

Social perceptions of climate change in Queenstown's ski industry: A framework of contextual vulnerability

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Abstract:

The tourism industry both contributes to – and is affected by climate change. Many tourism sub-sectors rely on the local climate as a key element to their tourism offering, none more so than the ski industry. Elevation, aspect, water resources and management structure are just some of the factors which play into degrees of climate change vulnerability. This paper is empirically focused on the Queenstown Lakes region of New Zealand, a popular winter tourism destination with six commercial ski field operations. Qualitative interviews with a range of industry stakeholders identified perceptions regarding threats and opportunities for the region. This paper finds a multitude of perceptions regarding vulnerability and concludes that considering contextual vulnerability, rather than the outcome of climate change alone, is vital in order to address the risks associated with climate change effectively.

Key words

Vulnerability, risk perception, climate change, weather variability, ski industry, New Zealand

1. Introduction

The tourism industry is sensitive to economic, social, ecological and technological global changes (Amelung et al., 2007; Gössling & Hall, 2006). Local scale manifestations of climate change will have implications for a wide variety of tourism sub-sectors. Tourism is intricately connected to weather and climate (Gómez Martín, 2005), often relying on specific weather as part of the tourism offering, exemplified by snow-based tourism. The ski industry exists in alpine regions which are often remote and rural, where tourism provides a stimulus for the local economy (König & Abegg, 1997) (Hamilton et al., 2007; Wolfsegger et al., 2008) which will be adversely affected by climate change (Fukushima et al., 2002).

The ski industry has been identified as particularly vulnerable to the biophysical manifestations of climate change (Hall & Higham, 2005). This is due to changing weather patterns, warming average temperatures, changes in precipitation and increasing extreme events. These manifestations are being addressed by the ski industry through technological advances such as snowmaking, which can alleviate reliance on natural snowfall. However the ski industry will also be affected by social manifestations of climate change which could include shifting travel behaviours, economic sanctions on carbon emissions, changing consumer demands, and ethical perceptions of resource consumptive activities. Thus while it is important to understand the biophysical changes to local climates, it is also important to address the social changes and perceptions which could also impact the tourism industry.

This paper presents an empirical study of the ski industry in the Queenstown Lakes region (Queenstown hereafter), New Zealand. Qualitative in-depth semi-structured interviews were conducted with 52 stakeholders from three main categorisations; industry, community and tourist. To the author's knowledge, this paper presents the first study specifically addressing perceptions of climate change vulnerability in Queenstown's ski industry, moving beyond ski field operators to incorporate a network of tourism businesses, the local community and tourists.

1.1. Contextual and output vulnerability

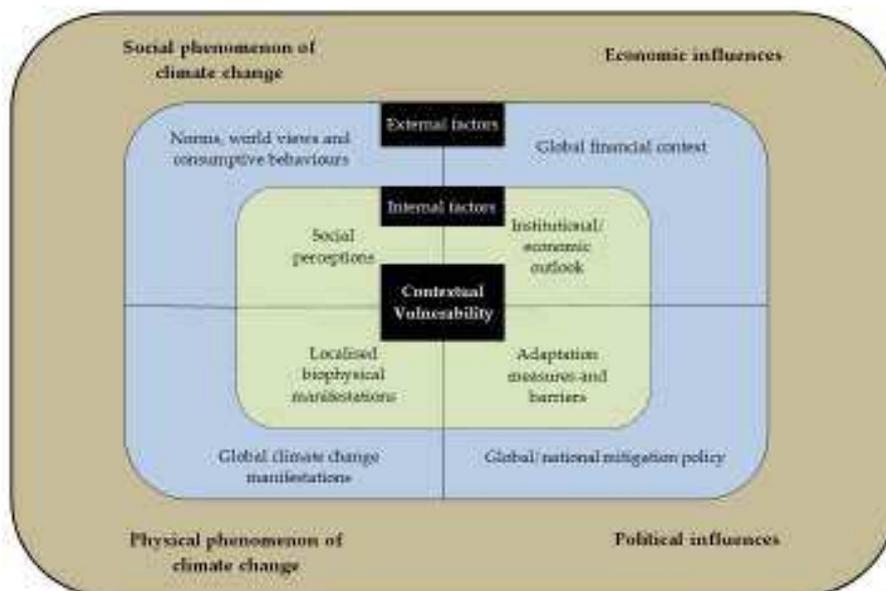
While the term vulnerability is rooted in geography and natural hazards literature, its application has now expanded to a wide range of academic disciplines and research areas. Both the natural and social sciences are concerned with assessing the climate change vulnerability of particular industries, ecosystems and social groups. This paper uses a contextual vulnerability definition as identified by O'Brien et al. (2007). This is contrasted with an outcome vulnerability model (Figure 1) which has been the dominant frame for understanding climate change vulnerability, and aligns with the Intergovernmental Panel on Climate Change (IPCC) definition (IPCC, 2007). The linearistic outcome model views vulnerability as the end-point after measures have been taken to reduce the risk through adaptation.

