

Alexandra Community Climate Change Discussion Forum Summary of Outcomes



Greg Bodeker, Stefanie Kremser, Matthew Hanson and Terra Dumont



National
SCIENCE
Challenges

THE DEEP SOUTH

Te Kōmata o
Te Tonga



Front Cover – Photo Acknowledgements

Alexandra: NZbybike.com
Old Bridge: Rankers.co.nz

Contents

Preface	2
Acknowledgements.....	2
Overview	3
Section 1: The Deep South Challenge (Rhian Salmon, Science Leader for Engagement).....	4
Section 2: Climate futures for Central Otago and the underlying science (Greg Bodeker).....	7
Section 3: Climate Change - Response for 'normal' people.....	10
Section 4: Outcomes of Discussion Theme 1	13
Section 5: Outcomes of Discussion Theme 2	14
Section 6: Outcomes of Discussion Theme 3	18
Section 7: Outcomes of Discussion Theme 4	21
Section 8: Outcomes of Discussion Theme 5	25
Section 9: Conclusions	28

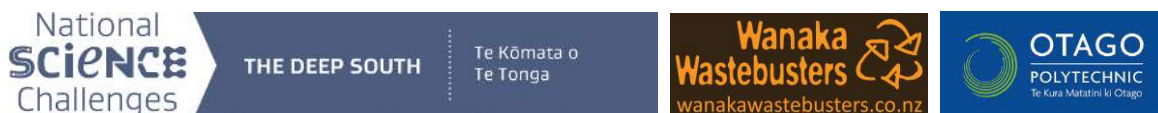
Preface

The Alexandra Community Climate Change (hereafter referred to as 3C) Discussion Forum arose out of deliberations within the MAD4CO (Making A Difference For Central Otago) group in the lead up to the Alexandra Thyme Festival. The goal was to host a discussion evening that would more closely link current climate change research to the needs of a small community, such as Central Otago, and to raise community awareness of the latest outcomes of climate change research. It was soon realised that this event would align well with the engagement programme of the Deep South National Science Challenge (DSC). The DSC therefore became a partner and primary sponsor in the organisation of this event and the event was selected as a pilot project within the engagement programme of the DSC.

The event was held on the evening of 7 November 2015 from 6:00 to 9:30 pm at the Alexandra Community Hall. The meeting was attended by 108 people.

Acknowledgements

We would like to start by thanking the primary sponsor for this event, the Deep South National Science Challenge (DSC). We are very grateful to Rhian Salmon, the leader of the engagement programme of the DSC for supporting this event and for her presentation at the event summarizing the purpose and goals of the DSC. We would also like to thank Wanaka Wastebusters and the Otago Polytechnic Cromwell campus for their additional sponsorship of this event. Without our sponsors this event would not have been possible.



In addition we would like to thank:

- Clair Higginson for her tireless work in assisting with the organisation of this event and for ensuring that all logistics happened smoothly and seamlessly.
- The MAD4CO group for supporting this event, and a special thanks to Clair, Sophie, Loretta, Andrew and Anna for assisting with the preparation of the venue for the event and tidying up after the event.
- Amy Scott for doing a perfect job in chairing the event, keeping everyone on time, and ensuring that everyone remained on topic. Amy was given the responsibility of ensuring that the event was a success and she fulfilled that responsibility 100%.
- Ollie Yeoman for his introductory talk to the event which set the tone for the event and gave all participants some food for thought.
- Speaking of food, we would like to thank the Alexandra Dunstan Lions Club for catering the event and ensuring that people were well fed throughout the evening. And thanks to the 'BMX ladies' for running the bar.

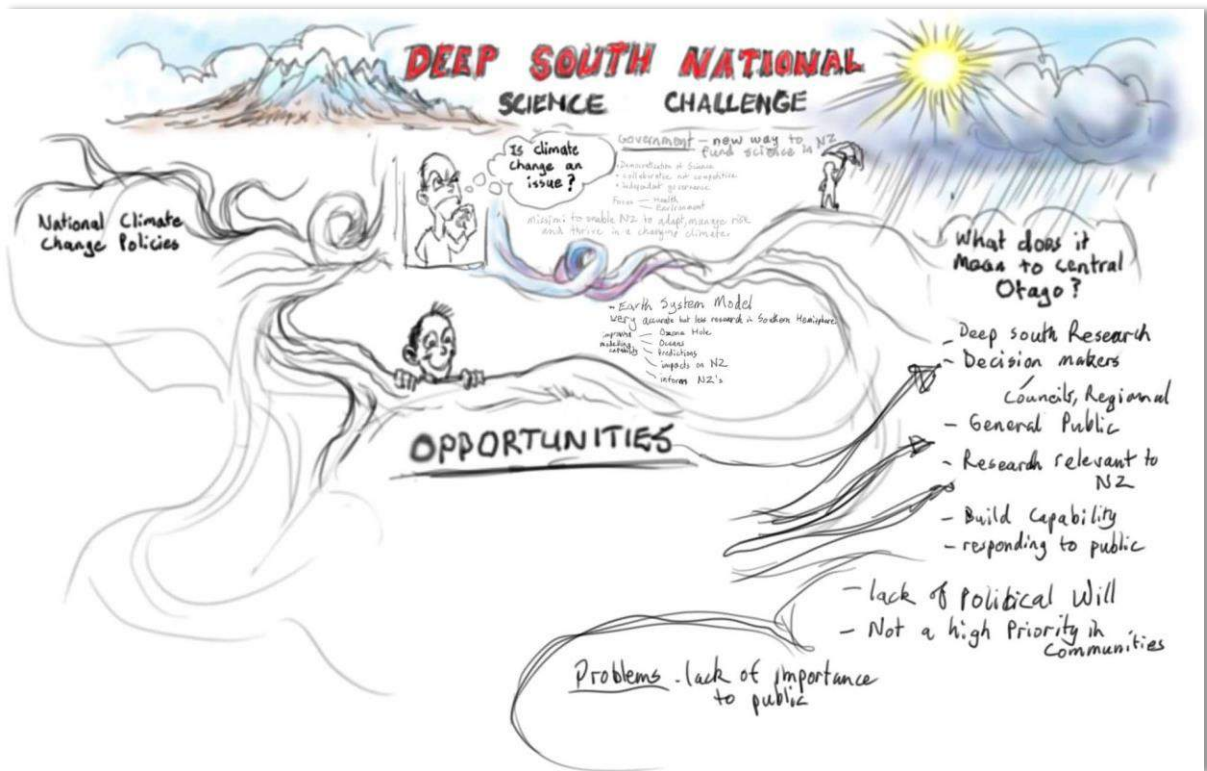
- Bruce Potter for capturing the event through his drawings which are included in this report.
- Heather Horswell for assisting with the videography of the event.
- Finally we would like to thank the attendees for sharing their thoughts and ideas in such a generous way and for giving up a Saturday night to participate in the discussions. Without you, we would not have had an event.

Overview

The 3C Discussion Forum began with three presentations to 'set the scene' for the evening. Short summaries of these presentations are provided in Sections 1, 2 and 3. The heart of the forum was the discussion of five main 'themes'. Attendees at the forum were seated around 18 tables with 6 to 8 people at each table. The five themes were discussed sequentially at each table with 15 minutes being allocated to each theme. Following each discussion, a short question and answer session (5 minutes) gave participants an opportunity to express any thoughts or ideas they had which they felt may be of interest to the meeting as a whole. Group selected scribes at each table captured the outcomes of the discussions on A3 sheets of paper. These pages have been collated and scanned and are available from Greg Bodeker (greg@bodekerscientific.com) on request. Distillations of the thoughts and ideas captured via this process are provided in Sections 4 to 8. These summaries are provided with little, if any censorship. Where comments lacked clarity to the extent that their meaning could not be understood, these were excluded from the summary. Similarly, comments that were deemed to be outside of the scope of the meeting, and hence this report, were also excluded. The authors recognise that for many of the suggestions listed in Sections 4 to 8, whether or not they are feasible has not been assessed. Conclusions are provided in Section 9.

