This policy statement explains the importance of health within climate change impacts so that public health professionals and others can take substantive action.

The statement describes the cause and extent of global climate change, the urgency, and the risks to human health and wellbeing. The statement then outlines action to prevent and manage these risks to human health – and conversely, the potential health co-benefits from well-designed policies to address climate change. Finally the statement identifies public health medicine responsibilities for climate health action.

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Part 1. Evidence on global climate change and health impacts

1.1 Changes in the global climate

The Intergovernmental Panel on Climate Change (IPCC)'s Fifth Assessment Report (AR5)^{*} of 2013 states that warming of the global climate system is unequivocal. The world has warmed by an average of 0.8°C since the 1850s and this has been accompanied by ocean warming, melting of snow and ice and sea-level rise^{3,4}. Each of the past three decades has been warmer than all the previous decades on record, rate of ice loss and sea-level rise has increased over the last two decades, and the first decade of the 21st century was the warmest on record⁴.

Along with warmer temperatures there have been long-term changes in other aspects of the climate system^{3,4,5}. It is likely[†] that the frequency and/or duration of heat waves has increased in large parts of Europe, Asia and Australia (and medium confidence[‡] for the rest of the world). It is likely that there are more areas experiencing heavy rainfall events, whilst other areas are likely experiencing more intense and/or longer droughts. It is also likely that there has been an increase in the frequency and/or size of extreme high sea-level events^{3,4}.

1.2 Causes of climate change

Most of the increase in global temperature since 1950 is extremely likely[§] due to the increase in anthropogenic (human-produced) greenhouse gas (GHG) concentrations^{3,4}.

There is very high scientific consensus in this area, with 97% of active climate scientists agreeing on the reality of anthropogenic global warming⁶, along with national and major scientific institutions around the world^{7,8}.

Concentrations of GHGs in the atmosphere – carbon dioxide, methane and nitrous oxide – have increased markedly since 1750, and are now at levels unprecedented in at least the last 800,000 years. Carbon dioxide (CO₂), the most important human-produced GHG driving climate change, has increased in concentration from 278 parts per million (ppm) in 1750 to a record reading of 400ppm in May 2013 (less after adjusting for season)^{**}, and at an accelerated rate compared with previous periods^{4,9}. The primary source of the increase in carbon dioxide is fossil fuel use, followed by land use change⁴.

New Zealand contributes 0.2% of world GHG emissions¹⁰ with 0.06% of the global population¹¹, which means New Zealand has the fifth highest per-capita annual gross GHG emissions amongst established economies¹². Major sources of New Zealand emissions are the agricultural and transport sectors¹³.

^{*} The NZCPHM aims to reference the most up to date Assessment Report wherever possible. The AR5 is the most recent IPCC assessment. Only the first part of the AR5 (the 'Physical Science Basis', Working Group I) has been released to date, therefore other parts of this policy statement still refer to the Fourth Assessment Report (AR4).

[†] Likely: IPCC quantitative assessment of >66% probability.

[‡] Medium confidence: IPCC qualitative assessment of medium evidence (type, amount, quality) and medium agreement of evidence.

[§] Extremely likely: IPCC quantitative assessment of >95% probability.

See: https://www.ipcc-wg1.unibe.ch/guidancepaper/ar5_uncertainty-guidance-note.pdf

^{**} There is seasonal variation in the concentration of CO₂ in the atmosphere. In May 2013 the world average concentration was 399.77ppm CO₂ actual, reduced to 396.54 after seasonal adjustment for trend; by August 2013 the seasonally-adjusted concentration was 396.82ppm (395.15 actual) (source: NOAA⁹ at ftp://ftp.cmdl.noaa.gov/ccg/co2/trends/co2_mm_mlo.txt, accessed 23 September 2013).

1.3 Projections of future climate change

There is a lag period between increased GHG concentrations and increased temperature^{14,15} which means that, even if these concentrations were not to increase any more, the world is already committed to further warming (of at least 0.6°C) as a consequence of past emissions⁴.

In reality, GHG concentrations are continuing to rise, and if nothing is done to constrain emissions (business as usual) we may face GHG concentrations in excess of 1000ppm CO₂-equivalents by 2100^{3,4,16}, leading to likely temperature increases of 2.6-4.8°C^{3,4}. Indeed recent assessments predict high levels of warming (4-6°C) as increasingly possible, given the level of emission reduction pledges by countries and with the continuation of fossil fuel intensive global development^{16,17,18,19,20}.

Conversely if the world was to take strong coordinated action to rapidly reduce GHG emissions it may be possible to limit long-term temperature increases to about 2°C^{4,21}. There has been international agreement since 2009²² that global warming should be limited to 2°C, or less²³; even 2°C warming will have serious adverse consequences for many parts of the world¹⁶. Small island states threatened by rising sea levels, including the 14 Pacific Island states, have called for a limit of 1.5°C warming²⁴.

New Zealand is expected to continue warming over the coming decades with changes in rainfall, wind patterns, extreme events, and ocean chemistry. It is likely to be wetter in the west and drier in the east and north. Heavier and more frequent extreme rainfalls are expected, along with more drought, more of the strongest winter winds, and more extra hot days (>25°C). Some of these extremes (e.g. heavy precipitation, temperatures) have already been observed. Sea-level rise is expected to continue with an increase in the frequency of extreme high tides and their associated risks (coastal flooding, inundation, erosion). The oceans surrounding New Zealand will continue to acidify^{21,25,26}.

This is not only an issue for future generations. The destabilising climate is more immediate than commonly recognised. Most New Zealanders alive today will live to experience the impacts of excess greenhouse gases that are emitted this year^{††}.

1.4 Limitations of current evidence on global climate change, and emerging evidence

Because the global climate system is complex, and future levels of emissions depend on global behaviour, the precise speed, timing, magnitude, and exact impacts of climate change remain uncertain¹⁶.

Climate models can, however, reproduce climate changes already observed in the 20th century, and these models along with direct observations and study of past climates (paleoclimatology), provide a firm basis for projecting future climate changes¹⁶.

