

# Oxford Research Encyclopedia of Climate Science

## Climate Change Communication in New Zealand

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### Summary and Keywords

Climate change communication in Aotearoa New Zealand occurs through multiple channels, including public communication by experts; formal and informal science-policy dialogues; and publication of popular books, documentaries, and media reports. There is, in addition, a wide array of climate change communication activities that are less well documented, such as those that utilize the education system, social media, art, community events and festivals, and co-production processes related to adaptation and mitigation choices.

Although research into the communication of climate change is in its infancy in the country, data on public attitudes toward climate change over the past decade indicate that most New Zealanders believe climate change is occurring, is anthropogenic, and is a serious concern. This is mirrored by research into media coverage on climate change, which shows that mainstream news reports are largely consistent with the scientific consensus and reports issued by the Intergovernmental Panel on Climate Change (IPCC), and do not give much coverage to skeptical or catastrophic viewpoints.

Keywords: Aotearoa New Zealand, climate change communication, public engagement with science, science communication, Māori knowledge, Antarctic science, emissions trading scheme

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## Introduction

Aotearoa New Zealand is a relatively small and prosperous liberal democracy in the South Pacific with a well-educated population and an economy based substantially on tourism, dairy farming, and light manufacturing (Organisation for Economic Co-operation and Development [OECD], 2007). While future changes in Aotearoa New Zealand's climate are expected to be less severe than in many other countries, the Ministry for the Environment (2016A) reports that by 2100 the country is likely to experience:

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- higher temperatures, with greater increases in the North Island than the South
- rising sea levels
- more frequent extreme weather events, such as droughts (especially in the east of New Zealand) and floods
- a change in rainfall patterns, with increased summer rainfall in the north and east of the North Island and increased winter rainfall in many parts of the South Island.

Although the scale of these impacts is less than most other countries will experience, many economic sectors, environmental systems, and population groups—including the indigenous Māori people,<sup>1</sup> many of whom live in the north and east of the North Island—are climate sensitive and face significant risks. The country's inhabitants identify as European (74%), Māori (15%), Asian (12%), Pasifika (7%), and Middle Eastern/African/South American (1%) (Statistics New Zealand, 2013B).<sup>2</sup> While Christianity is the dominant religion, a high proportion of the population (42%) have no religious affiliation (Statistics New Zealand, 2014).

The country's relatively small population (4.6 million) leads to both opportunities and barriers related to climate change communication. On one hand, there are fewer comprehensive, centralized, government-led, sources of information (such as websites, portals, and resource repositories) about climate change than in more populous countries, and fewer independent research and civil society organizations with the capacity to provide credible information alongside information provided by the government. There is also a limited science media landscape, a small climate change science research community, and very little research focusing specifically on climate change communication. The small size and low emissions footprint of Aotearoa New Zealand has also resulted in both a lack of climate change research specific to Aotearoa New Zealand and a perceived lack of opportunity to influence global mitigation.

These limitations are balanced, on the other hand, by opportunities provided by a small and innovative community working in the climate change area. Aotearoa New Zealand has a base of highly skilled science, economic, social science, and policy researchers who can regularly engage directly with government ministers about climate change; it is relatively easy to call together stakeholders from diverse sectors; and it is possible to respond rapidly to new economic opportunities and policy directions (arguably because the policymaking processes in Aotearoa New Zealand are less complex and bureaucratic than elsewhere). This agility not only fuels new activities, but has also enabled the community (at times) to demonstrate leadership internationally.

Moreover, the country's unusual emissions profile,<sup>3</sup> relatively high domestic abatement costs, and experience with market instruments led to a heightened interest in emission pricing as a mitigation measure. In 2008, after consideration of a carbon tax, the country introduced the world's first emissions trading scheme (ETS) designed to cover all sectors of the economy, although biological emissions from agriculture are not fully included (covered in more detail in "COMMUNICATION OF CLIMATE CHANGE IN A POLICY

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CONTEXT”). The New Zealand ETS is not only the government’s key policy response to climate change, it has also been the stimulus for much communication and dialogue about climate change in Aotearoa New Zealand.

The landscape of New Zealanders’ opinions and beliefs about climate change is mapped by drawing on a range of survey results published between 2008 and 2015 (see “CLIMATE CHANGE COMMUNICATION: CONTEXT AND LANDSCAPE”). Also discussed are climate change communication that occurs via: mainstream media in Aotearoa New Zealand; other published communication efforts such as books, documentaries, public lectures, blogs, and art; and more innovative communication including targeted, dialogic, and co-production activities. There are, of course, many factors that influence the framing of climate change communication in Aotearoa New Zealand, including the country’s strong economic dependence on primary industries, its unique and threatened biodiversity, its small size and low emission footprint, and its international reputation, promoted through government marketing campaigns as pristine and unspoilt. Three distinctive features of Aotearoa New Zealand’s climate change landscape are highlighted that impact on communication around this topic. These features are: its physical location between vulnerable regions (Antarctica and the Pacific) that will be greatly impacted by climate change and with which Aotearoa New Zealand has close links (“GEOPOLITICAL CONTEXT”); the policy engagement landscape, including the New Zealand ETS and the relative ease of access to policymakers (“COMMUNICATION OF CLIMATE CHANGE IN A POLICY CONTEXT”); and the potential impact of climate change on Māori communities (“ENGAGING MĀORI SOCIETY ABOUT CLIMATE CHANGE”).

## Climate Change Communication: Context and Landscape

### Public Perceptions of Climate Change

In order to understand climate change communication activities and interventions in Aotearoa New Zealand, it is important to first appreciate the context within which they operate. Data from surveys that have explored New Zealanders’ attitudes and beliefs about climate change are therefore summarized here.

Public attitudes to climate change were surveyed around the time of the implementation of the New Zealand ETS in 2008, which is discussed in more detail in the section “DIMENSIONS OF CLIMATE CHANGE COMMUNICATION DISTINCTIVE TO AOTEAROA NEW ZEALAND; COMMUNICATION OF CLIMATE CHANGE IN A POLICY CONTEXT.” All of these surveys indicated that a significant proportion of New Zealanders considered climate change to be occurring, to be caused by humans, and to be an issue of concern. For example, the majority of respondents in a large national survey agreed that climate

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change was a problem (76%) and that its effects had already begun to happen (65%) (New Zealand Business Council for Sustainable Development, 2009). Another study found that 80% of respondents agreed that the world was experiencing climate change and it was a problem; 44% of these respondents further agreed that there seemed to be clear proof that climate change was caused by human activity (Stuart, 2009). This same survey also found that those who rated climate change as extremely serious also rated human behavior as having a very direct impact on climate change. A nationally representative survey found that 33% of the general public strongly believed that climate change was happening, and 38% strongly believed that humans or animals had a direct impact on climate change (New Zealand Institute of Economic Research, 2008). Finally, another survey found that nearly 31% of respondents identified “global warming/climate change/ozone layer” as the single biggest issue facing the world (Hughey, Kerr, & Cullen, 2008).

More recent public surveys have confirmed that climate change remains an important issue for most New Zealand citizens. In 2012, two public opinion polls observed that more than half (52.4%) of New Zealanders considered climate change to be an “urgent problem” or a “problem for now” (HorizonPoll, 2012B), and that more than 60% of New Zealanders wanted more climate change action from business, fellow citizens, and the government (HorizonPoll, 2012A). More recently, in a 2015 survey, 87% expressed at least some concern about the impact of climate change on society in general, and 84% expressed at least some concern about the impact of climate change on them personally (HorizonPoll, 2015).

In order to probe the subtleties within these broad-brush analyses of climate change belief, Sibley and Kurz (Sibley & Kurz, 2013) examined representative survey data of more than 6,000 New Zealanders regarding their responses to two distinct climate change beliefs: “Climate change is real” and “Climate change is caused by humans.” Analyses revealed four belief profiles: those who believed in climate change and its human cause (53%), undecided (30%), complete skeptics (10%), and those who believed the climate is changing but is not caused by human activity (7%). Milfont and colleagues (Milfont, Milojev, Greaves, & Sibley, 2015) subsequently tried to identify the socio-psychological characteristics of these four belief profiles. They found that respondents who were younger, female, educated, politically liberal, belonged to ethnic minority groups, and those who perceived that they were able to influence environmental outcomes, showed higher levels of belief in climate change and its human cause. This lends support to the “conservative white male” effect—in which conservative white male individuals are more likely to deny human influence on climate change—that has been observed in the United States (McCright & Dunlap, 2011), in the United Kingdom (Poortinga, Spence, Whitmarsh, Capstick, & Pidgeon, 2011), and in other countries, for example Brazil and Sweden (Jylhä, Cantal, Akrami, & Milfont, 2016).

