Convinced, ambivalent or annoyed: Tyrolean ski tourism stakeholders and their perceptions of climate change

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**Highlights**
- Climate change perceptions of tourism stakeholders in Tyrol (Austria) are examined.
- Climate change is not perceived as a real threat by stakeholders.
- Awareness is mainly limited to perceiving the issue as a global phenomenon.
- Current technical adaptation strategies are not primarily climate-induced.
- At present, coping with climate change is not a priority for risk management.

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**Abstract**

Its focus on snow-dependent activities makes Alpine winter tourism especially sensitive to climate change. Stakeholder risk perceptions are a key factor in adaptation to climate change because they fundamentally drive or constrain stakeholder action. This paper examines climate change perceptions of winter tourism stakeholders in Tyrol (Austria). Using a qualitative approach, expert interviews were conducted. Four opinion categories reflecting different attitudes toward climate change issues were identified: convinced planners, annoyed deniers, ambivalent optimists, convinced wait-and-seers. Although the findings generally indicate a growing awareness of climate change, this awareness is mainly limited to perceiving the issue as a global phenomenon. Awareness of regional and branch-specific consequences of climate change that lead to a demand for action could not be identified. Current technical strategies, like snowmaking, are not primarily climate-induced. At present, coping with climate change is not a priority for risk management. The findings point out the importance of gaining and transferring knowledge of regional and branch-specific consequences of climate change in order to induce action at the destination level.

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**1. Introduction**

Climate change is increasingly regarded as the single most serious global environmental problem (Scott, Gössling, & Hall, 2012; see also Houghton, 2009). Significant variations in the mean state or variability of climate are major drivers of global environmental change encompassing changes in ocean currents, land cover or biodiversity. Environmental change on a global scale will result in possibly far-reaching negative effects at the regional or even local level, ranging from problems with water availability and water quality to soil erosion and flooding (Houghton, 2009; IPCC, 2007). Because of strong interlinkages, global environmental change is in turn impacting climate change.

Modified temperature and precipitation patterns will also have considerable consequences for various socio-economic systems, including tourism. Since climate is a key resource for several forms of tourism, climate change is likely to pose a major challenge for many destinations (Scott, Amelung, et al., 2008).

International tourism is a global key driver of socio-economic progress; it has a central role in creating jobs and in providing infrastructure (United Nations World Tourism Organization (UNWTO), 2013). Tourism is also of vital importance to the European economy. A total of 534 million international tourist arrivals represent a global market share of 52% for European tourism (UNWTO, 2013). Tourism accounts for more than 5% directly and
about 10% indirectly of the EU GDP (European Commission, 2012). European tourism is especially intense in coastal regions, some cities and Alpine regions (Eurostat, 2011).

According to Becken and Hay (2007), the European Alps generate about 7–10% of the annual global income from all-year tourism, with some 100 million tourists visiting the Alps each year. Many mountain and winter tourism destinations in the European Alps are among the most frequently visited regions in the world. Many forms of Alpine winter tourism are dependent on snow-based activities. In many rural areas, winter tourism has become the primary source of income (Abegg, Agrawala, Crick, & de Montfalcon, 2007).

Since the 1970s, downhill skiing has expanded heavily in the over 600 ski resorts located in France, Switzerland, Austria and Italy (Abegg et al., 2007). The number of domestic and international skier visits to the European Alps shows the dominance of this region in worldwide winter tourism. While 400 million skier visits are generated globally, the Alps account for 176 million skier visits per year, representing 44% of the total visits (Vanat, 2013). Austria is among the largest national markets, generating about 51 million skier visits per year (WKO, 2012).

Its focus on snow-dependent activities makes Alpine winter tourism highly vulnerable to the effects of an ongoing warming trend (Scott, 2011; Scott et al., 2012). Consequently, regional climate change projections for Europe and the Alps are essential for assessing the future of snow-based tourism. Kotlarski, Bosshard, Fischer, Lüthi, and Schär (2010) compared current regional climate change scenarios for Europe and the Alps. The greenhouse gas forcing used by these models was derived from the Intergovernmental Panel on Climate Change (IPCC) SRES A1B emission scenario (IPCC, 2000). Depending on the applied model chain and season, winter temperatures are projected to increase by 0.8–2.6 °C until 2050 and by 2.9–4.2 °C until 2100, compared to the 1961–1990 baseline. Precipitation changes were found to be highly uncertain until 2050. However, by the end of the twenty-first century, there is model consensus regarding drier summer seasons and wetter winter seasons (an increase of 6.7–19.7% compared to baseline climate). Moreover, Kotlarski et al. (2010) report a decrease in snow cover resulting in an almost complete loss of snow in lowlands by 2100.