Figure 1. Outcome vulnerability framing for the ski industry



Contextual vulnerability considers the human-climate relationship in a more complicated and multi-dimensional way, rather than focusing on biophysical impacts and coping capacity alone. O'Brien et al. (2007) recognised that the contextual conditions of a specific industry or business will influence exposure, coping capacity and responses to climate change. The research presented in this paper reconfigures vulnerability to climate change for the ski industry by considering the contextual factors. Figure 2 depicts the interacting features of a ski field's contextual vulnerability. These include snowmaking as the main technological method to reduce dependency on natural snowfall, localised manifestations of climatic changes, institutional capacity to cope, and perceptions of climate change risks. Empirically tackling all aspects of contextual vulnerability is beyond the scope of this study and therefore this paper will focus on the socio-cultural perceptions and technological advancements, integrating the biophysical manifestations and institutional/ economic frameworks through the discussion.

Figure 2. A conceptual framework of contextual vulnerability to climate change for the ski industry



Source: Framework developed from O'Brien et al.'s (2007) contextual vulnerability concept.

1.2. Climate change & the ski industry

The ski industry has received significant academic attention from climate change research (Dawson & Scott, 2007; Scott & McBoyle, 2007; Scott et al., 2007; Scott et al., 2006), with particular focus on modelling, vulnerability assessments and adaptation. Research has covered a wide geographical space; however New Zealand has been, until recently, largely neglected (see section 1.3). Snow reliability is central to destination choice (Amelung et al., 2007; Behringer et al., 2000). The ability to provide a consistent tourism offering in the ski industry is challenged by climate change. As well as decreased snow reliability, studies have shown that climate change could also lead to increased snowmaking costs and contraction of the ski season (Elsasser & Messerli, 2001; Steiger & Mayer, 2008).

Modelling has been used extensively to forecast climatic changes for specific ski destinations, and countries (Hennessy et al., 2003; Scott et al., 2006), and identified the importance of including snowmaking capacity into these assessments to ensure they represent operational conditions and are relevant for decision makers. Social, perceptual studies of climate change and associated vulnerability are less numerous, and have been limited by the ski industry's willingness to participate in research. Scott et al. (2012) identified a disparity between optimistic ski industry perceptions and the negative media reporting, which can contribute to loss in finance and investment. Bicknell and McManus (2006) also found concern that talking about climate change was more threatening to the ski industry than physical manifestations. This could explain industry concern about academic research. However there has been a progression in supply side perceptions of climate change, with research showing ski field operators have become more willing to acknowledge the risk of climate change (Morrison & Pickering, 2012), this could align with certainty amongst the general population.

1.3. Case study area: Queenstown's ski industry

Queenstown is situated in the Southern Alps region on the South Island of New Zealand. It is a popular domestic and international tourism destination. While domestic tourist arrivals in Queenstown airport peak during the summer (86,426 in January 2012), international tourists double during the winter period of July and August (33,320 in August 2012) (Destination Queenstown, 2012). There are four main commercial downhill ski fields; two are connected through a parent company. In addition, Queenstown offers a freestyle ski park, and a cross country ski field (Table 1). The ski fields are served by two main townships; Queenstown and Wanaka.