Section 1: The Deep South Challenge

(Rhian Salmon, Science Leader for Engagement)



The National Science Challenges (NSCs) were established to 'fund research, science or technology, or related activities that have the potential to respond to the most important, national-scale issues and opportunities identified by science stakeholders and the New Zealand public'. The intent of the NSCs is to conduct research in a way that goes beyond business as usual. The NSCs are funded through a collaborative process rather than a competitive process, incorporating Vision Mātauranga, and including a high level of societal engagement. NSCs are mission led with a research focus on national issues. High quality science associated with the NSCs is facilitated by bringing together the best possible teams from across the country. Because the issues being addressed by the NSCs are often complex and interrelated, these teams are multidisciplinary and collaborative. Stakeholders and communities have been involved in the design of the NSCs and this event was held, in part, with this process in mind. Each of the NSCs is overseen by an independent governance board.

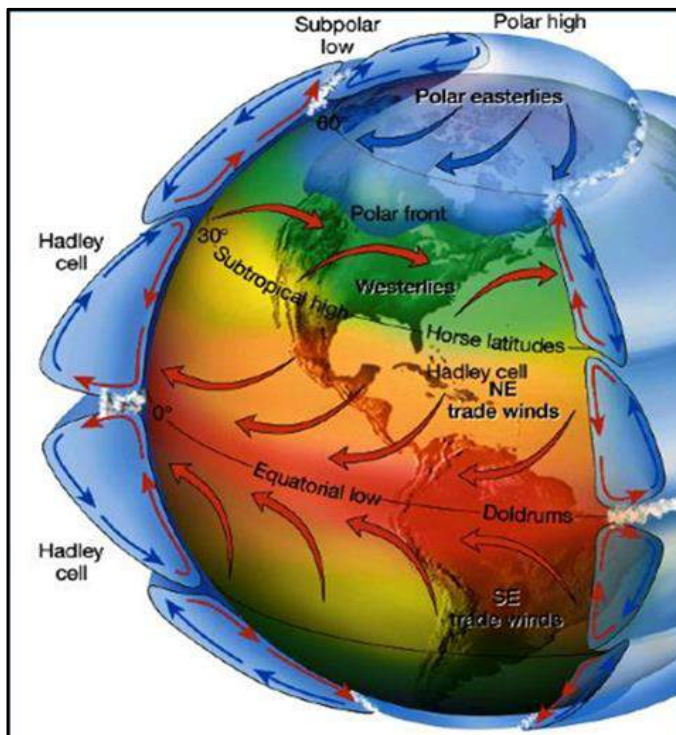
The stated mission of the Deep South National Science Challenge (DSC) is:

"To enable New Zealanders to adapt, manage risk, and thrive in a changing climate. Working with our communities and industry, we will guide planning and policy to enhance resilience and exploit opportunities. This will be built on improved predictions of future climate, supported by new understanding of Antarctic and Southern Ocean processes. The Challenge will focus on the effects of a changing climate on key climate sensitive economic sectors, infrastructure and natural resources."

As such, the DSC has a clear focus on climate. There are, however, other NSCs that also have a climate research component such as:

- Building better homes, towns and cities - urban climate impacts.
- Resilience to nature's challenges - coastal inundations, erosion, floods.
- Our land and water - floods, farm impacts, drought events, climate implications on productivity.
- New Zealand's biological heritage - biodiversity, biological impacts of climate change.
- Sustainable seas - marine impacts of climate change.

The DSC will therefore connect to these other NSCs.



The Earth system is complex with many interconnected components that require sophisticated models to simulate its evolution. The models that are used to do this are Atmosphere-Ocean Global Climate Models or their even more sophisticated counterparts - Earth System Models. One of the key goals of the DSC is to develop New Zealand's first Earth System Model to provide best possible projections of expected future changes in New Zealand's climate and the impact of those changes on local ecosystems, the economy and society. Within the DSC, a *Processes & Observations* programme provides the necessary input to an *Earth System Modelling & Prediction* programme, which in turn provides state-of-the-art projections of future changes in climate to an *Impacts & Implications* programme. These three programmes,

together with the *Vision Mātauranga* and *Engagement* programmes, comprise the core of the DSC.

The DSC engagement programme, in addition to ensuring that the outputs of the DSC are tailored to meet the needs of its users, also looks to key stakeholders in the programme and to the general public to inform research priorities across the programme. One of the goals of the 3C event was to better understand the needs of the different users of climate information in Central Otago to guide research priorities within the DSC. The DSC also aims to develop capacity within communities to take up the research being generated by the DSC and this too was a facet of the 3C event i.e. to provide attendees with background information such that they can best capitalize on the outputs from the DSC.

A survey of elected officials in New Zealand showed that, from their perspective, the most important factors preventing them from planning for adaptation to climate change were:

1. Lack of locally specific information.
2. Not a high priority in the community they were responsible for.
3. Budget constraints.
4. Lack of political will.

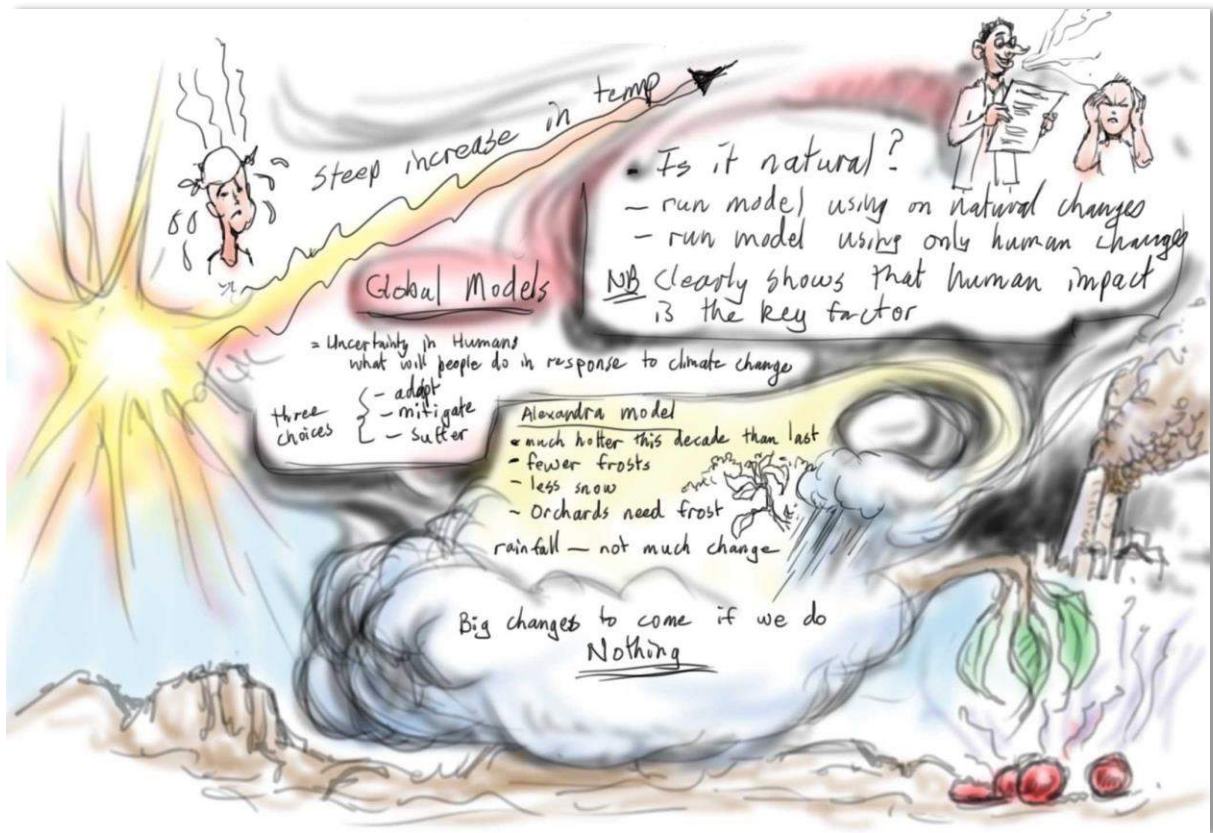
One of the goals of the DSC in supporting the 3C event was to address items 2 and 4 in this list. When officials were asked to assess what they considered as 'big hurdles' to implementing adaptation to climate change, the top three were:

1. Budget constraints (>50% of respondents).
2. Lack of public awareness or demand to take action (>50% of respondents).
3. Lack of perceived importance to the public (~45% of respondents).

Again, the DSC, through the 3C event, sought to address issues of lack of public awareness and lack of perceived importance to the public.

It was made clear to attendees that they play a key role in informing the research that is done in the DSC, the impact that the DSC will have, and in the action that our local government will take on climate change.