In a study published by the Organisation for Co-operation and Development (OECD), Abegg et al. (2007) found a decline in the number of naturally snow-reliable Alpine ski areas from 609 to 404 (under a +2 °C warming scenario) and to 202 (under a +4 °C warming scenario). The authors concluded that climate change is a serious challenge to the Alpine ski industry, which was confirmed by Steiger and Abegg (2011) for Austrian ski areas. In the latter study, a site-specific physical snow module was applied, also taking snowmaking into account. Steiger and Abegg (2011) showed that the impact of climate change on Austrian ski areas can be balanced with snowmaking under a warming scenario of 1–2 °C. Assuming a warming of more than 2 °C, snowmaking is not considered to be an appropriate strategy because operational costs would increase dramatically.

The severity of effects in the respective tourism regions and destinations will heavily depend on their individual ability to adapt to climate change. Adaptation in the context of climate change refers to “adjustments in ecological-socio-economic systems in response to actual or expected climatic stimuli, their effects or impacts” (Smit, Burton, Klein, & Wandel, 2000, p. 225). Adaptations can be anticipatory (taken proactively before the climate stimulus), concurrent (during) or reactive (in response). Based on their degree of purposefulness, Smit et al. (2000) distinguish between autonomous (spontaneous) and planned (deliberate) adaptive responses to an actual or anticipated stimulus. Adaptations in socio-economic systems are often concurrent or reactive in nature (Smit et al., 2000).

There are many different forms of adaptive responses to climate change. Smit et al. (2000) distinguish between primarily technological, behavioural, financial, institutional and informational adaptations, while Scott et al. (2012) provide a more detailed classification scheme of technical, economic, policy, institutional, managerial, planning, legal and behavioural climate adaptations. Adaptive strategies in the snow-based tourism industry range from technical actions (e.g., increased use of snowmaking) to managerial responses, including the introduction of alternative tourism products for skiing in the winter season or low-season closures (Dawson & Scott, 2013; Hall & Higgham, 2005; Scott, Dawson, & Jones, 2008; Scott, de Freitas, & Matzarakis, 2009; Scott et al., 2012). More recent strategies also involve behavioural action, such as the use of real-time webcams of snow conditions (Scott et al., 2012).

Effective adaptation reduces a region’s vulnerability to climate change. On the local or regional level, the potential of a system to adapt is not only determined by economic and technical resources but also by such factors as managerial ability or access to information resources (Smit & Wandel, 2006). Stakeholder perceptions are another crucial aspect in reducing vulnerability to climate change. The key players’ awareness of climate change determines whether effective action is taken (Belle & Bramwell, 2005; Klint et al., 2012). The perceptions of the potential costs and effects of the threat are decisive for the perceived need to adapt in a region. According to Belle and Bramwell (2005), perceptions of individuals and interest groups are also crucial to both the development of public policies and the acceptance of proposed policy measures. Correspondingly, learning to live with change and uncertainty is due not least of all to how well stakeholders in a region perceive potential challenges. In the context of climate change research, risk perception studies among stakeholders are vitally important in assessing a region’s vulnerability to climate change.

Extensive research has been conducted on the relationship between snow-based tourism and climate change in recent years (e.g., Hall, 2006, 2011; Scott, Dawson, et al., 2008; Scott & McBoyle, 2007; Scott, McBoyle, & Minogue, 2007; Steiger, 2010, 2011). However, empirical social research on the supply side, focusing on the perception of climate change among key players in the ski industry, is still limited.

The present study aims to fill that gap in one of the most important European snow-based winter tourism regions. More specifically, the study (1) reveals the level of climate change awareness of and involvement with the issue in one of the top Alpine tourism regions; (2) identifies the present role of climate change in regional and destination risk management; (3) elaborates on the significance of snowmaking for the ski industry; and thus (4) contributes to the literature on supply-side perception in the context of climate change and snow-based winter tourism.

