

Learning about Climate: An Exploration of the Socialization of Climate Change

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ABSTRACT

While the term “climate change” is highly recognized by the nonscientific general public, understandings of its manifestations are varied, contrasting, and complex. It is argued that this is because climate change has become simultaneously a physical and a social phenomenon. Thus, climate change is becoming socialized through nonscientific interpretation. Research has considered the roles of independent sources of information used to inform these communities, ranging from media sources to personal experiences. However, little consideration has been made of the interplay between information sources and how these sources are perceived by nonscientific communities in terms of trust. This paper presents a qualitative study of 52 ski industry stakeholders in Queenstown, New Zealand. It explores the sources of information used by these communities to construct understandings about climate change, their perceptions of these sources, the dominant interpretive factors, and the interactions between the information sources. It finds that personal experiences of weather are used to interpret other sources of information and are drawn upon to corroborate and reject the existence of climate change and its relevance for their locality. This paper concludes that locally relevant information on climate change is required to ensure that it is applicable to nonscientific realities and lived experiences.

1. Introduction

Climate change is both a physical and a social phenomenon (Hulme 2008, 2009; Urry 2011). Acknowledging the existence of these two conceptualizations of climate change is essential in order to appreciate the many varied ways that the nonscientific public can perceive, know about, and understand climate change (Hulme 2012). Knowledge about the physical phenomenon of climate change is quantified and measured on a global and regional scale by institutions such as the Intergovernmental Panel on Climate Change (Solomon et al. 2007; Hulme 2012) and increasingly using national and even local-scale climate modeling (Hennessy et al. 2003; Hendrikx et al. 2012).

Attention has begun to turn to the ways through which nonscientific communities come to know about, and thereby socially construct perceptions of, climate change. Research concerning the processes through which climate change becomes socially understood has focused on values and ideologies (Hulme 2009) and individual information sources (Wilson 2000a; Myers et al. 2012; Akerlof et al. 2013). So far, however, there has been

little discussion about the variety of information sources used by nonscientific communities, the interplay between the sources, and how these sources of information are perceived by the nonscientific public (Lorenzoni and Hulme 2009).

The empirical research presented in this paper is situated in the Queenstown Lakes (Queenstown hereafter) region of New Zealand, an international tourism destination. The availability of natural snowfall and the development of winter sports was critical to the transformation of Queenstown from a domestic destination to an all-season international resort, a transition that dates to the opening of the first commercial ski field in the region, Coronet Peak, over half a century ago (Higham 2005). This qualitative research engages with a range of stakeholders from the ski industry. Stakeholders are defined as individuals with a livelihood and/or lifestyle dependency on natural snow and who therefore maintain a deep sense of appreciation of the critical relationship among local weather, business performance (Smith 1993), and recreational activities.

How do nonscientific communities construct understandings of climate change?

Climate can be understood through formal longitudinal meteorological statistics or as an *imaginary* constructed

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by local perceptions, actions, and cultures (Hulme et al. 2009; Hulme 2012). Weber (2010) uses categorizations of *personal experience* and *statistical description* to differentiate between sources of climate change information. While the former relies on the personal interpretation of localized weather events, the latter puts the responsibility on scientific interpretation. Yet, there are complexities attached to both sources. Indeed, differentiating between weather and climate¹ can be difficult for non-scientific communities (Weber 2010). This can lead to the attribution of unique weather events to climate change, which can be aligned to underlying perceptions of, or belief in, climate change (Weber 1997). This was identified by Rebetez (1996) who argues that when winter days are warmer than average it can be perceived by nonscientific communities to be a sign of climate change, yet cooler periods of weather are interpreted as proof that climate change does not exist.

This was also reported by Dutt and Gonzalez (2012): “Day to day personal experiences do not always agree with scientific description and predictions of future climate consequences: when there is two feet of snow on the ground, a person perceives the threat of climate change as far off.” This suggests that expectations of climate change can mediate perceptions of weather, with cooling events less likely to be linked to climate change.² Still, nonscientific communities use weather signals to interpret changes to the local climate, affecting and affected by reported belief and concern about climate change (Bord et al. 2000; Hamilton and Keim 2009; Li et al. 2011; Ryghaug et al. 2011).

The mass media’s role in providing informal non-scientific climate change education has received considerable academic attention (Bell 1994b; Wilson 2000a,b; Carvalho and Burgess 2005; Boykoff 2007a,b; Boykoff and Boykoff 2007; Ryghaug et al. 2011; Marin and Berkes 2013). Media agenda setting theory (Atwater et al. 1985; Zhu and Blood 1997) suggests that the salience of an issue can be raised through increased media attention (Sherry 2002). Topics of high interest coupled with high uncertainty, such as climate change, are more susceptible to the effects of media agenda setting.

Journalists operate as mediators between scientific and nonscientific communities (Mikulak 2011). Yet, often they too have a nonscientific understanding of climate change (Bell 1994b). Consequently, it is argued that

journalists can underplay the scientific consensus and accentuate the scientific debate, contributing to misrepresentation, miscommunication, and contradictions (Wilson 2000b). Within the climate change discourse, media sources have been critiqued for providing balanced weighting in media reporting despite nearly unanimous scientific agreement (Boykoff and Boykoff 2005; Boykoff 2007a), judging which voices and messages gain prominence (Brown et al. 2011), and being inaccurate, biased, and sensationalist (Carvalho and Burgess 2005).