Climate science is continually evolving and this is evident with the greater acuity seen in sequential IPCC assessments. New information continues to emerge on ice-melt, sea level rise, and tipping points^{4,27,28,29,30}.

An important area of emerging evidence is ocean acidification. The oceans have absorbed about one quarter of the total amount of CO₂ emitted by human activities since preindustrial times. Whilst this has blunted some of the impact of CO₂ on global warming, it has also made the oceans significantly more acidic (pH has fallen about 0.1 units since preindustrial times), which threatens marine

^{††} Perhaps 60% of global warming from emissions occurs within 25 to 50 years¹⁵. Within their lifetimes, people currently aged in their early 30s and younger – some 45% of New Zealanders – may therefore experience around 2/3rd of adverse climate effects from this year's excess emissions.

ecosystems and hence food security^{4,26,31}. A greater amount of acidification can be expected in New Zealand's oceans, as CO₂ is more soluble in colder waters^{25,26}.

1.5 Health impacts of climate change

Climate change and its environmental and social manifestations result in diverse risks to human health, both direct and indirect, that are recognised by world health authorities and leading medical journals alike³²⁻⁴⁷, with statements that the consequences to public health are potentially catastrophic^{35,39,41}.

A three-level classification of these risks and causal pathways is shown in the following table^{32,33}, and the [Appendix](#) to this statement further describes processes and pathways through which climate change influences human health.

Risk Category	Causal Pathway
Primary	Direct biologic consequences of heat waves, extreme weather events, and temperature-enhanced levels of urban air pollutants
Secondary	Risks mediated by changes in biophysically and ecologically based processes and systems, particularly food yields, water flows, infectious-disease vectors, and (for zoonotic diseases) intermediate-host ecology
Tertiary	More diffuse effects (e.g., mental health problems in failing farm communities, displaced groups, disadvantaged indigenous and minority ethnic groups) Consequences of tension and conflict owing to climate change-related declines in basic resources (water, food, timber, living space)

Table 1. Three level classification of climate change and health impacts causal pathways^{32,33}.

1.5.1 Global health impacts

Evidence presented in the Fourth Assessment Report of the IPCC in 2007 (AR4) strongly suggested that climate change was already contributing to the global burden of disease and premature deaths^{38,48}. It was anticipated that the burden of disease would increase over coming decades, with larger increases from mid-century³⁸.

Projected climate change health impacts included malnutrition (high confidence^{††}), deaths/injuries from extreme events (high confidence), vector-borne disease such as dengue fever (high confidence), cardio-respiratory effects from air pollution (high confidence), and diarrhoeal disease (medium confidence)⁴⁹.

The AR4 noted that population vulnerability to climate change health effects would vary by geographic location, demographics, background burden of climate-sensitive diseases, strength of the health system, and socio-economic capacity to adapt³⁸.

Since the AR4 there has been a growing number of publications in the climate change-health area, though quantitative studies still remain relatively few⁵⁰. These studies have added to the evidence base around climate change impacts on health, for example:

- The association between very hot days and increased mortality has been shown to be very robust^{51,52,53}.

^{††} High confidence: IPCC qualitative assessment of a high level of evidence (type, amount, quality) and high agreement of evidence.

- Floods continue to be the most common weather disaster, and the epidemiologic evidence relating to immediate health impact (trauma and deaths) is clear^{54,55,56}.
- Emerging evidence for indirect health impacts (e.g. from pre-existing medical conditions, mental health, conflict) persisting beyond extreme weather events^{57,58,59,60,61,62,63}.
- A number of recent studies have projected substantial increases in the number of malnourished children in the future as a result of climate change^{64,65,66}.
- New research on heat stress and occupational health concerns for workers (particularly outdoor workers)⁶⁷.

A recent analysis by DARA and The Climate Vulnerable Forum suggests that climate change already causes 400,000 deaths per year (through malnutrition, heat illnesses, diarrhoeal infections, vector borne disease, meningitis and environmental disasters) and that this number will increase to more than 650,000 deaths per year by 2030 if current emission patterns continue⁶⁸.

Most of the climate-health risk assessments to date are based on lower-range warming scenarios (around 2°C) and consider relatively near-future timeframes (e.g. 2030 or 2050). However it is becoming increasingly possible that higher levels of warming (4-6°C increase) may occur by 2100^{14,17,18}, in which case there may be important threshold and non-linear health effects that seriously test or even exceed capacity to adapt in large parts of the world^{19,20,69}.

1.5.2 New Zealand and Māori health impacts

New Zealand will not be insulated from the consequences of climate change. Climate trends may already be affecting the health of New Zealanders⁷⁰, and the impacts over coming decades are likely to be multifaceted (Table 2). Health impacts will depend on the extent and rate of warming in New Zealand, the adaptive capacity of individuals and society, and the policies and programmes New Zealand chooses to use to mitigate and adapt to climate change^{70,71}.

New Zealand already has a relatively high burden of several climate-sensitive diseases (e.g. enteric infections, allergic disease, skin cancer)^{72,73,74,75} and this will influence future climate-health burden.

There will be different impacts for different parts of the population depending on age, ethnicity, health status and socio-economic vulnerability⁷⁰. Māori are at risk of disproportionate impacts compared with non-Māori^{70,76,77}, not only because of differences in health and socio-economic status, but also because of indigenous relationships with the environment, customary practices such as collection of kaimoana (seafood)⁷⁸ with exposure to food-borne disease risk, and differential access to^{79,80,81} and quality of health and social services^{82,83,84,85,86,87,88}.

The New Zealand economy, and the Māori economy (which is heavily invested in climate-sensitive primary industries)⁷⁸ will be influenced by global climate and socioeconomic changes and responses to climate change^{21,25}.