Table 1. Details of Queenstown ski fields including elevations, ownership, boundary and snowmaking. Source: Ski field websites and operator correspondence

Ski field	Type	Ownership	Base/ top elevation	Distance from closest township	Boundary area	Snowmaking (number of snow guns)
Cardrona	Downhill	Independent	1670m/ 1860m	34km (from Wanaka)	345	54
Coronet Peak	Downhill	NZSki organisation	1168m/ 1649m	18km (from Queenstown)	280	141
The Remarkables	Downhill	NZSki organisation	1622m/ 1943m	28km (from Queenstown)	357	58
Snowfarm	Cross country	Independent	1515m/ N/A	35km (from Wanaka)	50km of trails	None
Snowpark	Freestyle park	Independent	1420m/1530 m	35km (from Wanaka)	10	33
Treble Cone	Downhill	Independent	1260m/ 1960m	26km (from Wanaka)	550	26

The ski industry is predominantly focused on the northern hemisphere, with 98.1% of global skier days (Lazard, 2002). However southern hemisphere ski destinations are important sources of tourism revenue. New Zealand, Australia, Chile and Argentina are the main focus of the southern hemisphere ski market. Australia and New Zealand collectively represent 70% of southern hemisphere skier days (Lazard, 2002). Thus New Zealand is a key player in the southern hemisphere ski market with 1.4million skier days in 2011 (NZSAA, 2012).

Recent climate modelling in New Zealand reported that the elevation of areas with snow for over three months per year will rise by up to 200m by 2040s (from 1550m in 1990) and up to 450m by 2090s (Hendrikx et al., 2012). These elevations will directly affect the ski industry which operates between 1,000 and 2,000m. In their study of industry vulnerability and snowmaking potential, Hendrikx and Hreinsson (2012) find a negative correlation between ski field elevation and the reduction in the number of days with operational snow depths (.30m). This finding suggests the lower elevation ski fields will be most affected by climate change; however they also note that other factors including local climatology will also affect the degree of vulnerability. Snowmaking capacity is undoubtedly a key factor. Table one identifies the varying degree of snowmaking infrastructure already in place in Queenstown's ski fields. It clearly shows that the lowest elevation ski field, Coronet Peak, also has the largest snowmaking capacity. Hendrikx and Hreinsson (2012) find that snowmaking could make up for reduced natural snow and allow operational snow days to return to 1990s levels. However as a constrained adaptation, snowmaking could be limited by social, political and availability factors in the future.

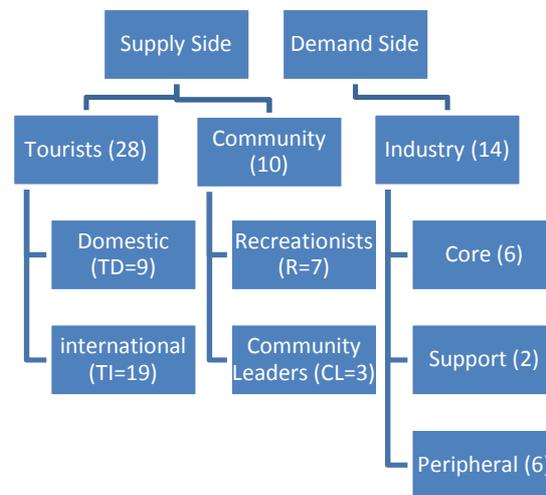
2. Methodology & methods

This paper presents empirical research using a qualitative, social constructionist methodology. A moderate form of social constructionism was adopted (Hannigan, 1995; Jones, 2002) which addresses the multiple realities which affect perceptions and knowledge about climate change. As such this research was grounded in an interpretivist research paradigm and epistemological relativism. The aim of this research was to critically assess social perceptions of vulnerability in the ski industry of Queenstown, New Zealand. It specifically challenges vulnerability assessments based on modelling and scientific measurement alone, identifying the range of factors which contribute to vulnerability including individual and collective perceptions.

Three rounds of interviews were conducted during 2011. Participants were purposively sampled (Mason, 2002) based on predefined stakeholder categorisations (see: figure 3), thus participants were identified through an internet search based on institutional or group affiliations. Industry participants were identified through an internet search for ski field managers and wider industry affiliations. Community participants were recruited through community skiing organisations. Tourists were subdivided between domestic and international (Australian), selection criteria stated that all tourist participants should have visited Queenstown for the primary purpose of snow based tourism at least once in the past five years. Domestic tourists were recruited through University staff and student associations in Dunedin and Christchurch and snowball sampling methods. International tourist interviews were conducted in Queenstown, New Zealand, and Sydney, Australia.