Finally, a longitudinal study has examined whether the level of agreement with these key climate change beliefs (i.e., “Climate change is real” and “Climate change is caused by humans”) has increased or decreased over a six-year period for the same group of New Zealanders ( $N = 10,436$ ; Milfont, Wilson, & Sibley, 2017). The results indicated that

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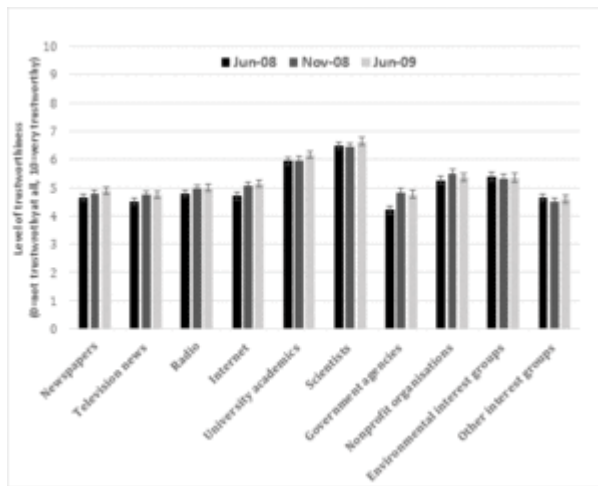
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agreement with climate change reality was higher at all time points than agreement with anthropogenic climate change. Importantly, there was a steady increase in levels of agreement with both beliefs over the 2009–2015 period.

These survey results tend to suggest that the majority of New Zealanders are concerned about climate change. However, this by no means indicates that all citizens of Aotearoa New Zealand believe in anthropogenic climate change. To illustrate this point, a 2013–2014 cross-national study examined ways to motivate climate change action across 24 countries (Bain et al., 2016). The data allowed researchers to categorize respondents as either *convinced* that climate change is real (those who selected “I believe climate change is occurring, and human activities are having significant effects on climate change”) or *unconvinced* (those who selected “I believe climate change is occurring, but human activities are not having significant effects on climate change,” or “I do not believe climate change is occurring”). The number of New Zealanders convinced of the reality of climate change ( $N = 251$ ) was similar to the average number of convinced respondents from the other countries ( $N_{\text{average}} = 297$ ). However, the number of New Zealanders not convinced about the reality of climate change ( $N = 290$ ) was higher than the number of those convinced, and also six times higher than the average number of unconvinced from the other countries ( $N = 48$ ). Another cross-national study, using data from the 2010 International Social Survey Programme, provides similar findings. Although New Zealanders showed one of the highest levels of environmental concern (second out of 14 countries), they also showed one of the highest levels of climate skepticism (assessed with a number of questions), just behind Australia and Norway (Tranter & Booth, 2015). These findings illustrate that a substantial number of New Zealanders remain unconvinced about anthropogenic climate change and that the proportion of climate skeptics in Aotearoa New Zealand is greater than in other countries. This is an important factor to consider when communicating about climate change.

Effective climate change communication requires not only an appreciation of attitudes to climate change, but also an understanding of where citizens get their information from, and which information sources they trust. This was explored as part of the 2012 Social Attitudes Survey, which surveyed more than 550 New Zealanders randomly sampled from the New Zealand Electoral Roll (Milfont, 2012). Respondents were asked to rate the level of trustworthiness of information on global warming and climate change from ten sources presented in the following order: newspapers, television news, radio, internet, university academics, scientists, government agencies, nonprofit organizations, environmental interest groups, and other interest groups. Respondents were found to express greater trust in scientists and less trust in government agencies. The longitudinal data<sup>4</sup> derived from this study ( $N = 269$ ; Milfont, 2012) provided similar across-time results, with respondents indicating greater trust in scientists and university academics and less trust in government agencies and interest groups, as shown in Figure 1.

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Figure 1. Perceived trustworthiness of information on global warming and climate change provided by distinct media and groups in Aotearoa New Zealand, based on a panel sample of 269 respondents (Milfont, 2012).

## Other Stakeholder Perceptions of Climate Change

Over recent years there has been an increased interest in, and funding for, sector-specific engagement about climate change, detailed in a systematic literature review (McKim, 2016) undertaken as part of the government-funded Climate Change Impacts and Implications (CCII) project, a highly interdisciplinary initiative that ran from 2012–2016, which explored both physical and social impacts of climate change and their implications in New Zealand.

One of the five CCII Research Aims (RA4) was focused on “enhancing capacity and increasing coordination to support decision-making,” and included substantial sector research and engagement. The associated synthesis report (Lawrence et al., 2016) was based on engagement across a number of communities of interest including different governance levels and sectors. The research found that in many of these cases, sectors required more detailed information in order to make key decisions about climate change that were tailored for their sector. The tourism sector, for example, needs more detail for managing disruption to travelers’ plans, the electricity sector (which is highly dependent on hydro-electricity) requires robust information to manage uncertainty related to rainfall projections, the kiwifruit industry requires more landscape-scale and economic information, and forestry requires more information about disease vectors in order to breed tree resistance to diseases. The authors found that while the public sector was better able to clearly articulate long-term responsibilities with regard to climate change, this sector was also more risk-averse and slower to respond. In contrast, while the private sector was more able to act quickly, many individuals contacted from this sector initially assumed that the researchers were contacting them about the ETS, as this was the main climate change policy initiative that they were aware of. The authors identified the main barriers to decision-making were related to governance and institutions, policy, psychosocial factors, resources, and uncertainty. This work integrates and builds on an emerging body of research focused primarily on tourism (Becken, Zammit, & Hendriks, 2015; Hopkins, 2014; Smith & Rodger, 2009) and local government (Birchall, Ball, Mason, & Milne, 2013; Lawrence et al., 2015; Manning, Lawrence, King, & Chapman, 2015; Reisinger, Wratt, Allan, & Larsen, 2011) adaptation to climate change, expanded in more detail in the literature review by McKim (2016). This literature draws attention to the tension between economic incentives and possible mitigation and adaptation choices in the tourism sector, for example, such as carbon offsetting related to air travel to New Zealand (Smith & Rodger, 2009), and the increased use of snow-machines to extend the ski season (Hopkins, 2014).

The framing of climate change as a problem was also explored in the CCII project using visualization methods (Flood & Lawrence, 2017), since the framing of the nature of the climate changes emerged as a significant issue needing attention for communicating the climate change problem. The developing practice in New Zealand by local government in particular, using the Dynamic Adaptive Policy Pathways planning approach (Haasnoot, Kwakkel, Walker, & ter Maat, 2013; Lawrence & Haasnoot, 2017), is one way in which to

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communicate uncertainties and changing risk profiles over long time frames. This approach is now embedded in the government's coastal hazards and climate change guidance, and a communication programme is planned for its roll out in 2017.

In summary, studies over the past decade have found that a large proportion of New Zealanders believe in anthropogenic climate change and are concerned about risks related to climate change, and that the two key beliefs ("climate change is real" and "climate change is caused by humans") are increasing over time. In addition, survey data suggest New Zealanders tend to show greater trust in scientists than government agencies, with trust in the media falling between the two. At the same time, New Zealanders show one of the world's highest levels of climate skepticism (see Tranter & Booth, 2015), which is contrary to the way the topic is presented by mainstream media. Questions therefore remain as to the reasons for this high level of climate skepticism in New Zealand. In addition, research involving the public and private sectors has shown that while the public sector has a longer-term outlook, it is slower to respond to the potential impacts of climate change. In contrast, the private sector is faster to respond but less engaged with the issue. Research with representatives from both sectors identified a need for more refined climate information in order to make climate-related decisions.

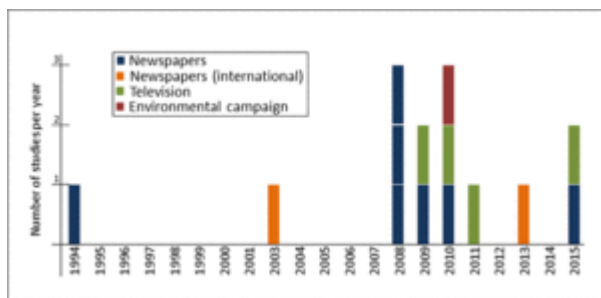
## **Climate Change Communication Landscape**

### **Climate Change Communication in Mainstream News Media**

Academic research on climate change communication in the New Zealand media is limited, but growing. Several studies have examined the framing and discussion of climate change in newspapers (Bell, 1994; Chetty, Devadas, & Fleming, 2015; Russill, 2008; Craig, 2008; Howard-Williams, 2009; Kenix, 2008; Williams, 2010) or television (Bourk, Rock, & Davis, 2015; Buettner, 2010; Craig, 2009; Howard-Williams, 2011). Another study explored how two environmental campaigns were managed and covered by the media (Craig, 2010). There are also two articles that include Aotearoa New Zealand in a comparison of newspapers' climate change coverage (Dispensa & Brulle, 2003; Schmidt, Ivanova, & Schäfer, 2013). These studies are unevenly spread between 1994 and 2015, as shown in Figure 2.



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Figure 2. Timeline of academic studies on climate change communication in Aotearoa New Zealand.

The 2008 and 2010 publication peaks are linked with the publication of special issues “Ecomedia” in *Media International Australia*, edited by Australian scholars Kitty van Vuuren and Libby Lester,<sup>5</sup> and “New Zealand Media and Environment” in the *New*

*Zealand Journal of Media Studies*,<sup>6</sup> which was edited by New Zealand-based scholars Angi Buettner and Geoffrey Craig. While Craig is the most prolific author in this field to date, with three published articles, no individual scholar emerges as a clear reference point.

Bell (1994) appears to be the first scholar to study the coverage of climate change in New Zealand newspapers. Exploring a six-month period in 1988, Bell’s research was prompted by the prominence of climate change as a topic in New Zealand environmental news and aimed to verify the scientific accuracy of the domestic information provided to the public. He found that “reporting of basic scientific facts was overwhelmingly accurate. News sources rated over 80% of stories no worse than slightly inaccurate” (Bell, 1994, p. 259). These findings have been consistently confirmed by subsequent studies (e.g., Chetty et al., 2015, p. 3, which examined the one-year period 2009–2010).