2. Literature review

2.1. Risk perception research

Risk perception research is rooted in the nuclear debate of the 1960s (Sjöberg, 2000) and has been of particular interest to scientists and policymakers since that period. The fields of psychology, sociology, political science, geography and anthropology have contributed to the early literature pertaining to this issue (Slovic, 1987). Several theoretical approaches have been developed to explain differences in risk perception among individuals and groups (e.g., Douglas & Wildavsky, 1982; Fischhoff, Slovic, Lichtenstein, Read, & Combs, 1978; Kasperton et al., 1988).

Research (e.g., Slovic, 1987, 2000) has shown that perceived risk is not only influenced by technical risk estimates but also determined by several qualitative characteristics related to whether a
hazard is catastrophic or chronic, dreaded or common, old or new and delayed or immediate. The extent to whether a hazard is controllable, observable, fatal and known to science also shapes risk perceptions. Moreover, various social and cultural factors influencing risk perception (e.g. Baron, 2006; Berger, Brown, Kousky, & Zeckhauser, 2011; Costa-Font, Mossialos, & Rudisill, 2009; Sjöberg, 2000; Sunstein, 2006; Wachinger, Renn, Begg, & Kuhlicke, 2012) and a range of psychological barriers to addressing climate change (Gifford, 2011) have been identified.

Studies of climate change risk perception examine participants’ awareness of possible effects of climate change. Recent research has found a discrepancy between the scientific community and the general public with regard to perceptions of challenges posed by climate change (e.g. Etkin & Ho, 2007; Lorenzoni & Pidgeon, 2006). The complex, pervasive and time-delayed nature of climate change risks was found to lead to a limited understanding of possible consequences among lay people (e.g. Lorenzoni & Pidgeon, 2006; Weber, 2006).

Climate change perception research in the field of tourism not only highlights barriers to adaptation and reveals knowledge gaps but also indicates opportunities for stakeholder action (Klint et al., 2012). A growing body of literature has investigated tourist and stakeholder climate change perceptions in various types of tourism destinations, including coastal tourism (e.g. Braun et al., 1999; Buckley, 2008; Buzinde, Manuel-Navarrete, Yoo, & Morais, 2010; McEvoy, Cavan, Handley, McMorrow, & Lindley, 2008; Rauken, Kelman, Jacobsen, & Hovelsrud, 2010; Valls & Sardá, 2010; McEvoy, Cavan, Handley, McMorrow, & Lindley, 2008; Gößling, Bredberg, Randow, Sandström, & Svensson, 2006; Hall & Clayton, 2009; Hübler & Gößling, 2012; Klint et al., 2012; Uyarra et al., 2005) and tourism in mountain regions (e.g. Prideaux, Coghlan, & McNamara, 2010; Scott, Jones, & Konopek, 2008).

2.2. Climate change perception studies in snow-based destinations

In snow-based destinations, demand-side climate change perception studies have been conducted in Australia (e.g. König, 1998; Pickering, Castley, & Burtt, 2010), New Zealand (e.g. Prince, 2010), North America (e.g. Dawson, Havitz, & Scott, 2011) and Europe (e.g. Behringer, Buerki, & Fuhrer, 2000; Unbehau, Pröbstl, & Haider, 2008). In Australian ski resorts, there has been a growing amount of supply-side climate change perception studies conducted among tourism managers (e.g. Bicknell & McManus, 2006; König, 1999; Morrison & Pickering, 2013; Roman, Lynch, & Dominey-Howes, 2010; Turton et al., 2010). An overview of European supply-side perception studies conducted among various stakeholder groups in the past decade is given in Table 1.

Bürki (2000) used focus groups to investigate how tourism representatives in Central Switzerland perceive the issue. Even at that time — long before climate change became the subject of today’s broad media coverage — the author reported that “climate change has been recognised as a problem for [snow-based] winter tourism” (Elsasser & Bürki, 2002, p. 255). The survey participants stated that climate change was already affecting destination development. The group discussions also revealed the ambivalent attitude of tourism representatives toward climate change. On the one hand, potential consequences were downplayed. On the other, climate change was used to legitimate both the expansion of snowmaking facilities and the extension of ski areas to higher elevations. The tourism representatives were unanimous in their belief that Alpine winter sports can only survive if snow reliability is guaranteed.