Nevertheless, in a recent study by Marin and Berkes (2013), media accounts of climate change were reported to be largely irrelevant to local communities, as a result of the contrasting epistemological positions between the media and the communities. Accordingly, they argue that climate change knowledge of local nonscientific communities is not influenced by media frames of climate change alone but more readily shaped by a range of information sources and the interplay between the sources³ (Marin and Berkes 2013). Indeed, research suggests that information provision in general has a limited influence on public attitudes and therefore it is public engagement with information that requires greater examination (Lorenzoni and Hulme 2009).

2. New Zealand: Framing the social, cultural, economic, political, and climatic context

Set in the South Pacific, New Zealand has two main islands: the North Island and the South Island along with several smaller islands amounting to 269 652 km² (Statistics New Zealand 2013b). While the landmass is slightly bigger than that of the United Kingdom, New Zealand’s population density is significantly lower. Most of New Zealand’s 4.4 million residents (Statistics New Zealand 2013a) reside on the North Island, with one-third of the population living in Auckland. Consequently, regions of the South Island have one person (or less) per square kilometer (2006 New Zealand census).

Migration is central to New Zealand society (Lovelock et al. 2012). Since the Māori settlement over 1300 years ago, New Zealand has seen waves of dominant migrant populations from European settlement in the 1840s through to modern day Asian migration. At present, most New Zealand residents are of European descent (77%), followed by Māori (15%), Asian (10%), and Pacific Islands (7%)⁴ (Ministry of Social Development 2010), although

¹ Weather is the atmospheric conditions at a specific place and time, whereas climate is the accumulation of weather events over an extended temporal and spatial period (Schneider et al. 2011).

² Which is often expected to manifest as a warming trend (global warming).

³ For instance, the layering of information from a variety of sources including, but not limited to, personal experiences, the media, and informal interactions.

⁴ Respondents were able to identify with more than one ethnicity.

this could change in coming decades as a result of internal factors such as immigration policy and external factors including climate change.

Since 2008, New Zealand has been ruled by the center-right “National” party. In the 2011 election, National won over 47% of the votes, followed by the Labor Party (27%) and the Green Party (11%). New Zealand experiences an overwhelming urban/rural divide in terms of political positions. In terms of climate change, New Zealand’s primary response came in the form of the Emissions Trading Scheme (ETS) first established by the Labor government, under the Climate Change Response (Emissions Trading) Amendment Act 2008. This was then amended by the National government in 2009 and 2012, which saw the removal of many of its key features. This was followed by the National Government’s recent opt out of the Second Commitment Phase of the Kyoto Protocol.

Biennial “perceptions of the state of the environment” surveys have been conducted since 2000. In the 2010 survey, 24% of respondents perceived global warming/climate change to be the greatest global threat (Hughey et al. 2010). Domestically, however, respondents argued that water related issues are the greatest risk. Thus, it can be suggested that for many New Zealanders, climate change is perceived to be a global (distanced) rather than local threat. Nevertheless, with a market economy and heavy dependence on international trade (Statistics New Zealand 2013b), New Zealand is vulnerable to external as well as internal stressors.

The climate in New Zealand is already changing. In alignment with global average temperature increases, New Zealand has experienced an increase of 0.96°C in the past century (Ministry for the Environment 2009; Wratt et al. 2013). This has disproportionately affected average minimum temperatures with an increase of 1.2°C, with direct implications for many of New Zealand’s industries including the ski industry. Research has indicated that New Zealand’s ski fields will have the technical capacity to use snowmaking technologies until the mid-to-late century (Hendrikx and Hreinsson 2012). This is in stark contrast to the neighboring ski industry of Australia. It has been argued that this relative vulnerability is an opportunity for Queenstown’s ski industry (Hennessy et al. 2007; Hendrikx et al. 2013). In terms of climate change impacts arising from increased average temperatures (and other manifestations), several reported impacts will directly affect New Zealand’s ski industry including fewer cold temperatures and frosts, increased westerly wind flow, long-term reduction in ice volume and glacier length, and a decrease in the duration of seasonal snow (NIWA 2013). Nevertheless, research has reported optimism amongst the ski industry as a result of Australia’s relative vulnerability (Hopkins et al. 2013)

TABLE 1. Table of participants in stakeholder categories.

Stakeholder categorization	Stakeholder subcategory	Number of participants	Length of interview (minutes)
Ski industry	Core	6	30–80
	Support	2	Avg 50
	Peripheral	6	
Community		7	31–58 Avg 44
Tourists	Domestic	9	30–64 Avg 36
	International	19	6–44 Avg 24
Government		3	37–55 Avg 47

and the capacity to use snowmaking technologies (Hopkins 2013a).

3. Methodology and methods

A social constructionist approach to understanding knowledge creation is adopted for this research. While there have been critiques of the appropriateness of social constructionism to discuss environmental issues (Burningham and Cooper 1999), this is without consideration of the spectrum of constructionist thought (Jones 2002). This paper specifically aligns with a moderate or contextual form of social constructionism (Hannigan 1995; Milton 1996; Jones 2002), which while being epistemologically relativist does not contest the ontological reality of environmental issues.

