

**BEFORE THE OTAGO REGIONAL COUNCIL  
AT DUNEDIN**

**Under the**

Resource Management Act 1991

**In the Matter of**

Proposed Otago Regional  
Council's Draft Regional Policy  
Statement

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**STATEMENT OF EVIDENCE OF ALEXANDRA KATHRYN MACMILLAN  
IN SUPPORT OF SUBMISSIONS BY THE WISE RESPONSE SOCIETY INC.**

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Acting Solicitor:

## **BACKGROUND**

1. My full name is Alexandra Kathryn Macmillan
2. I am a Public Health Physician and Senior Lecturer in Environmental Health at the University of Otago, based in Dunedin. I have MBChB, MPH and PhD degrees in medicine and public health. I am a Fellow of the NZ College of Public Health Medicine, as well as the co-convenor of the NZ Climate & Health Council (OraTaiao). I hold an honorary senior research position at the Bartlett Faculty for the Built Environment, University College London.
3. I have 30 peer reviewed publications in national and international journals, and as book chapters and peer reviewed reports. I have acted as a public health advisor to transport policy for the Auckland Regional Transport Authority (as it was then), Dunedin City Council and the NZTA.
4. My research interest and expertise is in the intersection of human health, environmental sustainability and social justice, with a strong interest in the building blocks for health and wellbeing, including clean air and water, healthy soils, and fair access to health promoting education, employment, goods and services and social connection. My research has focused on optimising policy decisions that integrate environmental, social, economic and health outcomes.
5. I have read the Code of Conduct for Expert Witnesses, and agree to comply with it.
6. I confirm that the issues addressed in this brief of evidence are within my area of expertise.

## **CLIMATE CHANGE AND HUMAN WELLBEING**

7. My comments are based on my research and understanding of the relevant scientific literature for Otago, nationally and internationally.

## **EXPECTED IMPACTS ON HEALTH IN NEW ZEALAND**

8. The table below summarises the expected medium term impacts of climate change on health in NZ. It's clear that Māori, Pacific and low income people will be affected first and hardest. With the exception of those impacts relating to housing and the indoor environment, all the health impacts listed in the table are mediated by actions of regional councils. With the exception of mosquito borne disease, all the health impacts are relevant to the Otago region.

<b>Food security and nutrition:</b> Increased global food prices, affecting a large number of locally produced and imported food staples in New Zealand, are likely to reduce the ability of some groups to afford a variety of nutritious foods, further compromising nutritional outcomes for those groups. <sup>2,30-32</sup>
<b>Mental health and suicide:</b> Increased stress and mental health issues (e.g. farmers with drought, victims of extreme weather). Young people may suffer anxieties about catastrophic climate change, not unlike those experienced by children growing up with the fear of nuclear war. <sup>2,33-36</sup>
<b>Housing and health:</b> Healthiness of some housing will be affected by extreme weather, for example, indoor moisture (with heavy rainfall, flooding), high indoor temperatures (during heatwaves in poorly insulated houses). <sup>37</sup> It is also likely that people will arrive in New Zealand from climate-change affected areas. This may put further pressure on availability of low income-larger family homes, potentially impacting household overcrowding and the incidence of some infectious diseases. <sup>14,38,39</sup>
<b>Injury and illness from extreme weather events (e.g. flooding, storms, landslides, storm surges, drought):</b> Immediate trauma, and indirect health impacts in weeks to months after extreme events (e.g. mental health problems, exacerbation of pre-existing medical conditions). <sup>2,40-42</sup>
<b>Heat-related deaths and illness:</b> Increases in heat-related deaths and illness, particularly for those with chronic illness and those aged over 65 years. Heat stress for outdoor workers. Winter deaths may decline, but this is uncertain as winter deaths may be influenced by seasonal factors that are unrelated to climate. <sup>2,43-50</sup>
<b>Vector-borne and zoonotic (animal to human) disease:</b> Increased likelihood that mosquito vectors could establish in New Zealand, which could lead to local transmission of mosquito-borne diseases (e.g. dengue, Ross River virus). Also possible impacts on other vector-borne diseases (e.g. tick-borne) and zoonotic diseases. <sup>2,51-56</sup>
<b>Food- and water-borne disease:</b> Heavy rainfall can lead to contamination of drinking and recreational water/shellfish with faecal pathogens from animals and humans. Both high and low rainfall, and higher temperatures may impact on bacterial and parasitic diseases causing gastroenteritis (e.g. giardiasis, salmonellosis). Dry conditions could affect continuity of household water supplies, impacting diseases influenced by hygiene. <sup>2,56-59</sup>
<b>Ultraviolet (UV) radiation:</b> Climate change may delay recovery of stratospheric ozone. Warmer temperatures could promote increased or decreased outdoor time, affecting exposure to solar ultraviolet (UV) radiation—with possible impacts on rates of skin cancer, eye disease, and vitamin D levels. <sup>2,60-63</sup>
<b>Physical activity:</b> Warmer temperatures, and either increases or decreases in outdoor time, may impact on levels of recreational physical activity—an important determinant of health. <sup>64</sup>
<b>Cardio-respiratory disease from air pollution:</b> High temperatures can exacerbate photo-chemical air pollution with impacts on respiratory disease. Hot, dry conditions increase potential for bush/forest fires, where smoke impacts on people with cardiorespiratory disease. <sup>2,65-68</sup>
<b>Allergic diseases, including asthma:</b> Possible impacts on allergic conditions with changes in plant distribution, flowering, and pollen production. <sup>2,69</sup>
<b>Indoor environment:</b> Climate change may affect the healthiness of indoor environments (e.g. overheating of buildings, changes in indoor air pollutants, flood damage and indoor moisture). <sup>37,70</sup>