This view is supported by Abegg, Kolb, Sprengel, and Hoffmann (2008). In a representative study among Swiss ski lift operators, the authors demonstrated that ski area managers trust the adequacy of snowmaking as a means of adapting to climate variability and change. Abegg et al. (2008) also reported that once prevailing defensive attitudes have given way to some kind of openness to the issue of climate change. They concluded that this openness and a high awareness of the problem in general are prerequisites for meeting the challenges that climate change is likely to pose for the snow-based winter tourism industry in upcoming decades. The results clearly indicated that Swiss ski lift operators take climate change seriously, with certain adaptation strategies already implemented and others planned.

In Austria, Wolfsegger, Gößling, and Scott (2008) conducted an online survey among managers of low-elevation ski areas. The results showed that climate change is not perceived as a substantial threat. The ski area managers were highly optimistic about the effectiveness of technical adaptation means, such as snowmaking, and they considered these to be sufficient to cope with climate change in the decades ahead. Sharing the costs of snowmaking with the accommodation industry was regarded as the most appropriate business strategy, followed by joining ski conglomerates and diversifying winter offerings.

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### Table 1

<table>
<thead>
<tr>
<th>Author(s) (year)</th>
<th>Study area</th>
<th>Sample</th>
<th>Research method</th>
<th>Interview periods</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bürki (2000)</td>
<td>(Central) Switzerland</td>
<td>Tourism representatives; N = 17</td>
<td>Focus groups</td>
<td>Summer 1998</td>
</tr>
<tr>
<td>Saarinen &amp; Tervo (2006)</td>
<td>(Northern) Finland</td>
<td>Nature-based tourism operators; N = 19 (9 operating on snow and winter activities)</td>
<td>In-depth interviews; semi-structured questionnaire</td>
<td>Spring &amp; early summer 2005</td>
</tr>
<tr>
<td>Abegg et al. (2008)</td>
<td>Switzerland</td>
<td>Ski lift operators; N = 160</td>
<td>Questionnaire</td>
<td>Summer 2007</td>
</tr>
<tr>
<td>Wolfsegger et al. (2008)</td>
<td>Austria</td>
<td>Ski resort managers; N = 36</td>
<td>Online questionnaire</td>
<td>September/October 2005</td>
</tr>
<tr>
<td>Luthe (2009)</td>
<td>France, Italy, Austria, Switzerland</td>
<td>Ski area managers; N = 20</td>
<td>In-depth interviews</td>
<td>May to September 2007</td>
</tr>
<tr>
<td>Saarinen &amp; Tervo (2010)</td>
<td>Finland</td>
<td>Winter tourism businesses; N = 173</td>
<td>Questionnaire, thematic interviews</td>
<td>Summer 2007</td>
</tr>
<tr>
<td>Strobl et al. (2011)</td>
<td>Austria</td>
<td>Destination stakeholders; N = 65 (in three destinations)</td>
<td>Moderated discussions in three workshops</td>
<td>March 2010</td>
</tr>
<tr>
<td>Tervo-Kankare (2011)</td>
<td>Lapland, central Finland</td>
<td>Tourism stakeholders: businesses, development officials, related industry; N = 19 (in two destinations)</td>
<td>Semi-structured face-to-face interviews</td>
<td>Spring &amp; fall 2009, spring 2010</td>
</tr>
</tbody>
</table>
A recent study by Strobl, Steiger, Peters, and Weiermair (2011) in three Austrian destinations employed moderated discussions about climate change and its impact on tourism. The authors found that climate change is a topic of discussion in these destinations, but mainly from a purely economic perspective focusing on how climate change influences the rates of return on investments in the long term.

Luthe (2009) conducted a transnational study of ski areas in France, Italy, Austria and Switzerland. Although the extent of change was unclear for many interviewees, the occurrence of climate change was not doubted. The ski area managers viewed high elevation and the possibility to make man-made snow to be crucial factors in meeting the challenges of climate change. They worried most about the increasing costs of technical adaptation and temperatures too high for snowmaking, but also on the indirect effects that climate change has on demand patterns as a result of snow-poor winters.