A qualitative methodology was employed to identify and explore the construction of knowledge about climate change. Qualitative research methods have been employed in several social studies of climate change as it contributes to the multiple understandings of climate change (Whitmarsh 2009; Wolf and Moser 2011). Semi-structured in-depth interviewing was selected to address the processes through which individuals come to understand and know about climate change. The 52 interviews were conducted with stakeholders in Queenstown, New Zealand. Hage et al. (2010) suggests that in order to produce relevant forms of knowledge, knowledge creation must move beyond scientists to include societal stakeholders and citizens in the process. Thus, a purposive sampling strategy (Mason 2002) was utilized to recruit participants (Table 1) through stakeholder categorization: industry ($n = 14$), community ($n = 7$), domestic tourists ($n = 9$), international tourists ($n = 19$), and government ($n = 3$). These stakeholder groups incorporate a wide breadth of individuals with a livelihood and/or lifestyle connection to the ski industry in Queenstown. Many participants fulfilled the selection criteria for multiple stakeholder categorizations but are listed in this research

TABLE 2. Electronic coding of the transcripts.

Coded themes (R1)	Coded themes (R2)	Number of references (R2)
Climate change	Climate change	149
1. Behaviors (mitigative)	Weather	123
2. Belief in climate change	Representations of weather and climate	77
3. Causes of climate change	Narratives of local climatic changes	128
4. Climate science	Knowledge construction and understanding	214
5. Datasets (modeling)		
6. Engagement with climate change		
7. Experiences of climatic changes		
8. Human responsibility for climate change		
9. Information sources		
10. Scientists and government		
11. Spatial scales		
12. Temporal scales		
13. Wider environmental issues and consumption		
Weather		
14. Understandings of weather/climate		
15. Difference between weather and climate		
16. Stories of local weather		
17. Learning about weather		
18. Importance of weather		
19. Weather forecasting		
20. Changes to weather		
21. Winter weather in 2011 (research year)		

by their primary identification. The interview program continued through to redundancy and saturation (Lincoln and Guba 1985; Eisenhardt 1989).

The purpose of this research was to conduct an in-depth exploration of how nonscientific communities construct understandings of climate change, specifically focusing on the sources of information used in these constructions. To achieve this, the interview program was developed around three main objectives: 1) to identify the sources of information utilized to construct understandings of climate change, 2) to explore the interplay between these sources, and 3) to assess the perceived utility of these sources.⁵

When using purposive sampling methods, the processes of sampling, data generation, and data analysis are dynamic and interactive (Mason 2002). Interpretation takes place throughout each stage of the research process (O'Reilly 2005), so preliminary interpretations occur in the field during interview and transcription processes as well as through a more structured interpretation of the empirical material post-fieldwork. Interviews were partially transcribed and thematically coded using NVivo10 qualitative software. Electronic coding and analysis “gives the researchers the opportunity to play around with their data and familiarize

themselves with the package sufficiently to be able to code confidently” (Basit 2003, p. 152).

The empirical material was interpreted utilizing thematic analysis, which prioritizes searching for emergent themes (Patton 2002). This is a typical approach for qualitative research, with the search for themes perceived to be the equivalent of the use of variables in quantitative research (Veal 2006). Themes can emerge as a result of both inductive and deductive reasoning, with field generated material combining with the researcher’s conceptual framework (Veal 2006). The “in-text coding” function of the NVivo10 software was used in order to code freely through the first reading, producing many overlapping categories and identifying a range of themes. During the first round of coding (R1), 21 codes emerged related to two main themes: climate change and weather (Table 2). A new NVivo file was then created and the transcripts were coded for a second time (R2). These were informed by the emergent themes from round one (R1) but further developed into five themes: climate change, weather, representations of weather and climate, narratives of local climatic changes, and knowledge construction and understanding. The process of double coding advanced the analysis process and interpretations of the interview transcripts.

This paper distinguishes between experiential and mediated sources of information. The former relates to the way personal experiences of weather influence public understandings of climate change, while still

⁵Distinguished as the most frequently cited by research participants.

acknowledging that intrinsic and extrinsic norms and worldviews will be used to interpret these experiences through individual frames of reference. The latter considers the multiple roles of science, the media, and informal conversations with friends and acquaintances. It investigates how these sources of information contribute to understandings of climate change among nonscientific communities and the expressed perceptions of these sources from research participants.

The boundaries between scientific and nonscientific types of knowledge are distinctly blurred (Ryghaug et al. 2011). There is a continuum of scientific knowledge; participants of this study had differing levels of scientific training, with some participants having received university-level science education. These participants were more likely to refer to scientific methods and express trust in scientific knowledge production, especially compared to individuals with little scientific training. For the purpose of this paper, the science/nonscience distinction is adopted; however, the simplification of these categories is acknowledged.