Section 2: Climate futures for Central Otago and the underlying science (Greg Bodeker)



The IPCC 5th assessment report provided unequivocal evidence that the annual mean global mean temperature is increasing - each decade for the last three decades has, on average, been about 0.2°C warmer than the previous decade. Earth's surface is now, on average, about 0.85°C warmer than in

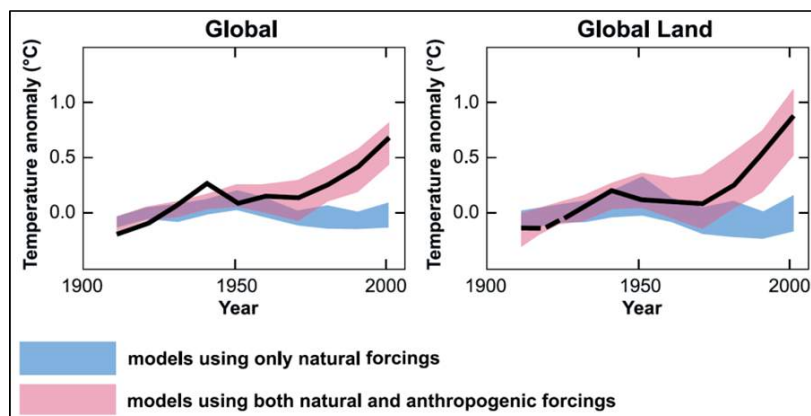


Figure 1: Observed and modelled changes in global mean surface temperature since 1850 over the whole globe (left) and over land only (right). Model simulations considering only natural factors affecting climate are shown in blue while model simulations also taking anthropogenic activities into account are shown in red.

the late 19th century. 2014 was the warmest year globally since comprehensive records began in about 1880 and 14 out of the 15 warmest years ever recorded have happened since 2000.

Increases in global average surface temperature since the 1950s can only be explained when increases in atmospheric greenhouse gas (GHG) concentrations are accounted for (see **Figure 1**); changes in solar

output, together with volcanic eruptions, would have caused a small cooling of the climate over that period. This differs from conditions during the 'medieval warm period' when some regions were as warm as in the mid-to-late 20th century. What we're seeing now is a trend where the entire globe is becoming warmer, not just isolated spots.

Atmosphere Ocean Global Climate Models encapsulate our understanding of the process that affect the climate system and provide the best possible means of simulating expected future changes in climate. Such models are built on a deep understanding of the physics of the climate system. They are computationally demanding and therefore expensive to run.

The IPCC 5th assessment report stated that the Earth in 2100 is likely to be between 0.3 and 4.8°C warmer than it was in the late 20th century. This apparently rather large range in expected changes in global mean surface temperature is not the result of uncertainties in the models or uncertainties in our knowledge of the climate system. Rather it is the result of our uncertainty in humans. Future increases in global mean surface temperatures depend largely on what we choose to do now - where our energy and food comes from, the type of buildings we live in, and the cars we drive. Essentially we have three options (1) adapt, (2) mitigate, or (3) suffer.

Bodeker Scientific has developed a tool that allows people to easily explore expected changes in climate at their location. That tool is available at <http://futureextremes.cci.org.nz/>. The user can select their location, the climate variable they are interested in (hot days, frosts, hot spells, cold spells),

and the GHG emissions scenario they want to explore (RCP2.6 = low GHG emissions; RCP4.5 = medium GHG emissions; RCP8.5 = high GHG emissions). Results for Alexandra, for RCP8.5, are shown in **Figure 2**. The likelihood of occurrence of different daily maximum temperatures (upper panel) and daily minimum temperatures (lower panel) are shown for the first decade (blue) and last decade (red) of this century. Over 2091-2100, on about 105 days of each year, the daily maximum temperature is projected to exceed 25°C in contrast to about 45 days each year over 2001-2010. Over 2091-2100, on about 40 days of each year, the daily maximum temperature is projected to exceed 30°C in contrast to about 10 days each year over 2001-2010. Over 2091-2100, on about 90 days of each year, the daily minimum temperature is projected to be below 2°C in contrast to about 130 days each year over 2001-2010. Over 2091-2100, on about 50 days of each year, the daily minimum temperature is projected to be below 0°C in contrast to about 85 days each year over 2001-2010.

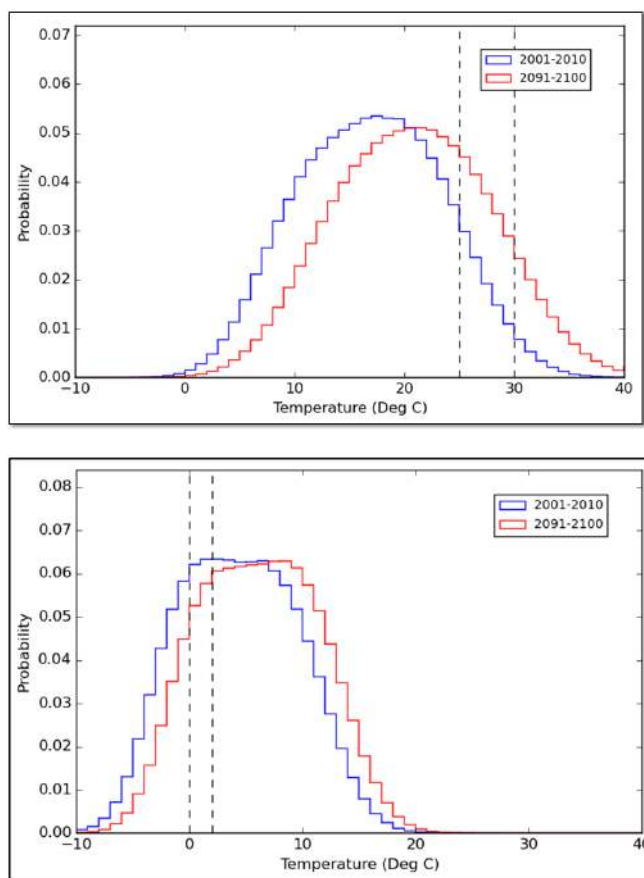


Figure 2: Changes in the frequency of hot days (upper panel) and frosts (lower panel) through the 21st century for Alexandra under the RCP8.5 GHG emissions scenario.

While changes in rainfall over Alexandra are expected to be minor over the coming century, changes in rainfall over the larger catchment of the Clutha River may be more significant - these changes have not yet been thoroughly investigated.

Figure 3 shows how the number of days in each year when daily maximum temperatures exceed 25°C is expected to change from 2015 to 2100 under the RCP8.5 GHG emissions scenario. Large regions of the country will experience significant increases in days with high maximum temperatures.

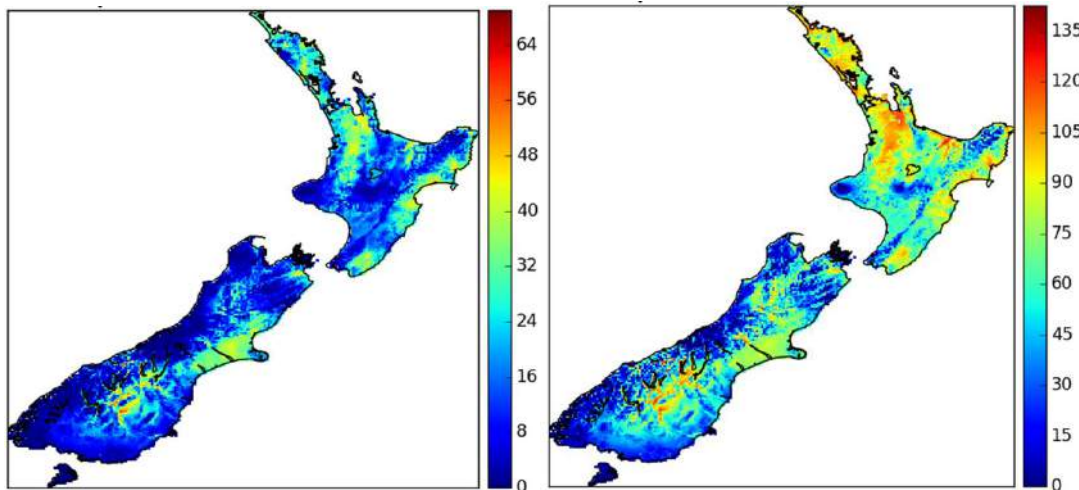


Figure 3: The number of days when daily maximum temperatures are expected to exceed 25°C in 2015 (left) and in 2100 (right) and the RCP8.5 greenhouse gas emissions scenario. Note the change in colour scale.