Ethical approval was granted from the University of Otago Ethics Committee in April 2011. All participants were provided with information sheets prior to the interview detailing subject matter, treatment of raw data, and assuring anonymity and confidentiality would be preserved. All participants gave written consent.

Figure 3. The stakeholder categorisations used for this study. Participant numbers are included in parenthesis.



Interview questions were modified according to the stakeholder grouping, however all interviews broadly discussed perceptions of vulnerability in Queenstown. In particular, interview questions covered: 1. Understandings of- and knowledge about- climate change, 2. Perceived risks to the Queenstown ski industry and 3. Opportunities for the region including adaptation. In total, 52 participants were interviewed in mutually convenient locations including coffee shops and workplaces. Interviews were audio recorded and partially transcribed before being uploaded to NVivo9 software. The transcripts were interpreted using inductive thematic coding (Patton, 2002), identifying patterns and categories in the empirical material, which were guided by the research aims and interview narratives (O'Reilly, 2005).

Of the seven major commercial *downhill* ski fields in New Zealand, four are represented by this research. Within Queenstown, only one ski field was unable to participate in this study. However, as this study highlights the importance of contextual factors, and localised realities in comprehensive understandings of climate change vulnerability, generalisations between New Zealand's ski fields are not recommended.

3. Results & discussion

3.1. Understanding climate change

This research finds significant evidence of increasing willingness by the ski industry to acknowledge and discuss climate change. There was an expressed view across all stakeholder categorisations that climate change exists and threatens the ski industry.

“There is no doubt the climate is changing, absolutely no doubt, you’d have to be stupid, have your head in the sand to disagree with it” (Ski Field Manager B).

This acceptance of climate change could be attributed to increased media and social attention to the issue. It also suggests that climatic changes are being personally experienced in Queenstown. This finding supports Morrison and Pickering’s (2012) recent study of Australian ski field operators and identifies a progression from earlier research where ski industry representatives denied the existence of climate change or were unconcerned (König, 1998). In line with previous research in Germany (Hoy et al., 2010), and Australia (Bicknell & McManus, 2006), divergence of opinion occurred over anthropogenic causation, and timescales for manifestations.

3.1.1. Barriers to knowledge construction

Analysis of the interview transcripts identified three barriers to understanding and engaging with climate change; trust, scale and knowledge. This finding corresponds with Lorenzoni et al. (2007) who identified these same barriers in the United Kingdom. Trust is vital for all sources of information, not just in formal scientific research. While friends and acquaintances are central to constructing knowledge, individuals will only embrace the information if they consider the person to be knowledgeable and trustworthy. When confronted with contradictory information, participants stated they would listen to the information which supported their current position, or personal experiences. For many participants, trusting the messenger is central to trusting the message (Hansen et al., 2003).

“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” (Ski Field Manager A).

Participants of this study clearly articulated a perception of climate change occurring in the distant future, thus removing urgency, or necessity to become informed. This relates to a distanced perception of risk, was previously found in a study of the American public (Leiserowitz, 2005).

“Sure it’s going to affect our industry more than any industry, but at the end of the day for me, that’s going to be 50 or 60 years down the track, what do I care personally? And that’s a very self centred viewpoint but I think probably a lot of people feel like that anyway.” (Ski Hire Shop Owner B)

Perceptions of a distanced risk also contribute to a self perceived lack of knowledge, where participants identified an inability to gain enough knowledge or to know enough about climate change. Community participant’s referred to a limited capacity to worry about issues, which supports the finite pool of worry hypothesis (Hansen et al., 2004; Weber, 2006). Whilst climate change is perceived to be temporally distanced, it does not become a priority for the non-scientific public.

“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” (R2).

This point was further expanded below where it is clear that the busyness of everyday life, and additional and alternative concerns limit engagement with ‘distanced’ climate change.

“It’s not that we don’t care, we not saying ‘stuff it, we’re happy in our life, it’s just that it is a small period in time and then we have to get up the next day, we have to take our kids to school, we have to go to work, we have to go to this meeting, we have to go to the gym...” (CL3).