4. Understanding climate change

Participants of this study identified the overlapping and simultaneous roles of sources of information: science/scientists, the media, informal conversations, and personal experiences. These sources of information are interwoven with interpretive factors: trust, contradictory and conflicting information, confrontation, and balance as well as barriers including temporal scales and the “finite pool of worry” (Hansen et al. 2004; Weber 2006, 2010). Interactions between the sources of information and social interpretations construct a multitude of differing imaginaries (Hulme et al. 2009) of climate change for nonscientific communities.

a. Understanding climate change through science

The scientific basis of climate change knowledge was identified by research participants, from all stakeholder categorizations, as an important source of information and one that was believed to be more trustworthy than alternative sources:

I believe in science more than other forms of information that are out there (Iain, ski field manager).

I accept the scientific consensus that climate change and the human effects are a real thing (Patrick, international tourist)

I do believe in the science, I think the science speaks quite clearly...I mean people that don't believe in the science, I think, are crazy (Elizabeth, ski field manager).

However, while *science* as a knowledge domain was largely trusted, it was broadly noted that *scientists* could be socialized, contributing to bias. One explanation for this was the role of funding regimes. This could indicate a separation in the participant's perceptions of science and scientists with more trust allocated to the former than the latter, as well as an understanding that scientists are also social actors and therefore fallible:

The scientist could be sponsored by, their research could be sponsored by an oil company or whoever and so they're coming from a certain bias, and I would take that into account (Rupert, ski guide).

b. Understanding climate change through the media

For many participants, science is mediated by media reporting and while the scientific basis of climate information was trusted, the reporting of scientific information was perceived to be less dependable. In particular, perceived contradictions among the scientific community along with the media's representation of these inconsistencies were argued by participants to be confusing and distancing for the nonscientific public. This was especially noted in relation to the dramatization of the climate change discourse. It was argued that this could lead to polarized viewpoints on climate change:

On TV the other night, two scientists were sitting there on the “Close-up” program, one's going, “Well come on, we don't actually know” and the other guy's going, “Yes we do!” So the public is going, “WHAT?!” (Hugh, ski guide).

Thus, Hugh outlined the confusion that arises for nonscientific communities when scientific rhetoric appears to present contradictory messages. Contributing to this are concerns over the trustworthiness of the media as a source of information about climate change. This led Elizabeth to perceive the media to be overly negative, resulting in inaccurate images of climatic change. Here, she refers to “scare tactics” as a media tool, rather than accurate representations:

Well the media, again from personal experience, loves a negative story, so I think they're always going to take it with scare tactics to sell papers essentially. Perhaps that's some of the reason why people are mistrustful of what they're seeing because you can't necessarily believe what you see on the television (Elizabeth, ski field manager).

Furthermore, participants found that media reporting of climate change often lead to feelings of guilt and blame. “Well, because I'm a victim of the media, according to my understanding, it's all our fault” (Helen,

local government). Other participants argued that media reporting is not “balanced” and therefore leads to misunderstandings over responsibility, impacts, and risks. This contributes to confusion over the attribution and causation of climatic changes:

From my experience, the second the media gets hold of something it immediately becomes more grandiose... the media is very selective because it's after a good story... they're not balanced and I don't think they ever will be in that regard because it's not their aim (Nick, community member).

Thus, media sources were not reported to be a valuable source of climate change information despite being recognized as a way of learning about climate change and a channel through which science is reported to the general public. The media was also discussed in terms of reported occurrences of extreme events. The increased frequency and intensity of extreme events are a central manifestation of climate change as reported by the IPCC and repeated by participants of this research. However, media reporting of recent extreme events, such as Hurricanes Katrina and Sandy, was thought to misrepresent whether increasing occurrences and intensities of extreme weather events actually exist or whether it is the result of increased media attention:

What I see is more turbulent weather patterns but is that a function of reporting or is it a function of reality? What I don't get, as a member of the public, is some comprehension of like is there a quantum out there which is genuinely changing? I think it is, but it could just be the fact that we have this amazing global media which says, “Oh we can report on Indonesian volcanoes now...” What's the truth? (Richard, domestic tourist).

This quote by Richard clearly characterizes the confusion that was evident throughout the stakeholder interviews over the reporting of climate change manifestations. This confusion could provide one explanation for the reported public preference for “wait and see” low-cost responses to climate change (Hanson 2011, 2012).

c. Understanding climate change through social interactions

Social interactions with family members, friends, and acquaintances were identified as another source of climate change information. However, these conversations were largely perceived to be confrontational rather than informative. In that way, climate change was compared to politics and religion: topics that are taboo in certain social situations. Many participants stated that they would

avoid conversing about climate change with individuals with opposing viewpoints. Jenna, a community member, affirmed that she discusses climate change with her close friendship group and people with commonalities in environmental and political stances but finds communicating with individuals who hold differing viewpoints on climate change to be challenging. Through communication with people with similar values and beliefs, compatible identities are developed within their interpretive community. This suggests that informal conversations may not be influential in learning about climate change beyond preestablished perceptions:

I don't try to convert people that are skeptical because I think that it becomes too personal... it's also very threatening to people because often it's seen as a criticism of their lifestyle and also, you know, it's not like, I still fly planes and I still go skiing, you know I don't feel like I'm in a position where I can tell everybody else how to change their behavior (Jenna, community member).