Intergovernmental Panel on Climate Change

The Intergovernmental Panel on Climate Change (IPCC) is a scientific intergovernmental body operating under the auspices of the United Nations. The IPCC was established at the request of the members of the United Nations. It was first established in 1988 by two United Nations organizations, the World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP), and later endorsed by the United Nations General Assembly. The IPCC produces reports that support the United Nations Framework Convention on Climate Change (UNFCCC), which is the main international treaty on climate change. IPCC reports cover the scientific, technical and socio-economic information relevant to understanding the scientific basis of risk of human-induced climate change, its potential impacts and options for adaptation and mitigation.

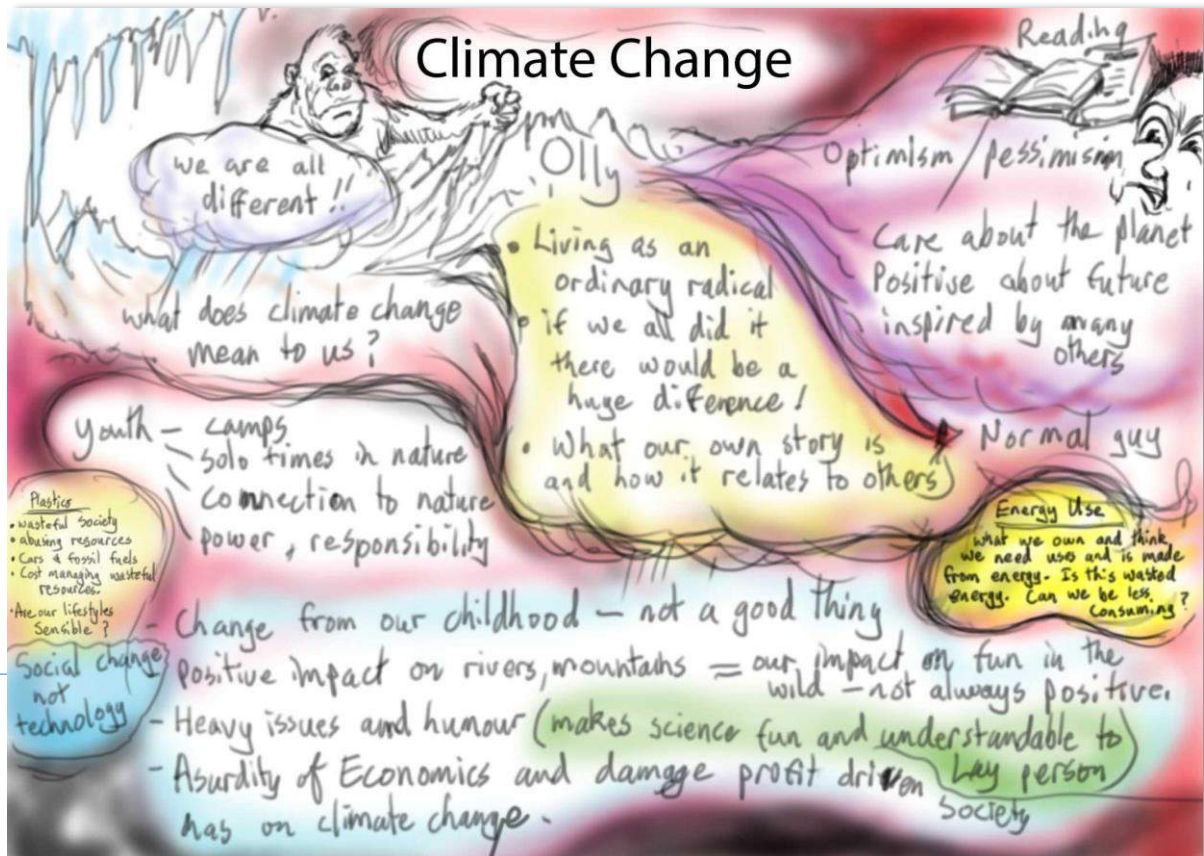
For the year ending 31 December 2014, total contributions by member states to the operation of the IPCC was NZ\$7.75 million¹ which covered a budget of just over NZ\$4 million in salaries and employee benefits. Total funding of research by IPCC in 2014, and in all previous years, was NZ\$0. IPCC has 10 full-time staff in its secretariat at the WMO in Geneva, plus a few staff in four technical support units that help the chairs of the three IPCC working groups and the national greenhouse gas inventories group.

¹Values in Swiss francs were converted to NZ\$ using the exchange rate on 8 November 2015.

Section 3. Climate Change - Response for 'normal' people

(Ollie Yeoman)

Ollie Yeoman was invited by the organisers of the 3C event to give a personal account of a response to the challenges of climate change and sustainability. This section summarizes the talk that Ollie gave to the meeting. Ollie began by relating the importance of sharing our interconnected stories and what had prompted him to trying doing something in his life to reduce his impact on the environment.



Ollie considers himself to be a fairly normal person. His one claim to fame is winning the Alexandra Blossom Festival Around the Clock Race this year. He is a husband, primary school teacher, son, outdoor enthusiast, and a new dad. He is not a scientist, an eco-warrior, or famous. As such, he came to the event to share his story. He hoped that the audience could relate to at least part of his story and hoped that others would be able to share their stories during the course of the evening as well. Ollie shared *why* he is trying to reduce his impact on the world, *what* the practical things are that he is doing, and his quest to gain perspective on what is 'normal'. For him, climate change is just one part of the ecological crisis that is occurring worldwide. He therefore made it clear that he is trying to live his life in a way that reduces not only climate change but environmental degradation as a whole.

The environment has always been important to Ollie and has shaped who he is as a person. He grew up in a family for whom the outdoors was important and therefore spent a lot of time tramping and boating. One of his most vivid memories was of a multi-week road trip through New Zealand with the entire family in a van. In addition to spending time in the outdoors with his family, he also developed

a relationship with the wilderness through his youth group. As a young person, some of his favourite memories were of having fun exploring the natural world with his friends. Time spent with the youth group also taught him the value of spending time by himself in the wilderness, and the deep level of connectedness and self-reflection that this time could bring him.

As a young adult, Ollie dove head first into adventure sports - climbing mountains and dropping down white-water rivers. He loved being out there and he loved the adrenalin. As he continued to spend more time in the outdoors, and continued to grow into adulthood, Ollie started to take more notice of the smaller things. The alpine daisies, robins, paryphanta snails, and colourful slugs. These details started to become an important reason for him spending time in the outdoors. His love of the winter environment also grew. He took more notice of icicles, wind carved cornices, and sastrugi. The effect of climate change on these phenomena in the natural world that he loved so deeply moved him. Some people may delight at the idea of a less frosty Alexandra, but Ollie would miss it. Those frosty cold mornings, followed by sunny clear days, are special to him.

Many books have influenced Ollie's thinking. One of these is 'The Irresistible Revolution' by Shane Claiborne. He speaks of 'living as an ordinary radical'; the power of what happens when many people in their ordinary lives choose to live in a way that some may consider radical. This really resonated with Ollie, and gave him hope that what he does really does make a positive difference in the world. Joe Bennett's book 'Where Underpants Come From' has made Ollie think twice about buying cheap items. It has made him consider if the item he is considering purchasing could really be made in a fair and environmentally aware way for the price he has paid for it. 'The Omnivore's Dilemma' by Michael Pollan has made Ollie reconsider what he eats, while 'The Shock Doctrine' by Naomi Klein educated him on the way politics influences capitalist policy. The book 'Enough' by John Naish shed light on the human instincts behind compulsive buying, helping Ollie curb this obsession in myself. Being a Christian, one of the most influential books in Ollie's life is the Holy Bible. It has reminded him that all creation is sacred and that it is his responsibility to care for it. All in all, these books have shaped and transformed Ollie's thinking. They have helped him understand the root causes of the symptoms he sees in himself and the world, as well as understanding what 'norms' are sensible and which are not.