A scientifically accurate presentation of climate change is found in television news as well as newspapers, as reported by Bourk, Rock, and Davis (2015). In their study of television news over three months in 2012, they found “no attempt made to give climate change naysayers equal time in a misguided attempt to appear balanced” (p. 14). These findings conflict with the New Zealand chief science adviser’s 2013 comment that “the media has communicated much [climate science] very badly in the false claim of presenting ‘balance’” (Gluckman, 2013).

New Zealanders do, however, also get information from international news sources, which have contained a lot of inaccurate reporting. Dispensa and Brulle (2003) compared the scientific accuracy of climate change representations in New Zealand media to other countries’ representations, with the aim of understanding the reason behind such differences. The authors conducted an archive search for the year 2000 to compare global warming coverage in the United States, Finland, and New Zealand. They suggested that the differences in coverage were linked to the presence (or absence) of vested interests by the petrochemical industry. According to the authors, the media at that time in Aotearoa New Zealand followed the general scientific consensus on climate change because there were no apparent vested interests (Dispensa & Brulle, 2003, p. 98).

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This conclusion, however, is challenged by Howard-Williams (2009), who explored the ideological construction of climate change in Australian and New Zealand daily newspapers. In his analysis, Howard-Williams did not identify significant differences between the Australian and New Zealand newspapers even though Australia “relies on fossil fuels for much of its electricity generation” (Howard-Williams, 2009, p. 35). He concluded by stating that “it seems unlikely that any one industry, such as coal or oil, has an impact on coverage, as Dispensa and Brulle (2003) suggest” (Howard-Williams, 2009, p. 40).

Regardless of the preferred explanation, all of the aforementioned studies acknowledge the remarkable consistency between the available scientific evidence of the time and the subsequent reporting of this science by the New Zealand media. According to Boykoff and Boykoff (2004), this situation contrasts with the historical coverage of climate change in the United States, which favours a “balanced” reporting approach, effectively undermining the strength of scientific consensus surrounding climate change and its causes.

The New Zealand media portrayal of scientific consensus on climate change exists despite attempts to push the skeptical view. For example, in 2007 the New Zealand Climate Science Coalition (NZ Climate Science Coalition, 2009)<sup>7</sup> received funding from the US-based Heartland Institute (Renowden, 2012)<sup>8</sup> and, in 2008, lobbied to get “stories in the business pages of national media, with articles liberally quoting Owen McShane and Bryan Leyland,<sup>9</sup> questioning the reality of climate change” (Hansford, 2008). These attempts “to create uncertainty in the minds of the general public” (Hansford, 2008) were promptly exposed in the magazine *New Zealand Listener* (Hansford, 2008).<sup>10</sup>

There could be several reasons for the New Zealand media’s consistency in messaging aligned with the Intergovernmental Panel on Climate Change (IPCC) and scientific consensus on climate change. For some media, such as Radio New Zealand, the country’s public service radio broadcaster, this was the result of a conscious decision. In 2010 the broadcaster developed a policy (based on concerns raised three years earlier) to not give airtime to skeptical opinions on controversial issues, such as climate change, where there was a strong evidence-based scientific consensus.<sup>11</sup> For other media, limited resources, in terms of time or skills, mean that published articles are mostly likely to be in line with press releases issued by government or research agencies. This is related to the reduction in jobs and expertise in the New Zealand media sector, where the “relentless pressures on media organisations’ revenue has led to a hollowing out of newsrooms” (Fallow, 2011, p. 56). As a result, the media are operating with “fewer reporters and younger reporters” (Fallow, 2011, p. 56).

Finally, the scientific accuracy of climate change in the media could also be linked to the activities of the New Zealand Science Media Centre (SMC), which was set up in 2008 as part of a government strategy to “engage New Zealanders with science and technology” (Science Media Centre, 2016). The key aim of the SMC is to “to promote accurate, evidence-based reporting on science and technology by helping the media work

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more closely with the scientific community” (Science Media Centre, 2016). Unlike science media centres in other countries, the SMC is fully government funded and hosted by the Royal Society of New Zealand. Many news media rely on the SMC’s efforts to bring science stories to their attention, to interpret complex scientific data, and to find local experts to provide commentary on scientific news and issues. Another distinctive feature of the reporting of climate change by the New Zealand media is the lack of sensationalistic coverage—strongly present in the U.K. and German press (Chetty et al., 2015, p. 12)—that stresses the possible catastrophic consequences of climate change.

With the anthropogenic contribution to climate change not disputed in mainstream media, and the lack of doomsday framing, the media discussion on climate change in Aotearoa New Zealand focuses on how to respond to the issue. As Williams sums up: “[t]he focus of reportage now has shifted to the implementation of government policies and the remaining party political differences” (Williams, 2010, p. 37). With this shift has come an increased reliance on institutional, particularly governmental, sources.

A month-long survey of the reportage of New Zealand environmental news in the country’s metropolitan daily and Sunday newspapers highlighted how “the environment in New Zealand news media print reportage is primarily articulated by bureaucratic, political, and corporate/industry interests” (Craig, 2008, p. 160). In addition, Williams, in a five-year study of the front-page stories in the newspaper the *Press*, found that “the Government’s line is preferred in twice as many climate change-related stories as that of opposition parties” (Williams, 2010, p. 27). In their one-year analysis of New Zealand newspapers, Chetty and colleagues found that “[p]olitical sources featured most commonly in coverage, representing 33% of all sources identified, followed by scientists/academics (20%) and NGOs (13%)” (Chetty et al., 2015, p. 11). Finally Kenix, in her small-sample comparison of an independent news website (*Scoop*) with the most popular newspaper (the *New Zealand Herald*) during 2006–2007, found that “[g]overnmental sources were, by far, the most sourced group and were found in an identical 28% of content from both the *New Zealand Herald* and *Scoop*” (Kenix, 2008, p. 130).

All these findings are intriguing because they suggest a lack of coverage of debate around climate change science and also highlight the degree to which the government is framing discussions about climate change in the New Zealand media landscape (despite there still being considerable political debate about responses to climate change). This phenomenon is possibly linked to the lack of specialist journalists and expertise in the New Zealand mass media, previously mentioned.

It is worth noting that these findings are based on a small number of similar studies. Three of the presented studies (Chetty et al., 2015; Howard-Williams, 2009; Kenix, 2008) used the same database (*Factiva*) that surveys only newspaper articles. Therefore, many areas of the New Zealand media landscape merit further research. Magazine articles and radio programs have yet to be considered in the academic literature, despite their important role in the New Zealand media.

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It is also worth noting that international online information is easily available to New Zealanders. A reader can seamlessly move from New Zealand-based content to international content by just clicking on provided links, possibly without noticing the change in context. The impact of this global stream of information on the public sphere in Aotearoa New Zealand warrants further analysis. The consumption of international online content may help encourage a false perception, such as that implied by the prime minister's chief science adviser, that the media in New Zealand are not supporting the IPCC key messages.

In conclusion, academic research that focuses on climate change communication in New Zealand media highlights three points. First, New Zealand's mainstream media predominantly present climate change in accordance with the general scientific consensus, and acknowledge its anthropogenic influence. Second, New Zealand mainstream media tend to avoid a doomsday framing of the future impacts of climate change on the planet. And finally, New Zealand mainstream media tend to frame any controversy associated with climate change as a political or social issue on how Aotearoa New Zealand should respond through adaptation and mitigation. It is, however, possible that this framing is strongly influenced by the government and under-represents dissenting voices. In addition, while climate change communication is dominated by IPCC-sourced summary statements, New Zealanders remain exposed through the Internet to a global range of views on climate change, which includes extreme climate skepticism and doomsday scenarios.

## **Climate Change Communication outside Mainstream News Media**

Academic scholarship about climate change communication in Aotearoa New Zealand suggests that media coverage of climate change is closely aligned with IPCC communications. This, however, is the consequence of the narrow focus of this research on newspapers and specific television programs. When the whole climate change communications landscape is taken into account, a more nuanced situation emerges in which skeptics have a presence, reflecting the diversity of public opinion outlined in the section "Public perceptions of Climate Change."

The communication of climate change outside the mainstream news media, with a focus on print and online publications such as books and blogs is outlined here. The role of social media, public lectures, television programs, and art and science festivals is mentioned more briefly. Climate change communication also occurs through many other important channels, such as the education system, community events, and environmental citizenship activities, which are not covered here.