Here, Jenna identifies one key feature of the climate change discourse that differs from other global environmental issues, such as ozone depletion, that have gained greater traction: the embeddedness of the causes of climate change within everyday sociocultural and economic practices and norms. Participants widely reported that these factors make climate change more confrontational and directly challenging.

The quest for balance was raised by participants in terms of social interactions, where communication with individuals holding strong positions was avoided. Thus, balance was not limited to media representations and reporting of climate change alone but a demand for all sources of climate change information:

It's hard because some people are saying there's no climate change, so we don't talk to those people because you can't get a balance (Hazel, international tourist).

This was further exemplified by Derek, who provided a detailed explanation of the differences he had experienced with an acquaintance. The language and strength of division is recognizable from this quote:

It's a hot topic at home, we get some people and they say, “Oh my god it's cold here this summer!” and I just say, “Well you thank god for global warming!” One woman that lived in New York... just got up and walked away and she said, “The world is getting hotter and that's that!” and she walked out. Well, they went home to their Northern [Hemisphere] winter and New York went under snow, it wasn't last year, the year before, went under snow for months and I thought, “Excellent!” (Derek, domestic tourist).

This quote also supports the work of Rebetz (1996) and Dutt and Gonzalez (2012) by identifying perceptions that warming weather trends are the underlying expectation in terms of climate change manifestations for nonscientific communities. In contrast, cold weather events, such as the snow storm in New York, are used as evidence that climate change is not occurring. This point is expanded further in the subsequent section, where localized personal experiences are addressed.

d. Understandings of climate change through personal experience

The use of localized personal experiences to narrate understandings of climate change focuses on issues of belief, climatic extremes, rapid change, erratic weather patterns, and difference in local climate. Most participants reported confidence in their own experiences and interpretations and therefore reported that they could explain or justify their personal position on climate change. However, one participant did raise concerns over the capacity of individuals to experience climate change, arguing that the long timeframes were beyond human comprehension. Personal experiences were used to both confirm and reject the existence of climate change.

Many interview participants lived and/or worked in alpine settings and used these environments to interpret changes to the climate. Understandings of climate change were embedded in these local social realities and intertwined with worldviews and social norms. The quote below is indicative of many of the participant's use of direct weather signals to explain their climate change perceptions. In this example, the participant had previously worked and resided in an alpine region on the North Island of New Zealand. She used these experiences to inform her evolving perceptions of climate change:

Well, I used to believe in it, we used to live on a ski field...they had a number of lean years in terms of snow...I was a believer until the ski fields, not the ski fields but you know, the country had some harsher winters again, and so it appeared that that theory was not as valid for us in New Zealand anyway (Julia, industry association manager).

This participant suggested that the "theory⁶ is not valid for New Zealand," which could be interpreted as referring to the global scale of climate change scientific forecasting, with this participant unable to see the expected manifestations from the physicality of climatic changes in her own everyday reality. This

participant, along with many others, vocalized the more vulnerable position of Australia's ski industry. This provided a sense of optimism that New Zealand was to be less impacted than Australia in the short to medium term.

Nevertheless, while the everyday localized weather is congruent with climate change forecasts the general public appear to be more likely to "believe" or "perceive" climate change; however, incongruence can result in distancing the public from the climate change discourse. The New Zealand glaciers were discussed by participants in terms of access for mountaineering, with increasing melt and decreasing mass having direct implications for lifestyles and livelihoods. Glaciers were also used as evidence of cyclical recession and growth periods that were perceived by some participants to be aligned with climatic changes.

Recent extreme events occurring both globally and locally lead some participants to believe that climate change is already happening. Participants used their personal weather experiences, including flood, drought, wildfire, and snow, to discuss current occurrences of climatic extremes that were attributed to the climate change discourse:

Yeah, it feels like it's everywhere: climate change is upon us. It's going to be obvious, I mean, it's super obvious what's going on. I'm from Australia, we've just gone through 8 years of drought and, you know, now they're going through floods and bush fires. It's just a lot of chaos happening out there (Suzy, community member).

Thus, chaos and extremes in weather conditions were used to justify the belief in climate change as both a current and future occurrence. Participants used their experiences and realities to frame climate change as a relevant issue with potential impacts for themselves and their social networks:

I definitely believe in climate change, you'd be mad not to, but it's going to be more about extremes of weather conditions as opposed to "it will get really hot and we won't get any snow." I mean, in my experience in the ski industry over the last 6 or 7 years, we've seen, especially up at Mount Ruhapehu, record snowfalls...so I think we're going to see more extremes (Elizabeth, ski field manager).

For ski industry participants in particular, but also reported by other stakeholder groups, extreme events were perceived to be less concerning than exponential warming. This was predominantly based on considerations of snow availability for the ski season. Furthermore, cooling climatic events contradicted the dominant perceptions and expectations of climate change as exponential warming. However, this perception overlooks

⁶The theory here is the theory of climate change and its impacts on the global ski industry.

the range of climate change manifestations⁷ as well as negative implications for the ski fields associated with increased extreme events including safety and access.