3.2. Risk perception

The local climate was identified as both a current and future risk for Queenstown’s ski industry. Present day weather and inter-annual variability is major threat to the ski industry and of greater concern to participants than future climate change. The inability to control this key industry requirement leads to feelings of powerlessness (Aitken et al., 2011; Stern, 2000).

“Its [our risk is] always weather, we’re farmers at the end of the day. We have very little influence over the weather per se, so if it wants to warm up in July, we can’t make snow, it’s too warm, it rains it washes all the snow away, that’s our vulnerability” (Ski Field Manager C).

However, the risk is still perceived to be distanced, and less concerning than alternative, more present threats such as the economic climate. While appearing to be a different risk to climate change, under a framework of contextual vulnerability, these rationales are strengthening the ski field's institutional and economic position.

“I think it’s something that we need to be mindful of. But it’s quite challenging because I think the perception is that it’s not going to have an impact for us for such a long period of time, that right now we’re more focused on immediate competition, about securing our business from Australia, about managing the current economic climate, those sorts of things are more pressing than a vulnerability that’s not going to affect us potentially for 20 years” (Ski Field Manager E).

The views expressed here thus provide evidence that uncontrollability or lack of behavioural options is central to vulnerability perceptions. Ski field managers are actively addressing business risks, which will factor into their contextual climate change vulnerability as well.

From the demand side perspective, tourists identified risks related to contraction of the ski season in Queenstown. Tourists articulated concern that this could increase the cost of skiing and thus prevent participation. It could identify a tipping point in terms of tourist’s ability to tolerate price increases. This should be considered further in relation to increasing snowmaking costs under scenarios of climate change.

“If it continues to get warmer, say for this year as example how the ski season will become shorter, it might only go from July to September rather than June to October in New Zealand. And it would probably become more expensive, it’s bound to become more expensive, because if they cut off say 6 weeks, 3 weeks at one end and 3 weeks at the other, then that’s 6 weeks less when they have to make the same income, so everything will be more pricey” (TD6).

3.3. Opportunities

3.3.1. Relative vulnerability

Despite identifying the risks of current weather variability and future climate change to the Queenstown ski industry, participants also recognised opportunities for the region, predominantly the relatively more vulnerable situation of Australia’s ski industry. This has been previously acknowledged by the IPCC who stated that, “tourist flows from Australia to New Zealand might grow as a result of the relatively poorer snow conditions in Australia” (Hennessy et al., 2007: p.523). This view was reiterated by ski industry representative in this research.

“The research which NIWA has come out with suggests that in the South Island here we are not going to be as greatly affected as other parts of the Southern Hemisphere, namely Australia” (Ski Field Manager C)

When considering the occurrence of climate change, participants clearly anticipate Australia to be affected sooner and more drastically, which gives optimism to Queenstown’s ski fields and a learning opportunity in terms of adaptive responses. This could be associated with the institutional context of vulnerability.

“It’s going to affect Australia much sooner than it’s going to affect us, and we will be in a situation due to our elevation to look at them and watch how they handle it and let them sort of lead the way a little bit, and go ‘well that’s worked for them, that hasn’t” (Ski Field Manager E).

Australia was identified as the main opportunity for growth and development of the ski industry in Queenstown. Data on Australian skier numbers in Queenstown is sparse, international skier data, for which Australia is perceived to be the greatest contributor, stands at 36% of skier days in 2010, up from 28% in 2000 (New Zealand Snowsports Council, 2012). The contraction of the ski season in Australia was perceived to be just one factor contributing to increased Australian tourists to New Zealand. Other factors include relative costs and ease of access (Hopkins et al., Forthcoming).

“Outside of the mountain it all comes down to opportunities coming out of Australia. If they’ve got less skiing, so their ski season becomes shorter, and more narrower, they are going to be wanting to come over to New Zealand, because it’s easier, it’s more affordable and the access from the direct flights etc., are all very good opportunities for us” (Ski Field Manager C).

From the Australian tourist’s perspective, New Zealand is considered to be an easy, low cost skiing holiday, with slightly better snow reliability. However snow reliability does not appear to be the driving motivation, the range of non-snow based activities available in Queenstown was identified by this research as being central to Australia tourist’s decision making.