Being a primary school teacher has opened Ollie's eyes to how fast norms can change. Recently he told his class about how when he was in high school he delivered milk in glass bottles to people's homes. They laughed at him and couldn't believe that milk was delivered in such a way only 15 years ago. Another change in norms that he finds very wasteful is single use plastic bags. They have only been commonly used since the 1960's, but today many people cannot conceive of shopping without them. Similarly with regard to motor cars - people put lots of money into buying, warranting, registering, fixing, refuelling, and building our cities around these carbon emitting death traps. Conversely, there is the cheap, safer, and healthier transport option of the bicycle. Alexandra is the perfect place to cycle - everything is within a few kilometres, it is flat, and the weather is fine. Ollie believes there is little excuse for driving within the town. In other parts of the western world, such as Denmark, cycling is a very normal form of commuting, where cargo bikes effectively carry large loads. A shop in Wanaka has recently started selling such bikes. Ollie hopes they catch on. Ollie says of himself that he is by no means perfect - he does own a private vehicle, but he tries to limit its use and to commute as much as possible via foot or bicycle. The piece of driving that Ollie has the most difficulty giving up is going into the outdoors. The wilderness has shaped who he is, but to immerse himself in the outdoors he has to use fossil fuels to get there. It is an issue both Ollie and his father have had trouble coming to terms with. Every time Ollie refuels his car he feels the guilt and stupidity of what he is doing. He looks forward to when he can take a bus to Glenorchy or the Matukituki.

Another norm Ollie has trouble justifying is the culture around cell phone upgrades. He raised the question: Just because your contract offers you a new phone, should you take it? If your phone breaks, then by all means replace it, but if it is still working properly, do you really need a new one? For Ollie, one of the hardest things to control his buying of is outdoor equipment. He doesn't really care about cell phones or nice cars. But he does love new kayaks and mountain bikes. He has posed the question to himself of "Are all of the resources going into that new toy worth buying it? Or can I continue to use the older model I already own?"

Ollie talked about how 'Stuff' makes up a significant amount of our personal energy use - on average around 48% (see **Figure 4**). As such, reducing the amount of stuff you own is one valid way to reduce energy consumption and thus carbon footprint. A related issue is to remember that the whole lifecycle of an item uses energy. Recently, Ollie bought a TV from the Salvation Army for \$5. When he brought it home and tried to watch a rowing race on it he found it was hard to see if it was a 4 or 8 person team. As such, he brought it to the tip and asked what the correct way of disposing of it was. He was told it would cost him \$50. Ollie's \$5 TV had just turned into a \$55 TV.

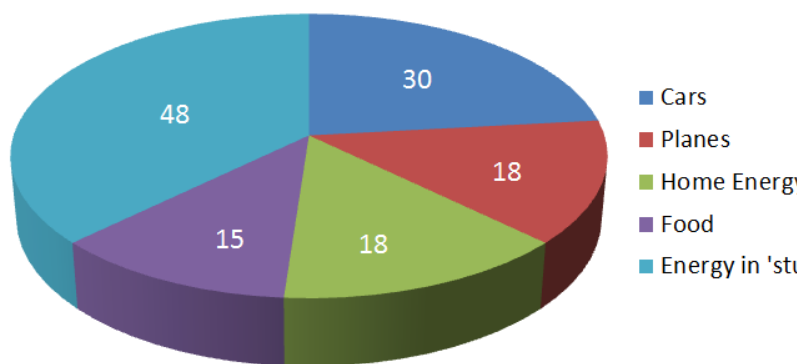


Figure 4: Personal energy use (in kWh/person/day) including imported embodied energy and energy spent on overseas travel - data from Phil Scadden and Oliver Bruce.

Having a child has opened Ollie's eyes to how many throw away and single purpose items are sold in regards to babies. Ollie and his partner use washable nappies. He says he couldn't live with himself if he was throwing away over 2000 disposable nappies a year! But he likes cotton cloths even better - as they have plenty of uses after his son no longer needs them.

Part of Ollie's job is being an Enviroschools teacher. He finds this incredibly rewarding as he gets to work with children to come up with initiatives to reduce their impact on the environment. The school where Ollie teaches has changed their rubbish collection system so that the recycling bin is larger than the rubbish bin. In addition, the children have created a fabulous food garden. In a few months they turned a piece of grass into a productive garden.

Can we do it? Ollie truly believes that we can. Becoming a father completely changed his perspective on life. Over the last couple of months he has adapted his life and now he can't see another way of living. Ollie pointed out that a lot of us are parents and in becoming parents have made massive changes in our lives. If we can be parents we can also change our lives to reduce our environmental impact.

Will what we do make a difference? Of this Ollie cannot be certain. But he does believe it is his responsibility to live an environmentally conscious life, regardless.

Section 4: Outcomes of Discussion Theme 1

The forum was provided with the following question:

Well, just how certain are we that this is an issue anyway? Isn't there so much uncertainty around climate change that we could and should continue with business as usual? And won't it cost too much to do anything anyway?

The responses have been summarized in the following three sub-sections:

1. Is climate change an issue?
2. What can we do about climate change? / Should we continue with business as usual?
3. What is the cost of action on climate change?

1) Is climate change an issue?

16 of the 18 groups declared unconditionally that climate change was a serious issue; one group went so far as to call it an overwhelming issue. Two out of the 16 groups specifically brought up a concern that climate change is an important issue, but others may not think the same. While the last two groups were not convinced that the science supports the assertion that humans are contributing to changes in climate, both groups still supported action on climate change. They felt that in the face of uncertainty it was more prudent to act than not act. Furthermore, irrespective of whether climate change is anthropogenic, they felt that action was needed because the issue of finite resources must be tackled regardless. Two groups specifically condemned the government's response to climate change. Several groups commented that they have felt the effects of climate change in their own lives such as witnessing the changes in the size of the Franz Josef Glacier and less frequent opportunities for skating on the Lower Manorburn Dam.

2) What can we do about it? / Should we continue with business as usual?

The general sentiment was that we cannot afford to continue with business as usual. Reasons given for this included concern about their personal legacy and that of their generation (4 groups), concern with the nature of capitalism (2 groups), and concern with the finite nature of our natural resources (4 groups). The participants stated the desire to effect both personal and societal change. While three groups felt that small changes are important, many groups felt that the problem was too large for individuals to make a change. They focused on the need to create a groundswell to lobby for change (5 groups), with requests to have the global community (2 groups), the government (4 groups) and corporate (1 group) involvement. The need for change was best articulated when one group wrote '[If we do not change voluntarily], change will be forced upon us like the scarcity of the 1930s or war time'

3). What is the cost of action?

All of the groups agreed that the cost of action was not too large. One group did not think that action on climate change needed to cost any more than business as usual. Six of the 18 groups believed that inaction would cost far more than action on climate change. There was a distinct sense of urgency on this issue; four of the groups expressed the opinion that delaying action now will only increase the cost of inevitable action. For some, cost was not a consideration; four groups specifically cited their legacy and said that we have a responsibility to act regardless of cost. One group wrote about the cost of inaction not simply being monetary; it affects the quality and joys of life such as our Central Otago landscapes and biodiversity.

Section 5: Outcomes of Discussion Theme 2

The forum was provided with the following question:

Whether or not climate change is an issue, if people generally perceive it to be so it could affect the Central Otago community e.g. fewer visitors and tourists as a result of 'climate guilt', perhaps an unwillingness to purchase produce from this region as a result of their high 'food miles'. What, if anything, can we as a community do to mitigate those impacts? What strengths can we capitalize on? What opportunities can we create?

The outcome of the discussions around theme 2 related to 5 distinct areas of interest:

1. Food and products
2. Transport of people and goods
3. Sustainable energy
4. Tourism and migration
5. Generic

1) Food and products

There was a large consensus amongst the participants that the community should focus on eating locally and seasonally grown food and that supermarkets should better support the selling of locally grown food. However, no suggestions were provided on how supermarkets should be encouraged to better support the selling of locally grown food. Alexandra as a town, and Central Otago as a community, should work towards being more self-sufficient and less reliant on food/products that have a high carbon footprint. Some participants felt that we should reduce our export rates of stock and food to other countries to keep most of it for the local consumers which in turn would help to reduce carbon footprint. The market viability of such a stance was not discussed however. If food and products have to be transported around the country, the community/New Zealanders should improve the logistics and distribution of food/products to reduce the food miles/carbon footprint. Even if we could all agree on eating and buying locally produced products there were some concerns about the energy and water that is used in the food production and that information regarding the energy and water used to produce food and consumer products is not readily available. Thoughts need to be put into on how to reduce food waste; which goes together with finding ways to discourage people of buying too much food. In general the attendees agreed that local businesses need to be supported and promoted and that the community should buy locally grown food but at the same time the focus of food producers should be on high quality food products. A few people suggested that it should be made more obvious to consumers what the true carbon costs of a product/food are. However, no suggestions were given as to how such a product/food carbon content should be calculated, who should be responsible for conducting such calculations, and how the costs for implementing such a system should be covered. If food does need to be imported into Central Otago from outside of the region, efforts should be made to reducing packaging associated with the transport of those products.