For tourist stakeholders, some changes to the local (Queenstown) climate were articulated. Experiences over the past two decades, including decreasing snow reliability, were expressed by participants. Since snow reliability is central to ski tourism offerings, this is a particular concern for the ski industry:

For the last sort of 15 years I've noticed a definite change in the seasons, less predictability of what the conditions are going to be like, and the winter's aren't as good as they used to be for sure (Jasper, international tourist).

The 2011 winter season in Queenstown was characterized by a range of domestic and international environmental occurrences that negatively impacted the tourism industry in Queenstown (Hopkins 2013b). This included an early season inversion layer that led to high temperatures in the alpine regions preventing natural snowfall and the use of snowmaking technologies resulting in a delayed opening for the ski season. Consequently, participants reflected on the current weather extremes in their responses:

It's a great year to be doing your research, amazing, because it's really making people question: I mean everyone's like "oh it's been like this before" but I'm like "yeah it has, but it does feel different to me." [Interviewer: How does it feel different?] It's just the growth in my garden feels different: it's been so mild. I walk my dog really early every morning and it hasn't been that frosty. Recently it has been [frosty] but not that just frost after frost after frost that we normally get (Jenna, community member).

This participant used everyday recreational activities to frame climatic changes and the changes over time. Thus, these changes have relevance to the participants' lifestyle and are easier to comprehend on a local scale and consider in light of other information sources, expectations of climate change manifestations, individual world views, and collective norms.

For some participants, reflecting on past weather conditions and events led to perceptions that climatic changes were occurring rapidly and with visible impacts upon the local region. Yet for others, climate change was argued to be temporally distanced, thereby indicating a divergence in nonscientific perceptions of the temporal reality of climate change. Past climate experiences were also used to identify changes; these were often

considered to be more reliable than recent events or hypothetical situations. Past experiences and changes based on local landmarks and behaviors allowed the nonscientific community to speak about changes with relevance to local realities:

I think, regardless of the science, I think that just in my lifetime there has been an incredible change; it's happened from when I was young to now...there was a lake in the park and that lake used to freeze every year and the whole community would go out skating; that now just doesn't happen...and that has happened quite rapidly (Duncan, domestic tourist).

This participant talks about the changes that have occurred in his lifetime and specific local events. This type of information gives nonscientific spatially and temporally relevant frames of reference. Further, this participant stated that "regardless of the science," suggesting that his own personal experiences were sufficient to develop understandings of localized climate change.

e. Barriers to understanding climate change

In contrast to the perception of current climate change, some participants indicated a perception that climate change will not occur in the near future, and this contributed to expressed opinions of climate change being someone else's problem, which could in turn lead to, and justify, a lack of action:

In 20 years' time I'll probably be in a rest home and it doesn't matter (laughs). Someone else will worry about it (Ben, community member).

Not in my lifetime (laughs). No, no, I can't see it happening in my lifetime, which is, I'm 58 now so I can't see that happening (Kathryn, domestic tourist).

This was reiterated by participants who identified disengagement associated with a lack of time and a compromised ability to "know" or understand climate change. This could indicate a substantial barrier to the climate change discourse for many nonscientific communities:

It's hard for individuals to know enough...people have enough to think about, you know; they feel like their worries and their life are big enough, without putting that on top of it (Jenna, community member).

A further explanation is evidenced by Cameron, a domestic tourist who argued that nonscientific communities are ill prepared to discern media and scientific reporting in terms of accuracy. Therefore, while science was generally perceived to be an objective and accurate source of climate change information, the nonscientific

⁷ Including cooling, warming, and extreme events.

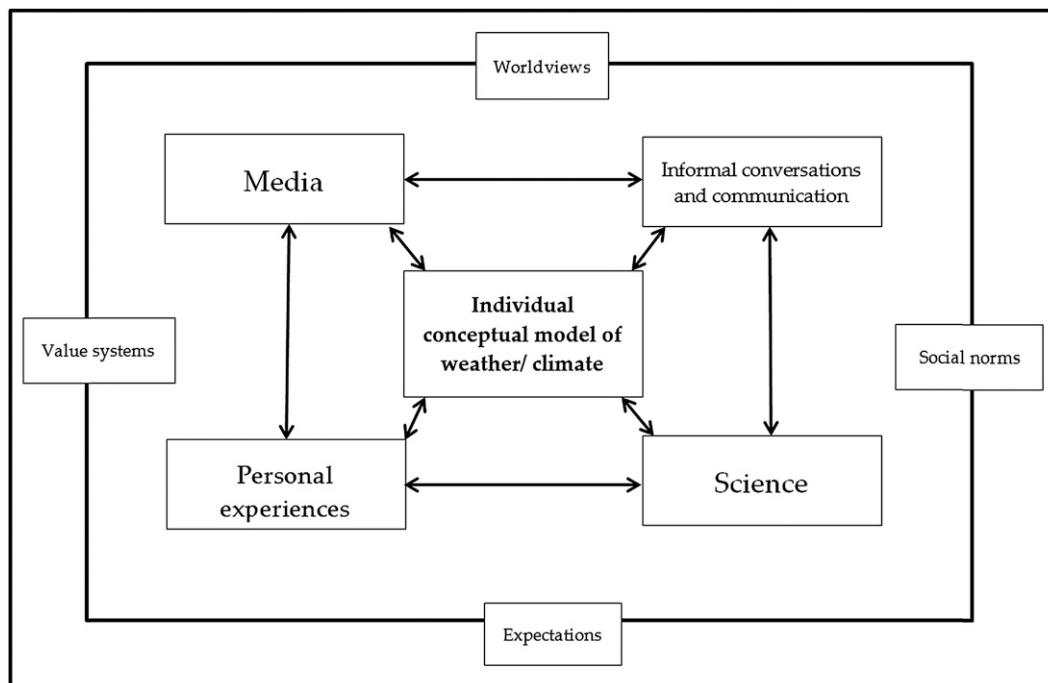


FIG. 1. A visual representation of information sources and interpretive factors emerging from the empirical research.