Many individuals interested in or working in climate change—both climate skeptics and those who support the scientific consensus—communicate with wider publics through popular books. Six books that support the IPCC position on climate change have been published in New Zealand since 2007, all with a specific focus on climate change in

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Aotearoa New Zealand (Chapman, 2015; Dorfman, 2008; Gillespie, 1997; Meduna, 2015; Morgan & McCrystal, 2009; Renowden, 2007). They tend to follow a similar pattern: starting by presenting the scientific consensus on climate change, they then urge actions at a national as well as personal level, while pressing the reader to take responsibility for impacts on future generations. It is notable that these books, which support the scientific consensus, are published by mainstream and respected publishers whereas the two books that challenge the summaries provided by the IPCC (Gray, 2010; Wishart, 2009) are self-published. As further evidence of the quality of the books that support the scientific consensus, two of them—Gareth Renowden’s *Hot Topic: Global Warming and the Future of New Zealand* and Gareth Morgan and John McCrystal’s *Poles Apart: The Great Climate Change Debate*—were shortlisted for the Royal Society of New Zealand science book prize. In late 2016, a book by an emeritus professor of politics, Jim Flynn, took a more catastrophic stance: predicting 4 degrees of warming and 8 meters of sea level rise by 2100 (Flynn, 2016). The book, and its predictions, got national media coverage (Nicholls, 2017), but was criticized by prominent climate scientists such as Professors Tim Naish and James Renwick, who responded by saying Flynn’s figures were “on the high side,” and he had the “wrong end of the stick about this increase in sea level rise” (Barraclough, 2017).

Renowden also blogs at *Hot Topic* (Renowden, N.D.), a blog devoted to climate change and shared on Sciblogs, a blogging platform hosted by the Science Media Centre. Many other bloggers on Sciblogs sometimes cover climate change as part of a focus on wider issues in science, agriculture, health and medicine, environment and ecology, technology, and science in society. In a different blog, a strong anti-IPCC view on climate change is presented by right-wing blogger Cameron Slater in *Whale Oil* (Whaleoil Staff, N.D.).<sup>12</sup> This blog, which claims to have “over 286,000 readers, 2 million visits every month” (Whaleoil Staff, 2014), controversially won “best blog” at the 2014 Canon Media Awards.<sup>13</sup> Another skeptical blog, [climateconversation.org.nz](http://climateconversation.org.nz), does not have such high readership but focuses entirely on climate change, with posts that support its assertion that “the late 20th century warming has been normal; the physics says that almost all the warming you can get from CO<sub>2</sub> has already been achieved; and the only reason to think warming will be dangerously high in the future is computer models that don’t match the climate.”

While there have been no published studies of climate change communication that takes place via social media in New Zealand, many of the authors and bloggers mentioned, as well as NGOs, politicians, and climate scientists working in New Zealand, share research results, local and international commentary, and personal opinions about climate change issues via social media such as Twitter and Facebook.

Public lectures and informal dialogue events, such as Science Express, NerdNite, and events at a regular Antarctic festival, IceFest, are popular in Aotearoa New Zealand and a common way in which experts reach a wider public on topics including climate change. As would be expected for events featuring a high number of academics and scientists, the vast majority of popular public lectures and dialogue events are consistent with the IPCC statements on climate change. Such events have been organized by every university in

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the country, as well as being a regular feature of events organized by the Royal Society of New Zealand. Several have also featured international visitors such as James Hansen, whose lecture tour was sponsored by the Green Party; and French academics who took part in three panel discussions under the title *The Age of Resilience*, which was organized by the French Embassy in the lead up to the 21st Conference of the Parties (COP21) negotiations in Paris in 2015. The most notable example of a lecture tour organized by climate skeptics was in 2013 when Christopher Monckton, a renowned climate skeptic, toured Aotearoa New Zealand to question the anthropogenic role in global warming (APNZ, 2013; Bayer, 2013). The visiting speaker was generally received with strong skepticism by the local press and was an object of ridicule (Bayer, 2013; Griffin, 2013; Hewitson, 2013; Renowden, 2013).

Among successful popular forms of engagement with climate change, two television programs stand out: *Off the Radar* and *WA\$TED!* both of which refer to climate change indirectly, within the framing of “sustainability.” First broadcast in 2008, *Off the Radar* was a television series about sustainable living. The show, presented by comedian Te Radar (aka Andrew J. Lumsden), was also published as a book and led to the development of two other television series, *Radar’s Patch* and *Global Radar* (NZ On Screen, 2017; Te Radar, 2017). These series further investigated sustainability in Aotearoa New Zealand and across the world. *WA\$TED!* was a reality television series during which several families were prompted to face their everyday ecological impact. The series aimed to prove that “you don’t have to be extreme to be green” and how it was possible to achieve a sustainable lifestyle starting from “your average household of eco horrors” (Fumes, 2017). The series ran for two seasons, in 2007 and 2008, and it was formatted to the United States, Canada, Spain, Denmark, Malaysia, and Portugal. The series also led to “a sponsored website, schools programme and high profile DVD sales” (Fumes, 2017).

Moreover, New Zealand artists have explored anthropogenic climate change through different media, and their work generally gives support to the scientific consensus on climate change. Examples include the theatrical drama *Heat* (O’Donnell, 2008) and three documentaries: *A Climate for Change*, *Thin Ice*, and *Hot Air* (Barry & King-Jones, 2014; Lamb & Sington, 2013; McLachlan & Goldring, 1992). These works were all well reviewed (Atkinson, 2008; Calder, 2014; Coleman, 2011; Smythe, 2011). Furthermore, many artists visiting Antarctica at the invitation of Antarctica New Zealand reference climate change in their Antarctic-inspired art. In addition, international art about climate change is also regularly showcased in New Zealand, such as the Australian play *Between Two Waves* (Meadows, 2012), which was adapted in 2015 for a New Zealand context (Riley, 2015).

Finally, it is important to highlight how single individuals can have a strong impact on the public awareness of issues such as climate change in New Zealand. For example, Gareth Morgan, a well-known economist and philanthropist, organized a significant Antarctica-focused outreach program that included a component on climate change. Morgan became convinced of the importance of climate change after researching and writing a book on climate change with John McCrystal (Morgan & McCrystal, 2009) and in 2012 initiated

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and led an expedition to Antarctica. The voyage included 40 “everyday New Zealanders” representing a range of professions and demographics, as well as six experts in Antarctic science.<sup>14</sup> The polar mission focused attention on conservation of biodiversity, commercial interests in the area—such as fishing, mining, and tourism—and climate change. The expedition and associated outreach program produced many climate change-related initiatives, including four books (McCrystal, 2012; Morgan & McCrystal, 2012; Morgan Family Foundation, N.D.; Simmons & Morgan, 2012), an award-winning documentary (Abbey, 2012), a schools program, a roadshow that engaged more than 10,000 school students, dialogue events reaching at least 3,500 individuals, an exhibition, and media articles that reached more than 200,000 people (Salmon, 2012).

In conclusion, climate change communication outside mainstream news media is characterized by the presence of voices that both align with the IPCC statements and scientific consensus and challenge it, with several vocal individuals working across a range of media, including books, blogs, lectures, and social media. Climate change is also regularly featured in public lectures and dialogue events, as well as some works of art, and is a frequent topic of postings and discussions on social media. Despite the international nature of the information reaching New Zealanders about climate change, within the country, single communication initiatives, and even a single individual, can have a considerable influence on the public discourse on climate change.

## Innovations in Climate Change Communication

Over the last few decades, international scholarly literature has highlighted a shift from one-way, information-rich, direct communication of science pointed at an intended “audience” to more nuanced, dialogue-rich, two-way engagement and co-production processes with varied “publics” (Nisbet & Markowitz, 2015). This transition has been echoed in Aotearoa New Zealand, which has experienced a growth of dialogue-rich, stakeholder-focused engagement activities related to climate change over the past decade.

In order to capture a snapshot of these activities, a survey<sup>15</sup> of the climate change engagement landscape in Aotearoa New Zealand was commissioned in late 2015 by the Deep South Challenge, a new national research effort focused on better understanding New Zealand’s future climate (Salmon, 2017). The preliminary results indicate that a broad and diverse array of organizations and individuals serving different constituencies conduct climate change engagement activities. A high-level review of the small sample of activity profiles submitted by respondents suggests that current engagement initiatives can be broadly grouped into five categories: those with a geographic focus (such as a specific community, city, or region), those with a climate aspect focus (such as sea level rise or mitigation), those with a sectoral focus (such as business or agriculture), those with a focus on community identity (such as youth or faith communities), and those that address cross-cutting issues, capacities, or disciplines (such as education, behavior change, or engineering). Most of these activities have not, however, been captured in

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academic literature due to a paucity of research in climate change communication in the country. Many of the respondents also requested that details of their engagement activities remain confidential.

Respondents to the engagement survey revealed a desire for better mechanisms for information sharing, coordination, and collaboration across organizations involved in climate change engagement. As end users of climate change research data, they also indicated that they would value more technical information in forms that can be applied practically to decision-making in their specific context (Salmon, 2017). These findings echo research on climate change adaptation (Adger et al., 2009; Biagini, Bierbaum, Stults, Dobardzic, & McNeeley, 2014; Lacey, Howden, Cvitanovic, & Dowd, 2015; Larsen & Gunnarsson-Östling, 2009; Moser & Ekstrom, 2010), in which there is a sense that climate change communication, where it exists, has tended to focus on the communication of facts, concepts, and general risks of climate change, rather than on how to improve and support pathways to informed decision-making related to the future climate. Similarly, research from Aotearoa New Zealand on both adaptation and mitigation also typically concludes with recommendations for communication of climate change (Evans, Milfont, & Lawrence, 2014; King, Penny, & Severne, 2010; Lawrence, Quade, & Becker, 2014; Manning, Lawrence, King, & Chapman, 2015; Milfont, Abrahamse, & McCarthy, 2011). For example, Aitken and colleagues (Aitken, Chapman, & McClure, 2011) report that heightened perceptions of powerlessness and the commons dilemma in Aotearoa New Zealand correlate with reduced action on climate change and conclude by suggesting that “information campaigns will be more effective if, rather than simply providing basic information on climate change, they provide information about the role of human actions in climate change and specific options for taking action” (p. 759). They also point out that the perceived risk of climate change, which correlates closely with action, should be a key consideration in the design of associated communications.