*Bennett et al 2014*

9. Some of these health impacts are already being experienced in the Otago region, including impacts of forest fires, health impacts of flooding, increasing food prices and stress to farmers from drought.

#### **CO-BENEFITS TO HEALTH OF WELL-DESIGNED CLIMATE CHANGE MITIGATION POLICIES**

10. Strong and urgent action is needed to reduce carbon dioxide emissions as well as other greenhouse gas emissions, including methane, to protect current and future health and wellbeing. Policies are needed at national, regional and local level to support the actions that individuals are already taken and to incentivise further action. The Regional Policy Statement is important to set the scene for well-designed action, including setting strong 2050 and interim targets and laying out a plan to reach those targets.
11. It is clear from international evidence that to protect health from catastrophic climate change a zero carbon emissions target for 2050 is needed by all countries and regions, along with significant reductions in other greenhouse gas emissions including agricultural methane.

12. Fortunately, many policies at a regional level to reach such targets can also assist with improving health and health equity if designed well.
13. Strategic planning for transport that shifts the balance of transport funding to reduce spending on carbon intensive road transport to affordable regional and urban public transport, as well as walking and cycling, brings multiple benefits for health and fairness. These include improvements in air quality; increased opportunities to build physical activity into daily life; fuel cost savings for households; improved neighbourhood social connection; reduced road traffic injury; and fairer access to education, employment and healthy goods and services. Leading the way with the infrastructure needed for electric vehicles would also incentivise a transition away from diesel and petrol use.
14. Strategic regional planning for food system resilience could also reduce emissions while improving health. In particular, maximising local production of a wide range of fruit and vegetables in ways that are adaptable to the level of climate change already locked in, as an alternative to the boom and bust milk powder economy, would bring significant health benefits while reducing both agricultural and transport emissions. Reducing regional meat and dairy intake while making fresh fruit and vegetables more affordable would improve nutrition, reduce food insecurity for low income households and reduce cardiovascular and cancer deaths. If appropriate ecologically sustainable agricultural was used, freshwater quality would also be improved.
15. Setting a pathway towards 100% renewable energy supply for Otago industry and households would also benefit health and wellbeing. In addition to improving air quality, regionally and locally owned electricity generation would provide local economic resilience and could be designed progressively to protect low income households from energy price rises.


#### **ROLE OF THE REGIONAL POLICY STATEMENT**

16. There is currently an inadequate adaptation and mitigation response to climate change at a national level. This makes it crucial that regional councils demonstrate leadership, showing communities and national government that a low carbon transition is both possible and desirable for wellbeing and resilience.

#### **INTERSECTIONS WITH OTHER OBJECTIVES**

17. Otago Regional Council's climate change policies strongly intersect with planning for freshwater sustainability and improving air quality.
18. Strong climate change mitigation and adaptation policies and actions at a regional level can also support sustainable economic development and regional economic resilience. For example, locally owned renewable

electricity generation, locally resilient food systems and affordable public and active transport all improve household level disposable income allowing for greater local and regional spending.



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Alexandra Kathryn Macmillan

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