research participants found it difficult to engage with the reporting because of inconsistencies, conflicting reporting, and confusion:

I think some articles are good when they're talking to the right scientists, but it's hard for someone like myself to weed through what's accurate and what's not (Cameron, domestic tourist).

5. Discussion

The empirical findings presented in this paper have provided a valuable insight into the various interacting information sources used by nonscientific social actors to learn about climate change and participant perceptions of the utility of these sources. Science/scientists, the media, informal communications with friends and acquaintances, and personal experiences are influenced by, and in turn influence, individual conceptual models (Fig. 1). Sources of information will be given different prominence and importance based on individual and collective value systems. In the case of the present research, personal experiences were highlighted as particularly significant because of the reliance on the weather for lifestyles and livelihoods. These personal experiences were interpreted in light of other information, expectations, individual world views, and social norms.

The four sources from which information about climate change emerges are interacting and mutually informing.

Preference for specific sources of information and trust in the information sources will be individually determined. For example, science is often consumed through media reporting, and friends and acquaintances will learn and reinterpret climate change information arising from the media, informal interactions, science, and personal experiences.

The visual representation of the empirical findings presented in Fig. 1 will structure the discussion that follows. Consistent with previous studies (Milne et al. 2008; Myers et al. 2012; Akerlof et al. 2013; Marin and Berkes 2013), the empirical material suggests that the interpretations of personal experiences of localized weather are central to nonscientific understandings of climate change. These experiences can be used to corroborate or undermine information arising from the media, science, and/or informal interactions (Bickerstaff 2004) in line with expectations.

First-hand experiences of weather, especially extreme weather events (such as the event that occurred during the fieldwork program), appear to be particularly significant in forming these understandings (Rebetz 1996; Pereira and Koifman 1999; Hulme et al. 2009). Importantly, whether the event is attributed to anthropogenic climate change or perceived to be an unrelated weather event is intricately connected to "belief" in climate change (Hulme et al. 2009) and predetermined expectations of climate change manifestations. This has previously been identified in terms of risk perception, where risks must be associated

with the climate change discourse to evoke mitigative or adaptive action (Whitmarsh 2008; Weber 2010).

Climatic changes perceived over time appear to be particularly dominant in affecting understandings and expectations of climate change. This was observed when participants related weather events to recreational activities such as ice skating on frozen lakes, dog walking, and gardening. These activities made participants feel able to relate climatic changes back to their own social reality (Lawrence 2009; Marin and Berkes 2013). Furthermore, participants of this study frequently used terminology of belief in climate change; it has previously been argued that where the environmental issue is far removed from lived everyday experiences, the non-scientific community has difficulty relating to and imagining it will happen, which contributes to conceptualizations of belief rather than certainty (Nilsen 1999).

Where the perceived climatic changes implied a warming trend, for example, decreased natural snowfall, it was more likely to be attributed to climate change (or its “synonym” global warming),⁸ whereas trends of increased snowfall were used to dismiss climate change forecasts as irrelevant for the New Zealand context (Dutt and Gonzalez 2012). This supports previous indications that episodes of weather may be used to challenge the existence of climate change (Rebetez 1996; Weber 2010). Thus, it appears that scientific forecasting needs to align with locally experienced weather events for it to be trusted or perceived to be relevant. This recognizes the importance of situating climate change in a regional context and everyday local realities (Slocum 2004). Indeed Lorenzoni and Pidgeon (2006) report that climate change needs to be situated in terms of specific localities to increase the salience of the issue. This also has implications for broader climate change education and suggests that for some, climate change is expected to manifest as a warming trend, as opposed to the wide range of climate change manifestations as reported by the IPCC (Solomon et al. 2007; Parry et al. 2007).

Local warming events, changes to expected weather, and chaotic weather were distinguished as features of climate change and thus used to justify the belief in climate change. A study by Myers et al. (2012) explains that people with a low engagement with the issue of climate change rely more on personal experiences of weather than preexisting beliefs. Consequently, expected

weather and experienced weather could become more important in terms of the general public’s belief in climate change. This therefore confirms the claim that climate change education needs to be localized and “place based” (Myers et al. 2012); something that the mass media is unable to provide (Marin and Berkes 2013). Thus, the reliance on the media as a key source of information for the general public could further distance nonscientific communities from the issue of climate change.