The question of how best to engage on climate change has thus become highly topical and is currently the focus of substantial international research and discussion (Bain et al., 2016; Lorenzoni, Nicholson-Cole, & Whitmarsh, 2007; Moser & Dilling, 2007; Nerlich, Koteyko, & Brown, 2010; Pearce, Brown, Nerlich, & Koteyko, 2015; Whitmarsh, O’Neill, & Lorenzoni, 2013). While Aotearoa New Zealand does not currently boast a strong research record in climate change communication, a number of innovative approaches toward climate change communication have been explored over recent years. Many of these approaches have the potential to have an impact internationally through replication or upscaling even if they haven’t been formally documented in academic literature. A selection of these activities are documented.

In 2016, Motu Economic and Public Policy Research, an independent nonprofit research organization (from here on referred to as Motu), led an international research consortium in designing an authoritative handbook on emissions trading for the World Bank and International Carbon Action Partnership. While the entire handbook was a global communication and engagement exercise with the goal of communicating international lessons learned and practical guidance on emissions trading scheme (ETS) design, the



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handbook also included a specific chapter on stakeholder engagement and capacity building (Partnership for Market Readiness & International Carbon Action, 2016). Motu also developed an emissions trading game for educational and professional development purposes and led a series of cross-sector stakeholder dialogue initiatives addressing different aspects of climate change mitigation, including agriculture, emissions trading and domestic decarbonization. In 2016, Motu published a synthesis report on Transformational Pathways to a Low Emissions Future, which was based on its two-year Low-Emission Future Dialogue, in which participants were invited to explore potential pathways toward a zero-net-emissions economy for the country, with specific foci on technology, policy and regulation, business, and behavior (Leining & Kerr, 2016). In addition to publishing papers in peer-reviewed journals, Motu communicates its climate change policy research through more accessible Motu Working Papers, Motu Notes, blogs, Facebook, Twitter and the use of haiku's to summarize research findings. In 2015, it collaborated with the *New Zealand Herald* to post a user-friendly online Household Climate Action Tool, which enabled users to see the emission profiles and explore mitigation opportunities for typical households in their income range.

The national climate research initiative, the Deep South Challenge, has prioritized engagement as one of its five programs.<sup>16</sup> This program, launched in 2016, emphasizes dialogic engagement, co-production of knowledge, and mechanisms whereby the science research priorities are informed by stakeholder needs (Salmon, 2017). Several other national activities have been developed or tailored for engagement with New Zealand-specific stakeholders and policymakers, such as a “serious game” adapted for New Zealand by Judy Lawrence and collaborators for engagement with local councils about their adaptation choices,<sup>17</sup> and round-table policy discussions led by Professor Jonathan Boston and Adrian Macey, who was New Zealand's first climate change ambassador (2006–2010) and chair of the United Nations Framework Convention on Climate Change (UNFCCC) Kyoto Protocol negotiations (2011).

Dialogues with Tomorrow, a 2010 Wellington-based lecture series, subsequently published as a book, placed “artists in conversation with scientists, business people and thinkers on themes related to climate change”<sup>18</sup> and included a dialogue between a photographer who had visited and produced work about Antarctica and a geologist specializing in Antarctic paleoclimates.

Innovative initiatives originating outside the country have also worked well in Aotearoa New Zealand. In the first global “Climathon”—an event organized by Climate-KiC, “the EU's main climate innovation initiative”—a team from Wellington was one of the winning teams selected to present its innovative city-focused climate solution at COP21 in Paris. Other examples include the Australia—New Zealand Climate Change and Business Conference, and development of a 2050 climate pathways calculator, which was based on a similar initiative in the United Kingdom. As in other countries, there are also considerable climate change communication campaigns and engagement activities led by local and international NGOs such as Generation Zero, Greenpeace, 350.org, Environmental Defense Society, Forest and Bird, Climate Reality Project, and others,

including community and religious groups. Several of these groups collaborated on Climate March demonstrations, in November 2015, in the lead up to COP21 negotiations in Paris. Details about the communication practices in the “New Zealand climate movement” can be found in Oosterman (2017).

# Dimensions of Climate Change Communication Distinctive to Aotearoa New Zealand

## Geopolitical Context

Despite Aotearoa New Zealand having a “clean, green” reputation, it actually ranks 42nd out of 61 countries—in the “poor” performance category—in a 2016 assessment of climate change performance (Burck, Marten, & Bals, 2015, p. 9). Moreover, between 1990 and 2014, Aotearoa New Zealand’s gross greenhouse gas emissions increased by 23% (Ministry for the Environment, 2016B, p. viii).

Perhaps New Zealand’s overall lack of any effective response to climate change is, in part, because Aotearoa New Zealand is not projected to experience the more severe biophysical climate change impacts that will affect many other countries. In addition, its contribution to global emissions is comparatively small, at 0.15% (Hopkins, Campbell-Hunt, Carter, Higham, & Rosin, 2015). As Hopkins et al. (2015, p. 574) explain, “[t]hese two factors have been used, either explicitly or implicitly, to reduce the importance of climate change on a national scale and to hinder the prioritization of action to both mitigate and adapt.”

Much action in Aotearoa New Zealand, therefore, tends to focus on the wider region. Situated between, and closely aligned politically with, the Pacific Islands and Antarctica, Aotearoa New Zealand is in the rare position of being both one of the countries projected to be least directly affected by adverse impacts of future climate change *and* closely located to (and in some ways defined by) two regions likely to experience some of the most extreme effects. Aotearoa New Zealand maintains a “right of sovereignty” over the Ross Dependency, a triangular wedge of Antarctica that extends from 160° East to 150° West to the South Pole, and includes the Ross Sea and McMurdo Sound. In the Pacific, Tokelau is New Zealand territory, and the Cook Islands and Niue are self-governing states in free association with New Zealand; Tokelauans, Cook Islanders, and Niueans are all New Zealand citizens. Most of the 7% of New Zealanders who identify as Pasifika maintain close family ties with people across the Pacific region, and Auckland, New Zealand’s largest city, is home to one of the largest Pacific populations in the world.

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The future impacts of climate change in the Pacific Islands are likely to have economic and political implications for Aotearoa New Zealand, particularly from aid and climate migration. This situation is already influencing climate change communication locally and internationally (see, e.g., Bonnett, 2016; Buchanan, 2015; McAdam, 2015).

As an example, in February 2016, Victoria University of Wellington hosted a Pacific Climate Change Conference called “In the Eye of the Storm.” This interdisciplinary climate change conference focused on “the effects, challenges and possible solutions for countries in the Pacific” and had a clear message: “climate change is upon us and nowhere is the impact more serious than in the Pacific” (“Pacific Climate Change Conference 2016,” N.D.). In a magazine interview about the conference, climate scientist and conference co-convenor Professor James Renwick said, “In terms of loss of lands and livelihood, sea-level rise will be felt more quickly in the Pacific than anywhere else . . . Combine that with an increased frequency of very strong tropical cyclones dumping more heavy rain and the Pacific will literally be in the eye of the storm at some times of year” (Priestley, 2016B). The conference culminated in the signing of a memorandum of understanding between the Secretariat of the Pacific Regional Environment Programme (SPREP) and Victoria University of Wellington to “co-operate on activities of mutual interest such as coral research, climate change research, and enhancing biosecurity” and work together “towards environmental protection and sustainable development in the Pacific.”

In contrast, environmental changes in Antarctica, such as ice sheet melting, will have a physical impact on Aotearoa New Zealand through a long-term increase in sea level (Royal Society of New Zealand, 2010). Because the direct implications of climate change for Aotearoa New Zealand have not historically been presented as severe or urgent, these two neighboring regions are often used as a framing for popular articles and books about climate change. Aotearoa New Zealand’s proximity to Antarctica has framed the discussions, and communication, of climate change in a distinctive way. As noted by Saunders and colleagues (2013), all of Aotearoa New Zealand’s universities and many of its Crown Research Institutes are engaged in Antarctic research. As one of the main gateways to Antarctica, the New Zealand economy in 2013 benefited by \$161.7 million from Antarctica-related activities (Saunders, Dalziel, & Guenther, 2013, p. 17). In addition, the relatively easy access to Antarctica from Aotearoa New Zealand, with regular flights to McMurdo Sound during the summer season, ensures that it is accessible for short visits from artists, media, and “distinguished visitors,” such as politicians, diplomats, and business and government leaders. Antarctica, and Antarctic science, therefore play an important political, diplomatic, and economic role for Aotearoa New Zealand. It is possible that this has had an influence on public awareness of Antarctic science, which is strongly connected to, and increasingly framed in the context of, climate change research.