Reduced export and tourism income, for example, could impact across the socio-economic determinants of health with increased unemployment, decreased household capacity to secure the basics for good health, and a reduced tax-base for health sector spending. New Zealand, as a nation, has a responsibility to its region – the Pacific – and the likely increase in demand for aid will also place pressure on the economy. These indirect impacts on the determinants of health may equal or even outweigh the direct health impacts of climate change in New Zealand^{21,76}.

Expected Health Impacts in New Zealand	Implications for Māori Health
<p>Food security and nutrition ^{32,77,89,90,91}</p> <p>Increased global food prices may exacerbate food insecurity and therefore compromise nutrition for some groups.</p>	<p>The Māori population experiences a higher burden of food insecurity compared with non-Māori⁹² and therefore are more at risk of the food security and nutrition impacts of climate change.</p>
<p>Mental health and suicide ^{32,76,77,58,59,60,61,93,94,}</p> <ul style="list-style-type: none"> • Increased stress and mental health issues, including suicide, related to loss of livelihood (e.g. farmers with drought). • Mental health concerns for people affected by extreme weather events and forced migration. • Psychological impacts on young people who may suffer anxieties about potential catastrophic climate change, not unlike those experienced by children growing up with the fear of nuclear war. 	<p>The Māori population has higher rates of mental illness and suicidal behaviour than non-Māori^{95,96,97}.</p> <p>Sources of increased stress will likely affect Māori at least as much as total population with additional impacts relating to loss of coastal land, urupa (cemetery), marae (meeting house), and other sites of significance⁷⁸.</p>
<p>Migrant Health issues ^{76,94,98,99,99,101}</p> <p>It is likely that migrants and refugees will arrive in New Zealand from climate-change affected Pacific Islands. This may impact on household overcrowding and incidence of some infectious diseases (e.g. tuberculosis).</p>	<p>Increased pressure on housing stock from an influx of migrants may have a greater impact on Māori, because Māori are disproportionately affected by poorer housing, household overcrowding and crowding-related infectious disease compared with non-Māori^{102,103,104}.</p>
<p>Injury and illness from extreme weather events (e.g. flooding, landslides, storm surges, drought) ^{32,38,70,76,77,105,106,107}</p> <ul style="list-style-type: none"> • Immediate trauma from extreme weather events. • Indirect health impacts in weeks to months after extreme event (from e.g. pre-existing medical conditions, mental health, conflict)^{58,59,60,61,62,63}. 	<p>Many Māori communities are situated in coastal areas that are vulnerable to sea level rise, storms and storm surges, erosion, and landslides⁷⁸.</p> <p>The Māori population has a higher burden of chronic disease⁹⁵ as well as differential access to, and quality of health services^{79,80,81,82,83,84,85,86,87,88}, therefore greater risk of indirect health impacts after extreme events.</p>
<p>Heat-related deaths and illness ^{32,38,67,70,76,77,108,109,110,111,112,113}</p> <ul style="list-style-type: none"> • Increases in heat-related deaths and illness, particularly for those with chronic disease, and those aged >65 years. • Winter-related deaths may decline, but there is uncertainty about the role of seasonal factors (such as infectious diseases) versus temperature in winter-related deaths. Heat-related deaths likely to outnumber any fewer winter deaths by 2050. • Heat stress and occupational health concerns for outdoor workers. 	<p>Māori have a higher burden of chronic disease, thus at greater risk of heat-related deaths and illness⁹⁵.</p> <p>Māori are overrepresented in semi-skilled and unskilled workforces, and may be more likely to be employed in heavy outdoor labour and therefore exposed to workplace heat stress^{114,115}.</p>
<p>Vector-borne and zoonotic disease ^{32,38,70,76,77,116,117,118,119,120}</p> <ul style="list-style-type: none"> • Increased likelihood that mosquito vectors could establish in New Zealand, which could lead to local transmission of mosquito-borne diseases (e.g. dengue fever, Ross River virus, Chikungunya, West Nile virus). • Possible impacts on other vector-borne diseases (e.g. tick-borne) and nonvector-borne zoonotic diseases. 	<p>The Māori population is concentrated in North Island, with many communities situated near the coast⁷⁸. These areas (e.g. Northland, Bay of Plenty) are at higher risk for the establishment of mosquito vectors of public health concern^{116,121}.</p>
<p>Food and water-borne disease ^{38,70,76,77,122,123,124,125,126,127,128}</p> <ul style="list-style-type: none"> • Heavy rainfall events can transport faecal contaminants into waterways. People can subsequently be exposed to pathogens through drinking water and recreation (e.g. swimming, contaminated shellfish). • Studies correlate temperature increases with food-borne disease (e.g. salmonellosis). • More frequent dry conditions may affect continuity of household water supplies, impacting diseases influenced by hygiene (e.g. enteric infection). • Climate change may be creating a marine environment that promotes toxic algal blooms, which are associated 	<p>A higher burden for Māori is expected, given higher rates of gastrointestinal infections for Māori compared with non-Māori⁹⁵, the comparatively high proportion of Māori with vulnerable, untreated water supplies, and in many locations the role of kaimoana as a regular part of Māori diet¹²⁹.</p>