In addition to increasing support for growing organic food locally, the suggestion was made that there should be compulsory certification of non-organic farmers including the requirement that the chemicals used during the cultivation of a crop should be listed.

The majority of the participants were was in favour of establishing a regular formal barter (swap/exchange) system for food for the Central Otago community to mitigate waste. Social media

could be used to promote and facilitate such a barter system. A few participants saw the community garden as one of the strengths of Alexandra.



Figure 5: MAD4CO 'Swap table' during Thyme festival. Courtesy of Sophie Mander

A suggestion was made that to minimize the use of fertilisers, and their intrinsic fossil fuel content, more use should be made of GPS systems when fertilisers are applied. Water was recognized as an important resource requiring additional attention. Some other thoughts of the community included: (i) the farming community should make better use of water resources e.g. by implementing more efficient

irrigation systems, (ii) despite the abundance of water in our region we need to think about conserving water, (iii) implementing dual water supply with high quality drinking water and greywater for garden irrigation and (iv) the community should be made aware of how much water has been used to produce food products. However, no suggestions were presented on how this might be applied and who would be responsible for providing this kind of information. The participants felt that irrigation companies should adapt irrigation supply by considering seasonal forecasts in irrigation water availability, e.g. reducing irrigation water quotas early in the season in El Nino summers to ensure that water is available later in the season.

2) Transport of people and goods

The majority of the attendees agreed that the Central Otago community needs to better utilise, and promote public transport systems in and out of Central Otago; where green solutions for public transport should be investigated. However, no examples for what a 'green solution' could look like were provided or discussed. While some attendees expressed the view that a train service should be reinstated in Central Otago, the impediments to such a development i.e. negative market forces, were not discussed. Besides developing a better public transport system, participants also discussed opportunities for individuals to minimize their transport-related impacts on the environment by e.g.



(i) driving more fuel efficient cars, (ii) using electric bikes and promoting their use to people who wouldn't normally use a bike, (iii) walking or cycling as much as possible, and (iv) to use car sharing opportunities. To encourage people/families to cycle more, it was recommended that the community/council needs to expand and promote cycle trails and encourage the use of bicycles as a way to get around town. Making bicycles available for use within the 50km zone of Alexandra for a gold coin donation per use could be considered.

3) Sustainable energy

In general the attendees felt that sustainable energy was a strength that Central Otago can capitalize on. There was widespread agreement that the council should do what it can to promote the use of renewable/efficient energy systems in Central Otago. The community should be incentivised to make more use of energy generated from solar, wind, and water power, with a strong emphasis on solar energy. One discussion group even suggested that a community solar power station should be created. People felt that a pricing system for solar energy needs to reflect the true benefits of using solar energy instead of other energy sources. Surprisingly, there was only one discussion group that suggested that the insulation of homes in Central Otago need to be improved.

4) Tourism and migration

There was some disagreement as to whether tourism in Central Otago should be encouraged or discouraged. While most attendees were in favour of promoting Central Otago as a tourist destination, others were less convinced that tourists are good for Central Otago and would prefer to see fewer tourists in this region. One concern raised was that tourists are wasteful. Suggestions for increasing the number of tourists visiting Central Otago included: (i) promote 'green' tourism (cycling trails rather than heli-skiing; walking tours rather than parachuting), (ii) promote outdoor adventure tourism and active holidays (walking, kayaking, cycling), (iii) generate a hut network for back-country skiing and not only promote heli/downhill skiing), (iv) promote Central Otago as a preferable destination for



Figure 6: Viaduct along the Central Otago Rail Trail

family holidays, (v) promote Central Otago as a destination for longer, less expensive holidays in contrast to the short and expensive style of holidaying e.g. in Queenstown and (v) residents of Central Otago should be encouraged to actively participate more in encouraging tourists to the region e.g. via programmes such as couch-surfing¹, warmshowers² and WOOFING³. There was a strong indication of the

¹ <https://www.couchsurfing.com>

² <https://www.warmshowers.org>

³ e.g. <http://www.woof.co.nz/>

need to promote Central Otago as a destination for domestic tourism, instead of focussing on international tourists. The suggestion was made that consideration needs to be given as to how to offset the carbon footprint of tourists coming to Central Otago. One suggestion was that the council could implement a programme of providing saplings that could be planted by tourists on CODC owned land with appropriate carbon sink certification/accreditation. This would turn a potential climate related threat (reduction in tourist numbers as a result of climate guilt) into a tourist marketing opportunity for Central Otago.

In general, the participants agreed that faster internet connectivity would attract more professionals to base themselves in Central Otago. Furthermore, the participants felt that more needs to be done to promote the unique lifestyle that Central Otago has to offer to professionals who are able to work remotely. It was felt that the younger generation in particular should be attracted to move to Central Otago.

5) Generic

The discussion also included some generic comments and suggestions which are briefly summarized below.

Attendees wanted to see the council encouraging more native planting and in particular riparian native planting of waterways as well as the planting of more heat tolerant trees. Attendees agreed that the clean/green environment that New Zealand is so often promoting needs to be maintained, including maintaining air and water quality, and that we should aim for the true '100% pure' image with a 100% carbon neutral economy. Some people also felt that Central Otago relies too much on irrigation and that irrigation is changing the iconic landscape of Central Otago; dry grass is what defines Central Otago and not irrigated dairy paddocks.

The low population density of Central Otago was seen as a strength of the region but, on the other hand, could lead to inhabitants concluding that we are so few that we don't need to make a change to make a difference. Attendees felt that there is little motivation to reduce carbon dioxide emissions until the effects of climate change are felt by the individual. Another idea that was proposed was the construction of a processing plant for rabbits and an associated idea to make rabbit shooting a tourist attraction in Central Otago.

The 'Grow Otago' utility (<http://growotago.orc.govt.nz/>) was brought to the attention of the participants and it was suggested that this tool could be used to better guide the use of land and resources in Otago. 'Grow Otago' is a collection of comprehensive maps of Otago's climate and soils. It provides information that can be used to improve existing land uses, develop new high value land-based activities and foster regional economic development by optimising the use of Otago's varied climate and soils. It should be noted however that the 'Grow Otago' utility is not being maintained by the Otago Regional Council (ORC).



Attendees felt that the community in Central Otago is well placed to provide an example to New Zealand of sustainable living and how to support the environment. We should not be afraid of leading the way. The Central Otago community should focus not only on things that happen/affect New Zealand directly but should also be cognizant of global developments that affect our community.

Furthermore, the participants felt that education and learning opportunities related to sustainable living are important, especially the education of our children/grandchildren.

Section 6: Outcomes of Discussion Theme 3

The forum was provided with the following question:

There are already many threats to the well-being of businesses in Central Otago e.g. increasing prevalence of online shopping. Encouraging reductions in consumption, as many climate activists propose, would be a further threat to business viability. What can we do to improve the resilience of businesses in Central Otago? What can we do to encourage the transition of existing businesses, or the establishment of new businesses, that will meet the needs of the Central Otago community if a shift to a more sustainable lifestyle is the goal?

1. Improving resilience of businesses in Central Otago

The most common suggestion (from 10 of the 18 discussion groups) was to encourage people to support their local businesses. The second most common suggestion (from 7 discussion groups) was that to outcompete online shopping, local businesses need to focus on their service, including excellent product knowledge, to be able to give customers a unique and enjoyable shopping experience they would not get online. Seven of the discussion groups thought that local businesses, instead solely of solely trying to compete with online retailers, should also take advantage of the opportunity to sell their products online. Another common idea was to use social media and other means to research what the community and tourists want, and to tailor businesses to these demands. Likewise, many discussion groups suggested that businesses should work together to support each other through sharing of resources such as buildings, starting a business network, and advertising each other's products.