To illustrate, Antarctica New Zealand, through its Community Engagement Programme and previous media and artists programs, supports visits to Antarctica from media, artists, and educators, almost all of which have unsurprisingly led to a message about the

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importance and relevance of the icy continent. One recurring theme of this commentary is research related to climate change, which is not surprising, given that climate change research is a top priority for both Antarctica New Zealand and the New Zealand Antarctic Research Institute (NZARI), the agencies responsible for, respectively, logistical support and coordination and promotion of Antarctic research. In its 2010–2020 Science Strategy document, one of Antarctica New Zealand’s three research priorities covers “climate, cryosphere, atmosphere and lithosphere” (New Zealand Government, 2009). The highest goal of NZARI is developing “a global understanding of Antarctica’s impacts and vulnerability in a changing global climate.” In January 2017, to celebrate the 60th anniversary of Scott Base, New Zealand’s Antarctic research station, Antarctica New Zealand partnered with TEDx to present TEDxScottBase, in which the selected speakers—including “an astronaut, a Cousteau, international researchers, sustainable business leaders, a renowned photographer, an award-winning film maker and one of New Zealand’s most popular musicians”—gave talks to “highlight climate change, celebrate science and embrace forward-thinking from Antarctica.” The “international researchers” mentioned on the webpage included two University of Otago scientists: Professor Christina Hulbe, a glaciologist, and Professor Gary Wilson, a marine geologist, talking about the impact of rising temperatures on, respectively, the Antarctic ice shelves and ice sheets.

Stories connecting Antarctic science with climate change are not unique to New Zealand; the difference is the relative size of the science media landscape against which these stories appear. New Zealand has very few science journalists—between 2011 and 2016 there have been only between one and three full-time science journalists at a given time. All of these full-time science journalists, and many other occasional or part-time science journalists, have participated in the Antarctic media program, resulting in a high proportion of Antarctic stories appearing in their programs, columns, or other outputs: see, for example, the work of Veronika Meduna on the radio show *Our Changing World*, Jamie Morton in the *New Zealand Herald* newspaper, and Rebecca Priestley in the *New Zealand Listener* magazine. In addition, Meduna has published three books on Antarctic science or climate-related research (Liggett, Storey, Cook, & Meduna, 2016; Meduna, 2012, 2015), and Priestley<sup>19</sup> has published an anthology of Antarctic science, which includes several pieces that cover the impact of climate change on Antarctica and the contribution of Antarctic ice-melt to sea level rise (Priestley, 2016A).

Connections between journalists and Antarctic research are further fostered by the “winter school” sponsored and run by NZARI, first offered in 2014, in which media, along with people working or interested in Antarctic policy, funding, and education, spend a weekend at a science communication workshop. In addition, in both 2012 and 2014, an Antarctic festival held in Christchurch, IceFest, featured several climate change-related lectures, dialogue events, and educational activities, which were recorded and archived by Radio New Zealand.

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*Click to view larger*

Figure 3. Google Trends search on the terms “climate change,” “global warming,” and “Antarctica” in Aotearoa New Zealand between January 2004 and May 2016. Available at <https://www.google.co.nz/trends/explore#cmpt=q&q=Antarctica,+climate+change,+global+warming&geo=NZ>

The strong connection between Antarctica and climate change in Aotearoa New Zealand is also illustrated by a Google Trends search on the terms “Antarctica,” “climate change,” and “global warming” between January 2004 and April 2016. As can be seen in Figure 3, there is a

correlation between these search terms. Indeed, searches for “Antarctica” correlated with searches for both “climate change” ( $r_s = .39$ ) and “global warming” ( $r_s = .73$ ). The same analyses for Australia and the United States produced correlations, respectively, of 0.19 and 0.84, and 0.26 and 0.30. The associations between the search terms “Antarctica” and “climate change” or “global warming” were therefore found to be much stronger in New Zealand and Australia than in the United States, with the association between “Antarctica” and “global warming” greater in Australia than in New Zealand. These findings show that New Zealanders (and, it turns out, Australians) relate climate change and global warming more with Antarctica than do individuals in the United States. This supports a hypothesis that the proximity of Antarctica to Aotearoa New Zealand has had an influence on the framing of climate change communication.

The national tendency to connect narratives about climate change to those about Antarctic research was also demonstrated in the announcement, in 2013, of eleven government-funded National Science Challenges. One of these, the Deep South Challenge, was given an objective, set by central government, “to understand the role of the Antarctic and Southern Ocean in determining our climate and our future environment.” The subsequently agreed mission of this initiative is to “enable New Zealanders to adapt, manage risk, and thrive in a changing climate [. . .] built on improved predictions of future climate, supported by new understanding of Antarctic and Southern Ocean processes” (The Deep South, 2014). While these challenges are meant to be primarily mission-led, the governmental setting of such geographical boundaries to the research activity clearly reflects a political dimension to the research, encompassing both a desire to support existing expertise in Antarctic research and an underpinning belief that key climate change research must include an Antarctic component.

While Antarctica (and its connection with climate change) is relatively high in the national consciousness, there is less media coverage of other key physical climate research, such as remote sensing of the atmosphere and ocean, in situ measurement of the ocean, and the centrality of climate modeling for predictions about future climate. As well as these types of science making for less interesting news articles—a story about the work of a climate modeler is not likely to be as compelling as a story about an Antarctic field geologist—this type of physical climate research has consistently received less

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research funding than Antarctic paleoclimate research, resulting in fewer press releases and fewer opportunities for stories.<sup>20</sup> The Deep South Challenge is taking steps to address this imbalance by focusing its public engagement efforts on understanding the role and importance of earth-system modeling in predicting future climate, and developing mechanisms for enabling New Zealanders to make more informed decisions about the impacts and implications of climate change (Salmon, 2017).

In summary, the narratives and framing of climate change in Aotearoa New Zealand have been significantly influenced by its physical proximity to, and close relationships with, the Pacific Islands and Antarctica, both of which are expected to be strongly impacted by climate change.

## Communication of Climate Change in a Policy Context

New Zealanders have historically taken pride in their international environmental leadership, which in the climate change arena is demonstrated by activities such as leadership in Kyoto protocol negotiations and establishment of the world's first all-sectors, all-gases emissions trading scheme (the second mandatory large-scale system after the EU emissions trading scheme). Many scholars, though, have been critical of New Zealand's climate change policy.

As Chapman and Gray said in 1998, "New Zealand policy has stayed closely aligned to the pace of international developments on the basis that to do otherwise would incur economic cost for no appreciable improvement in atmospheric concentrations of greenhouse gases" (Chapman & Gray, 1998, p. 230).

New Zealand's initial approach to meeting climate change targets was to increase energy efficiency and forestation rates to create carbon sinks (Gillespie, 1998). Research funding and regulations have supported climate change mitigation efforts in areas such as energy efficiency, waste minimization, and research into renewable energy and reduction of agricultural greenhouse gas emissions (Royal Society of New Zealand, 2016B), but the government's main climate change policy is the emissions trading scheme (ETS).

Plans for a carbon tax were outlined in the Climate Change Response Act of 2002 (Ministry for the Environment, 2002), which signaled that the agricultural sector—which contributes about 50% of New Zealand's greenhouse gas emissions<sup>21</sup>—would be excluded, at least initially, from any such scheme. In 2003, the Labour government explained that under New Zealand's climate change policy, agriculture would be excluded from any carbon tax "in recognition of the importance of agriculture and the absence of cost-effective emission reduction measures" (Hodgson, 2003). As an alternative measure, the government proposed an agricultural emissions research levy, which was dubbed by the media a "flatulence tax" or "fart tax" (although most emissions are from burping rather than farting). This proposed tax on livestock farmers, to account for greenhouse gases such as methane emitted by livestock, would fund research into mitigating agricultural greenhouse gas emissions. The research levy would have resulted in an annual payment of \$300 per farmer per year (to create an \$8.4 million fund), and was opposed by the center-right opposition parties National, Act, New Zealand First, and United Future, and by farmers. A September 2003 protest got international media coverage after hundreds of farmers and their supporters drove tractors and farm vehicles through Wellington from Civic Square to Parliament where they presented a 64,000-signature petition against the proposed tax. At the rally National MP Lockwood Smith led a cow onto the steps of Parliament, and his colleague Shane Ardern, a farm-owner, attempted to drive a tractor up the steps (Taylor, 2003; Fickling, 2003).

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In 2005, after substantial debate within policy circles, the government decided not to proceed with a carbon tax in favor of the ETS. The ETS, introduced in 2008 and amended in 2009 and 2012, was the world's first emissions trading system designed to cover not only all sectors of the economy but also the six major greenhouse gases. The scheme requires all sectors of New Zealand's economy to report on their emissions and, with the exception of biological emissions from agriculture, purchase and surrender emission units to the government for those emissions. Biological emissions from agriculture are also exempt under all ETS systems at present, for example, under the European, Kazakh, and Korean ETS as well as the Regional Greenhouse Gas Initiative and the Californian system in the United States.

Under the New Zealand ETS, the price on emissions was intended to “create a financial incentive for investment in technologies or practices that reduce emissions, and for carbon removals from forestry by allowing eligible foresters to earn New Zealand Units (NZUs) as their trees grow and absorb carbon” (New Zealand Government, 2015, p. 3). The scheme, though, has not delivered on what it set out to do. In a 2014 paper (Hadley, 2014), New Zealand governments from 1990 to 2008 are described as having “operated broadly under a ‘standard self-interest’ approach” (p. 477). But Hadley reserves his strongest criticism for governments in power from 2008, when the ETS was implemented, claiming that the government has “held back on policy development and is operating under a particularly narrow, highly unethical and unjust form of self-interest” (p. 477).