<p>with toxic shellfish poisoning in humans.</p> <ul style="list-style-type: none"> • Possible increase in incidence of leptospirosis through contact with flood contaminated surface water. • Increased temperature, and both high and low rainfall, may have impacts on parasitic diseases (e.g. cryptosporidiosis, giardiasis) particularly in the context of agricultural intensification in NZ. 	
<p>Ultraviolet radiation^{38,44,70,77,130,131,132,133,134}</p> <ul style="list-style-type: none"> • Climate change may delay recovery of stratospheric ozone. • Warmer temperatures may promote increased outdoor time in regions with traditionally cooler climate, but the reverse may occur in hotter regions. Increased or decreased outdoor time may affect exposure to solar ultraviolet radiation (UVR) – with possible impacts on rates of skin cancer and eye disease, and vitamin D levels. 	<p>The Māori population has a lower burden of melanoma skin cancer and non-melanoma skin cancer than non-Māori, but a higher burden of eye disease⁹⁵. Any impact on vitamin D levels would likely impact on the burden of chronic disease for Māori^{134,135,136}.</p>
<p>Physical activity¹³⁷</p> <p>Warmer temperatures and either increases or decreases in outdoor time, depending on region-specific changes in climate, may impact on levels of physical activity, with consequent health impacts.</p>	<p>Any changes in physical activity levels would likely impact on the burden of chronic disease for Māori.</p>
<p>Cardio-respiratory disease from air pollution^{32,38,70,76,77,138,139,140,141,142}</p> <ul style="list-style-type: none"> • High temperatures may exacerbate photochemical air pollution with impacts on respiratory disease – particularly in urban areas with high transport emissions (e.g. Auckland). Potential for bush/forest fire air pollution to impact on people with cardiorespiratory disease. 	<p>Given that Māori have a higher respiratory and cardiovascular disease burden than non-Maori, the impact of increased pollution would be likely to fall more heavily on Māori⁹⁵.</p>
<p>Allergic diseases, including asthma^{38,76,143}</p> <ul style="list-style-type: none"> • Possible impacts on allergic conditions with changes in aeroallergenic plant distribution, flowering, and pollen production. 	<p>Greater impact on the Māori population, who have a higher burden of asthma and allergic disease than non-Māori^{75,95}.</p>
<p>Indoor environment^{144,145}</p> <ul style="list-style-type: none"> • Climate change may affect the healthiness of indoor environments through overheating of buildings, changed concentration of indoor air pollutants, flood damage and indoor moisture. 	<p>Greater health impacts on Māori are expected, given that the Māori population is overrepresented in vulnerable housing¹⁰².</p>

Table 2. Health impacts of climate change in New Zealand, and implications for Māori Health.

1.5.3 Global and local health equity impacts

The negative impacts of climate change disproportionately affect developing countries, and the most disadvantaged and vulnerable within all countries, including the elderly, people with chronic medical conditions, indigenous peoples, children, and socioeconomically deprived and other marginalised groups^{34,68,69,146,147}. Climate change also affects intergenerational equity by threatening the health and wellbeing of younger and future generations⁶⁹.

Along with the disproportionate impact of climate change on the Māori population (described above in section 1.5.2), Pacific island nations in our region already face the negative effects of climate change, with low-lying, small islands such as Tuvalu, Kiribati and Tokelau being especially vulnerable to disease, displacement and economic impacts^{69,76,98}.

Pacific peoples in New Zealand have a tradition of supporting both family back in the Pacific and new arrivals from the Pacific to New Zealand. Thus climate change has implications for the financial,

housing and health challenges faced by Pacific people in New Zealand, as well as Pacific Island-based peoples dependent on financial support from New Zealand-based family members^{76,99,148,149,150}.

Poorly planned responses to climate change also have the potential to impact on social and health inequities. Mitigation policies that raise costs for fuel and energy (and therefore increase costs of goods and services) could place extra financial burden on families – particularly for Māori, Pacific and lower socioeconomic groups. Increases in the cost of living tend to impact more heavily on those with the lowest disposable incomes⁷¹.

1.5.4 Limitations of evidence on health impacts of climate change

Numbers of publications in climate change-health research are growing. However, quantitative studies still remain relatively few, reflecting an emerging field of epidemiologic research that faces the difficult task of teasing out climate and health effects from many other confounders over multi-decadal timeframes⁵⁰. Work continues to develop the best methodology for studying and quantifying climate-health effects.

Part 2. Actions to prevent and reduce harm to health from climate change

2.1 Precautionary principle

The precautionary principle states that where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing cost-effective action¹⁵¹.

The threat of serious harm to human health and wellbeing from climate change is reason to take the precautionary approach. Delayed action on other public health issues, such as HIV/AIDS and tobacco control, has resulted in unnecessary loss of life. Similar parallels now exist with climate change, requiring similar public health vigilance to accelerate action^{152,153,154}.

2.2 Delay and prevent climate change (mitigation)

2.2.1 Scale and speed of appropriate emissions reductions

In 2010, countries under the United Nations Framework Convention on Climate Change (UNFCCC) agreed that global warming should not exceed 2°C above pre-industrial levels, and to consider a stricter limit of 1.5°C in a future review^{16,23}.

For a 50% chance of limiting global warming to 2°C, the world needs to constrain GHG concentrations to around 450ppm CO₂ equivalents (CO₂-eq)^{16,155}. To give a greater chance of staying below 2°C the GHG concentrations would need to be kept much lower¹⁶. Some consider 350ppm CO₂ in the atmosphere to be a 'safe' level to which earth's living systems are adapted¹⁵⁶. This was the annual level of global CO₂ concentration last experienced in 1987⁹.

To constrain concentrations of greenhouse gases to this extent it is estimated that global emissions need to peak by 2015-2020, then reduce rapidly to near zero emissions this century^{157,158,159,160,161}.

This would require all major GHG emitters to do much more than they are currently doing and/or have pledged to do^{160,161,162,163}. Any delay in GHG emissions reductions would require even sharper global emissions reductions later to reach the same long-term outcome^{16,164}.

The 'carbon budget' concept is another way of thinking about the emissions reductions that are needed. The IPCC's Fifth Assessment report states that to give a >66% chance of staying below 2°C, the maximum amount of CO₂ that can be emitted over the industrial period is 1 trillion tonnes. At 2011 the world had already used up one half of that budget, and if current rates of emissions continue, the rest of the budget is likely to be exhausted by mid-century^{3,4,25}.

The UNFCCC currently holds that established economies (responsible for most of historical emissions) should lead efforts to reduce emissions through the Kyoto Protocol.

There are several other frameworks, in the context of fixed limits^{164,165,166}, that incorporate historical responsibility, science and fairness¹⁶⁷ in calculating emission reduction allocations^{168,169,170,171}. For example, the Greenhouse Development Rights (GDR) framework's Responsibility and Capability Index combines countries' cumulative emissions (responsibility) with their capability to mitigate (using wealth as a proxy, from per capita GDP adjusted for distribution of thresholds of individuals' incomes). The GDR framework would expect New Zealand to reduce its emissions by 41% below 1990 levels by 2020^{46,169,171} (for further detail see the supplements to this policy at <http://www.nzcpm.org.nz/policy-publications>).