Increased research into climate change resilient crops, disease/pest prevention, and what crops will best be suited for our land in the future, was mentioned by 4 discussion groups. The idea of Central Otago producing and distributing its own electricity from renewable sources (solar, wind, hydro) was a recurring theme. In addition, many discussion groups believed that resilience could be improved by changing the way the economy itself worked - creating a sustainable or resilient economy as opposed to a growth

economy. Likewise, there was support of businesses moving away from a profit model and towards one that also captures their social and environmental footprint. It is also important to note that not

everyone thought that change is bad - three of the discussion groups believed that local businesses need to be adaptive and willing to change and that this will be positive for the region. Other ideas suggested were:

- Make sure that purchasing over the internet is appropriately taxed.
- Businesses should offer online price matching.
- Have items purchased online collected at the closest retailer instead of being delivered to the buyer's door.
- Assist the elderly and computer illiterate with buying online.
- Focus on quality not quantity.
- Encourage bulk buying.
- Reduce packaging of products.
- Encourage consumers to support ethical and environmentally sound businesses.

2. Transitioning/establishing new businesses to meet the changing needs of the community

The answers fell into three general categories: 1) how to attract new businesses, 2) how to improve transportation and 3) ideas for new businesses. While some discussion groups believe that tourism is going to be important for the future of the Central Otago economy, others believe we should focus on the needs of residents.

Many discussion groups thought that Central Otago should use its location and lifestyle to sell itself to entrepreneurs, and, in order to achieve that, the area would need to provide more affordable housing (new and rental) and to bring in Ultra Fast Broadband. Other suggestions to support the development of new businesses in the area were:

- Reduce red tape e.g. compliance regulations.
- Support the infrastructure that underpins economic production such as large-scale irrigation water storage.
- A mentoring scheme for new businesses.
- Have a market day so that new businesses can trial their products.
- Strengthen lobbying for Central Otago interests.
- Increase car parking for customers.
- Increase the number of business premises available.
- Create a long-term plan around sustainability.

Six of the 18 discussion groups thought that improving low-carbon transport options within Central Otago, as well as to Dunedin and Queenstown, was important to supporting businesses. The most common suggestion was a carpooling network. Other suggestions were:

- Better bicycle commuting infrastructure.
- Electric vehicle charging stations.
- Put the train back on the railroad to Dunedin.

Most of the discussion groups believed that there are new business opportunities to be had in the region and that we should expand into new markets. There were many varied ideas in regards to new business ideas for the Central Otago region. Most involved transitioning away from primary production into value added products. These ideas included:

- Creating alcoholic beverages such as cider and brandy from waste fruit.
- Canning and drying local fruit.
- Using wilding pines.

- Services for the elderly.
- Using and increasing our potential for research.
- A perennial nursery of climate tolerant natives.
- Higher education e.g. an English Language School, Outdoor Adventure School, Sustainable Learning Centre.
- Develop the area as an IT centre.
- Bike and baby trailer factory.
- Research new protein sources such as sheep's wool and insects.
- Encourage tourism in adventure sports such as mountain biking, fishing and cross country skiing.

Section 7: Outcomes of Discussion Theme 4

The forum was provided with the following question:

Changes to the climate of Central Otago are predicted by climate models for the rest of the 21st Century (and beyond). What can and should we be doing to prepare for those changes? What weaknesses in Central Otago society, fauna, flora, and environment might be exposed by coming changes in climate? Are there specific actions we can consider taking to mitigate those weaknesses? Might some changes in climate actually create new opportunities? What can we do now to capitalize on those opportunities? What information is missing that might guide people's actions? What information gaps might the Deep South Challenge aim to fill?

The response of the participants to this question can be divided into three distinct categories.

1. Threats
2. Opportunities
3. Specific actions

Not every group provided information on each of these categories. More responses were received regarding direct actions than perceived threats and opportunities; however there were significant responses for each category. Since it was beyond the scope of the forum and this report to address the values and challenges of each response, what is provided below is purely a descriptive summary to document the perception of the forum's attendees.

1. Threats

The direct effects of climate change were considered a threat to the region as they may affect quality of life and the tourism industry. Several groups were concerned that the increasing prevalence of wildfires, increasing heat, and extreme weather events may impact the Central Otago lifestyle. As one group wrote, "Central is going to be very hot and people may not want to live here anymore." In addition, many groups were concerned with the viability of the ski industry in the area, the loss of which would impact tourism and recreation. There was also the sentiment that "no community can be immune from the major global responses to climate change which are inevitable - i.e. major migration."



In addition to the direct effects, many participants were concerned that the effects of climate change would negatively impact biodiversity. There were concerns that increased temperatures and aridity will affect the quality of Central Otago waterways. This would occur with increased irrigation use and increased water temperatures leading to lower flows and increased eutrophication. There was also significant concern that changes in climate could increase the problems posed by better adapted invasive species, leading to more pests and pest problems. The effects focused on loss of

biodiversity and increased insect pest challenges. Central Otago orchards may also be affected with the loss of beneficial frosts which also control pest populations.

Many groups suggested that changes in climate would result in increased resource use. Similar to the concerns over the water quality in rivers, the increased need for irrigation was raised as a threat to primary production in the region. In addition, the follow on effects from the increased demand for water were raised as threats. These included increased desertification, soil loss, and salination of productive soils. There was a concern that climate change would further complicate the balance between the environmental and societal needs for resources. Finally, the increase in temperature was raised as a threat as it would increase the use of power for air conditioning.



Several groups identified things that they felt threatened the Central Otago community's ability to act and adapt to a changing climate. These are listed below with minimal editing:

- People lack respect for climate and community.
- It is difficult to contemplate [the] challenges with so many unforeseen factors.
- [We have an] inability and unwillingness to look too far beyond our own needs.

2. Opportunities

The outcomes were not all negative; many groups identified potential opportunities posed by climate change. The majority (4 of 13) of the potential opportunities were based on the possibility that climate change might increase primary productivity either through new crops being viable in Central Otago or as a result of a longer growing season. The second most common response (3 of 13) focused on changes in energy use or energy production. Increased winter temperatures might require less heating and climate change might increase the potential to use solar energy generation in Central Otago. Another potential opportunity that was suggested was that displacement of populations in coastal areas as a result of sea level change may increase the population of Central Otago and that increased temperatures may be a tourism draw. Finally, one group suggested that the changes required by climate change could be beneficial as it provides an opportunity to solve other social problems.

3. Actions

The vast majority of the responses recorded for this theme were 100 specific actions that could be taken to respond to climate change. It should be noted that the forum did not have sufficient time for a full discussion of the feasibility, cost, and effectiveness of the specific actions. With the goal of being as inclusive as possible, these actions are recorded here with minimal editing. The most common recurrent suggestion (21 responses) was actions relating to water. These were mostly a call

for increased water use efficiency (11 responses) including specific calls for grey water recycling, pricing water for all (although there was disagreement on this topic), and reducing water demands by agriculture. There were also calls for increased water storage (3 responses) and further enforcement and larger penalties for breaching water quality and quantity regulations (3 responses). Other specific proposals included:

- Making more use of the Clutha River for irrigation and recreation.
- The Central Otago Community should take control of their water resources to ensure that they are never sold off or privatized.

The second most common theme was increased research and monitoring with regards to climate change (15 responses). Five of these responses were simply a call for more environmental monitoring. There were also four requests to research new crops for the area that will thrive in a warmer Central Otago. The remainder of the requests for research are listed below:

- [What are the] effects of climate change on local flora and fauna?
- How will water availability change?
- Research on dryland plants.
- [What are] the effects of intensification of land use?
- [What are the] effects [of climate change] on tussock- [it is] important to our water storage?
- Identify the human carrying capacity of Central Otago.

There was no time at the forum to identify what research exists, what monitoring is occurring, and the relevance and possibility of any particular research topic.

The third most common recurrent suggestion was a call for climate education (14 responses). For the most part, people wanted the information and data about climate change to be more readily available and comprehensible by the “common man”. Specific proposals included:

- Embed climate change into all levels of education
- Get more art and artists on board to explain climate change.
- Schools could do basic research and monitoring.



There was also a request to respond to misinformation (prevent it) and to increase the general science literacy of the community.

There are two additional common threads that developed. The first is to use more drought tolerant plants and to increase plantings (4 responses) and the second was a call for more local renewable energy generation (3 responses). Specifically, one action that was suggested was to have community ownership of

power generation. The remainder of the responses do not reiterate previous suggestions. These responses are reproduced, almost verbatim, below:

- Make [a] building code that is unique to our situation.
- Reduce methane from animals by changing their diets (dry shrubby land).
- Increase civil defence readiness.
- Reduce the use of palm supplements in dairy feed.
- Improve house insulation, perhaps by providing subsidies.
- Adopt home building techniques from hot/dry climates.