“Here there are a lot of ancillary things which you just don’t get, you get the mountain with snow, or the hill with snow in Australia but you don’t get all the stuff that you can do here... you know those ancillary things that go with the environment which you don’t get in Australia. You get skiing and that’s it” (TI11).

3.3.2. Adaptation: the role of snowmaking

Scientific assessment has shown that snowmaking will be able to address reductions in natural snowfall in Queenstown until the 2090s (Hendrikx & Hreinsson, 2012; Hendrikx et al., 2012). However the limitations to snowmaking, such as atmospheric constraints are a particular concern to the ski industry. As well as requiring specific climatic conditions, snowmaking is highly resource dependent requiring water and electricity which could become less available or more expensive under scenarios of climate change (Morrison & Pickering, 2012). Participants identified a current reliance on snowmaking to maintain season length and operationality during marginal weather. Thus, snowmaking is not perceived as only a climate change measure but a current business strategy which is vital for the region’s ski industry. It is perceived to be the main approach for reducing weather dependency. Indeed a Ski Field Manager (C) stated that, “without snowmaking now we would not have a very long season.” The investment in snowmaking in Queenstown has been highly publicised by the ski fields themselves and through the local media. Participants stated that snowmaking can reduce reliance on the local climate for snow. However these comments overlooked the atmospheric requirements of snowmaking.

“[They] have spent millions of dollars on snowmaking. It means they can have a longer season, they can make more money but also it helps to neutralise the effects of it a little bit because as long as it’s cold enough they can offer skiing. They never need snow they just need cold temperatures” (Ski Hire Shop Owner A)

In terms of a future focus, the ski industry participants identified improving technological innovations allowing for snowmaking in increasingly marginal weather conditions. ‘Trusting technology to cope with environmental change’ has previously been identified by Dubois and Ceron(2006) as a business response to climate change.

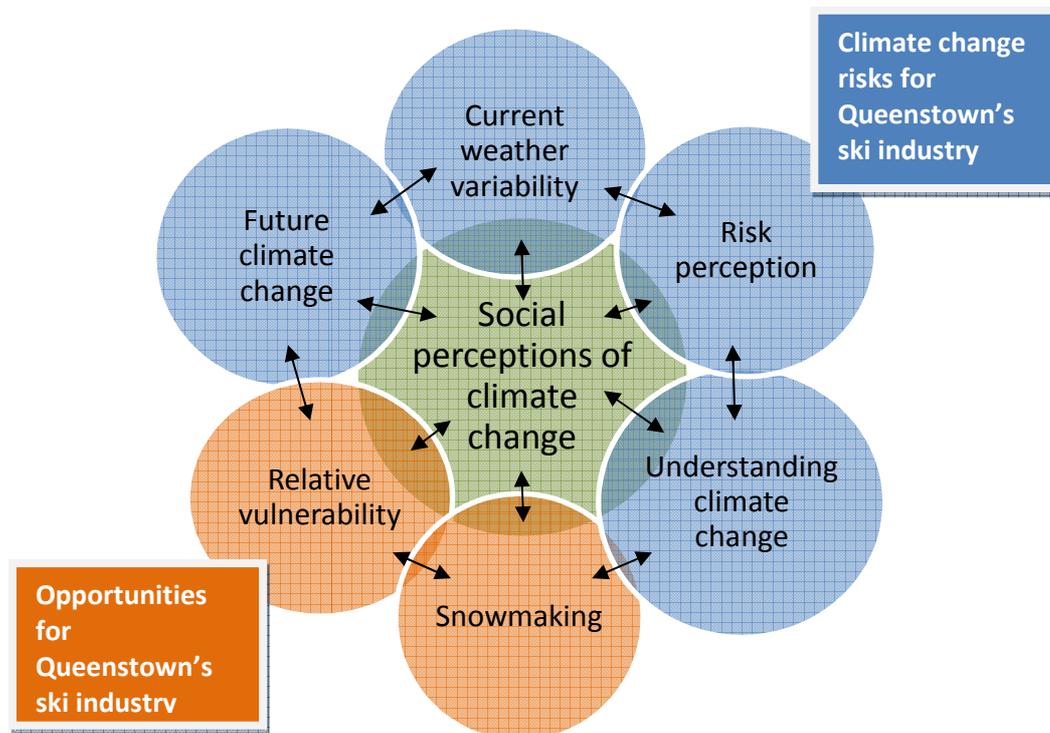
“There’s some hugely great technology coming with snowmaking, and snow guns that are able to make snow at warmer and warmer temperatures and I think this is what we need to be investing in” (Ski Field Manager D).