In 2016 the ETS, which was under a review process initiated in 2015, came under attack in reports issued by the Morgan Foundation and the Royal Society of New Zealand, and was discussed in the media (see, e.g., Macfie, 2016). As described in an emotive and well-publicized report by Simmons and Young (Simmons & Young, 2016), proportional to emissions, Aotearoa New Zealand has been the world's largest purchaser of Kyoto Emission Reduction Units (ERUs), including fraudulent Ukrainian and Russian ERUs, through the ETS. Allowing unlimited purchases of overseas Kyoto units by ETS participants at a time of global oversupply had the effect of dropping the domestic price of emission units in the country's ETS to close to zero, which disadvantaged a nascent carbon forestry industry.

In mid-2015, the ETS delinked from the international Kyoto carbon market and the domestic unit price proceeded to rise, reaching about NZ\$17 per metric ton in March 2017. New Zealand's gross and net greenhouse gas emissions have continued to increase since the ETS was implemented. In a 2016 evaluation of the system, Ministry for the Environment officials found no evidence that the ETS had contributed significantly to domestic mitigation (Ministry for the Environment, 2016C). The resultant increase in greenhouse gas emissions is such that Aotearoa New Zealand is now one of the world's highest per capita emitters of greenhouse gases: as of 2012, Aotearoa New Zealand's gross per capita emissions ranked the fifth highest among industrialized countries. The ineffectiveness of the scheme was acknowledged in a 2014 briefing to incoming ministers, which noted that “current settings are not driving meaningful emissions reductions” (New Zealand Government, 2014). The climate change minister has publicly



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acknowledged that the impact of the ETS on the country's emissions has been limited by the low carbon price, saying in February 2016 (when the price was under \$10) that "if the ETS is going to work, carbon has to cost more than it does right now" (Bennett, 2016).

While biological emissions from agriculture are not included in the ETS, the government acknowledges the importance of addressing the agricultural sources of much of New Zealand's greenhouse gas emissions by funding research into reducing agricultural greenhouse gas emissions, for example, by the New Zealand Agricultural Greenhouse Gas Research Centre (2017).

In two reports released in April 2016, the Royal Society of New Zealand outlined climate change implications for New Zealand (Royal Society of New Zealand, 2016A), and options for climate change mitigation (Royal Society of New Zealand, 2016B). The implications paper "summarizes the most recent findings about climate risks, uncertainties, impacts and implications for New Zealand" (p. 4) and is written so as to be accessible to a wide audience. The mitigation report, authored by eight experts from the natural and social sciences, architecture, engineering, economics, and law, was communicated to both policymakers and wider publics. It described the ETS as "ineffective in reducing New Zealand's emissions" (p. 7) and called for emission pricing to be "embedded in a wider package of mitigation policies and actions" (p. 7).

The Royal Society of New Zealand, which in recent years has produced expert advice and commentary on a range of climate related issues (see also its 2015 report on New Zealand's post-2020 climate change target [Royal Society of New Zealand, 2015]) is just one of several government or government-funded agencies that play a part in climate change communication in Aotearoa New Zealand, as a channel for information from scientists to reach policymakers and the wider public. While there is no single agency tasked with this role, until early 2017 the government ran a website, Climate Change, which contained information about "implications of climate change for New Zealand, what we are doing about it, and our reporting commitments" (Ministry for the Environment, 2017). In 2017, the content was distributed between the Environmental Protection Authority website, which has information about the operation of the ETS; and the Ministry for the Environment website, which contains information about policy, how climate change affects New Zealand, adaptation and mitigation, and international domestic reporting.

The Ministry for the Environment is the key government provider of climate change communication with responsibility for: evidence-based advice to other officials and politicians, engagement with international climate science advice, and maintaining the Ministry's information publications on climate change. The Ministry's reports have included both straightforward information on the likely impacts of climate change (Ministerial Group on Climate Change, 2001) as well as specific guidance for local government on preparing for climate change (Ministry for the Environment, 2016D).

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The prime minister's chief science adviser is tasked with giving the New Zealand prime minister "strategic and operational advice on science and science policy issues." A July 2013 report prepared by this office focused on *New Zealand's Changing Climate and Oceans: The Impact of Human Activity and Implications for the Future*. As an "assessment of the current state of scientific knowledge," the report acknowledged the assistance of "some of New Zealand's leading climate scientists" (Gluckman, 2013). The minister of climate change at the time, Tim Groser, described the report as "useful" and used it as an opportunity to defend New Zealand's response to date on climate change through "world-leading action on reducing agriculture emissions" and the establishment of the ETS.

The Parliamentary Commissioner for the Environment (PCE) is "an independent Officer of Parliament" with "broad powers to investigate environmental concerns." Between 2008 and 2016, the PCE published five major reports on aspects of climate change, and 14 pieces of work under the category "submissions and advice" related to climate change issues. The most recent major report is a 2015 report on Preparing New Zealanders for Rising Seas (Parliamentary Commissioner for the Environment, 2015). In addition, as part of an ongoing review of the ETS, the PCE released a report in 2016 on how agricultural greenhouse gases should be treated as part of New Zealand's climate policy.

The New Zealand Climate Change Centre (NZCCC) was launched in 2008, "in response to a perceived need for collaboration across providers of science-related climate research and services, and for mechanisms to facilitate interactions with end-users." It is hosted by the National Institute of Water and Atmospheric Research (NIWA) but includes scientists from many New Zealand universities and research organizations. NZCCC activities to date include: organizing conferences, workshops, and special events; coordinating submissions on climate change matters; coordinating nominations for climate change-related activities; developing a website to provide information about climate change, NZCCC members, and their research projects; producing a publication on climate change adaptation; and producing short briefings on the 2°C target, and the Intergovernmental Panel on Climate Change (IPCC) AR5 New Zealand findings.

Organizations involved in climate change communication—through dialogue events, round tables, research, seminar series, and conferences—include Victoria University's Institute for Governance and Policy Studies and New Zealand Climate Change Research Institute, the University of Otago's Centre for Sustainability, the Sustainable Business Council, Pure Advantage, and the Environmental Defence Society. In addition, the independent economic think tank Motu Economic and Public Policy Research (mentioned in the section on innovations on climate change communication), and Ecologic, a sustainability think tank, both conduct research into climate change impacts and use journal articles, media releases, newspaper articles, seminars, and their own publications and community fora to engage key stakeholders and the public.

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The communication channels between experts on climate change, from both the physical and social sciences, and policymakers tend to be less formal than in other countries. Because of the size of New Zealand, individual climate scientists are able to have direct access to policymakers. It is not uncommon, for example, for a government minister to telephone a university climate scientist for direct advice, rather than access information through a government agency.<sup>22</sup> In policy advice, therefore, as in the media landscape, the scale of the country is such that there is a chance for individuals to have a disproportionate voice because of the strength of personal relationships.

In summary, a number of formal and informal processes exist through which policymakers are engaged on climate change issues. This includes formal reports by the Ministry for the Environment, Parliamentary Commission for the Environment, the prime minister's science adviser, and the Royal Society of New Zealand, as well as informal engagement initiatives led by independent think tanks and groups within universities. The government's main climate change policy, the emissions trading scheme, has both been commended as a world leader in its early establishment and more recently criticized as an ineffective mechanism in reducing New Zealand's emissions.

### Engaging Māori Society about Climate Change

Māori are the indigenous people of Aotearoa New Zealand, and represent 15% of the population (Statistics New Zealand, 2013A). The Treaty of Waitangi regulates the relationship between Māori and New Zealand society at large, addressing issues such as land ownership, resource use, and political representation. Notwithstanding these arrangements, climate change is expected to exacerbate many of the socioeconomic difficulties and disparities already faced by Māori in Aotearoa New Zealand (King, Penny, & Severne, 2010, p. 101). It is also important to emphasize that Māori society is not homogeneous (King et al., 2010, p. 103), and thus climate change is expected to result in differential impacts.

Dialogue and engagement across Māori society about climate change have been mediated primarily by three different mechanisms: the research system, Māori representative structures and pan-tribal collectives, and central government. With regard to the first of these, the IPCC Working Group II (Reisinger et al., 2014) summarizes relevant literature about Māori and climate change, highlighting that “[t]he Māori economy depends on climate-sensitive primary industries with vulnerabilities to climate conditions” (2014, p. 1406), as Māori have significant investments in farming and fishing industries. Furthermore, Māori “regularly utilize the natural environment for hunting and fishing, recreation, the maintenance of traditional skills and identity, and collection of cultural resources” (2014, p. 1406). These economic and cultural aspects of the relationship between Māori and the environment place Māori as a part of society in Aotearoa New Zealand particularly exposed to climate change.

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One recent study illustrates the unique relationship between Māori and the environment in comparison to non-Māori in Aotearoa New Zealand. This study compared endorsement of environmental values (“Protecting the environment [preserving nature]”) among participants who identified as Māori ( $n = 1,113$ ), New Zealand European ( $n = 8,303$ ), Pasifika ( $n = 429$ ), and Asian ( $n = 428$ ) (Cowie, Greaves, Milfont, Houkamau, & Sibley, 2016). The analysis tested the main effects of ethnicity while statistically adjusting for the effects of other demographic factors (e.g., gender, age, deprivation level). The results showed that Māori value environmental protection more strongly than both New Zealand Europeans and Pasifika, but not Asian respondents.