Global extreme events are also significant for non-scientific understandings of climate change. However, these are experienced through second-hand sources, predominantly the mass media. Increasingly accessible and pervasive media reporting has raised public awareness of spatially removed environmental hazards and risks (Bell 1994a,b; Wilson 2000b; Brody et al. 2008). Thus, although the public may not experience the events first hand, they come to know and learn about the events through media coverage. The present research suggests that, for some, extreme weather events such as floods, droughts, and storms are depicted by media sources as manifestations of climate change. Some participants consider these events to be overused by the media to confirm the existence of climate change, suggesting that, contrary to Boykoff and Boykoff (2005) and Boykoff (2007a), participants of this study perceive the media to overrepresent climate change causes (carbon dioxide emissions) and impacts (including sea level rise, melting ice caps, and increased average global temperatures), rather than providing balanced reporting of climate change.

In terms of the science basis, this study finds that while the scientific basis is largely trusted, scientists were perceived in some cases to be corruptible or potentially biased especially in terms of research funding. In some cases, nonscientific communities will be unable to distinguish between “mainstream” climate science and that funded by oil companies. This could suggest that social interactions, relationships, and trust between social actors and information sources are at the core of communicating climate science (Hart and Nisbet 2011; Myers et al. 2012). Indeed, it could indicate public concern over the fallibility of humankind and a need for greater interactions with scientists. Reported contradictions and uncertainty in climate science can act as a barrier to public engagement with climate change information. Contradictions in messages from science, media, and informal conversations lead to confusion amongst nonscientific communities or total disengagement with the issue of climate change. As nonscientific communities will pay more attention to sources of information that are perceived to be trustworthy (Slovic 1987), trust in the source of information is vital for the message to become accepted

⁸ Research has suggested that although climate change and global warming can be used as interchangeable terms, in fact for the general public they have quite different meanings, with more expressed concern over global warming than climate change (Whitmarsh 2009).

and relevant. Hansen et al. (2003, p.115) concur that “if people do not trust the messenger, they will not trust the message.” Participants clearly articulated the overwhelming nature of climate change information for nonscientific communities and an inability to prioritize this information, especially where contradictions exist.

It has been argued that informal interactions are an important source of nonscientific information (Freudenburg and Pastor 1992; Ungar 2000). This study finds that informal conversations with friends and acquaintances can be confrontational where contrasting views on climate change emerge. The polarizing nature of climate change means that these conversations can be argumentative and passionate and therefore avoided. This could be explained by conflicting worldviews, political positioning, and/or the magnitude of the issue. While there were indications of connections between perceptions of climate change and broader discourses on sustainability and consumption, further research is required to better understand how these factors contribute to interpretations of information sources as well as climate change (Bellamy and Hulme 2011).

While informal conversations are thought to help individuals “negotiate compatible identities” (Ungar 2000, p. 299), this may not be the case with polarizing and passionate topics such as climate change. Further consideration of cultural theory and interpretive communities (Douglas and Wildavsky 1982) could aid understandings of how individuals and communities “differ in their endorsed patterns of interpersonal relationships” (Weber 2010, p. 335). In turn, these communities affect collective ways of knowing about climate change, socially amplifying some risks while ignoring others. Future research could develop the dominant narratives raised in this paper and consider these alongside the interpretive communities for a greater understanding of their origins and underlying norms.

Finally, there is a range of contrasting positions in terms of the temporality of climate change evidenced in this paper. For some participants, experiencing changes to the local climate and media reported global changes were used to prove the existence of current climate change. Conversely, other participants expressed the view that climate change would occur in the future and was therefore less concerning. For these participants less current changes were expected or experienced and this could therefore suggest that experiences of climate change are related to perceived temporal scales of manifestations. Expectations of climate change will have implications for the lens through which personal experiences are interpreted. Further research avenues could include investigations of the relationship between expectations and temporal scales of perceived manifestations of climate

change. In addition, greater attention is required regarding the New Zealand context that, although exhibiting similarities with the global literature, has distinct contextual factors that need further examination.

6. Implications and conclusions

This paper has provided a preliminary investigation of the socialization of climate change. It has recognized, as expected, a messy process involving interrelated information sources and complexities related to trust, contradictions, and (locally) place-embedded understandings. The focus of this paper has been the informing information sources; however, this is just one aspect of the socialization process and further research is required to better understand this process. Furthermore, this paper has shown that localized realities are central features of nonscientific understandings of climate change and therefore there will be multiple ways of knowing about climate change. This can lead to greater difficulties in science communication and evoking behavioral change, as a one-size-fits-all approach to climate change information, even on a national scale, may not concur with local experiences, leading to cognitive dissonance and increased distancing of the climate change discourse for nonscientific communities.

The present text has contributed to greater comprehension of the processes, sources, and interplays in three important ways. First, it has identified the range of sources used by nonscientific communities; this has not previously received academic attention in its entirety, although research has addressed discrete elements such as the role of personal experience (Myers et al. 2012; Akerlof et al. 2013) and the media (Wilson 2000a). Second, it has taken a preliminary step toward understanding the interplay between the sources of information. Finally, it has drawn out the key interpretive factors and overriding themes that dominate discussions around the sources of climate change information for the general public. This has implications for addressing the best ways to convey climate change information to the general public.

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