Saarinen and Tervo (2006) identified perception and adaptation strategies of nature-based tourism businesses with regard to climate change in Finland. The authors reported that the interviewees were generally aware of the issue, but at the same time highly sceptical. Half of the survey participants did not believe that the climate is actually changing and were doubtful about any significant effects on future tourism in their region. Climate change was seen as a minor threat, if a threat at all. The authors recognised a lack of adaptation planning and showed that adaptation strategies like snowmaking were undertaken to meet the challenges presented by general weather variations and market changes. Since many respondents were already used to adapting tourism operations to changing weather conditions in the short term (see also Tervo, 2008), they felt optimistic about being able to manage a gradual change in climate, if necessary.

Two years after this interview-based study, the authors conducted another survey among winter tourism businesses in Finland that revealed a growing awareness to changing climate (Saarinen & Tervo, 2010). Perceptions had changed significantly in this short time, with the majority of businesspersons now believing that the climate is changing. Asked about signals in their regions, they reported shorter winters and delayed arrival of permanent snow. More than half of the respondents felt that future conditions for nature-based tourism would be unfavourable. Discussing this change in perceptions, the authors critically mention the differences in study design and admit that a direct comparison of study results is not possible. However, they argue that the respondents' awareness of the issue may have been heightened by two relatively warm and snow-poor winters in 2005/2006 and 2006/2007 as well as by the growing public debate on climate change and increasing media coverage in Finland.

Brouder and Lundmark (2011) conducted a perception analysis in northern Sweden. In a quantitative survey of winter-oriented tourism businesses, they found that three-quarters of all respondents believe that some form of climate change is under way. The authors emphasised the importance of an intra-regional scale of analysis and demonstrated differences between perceptions in the inland areas and the coastland. However, the study subjects did not feel that climate change would have a drastic impact on the tourism sector in the coming decade. With regard to previous and future strategies, the authors stated that tourism businesses “intend to remain as long as possible and will adapt during the season depending on conditions with no strong evidence of strategic, long-term planning” (Brouder & Lundmark, 2011, p. 929).

The most recent investigation of the issue was conducted by Tervo-Kankare (2011), who interviewed tourism stakeholders in two Finnish destinations. The author reported that concern about potential impacts of climate change is mainly induced by extraordinary weather events and belated starts to the Christmas season. The level of climate-change-related activity in the destinations was found to be low and largely dependent on individual ambition. Although tourism stakeholders generally had a good understanding of the issue, climate change was considered “to be a minor factor among all factors affecting the destinations’ future and development plans” (Tervo-Kankare, 2011, p. 407). One main conclusion of the survey was that tourism-related climate change awareness has not yet found its way to the practical level.

The different research designs and methodologies, as well as the diverging characteristics of the tourism system itself in the respective study areas, hamper a detailed comparison of survey results. Moreover, there are indications that differences in perceptions may also be influenced by the winter weather preceding the investigation. The studies reporting a relatively high awareness of climate change were conducted after the analogue winter seasons of 1997/1998 (Bürki, 2000) and 2006/2007 (Abegg et al., 2008; Luthe, 2009; Saarinen & Tervo, 2010). An analogue winter season is an anomalously warm season that is likely to represent average future climate conditions (Steiger, 2011).

Like Abegg et al. (2008), Luthe (2005) pointed out that his survey was conducted in summer 2007 following the warmest winter season on record in many parts of the European Alps. This may have influenced the study results. In their comparative paper discussing the results of their perception studies conducted in 2005 and again in 2007, Saarinen and Tervo (2010) concluded that the two relatively warm and snow-poor winters in 2005–2006 may have contributed to increased risk awareness among study participants.

The literature reveals most steps taken to adapt to climate change to be reactive and highly individualistic for various reasons, such as the competitive nature of the ski industry with its short planning cycles or differing business models, geographic characteristics or government jurisdiction (Abegg et al., 2007; Scott & McBoyle, 2007; Tervo-Kankare, 2011; Trawöger, 2011). As Scott & McBoyle (2007) state, it is “difficult to sort out adaptations in the ski industry that were driven mainly by climate and those that are the result of other non-climate factors” (p. 1426). Most strategies currently aim at some form of risk reduction in relation to climate variability.