2.2.2 New Zealand's mitigation policies

New Zealand has set a target for reducing GHG emissions to 5% below 1990 levels by 2020¹⁷², with a long term target of a 50% reduction by 2050¹⁷³ and a conditional^{§§} target of 10-20% below 1990 levels by 2020¹⁷³.

New Zealand's targets are well below what scientists calculate is necessary from established economies in order to stay within the 2°C warming limit. The IPCC AR4 suggested emissions reductions by established economies of 25-40% below 1990 levels by 2020, and 80-95% below 1990 levels by 2050¹⁷⁴. New Zealand's targets are also well below what is calculated using responsibility and capability frameworks such as the GDR framework (GDRf)⁴⁶.

Established economies, like New Zealand, historically have had high greenhouse gas emissions and have benefited from activities that cause high emissions. Consequently, they are in a position, and have a responsibility, to mitigate past actions and contribute rapidly and proportionately more reductions than nations with historically lower emissions (for further detail, see the supplements to this policy at <http://www.nzcpm.org.nz/policy-publications>).

The new target for 2020 of reducing net emissions by 5%¹⁷² in effect is a nil reduction in gross emissions (due to temporary forest offsets)^{46,173}, as are targets that are conditional on future international action to reduce emissions¹⁷³. Thus, in effect New Zealand has no gross⁴⁶ emissions reduction targets at present.

These features of New Zealand gross GHG emissions are summarised in Figure 1 below.

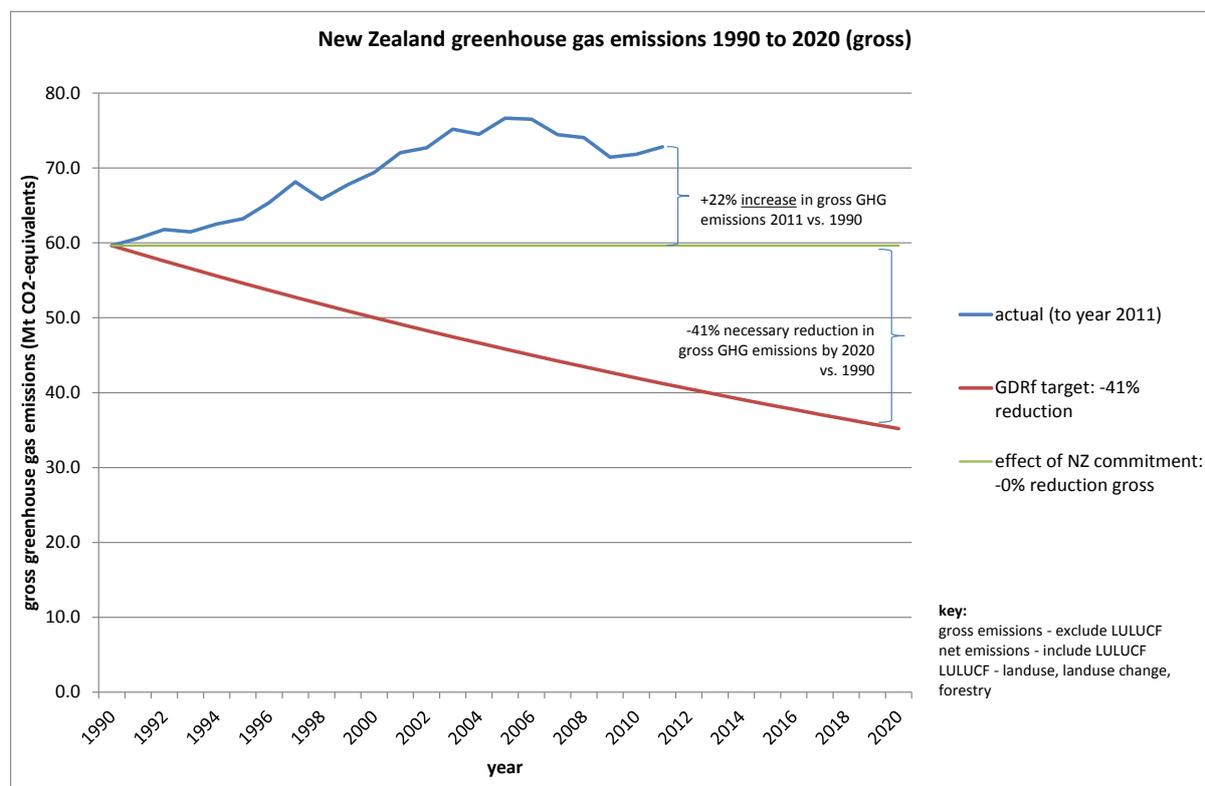


Figure 1. New Zealand's gross greenhouse gas emissions 1990 to 2020 – targets and actuals^{46,169,171,172,173,175,176}

§§ Conditional targets/pledges are those that are conditional on other countries, i.e. 'the extent of future international action to reduce emissions'

New Zealand's gross emissions are still rising¹³, and New Zealand has withdrawn from a second Kyoto Protocol commitment period¹⁷². New Zealand has no plans to progress a Low Carbon Development Plan as agreed at the December 2010 UNFCCC meeting in Cancun¹⁷⁷.

The 2011 UNFCCC review of New Zealand's climate policies concluded that the measures in place in New Zealand were inadequate to achieve one third of a 10% emissions reduction target¹⁷³. This was before further weakening of New Zealand's Emissions Trading Scheme¹⁷⁸.