- Reward organic and "bio" farming.
- CODC credits or rate cuts to "bio" and organic orchards, farms, and businesses.
- Rethink corporate foreign farming.
- Rethink dairying in Central Otago.
- No Dairying.
- Resist dairy conversions
- Introduce stock limits.
- Limit family size.
- A CO₂ budget for farms and families.
- Change CODC building rules to require carbon neutral buildings.
- No plastic bottles-all glass with deposit.
- Prices should reflect costs of the whole product life.
- Ban on one-use bags (nationally).
- Build bike lanes.
- Build underground cave network and houses (to deal with heat).
- Shared power generation in small communities.
- Share infrastructure i.e. food and tools.
- Green waste utilisation.
- Increase public transport.
- Add charging stations for electric cars.
- Increased flood protection.
- Aging infrastructure needs to fold into the costs - and into future funding.
- Deep South Challenge and scientists should lobby politicians to do the right thing.
- Strengthen community networks.
- Locally designed and produced sunglasses.
- Diversify our primary industries to become self-sustainable and export surplus.
- Be good to bees.
- Control wilding pines.
- Don't 'geoengineer' as the response of choice.
- Set up a seed bank.
- Stop inviting industry just because they bring money.
- Create products from our excesses (i.e. rabbit skin, wilding pine products, merino) and sell them online.
- Create plantings that reduce fire risk.
- Create a "shake out" like campaign for climate change.
- Diversify industry.
- Generate performance data on household energy use.
- Invest in science.
- Support community recycling and composting programmes.
- Turn off the economic decision making process.

Section 8: Outcomes of Discussion Theme 5

The forum was provided with the following question:

Where are we as a community lacking information that challenges our ability to take action? What are the impediments to taking action? Are there policies (either national or regional) that discourage action? Does our community want to know more about impacts and implications, more channels to information, greater connectivity and understanding about climate change policies etc.? What can the Deep South Challenge do for us?

The comments and suggestions listed below reflect the ideas presented by the attendees with little or no censorship implemented by the authors. Where comments lacked clarity to the extent that their meaning could not be understood, these were excluded from the summary. Furthermore, comments that were deemed to be outside of the scope of the meeting and hence this report, were also excluded from the summary below. The authors recognise that many of the suggestions listed below on how the Deep South Challenge might help, are not economically and/or financially feasible.

The first two questions of this discussion theme, viz.

- Where are we as a community lacking information that challenges our ability to take action?
- What are the impediments to taking action?...

are interconnected and were therefore answered jointly by the participants. The discussion around these two questions was focussed on two main areas that were recognized by the majority of the participants i.e. (1) lack of information and (2) apathy and lack of interest in the community.

1. Lack of information and media to provide information

The majority of the participants felt that they are not provided with enough information on whether climate change is man-made or naturally caused, with the result that there is still some scepticism as to whether climate change is real. The feeling was that there is too much conflicting and/or misdirected information in the media and community which hampers taking action by the community. The lack of information about climate change and its effects was seen as a reason for why people might be doubtful or sceptical of the need for action. The participants communicated that there is a clear need for a decent public media to provide information about climate change and its effect in simple phrases and pictures that show and explain what the consequences of our actions, or lack of action, will be. Another area where participants felt there was a dearth of information is about water and waste-water. It was mentioned that the community would like to have more information about water quality, water sources and the use of water by the community.

2. Apathy and lack of interest

The majority of the participants felt that unless people in our community are directly affected by some change, they are unlikely to proactively respond to such changes. The view was expressed that the community is more focussed on sports than the big issues such as climate change and its impacts. It was recognized that this apathy acts as an impediment to changes for the better. As such the participants wanted to see more input/action from the community. The reason for people being apathetic towards responding to the challenges of climate change was thought to be the fact that the effects of climate change lie too far in the future and are not immediate enough to require immediate action. While participants suggested that incentives and leadership needed to be put in place, no

specific ideas were forthcoming on what form that leadership would need to take nor how to implement that. As an incentive e.g. for using solar photovoltaics on private homes, a few participants indicated that the generated power that is not used by the homeowners but is fed back into the grid, should be bought off the owner at a price that would incentivise the installation of solar photovoltaics.

Participants suggested that climate change and its impacts need to be made more relevant to the community and to individuals. However, there were no specific suggestions on how to achieve that. Some participants felt that an impediment to taking action is that a community consensus about climate change has not reached.

There was little feedback regarding the third question:

- Are there policies (either national or regional) that discourage action?

The majority of the participants thought that the current government is too focussed on roading, transport systems and the use of cars, rather than supporting public transport. Furthermore, it was felt that the government is too focussed on economic growth. The majority of the participants felt that national targets and standards for e.g. emissions and housing specifications are too weak, further discouraging action. On a regional level, people felt that their voices are not heard by the CODC or ORC, in particular, if they provide suggestions/ideas that are not related to business or economic growth. The participants felt that the councils are not doing their job in looking after the environment. A posited reason for that was that the people on the council are usually farmers' friends. Some of the participants believed that the CODC fails to keep the community interested in issues related to climate change and to bring the CODC message across.

There was some disagreement on whether or not our community wants to know more about the impacts and implications of climate change. It was hoped that for those people who do want to know more about the impacts and implications of climate change, that the Deep South Challenge can provide that information. However, others felt that there was already enough information and more would only overwhelm the community; the focus should instead be on presenting the information in better ways that encourage immediate action.

One participant registered a concern with the global response to climate change, particularly citing concerns that local freedoms could be lost to institutions such as The United Nations. It was noted that the details of the international response to climate change were beyond the scope of this meeting and this topic was not discussed further.

There were two clear message from the participant in answer to:

- What can the Deep South Challenge do for us?

(1) Open access to databases and transparency in data and analysis and (2) science findings need to be communicated clearly and simply without jargon. The hope is that the Deep South Challenge will organize more workshops and/or forums where scientists present their research, the possible effects of climate change to the locals, and case studies of communities that have implemented changes and the lessons those communities have learned. Where communities have been successful in implementing changes in response to the challenges posed by climate change, those experiences need to be shared with other communities. Generally it was felt that the Deep South Challenge should be able to help with presenting the scientific consensus, and the impacts of climate change, as an honest broker of information. The information sought by communities from the Deep South Challenge is not limited to how climate may change under difference scenarios, but should also

include information on what individuals can do to mitigate changes in climate. Deep South Challenge forums and workshops should not be targeted at the older generation but rather at the younger generation. It was also pointed out that Central Otago includes not only Alexandra and Clyde and that more promotion needs to be put in place to include the communities from e.g. Cromwell and the Maniototo. Some participants felt that the Deep South Challenge could help with informing sectors with high GHG emissions on what the effects of GHG emissions on the climate system are. The Deep South Challenge was encouraged to collaborate with schools and the local and national government to create a toolbox for community action.

Section 9: Conclusions

While every effort was made to encourage the attendance of a wide spectrum of the Central Otago residents to attend this meeting, we recognise that the 108 people who attended the meeting are unlikely to be truly representative of the diversity of the Central Otago populace. That said, high level outcomes from the event included:

- The majority of the participants acknowledged that climate change is an issue and that a proactive response is required.
- There are many ways in which Central Otago can capitalize on the opportunities posed by climate change and an increase in climate awareness. Some examples are:
 - Promoting Central Otago as a low carbon destination for tourists (assuming that a means can be established to mitigate GHG emissions in getting here),
 - Central Otago has an abundance of sunshine and more should be made of this resource,
 - Central Otago can provide an attractive lifestyle for climate-conscious professionals who have the freedom to work remotely (once the issue of providing faster internet connectivity has been addressed).
- There was an appreciation that developing resilience in Central Otago businesses in the face of the challenges of climate change, and in particular shifting consumer preferences, is essential. While encouraging a sharing economy and reductions in consumption are good for reducing carbon footprints and enhancing sustainability, the adverse by-products of such actions should not be overlooked.
- Attendees at the event do look to local government to take action on their behalf to respond to the challenges and opportunities posed by climate change. Any initiatives taken by local government in that regard are likely to receive considerable support.
- People want to know, quantitatively, how their natural environment is changing. Access to data and resultant information from improved monitoring of the conditions of the local environment would be well received. Citizen science projects could support such monitoring.





42 Russell Street, Alexandra 9320
Ph: 03 448 8118 www.bodekerscientific.com