In another set of analyses, Cowie et al. (2016) investigated what particular dimensions of Māori identity drive higher environmental values among a sub-sample of Māori participants ( $n = 193$ ). In contrast with expectations, belief in Māori spiritual concepts was not linked with broader environmental values, but sociopolitical consciousness was. That is, the extent to which Māori participants recognize the importance of, and stand up for, Māori political rights was related to environmental values. Māori political consciousness is thus one central reason why Māori tend to value the natural environment more than non-indigenous New Zealanders (Cowie et al., 2016), and could be an important vehicle for engaging Māori communities in climate change action.

The National Institute for Water and Atmospheric Research (NIWA) is one of the leading research organizations that has specifically explored climate change in relation to Māori (NIWA, 2013). Furthermore, through its Māori Research and Development Unit—Te Kuwaha o Taihoro Nukurangi, NIWA convened the first (2003) and second (2006) Māori Climate Forums, which aimed to foster a dialogue about climate change between Māori and the scientific research community (King & Penny, 2006, p. 5). Further opportunities for engaging Māori society through research are being supported through the Vision Mātauranga programme in the Deep South Challenge (Deep South National Science Challenge, 2014).

Engagement about climate change has also been facilitated by representative structures within Māori society, such as rūnanga, trusts, and marae committees (e.g., Te Rūnanga o Kaikōura, 2007; Ngāi Tahu ki Murihiku, 2008; Raukawa Settlement Trust, 2015), which have done considerable work to address climate change from a Māori perspective. Several iwi and hapū (Māori tribal affiliations) have developed environmental management plans that have specifically identified climate change impacts as an issue for their people. Another, smaller, group went a step further and identified actual tribal policy to deal with climate change (Ngāi Tūāhuriri Rūnanga et al., 2013; Te Rūnanga o Kaikōura, 2007). These are significant examples of an alternative form of climate change engagement developed by Māori, for Māori.

Pan-tribal collectives such as the Iwi Leaders Forum are also instrumental in climate change engagement. As an example, the Climate Change Iwi Leaders Group held a series of regional “hui” (community meetings) in 2012 to engage Māori trusts and incorporations, whanau, and hapū on climate change and how it may impact Iwi Māori.

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The findings from this nationwide engagement were compiled into a report that was presented to a national hui in Wellington in 2012. The report summarized key issues facing Māori society as well as recommendations to be discussed in response to potential changes in government policy and legislation related to the ETS and climate change more broadly (Climate Change Iwi Leaders Group, 2012).

A third process for engaging Māori society about climate change are the efforts led by central government, such as the explicit focus on the implications of emissions trading policy on Māori and establishment of a Māori Reference Group during the ETS design (Ministry for the Environment, 2007). In addition, the government has engaged regularly with the Iwi Leaders Group on climate change mentioned previously, and there have been Māori representatives on the Aotearoa New Zealand delegations to the UNFCC Conference of Parties (COPs).

Notwithstanding these contributions, the effectiveness and uptake of the different forms of climate change communication that have come from such diverse efforts (institutional or otherwise) have not been assessed. Thus, while there is currently a very exciting phase of production of different forms of communications and engagement, for and by Māori, there is still no analysis of these communication efforts and limited research on Māori issues related to climate change.

More remains to be done to engage with the most vulnerable groups across Māori society (including kin groups isolated or discounted by political differences or strained relationships), and to determine how to build capacity to use scientific knowledge for adaptation. Given that perceptions of risks are known to be important in influencing communities' actions, tailored information and working with key influencers to communicate such information would likely assist such gaps.

## Conclusion

An overview of research shows that while a majority of New Zealanders believe that anthropogenic climate change is occurring, there is still a substantial proportion of the population who remains skeptical or unsure (Milfont, Milojev, Greaves, & Sibley, 2015). This is not, however, represented by New Zealand mainstream media coverage, which strongly aligns with Intergovernmental Panel on Climate Change (IPCC) messaging around the reality and risks of the issue. Less research has been carried out into alternative media streams, which reflect more divergent views, or the more targeted, innovative, and dialogic engagement activities that are occurring around the country.

While Aotearoa New Zealand is regularly assessed as being one of the countries least at risk from the direct physical effects of climate change ("ND-Gain Country Index," N.D.), its regional neighbors (specifically Antarctica and the Pacific Islands) are among the most vulnerable on the planet. This contrasting regional context is one distinctive feature of

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how climate change is framed and communicated in New Zealand. A second is the policy landscape, with its focus on an emissions trading scheme and its relatively low barriers for interaction between climate change experts and policymakers. A third distinctive feature is related to the impact that climate change may have on groups such as Māori communities.

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### Notes:

(1.) Māori are descended from East Polynesian settlers who arrived in the 13th century. The United Kingdom established British sovereignty in Aotearoa New Zealand through the Treaty of Waitangi, which was signed in 1840 with Māori chiefs. The most commonly

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used language is now English, but Te Reo Māori is also an official language, along with New Zealand Sign Language.

(2.) Percentages add up to more than 100% as people were able to identify with more than one ethnic group.

(3.) Nearly half of New Zealand's gross emissions are biological emissions from the agriculture sector. About 80% of New Zealand's electricity is generated by renewable electricity, and forests offer a significant carbon sink.

(4.) The longitudinal (panel) data was derived from this larger sample, representing the 269 respondents (out of the original 550) who completed all three waves of the survey.

(5.) Despite the journal title, two articles of the issue are focused on New Zealand.

(6.) The journal has changed its name and is now called *Media Studies Journal of Aotearoa New Zealand*.

(7.) "The New Zealand Climate Science Coalition was formed in April 2006 by a group of New Zealanders, mostly resident here but some overseas, who are concerned at the misleading information being disseminated about climate change and so-called anthropogenic (man-made) global warming" (NZ Climate Science Coalition, 2009).

(8.) "The Heartland Institute, the US organisation that plays a key role in organised climate denial, has directly funded New Zealand's most prominent sceptics, a search of US Internal Revenue Service documents has revealed. In 2007, Heartland granted US\$25,000 (NZ\$32,000) to the New Zealand Climate 'Science' Coalition, sending the money to New Zealand CSC member Owen McShane" (Renowden, 2012).

(9.) McShane and Leyland are also foundation members of the Coalition (NZ Climate Science Coalition, 2009).

(10.) The *New Zealand Listener* is "the country's only national, weekly current affairs and entertainment magazine" and "covers the political, cultural and literary life of the country" (*New Zealand Listener*, 2016).

(11.) Veronika Meduna, personal communication, 2016.

(12.) See, for example, the article "NASA: "Impossible to Deny Climate Change"; Nobody Is Denying It, We're Just Not Convinced It's Humans Who Are to Blame".

(13.) "The Canon Media Awards are the New Zealand publishing industry's premier awards, held annually to encourage, showcase and acknowledge the best of New Zealand's newspapers, magazines and websites, as well as the work of feature writers, columnists, cartoonists, reviewers and photographers" (Canon Media Awards, 2016). The publication of the book *Dirty Politics* (Hager, 2014) sparked a debate over the possible withdrawing of the award for Slater's role during a local political campaign (Stuff, 2014).

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(14.) One of the authors of this article, Salmon, was sponsored by Antarctica New Zealand to participate in this voyage and help coordinate associated education and public engagement activities. Other research organizations, including both Crown Research Institutes and universities, sponsored their Antarctic experts to join the month-long expedition. Three of the six Antarctic experts specialized in paleoclimate research. This is an example of the strong and proactive investment demonstrated by the Antarctic science community to engage the public. The connection between climate change communication and Antarctica is explored elsewhere in this article.

(15.) In October 2015, a voluntary survey was distributed to 374 people spanning 292 organizations representing government, research, business, NGOs, education, culture, and media, to collect information about current climate change engagement activity in New Zealand. Recipients were encouraged to circulate the invitation further as appropriate. Those respondents who chose to submit activity profiles tended to be involved in education or training, development of technical guidelines, information collection, or community activism. Responses were received from 125 people, some in their personal capacity and some as a representative of an organization. These high-level findings are reported in the Deep South National Science Challenge Draft Engagement Strategy.

(16.) Salmon, one of the authors of this article, was appointed in 2015 to lead the engagement program for the Deep South Challenge.

(17.) Judy Lawrence, personal communication, 2016.

(18.) In line with our comments about Aotearoa New Zealand's geopolitical alignments, of the six lectures, one was focused on Antarctica and one on the Pacific Islands.

(19.) Priestley is a co-author of this article.

(20.) For example, an analysis by Professor Dave Frame, who is director of the New Zealand Climate Change Research Institute, was director of the Deep South Challenge in 2015 and 2016, and specializes in climate science and policy, shows that between 2005 and 2013, the Marsden Fund—New Zealand's premier blue sky research fund—allocated NZ\$9 million to paleoclimate research projects compared to less than NZ\$6 million to all other types of climate-related research, including climate modeling, and research into atmosphere, modern cryosphere, and oceanography.

(21.) As counted under the internationally adopted "100-year Global Warming Potential" (GWP-100) metric. Different metrics would have a significant effect on New Zealand's profile, and New Zealand pays close attention to work on greenhouse gas metrics.

(22.) Professor Dave Frame, personal communication, March 17, 2016.

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