A number of barriers may be contributing to lack of strong mitigation policy in New Zealand:

- Historically low levels of public concern about climate change compared with other OECD nations^{179,180}.
- Active climate change denial^{152,153,154,181}.
- Emissions-intensive economic policies^{182,183,184,185} alongside the weakening of the Emissions Trading Scheme¹⁷⁸.
- Relative lack of investment in public and active transport and lack of regulations to improve energy efficiency of housing stock¹⁸⁶.
- Exclusion of climate impacts from resource management legislation¹⁸⁷.
- The potential loss of ability to regulate around greenhouse gas emissions¹⁸⁸.

2.2.3 Health and equity co-benefits from mitigation

Well-designed policies to reduce GHG emissions can bring about substantial health and health equity co-benefits including reductions in heart disease, cancer, obesity, musculoskeletal disease (degenerative arthritis of the spine and major joints), Type 2 diabetes, respiratory disease, motor vehicle injuries, and improvements in mental health^{189,190,191,192}.

These co-benefits arise because some emission reductions measures impact on important determinants of health, especially energy intake (nutrition) and expenditure (physical movement). For example:

- Low-carbon transport (walking, cycling, public transport) improves physical activity, and can reduce air pollution and road traffic injuries^{194,195,196,197,198,199}. Walking and cycling are inexpensive modes of transport, and public transport is used proportionately more by people with lower incomes. Hence investing in low-cost public transport, along with walking and cycling infrastructure, could benefit health, climate and equity¹⁹⁴.
- Healthy eating, including increased plant and reduced red meat and animal fat consumption, would reduce the emissions associated with food production and likely lead to reduced rates of bowel cancer and heart disease^{200,201,202,203,204}. Plant-based diets can save costs, and further improving access to plant-based foods could improve health, climate and equity²⁰⁴.
- Both increased physical activity and healthy eating have the potential to reduce obesity (and in turn reduce the contribution that obesity makes to climate change and health inequities)^{79,81,205}.
- Improving indoor environments (e.g. energy efficiency measures) can reduce illnesses associated with cold, damp housing. For example, childhood asthma and chest infections which are leading causes of hospital admissions, particularly for Māori and Pacific children^{206,207,208}.

- Increasing energy efficiency and/or moving away from fossil fuel energy would reduce health-damaging air pollution (e.g. particulate matter) from fuel combustion, in both indoor and outdoor environments¹⁹⁰, with large health gains¹⁹¹.

Health and equity gains are not automatic. There needs to be deliberate policies that align health, equity and climate goals^{71,209}. For example, recycling carbon penalty revenue into healthy housing initiatives for Māori, Pacific and low income groups could have triple benefits for health, equity and climate change mitigation⁷¹. Complementary policies to redistribute income may well be needed, to redress the effects of increased living costs (from climate mitigation policy) on income inequities⁷¹. Enhancing potential health co-benefits and reducing costs for low income households need to be central to the design of any carbon pricing scheme; experience overseas shows that this is possible⁷¹.

The NZCPHM's policy on Health Equity², which endorses that of the New Zealand Medical Association (2011)²⁰⁹, observes that tackling the social determinants that underlie health inequity, and tackling climate change, often require similar decisions and actions (paragraph 23).

Health and equity co-benefits associated with climate change mitigation also have the potential to significantly reduce costs on the health care system^{210,211}.

2.3 Prepare to limit harm to health from climate change (adaptation)

There are a number of increased public health activities needed to help prepare for and cope with the health impacts of climate change in New Zealand and the surrounding region^{76,212,213}. Some of these are listed below:

2.3.1 Reorienting (or supporting) health services

- Health service planning that accommodates likely increased burden from climate-sensitive diseases.
- Prioritise population groups that are likely to need the greatest health support in the face of climate change – Māori, Pacific, people on low incomes, rural people, children, and the elderly.
- Health and social service planning that accommodates the likely increased number of migrants from the Pacific to New Zealand⁷⁶.
- Strengthening the resilience of health infrastructure and services to extreme events²¹².

2.3.2 Health improvement

- Health promotion to strengthen the health, social cohesion and resilience of communities (especially vulnerable communities)⁷⁶.
- Develop and strengthen the public health workforce²¹².
- Support public policies that lessen both climate change and its effects, e.g. advocacy for energy-efficient housing, active and public transport, and improved nutrition.

2.3.3 Health protection

- Public health surveillance and early warning systems for new and emerging illnesses/ diseases, coupled with adequate response capability^{5,214}.
- Communication resources e.g. staying well in heat, avoiding environmental health risks from flooding/drought/air pollution, mental health in times of hardship^{212,213}.
- Emergency preparedness for extreme weather events^{5,212,213}.
- Vector surveillance and control²¹².
- Public health monitoring and management of drinking water and recreational water²¹².
- Food hygiene measures²¹³.

2.3.4 Research

- Continued research into the health impacts of climate change in New Zealand, and the most effective and equitable ways to adapt²¹⁴.

2.3.5 Intersectoral

- Work with other sectors to increase resilience to climate change in public health infrastructure, urban design and environments^{212,213}.
- Stressing social determinants as the basis of good health, and therefore encouraging plans to future-proof New Zealand's socioeconomic situation amidst global responses to climate change.

2.3.6 International

- Financial and technological aid for developing country mitigation and adaptation (e.g. in the Pacific)^{14,215,216}.
- International diplomacy to support climate and resource justice and to avoid conflict²¹².

2.4 Possible harms to health from action to prevent and limit climate change

There are potential risks to health from action on climate change that need active consideration and management. Potential threats include increasing inequities and food insecurity.

Poorly planned climate change responses have the potential to widen social and health inequities by imposing additional economic burden on low income households^{46,71}. This risk could be lessened by investment in public transport, continuing support for housing insulation and heating, and redistributive policies to ensure that all families have incomes adequate for healthy living⁷¹.

Food shortages and price rises associated with the use of crops to produce biofuel can impact on food security and nutrition for poor communities in developing countries²¹⁷.

However ultimately, failing to act on climate change will produce profoundly greater costs and damage to the economy and human health^{218,219,220}.