Technical adaptation and snowmaking are integral to reducing vulnerability to climate change, they address the physical manifestations of change and as such are a clear means through which business as usual can continue. However snowmaking is also a business strategy which can either strength the economic position of the ski field by increasing market share, or weaken the economic position through path dependency and infrastructural investments.

4. Implications

The qualitative approach used in this study has identified varied social perceptions of climate change in Queenstown’s ski industry. Findings suggest that risk perceptions are temporally and spatially predicated whereby perceptions are constructed through current and future risks, which must be relevant to specific localities (figure 4). Vulnerability for Queenstown’s ski industry is clearly associated with their dependency on weather, which forecasts suggest will become increasing variable under scenarios of climate change. However there are a wide range of contextual factors which will affect the risk to individual ski fields including; financial positions, organisational structures, resource access, and geographical features. Thus this paper finds that a contextual vulnerability framework should be adopted to consider the wider range of issues affecting ski fields and the wider ski industry.

Figure 4. Social perceptions of climate change in Queenstown’s ski industry



This research identifies perceptions of climate change as a distanced issue, with more pressing concerns affecting everyday lives and business environment. Additional and alternative shorter term risks also contribute to the contextual vulnerability of Queenstown's ski fields. Ski field operators identified current competitors, increasing market share and the economy as being more pressing issues which supersede climate change in terms of concern. However these factors will contribute in terms of a contextual vulnerability framework. Biophysical manifestations are just one element of climate change which will need to be considered.

Snowmaking is central to the Queenstown ski industry's current and future business strategies. While currently snowmaking is used to ensure season length, ski field operators clearly trust in technological developments to address longer term changes to the climate. Scientific assessments have forecast that in Queenstown, climate change will be experienced as inter-annual variability for the near future

(Hendrikx & Hreinsson, 2012; Hendrikx et al., 2012). As a result, through incremental behaviours to mitigate this risk, the ski fields and wider industry will be tackling the physical manifestations of climate change. Thus, the short term planning of ski fields may be sufficient to adapt to the small changes as they occur. However, there could be other changes such as increased extreme events, or social shifts which cannot be addressed in this way.

Within Queenstown there could be contraction of the ski industry as a result of increased climatic changes. This will not, however, be solely based on elevation or natural snow depths. There will be a range of institutional, resource and human factors implicating the survival of ski fields, and it is important for individual ski fields to consider their position. While climate modelling can provide some data and expected implications or affects of climate change on natural seasonal snow, ski fields must also consider their business position more holistically.

This study has implications for the wider tourism industry, and identifies the importance of addressing climate change vulnerability from a contextual perspective. Future research into specific tourism sub-sectors, destinations and activities needs to comprehensively understand the complex contextual dynamics which will predicate vulnerability to climate change beyond the risks understood through climate modelling. Through opportunities and risks associated with climate change, winners and losers will be created. Through a framework of contextual vulnerability, the tourism industry can better prepare itself for the challenges which lie ahead.

5. Conclusions

Dependency on the climate is an inherently dangerous position for any industry or business. As climate change manifestations increase in the Queenstown region and indeed globally, the reliance on stable and specific weather becomes increasingly treacherous. This paper has explored stakeholder perceptions of climate change through a contextual vulnerability framework. While climate modelling has identified significant biophysical impacts of climate change for Queenstown's ski industry, the vulnerability of individual ski fields will, at least for the next 20 - 50 years, be related to a range of contextual factors. These will include capacity to adapt, technological developments, institutional and economic structures and social perceptions. Climate change will have implications for a range of tourism subsectors, all with unique challenges. As we enter a period of significant global change, it is important that the tourism industry addresses the complex and interacting web of contextual factors influencing vulnerability.

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