Part 3. The role of public health medicine and the NZCPHM

3.1 Responsibilities of public health medicine

Climate, health and equity are inseparable. Addressing climate change should be an essential component of health policy, and health and equity outcomes must be key priorities within climate change policy^{192,193}.

The College has an important responsibility to ensure that the risks of climate change for population health and health equity are understood, and to press for urgent and effective action.

This responsibility arises from; (1) the risks of climate change to population health, both directly and indirectly, (2) the risks of climate change to health equity, and (3) the substantial population health gains as co-benefits of appropriate interventions to reduce greenhouse gas emissions.

3.2 Strengths of public health medicine

The timing, magnitude and exact impacts of climate change on population health still involve some uncertainty. Managing uncertainty and risk are core competencies and routine activities for doctors and public health medicine practitioners^{214,221}.

Public health also has a history of investigating and managing environmental (and other) risks to population health^{152,214}, and brings particular skills to the complexities of climate change including a focus on prevention and the determinants of health, highlighting the role of the state in protecting population health, and a multidisciplinary basis²²².

3.3 Actions that the NZCPHM supports

The NZCPHM seeks to both raise understanding of the public health consequences of climate change, and lead in preventing and preparing for those consequences. The NZCPHM therefore supports the following:

3.3.1 Position statements on climate change and health by other New Zealand and international health organisations:

- The New Zealand Medical Association Position Statement on Health and Climate Change (2010)²²³.
- The Doha Declaration on Climate, Health and Wellbeing (2012)²²⁴.
- The joint letter from The Royal College of Physicians and 17 other professional bodies, including the Royal Australasian College of Physicians (published in The Lancet and the BMJ in 2009)³⁹.
- The World Medical Association's Declaration of Delhi on Health and Climate Change (2009)⁴⁰.
- The United Kingdom (UK)'s Faculty of Public Health's joint stand for collective action on climate change (2008), signed by 18 organisations including the UK Public Health Association, The Royal Institute of Public Health and The Association of Directors of Public Health⁴¹.
- The Public Health Association of New Zealand Policy on Preventing Global Climate Change (2001)²²⁵.
- OraTaiao: The New Zealand Climate and Health Council's policy statement (2010)²²⁶.
- The Doctors for the Environment Australia position statement²²⁷ and policy²²⁸ on climate change and health (2013).
- The Public Health Association of Australia's Safe Climate Policy (2013)²²⁹.

These organisations' positions are replicated in the supplements to this policy statement at <http://www.nzcpmh.org.nz/policy-publications>.

3.3.2 Education and training:

- Strengthening medical undergraduate, postgraduate and public health training to ensure knowledge of global climate change health and health equity impacts, mitigation and adaptation.
- Increasing awareness amongst health professionals, governments and communities about the health implications of climate change and the need for health promoting mitigation and adaptation.

3.3.3 Advocacy toward:

- Climate change policy that improves population health, accords with Te Tiriti o Waitangi, and that creates a more equitable, just and resilient society.
- Placing public health and equity at the centre of climate change policy^{192,193}.
- Government climate change mitigation targets and policies⁴⁶ aligning with the scientific evidence on the urgency and scale of necessary emissions reductions, and that support health and equity.
- Fair and equitable approaches^{2,167} to the allocation of emissions reductions amongst countries, which take into account overall carbon budgets^{164,166}, historical responsibility and capability to mitigate (for further detail see the supplements to this statement at <http://www.nzcpmh.org.nz/policy-publications>).
- Including climate change as a consideration in all Health Impact Assessments and 'Health in All Policies' approaches.
- A globally coordinated effort to rapidly upscale carbon-neutral energy production to replace energy production from fossil fuels.
- Stopping new fossil fuel extraction and phasing out existing fossil fuel extraction, with support for local communities^{***,230,231,232}.
- Investing in renewable energy²³³, not fossil fuels²³⁴.
- Government climate change adaptation policies that are proactive, and actively support populations that will be worst affected by climate change.
- The health sector leading in climate change mitigation and adaptation.
- Priority for populations that are most at risk of climate change health impacts globally and in New Zealand (e.g. women and children in poor nations³⁴, Māori, Pacific, low income, those living rurally, children, and the elderly).

3.3.4 Public health medicine leadership in:

- Epidemiological, health economic and other research on the health impacts of climate change, health co-benefits of mitigation action, and health-promoting approaches to adaptation¹⁹³.
- Promoting the potential health co-benefits of climate action and the inter-relationships across sectors (e.g. urban planning relationship to active transport, and hence climate and health outcomes).
- Translating climate-health research to inform evidence-based climate change policy.
- Health service planning and building health system resilience against increased burden of climate-sensitive diseases and climate risks.
- Emergency preparedness in the health sector for extreme weather event scenarios.
- Health and social service planning to accommodate climate migrants.

*** Coal and oil reserves are an enormous source of potential GHG emissions. The world cannot afford to extract most (80% by some estimates²²⁹) of known fossil fuel reserves, let alone explore new sources.

- Future-proofing public health infrastructure and environments to climate change.
- Vector control and surveillance for new and emerging diseases.
- Surveillance for the environmental health risks of climate change.
- Public education and communication resources for climate-health risks.
- Research to inform effective ways to build widespread community and policy-level commitment to strong climate action in New Zealand and worldwide.

3.3.5 Measuring and reducing GHG emissions by the health sector:

- Measuring health organisations' carbon footprint with existing tools, e.g. <http://www.carbonzero.co.nz/calculators/>, [ACE Carbon Calculator](#).
- Putting in place plans and monitoring toward reducing emissions (e.g. CEMARS programme <http://www.carbonzero.co.nz/options/cemars.asp>).

3.3.6 Action by the NZCPHM and its members at personal, professional, and organisational levels to:

- Be informed about health implications of climate change e.g. via the IPCC (http://www.ipcc.ch/news_and_events/docs/ar5/ar5_wg1_headlines.pdf), the WHO (<http://www.who.int/globalchange/en/>) and the Real Climate site (<http://www.realclimate.org/>).
- Inform others about the health risks of climate change and the health benefits of action to reduce GHGs.
- Calculate GHG emissions for households and organisations, e.g. using the CarboNZero calculator (<http://www.carbonzero.co.nz/calculators/>) or the ACE Carbon Calculator (<http://greenfleet.org.nz/index.php?page=ace-carbon-calculator>).
- Champion reductions in household/organisational emissions e.g. starting with 10% annual emissions reductions focussing on the areas of energy, travel, food and waste,
 - The 10:10 website (www.1010uk.org),
 - The NHS Sustainable Development Unit website (www.sdu.nhs.uk/documents/publications/1237308334_qylG_saving_carbon_improving_health_nhs_carbon_reducti.pdf),
 - The UK Faculty of Public Health site (www.fph.org.uk/sustaining_a_healthy_future).
- Invest in renewable energy and low carbon economic development, not fossil fuels.
- Challenge fossil fuel expansion and emissions-intensive developments, as active citizens.
- Collaborate with others on climate change mitigation and adaption – health and social service providers, local councils and communities, Iwi and Hapū (Māori tribes and subtribes), and other sectors, e.g.
 - OraTaiao: The New Zealand Climate and Health Council (www.orataiao.org.nz),
 - the Public Health Association of New Zealand (www.pha.org.nz).
- Offset transport and energy related carbon emissions e.g. tree planting (www.forestsforhealthnz.org.nz).

Links with other NZCPHM policies

Health Equity
Māori Health
Sustainability
Trans Pacific Partnership Agreement
Transport
Housing
Tobacco control
First 1000 days
Rheumatic fever

List of Supplements

Supplementary material, provided separate to this document comprises:

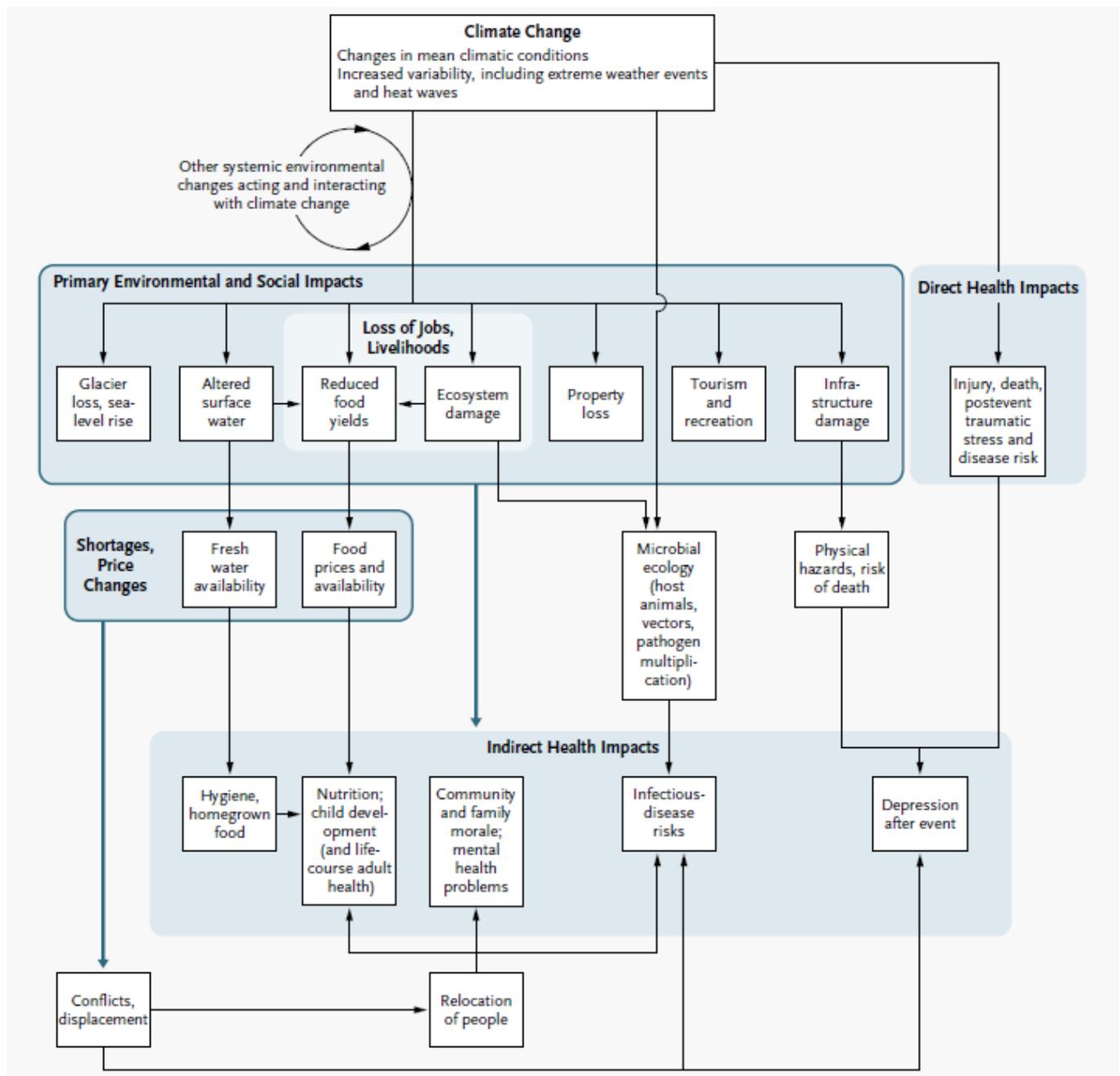
1. Background to the NZCPHM's stance on national targets.
2. Statements on climate change by other New Zealand health organisations and international public health medicine and climate health bodies.

Supplements are available at: <http://www.nzcpm.org.nz/policy-publications>

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Appendix:
Processes and pathways by which climate change influences human health



Source: McMichael AJ. Globalization, climate change, and human health. *N Engl J Med.* 2013; 368(14): 1335-43.

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Changes in the global climate, causes of climate change, projections of future climate change

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