The present study was conducted after an average winter with regard to snowfall and temperature. Therefore, the participants’ perceptions were not affected by having experienced an exceptionally snow-poor and warm winter season immediately prior to the study. The preceding winter of 2009/2010 was characterised by a warm and dry November. In most ski resorts, a very cold December had already made snowmaking possible at the beginning of the season. Persistently good snow conditions until Easter in late March produced good results for Tyrolean winter tourism.

3. Study area

The study area, Tyrol, is a state situated in the western part of Austria (Fig. 1). Tyrol holds a dominant position in Alpine tourism in general and snow-based winter tourism in particular. In 2010, the region had a total of 43 million overnight stays, which accounted for as many as one-eighth of all overnight stays estimated in the Alps (Statistics Austria, 2011). Tyrol ranks seventh among the top 20 tourism regions in the EU-27 with regard to nights spent by non-residents in hotels and campsites (Eurostat, 2011). On a national level, Tyrol generates about 40% of Austria’s tourism turnover and holds one-third of the country’s beds. The total number of 24 million domestic and international skier visits recorded in Tyrol (WKO, 2012) represents 47% of Austrian, 13% of Alpine and 6% of global skier visits.
The economic significance of tourism in the state itself varies regionally. While tourism contributes an average of 16% to the Tyrolean GDP, considerably higher percentages are reported by various counties. In valleys such as the Ziller Valley, the Ötz Valley or the Paznaun, tourism destinations report that an average of 57% of the population is employed in the tourism industry, with some figures as high as 86% (Trawöger, 2010). These values are well above the average of 35% (ÖHV, 2008) reached in Austrian winter tourism communities (i.e., communities with more than 60% of overnight stays during the winter season).

With its location in the European Alps, the climate of the area includes oceanic, continental, polar and Mediterranean influences (Beniston, 2006). The Alpine climate in Tyrol is generally characterised by short and humid summers, with precipitation peaking in June and July. Due to orographic effects, precipitation exhibits wide discrepancies between various sites over very short distances (Beniston, 2006; Fliri, 1975). Precipitation is highest along the northern rim of the Alps and lowest in inner-Alpine dry valleys (Fliri, 1975; Frei & Schär, 1998) like the Inn Valley or the Ötz Valley. Temperatures generally show a low degree of spatial variation, with an average annual temperature of about 8–9 °C in lowlands. In the winter months, spatial differences are frequently caused by atmospheric inversion (lower temperatures in lowlands) and Foehn effects (higher temperatures). At higher altitudes, the cold periods are considerably longer, with permanent snow cover from November until April or even later.

Some recent investigations focus on the potential impacts of climate change on the ski industry in the study area (Steiger, 2010, 2011; Steiger & Trawöger, 2011; Trawöger, 2010). Steiger and Stötter (2013) applied a ski season and snowmaking simulation model to the Tyrolean ski areas. Two indicators were used to assess snow reliability: snow reliability according to the 100-days rule by Abegg et al. (2007) and ski operation maintained in the Christmas period in 75 per cent of all winters, according to Scott, Dawson, et al. (2008). Given that ski areas are equipped with snowmaking facilities, all ski areas in the study area are snow-reliable until the 2030s (high emission scenario) and 2040s (low emission scenario). At the end of the century, only between 28% (snow-reliable in the Christmas period) and 65% (snow-reliable according to the 100-days-rule) are snow-reliable in the low emission scenario. In the high emission scenario, the share of snow-reliable ski areas at the end of the century decreases to 4–14%. Snow production would need to be increased substantially because Steiger and Stötter (2013) assume a doubling of snow production in half of the ski areas by the 2050s and a tripling by the 2080s in the high emission scenario.

Based on the same ski season simulation model, Steiger & Trawöger (2011) developed a multi-level snow reliability classification scheme and related it to the economic significance of winter tourism in Tyrolean tourism board regions. The results indicate that some areas in the northwest (Tannheimer Tal) and northeast (Kitzbühel) of Tyrol will experience high vulnerability by the 2030s. Destinations in these areas are characterised by short- to medium-term snow reliability combined with a strong regional economic dependency on winter tourism.

4. Study design and research methods

4.1. Survey sample

The study design and research methodology are illustrated in Fig. 2. The survey sample was determined on the basis of a multivariate data analysis (Trawöger, 2010) that identified four groups of Tyrolean ski resorts differing in their projected vulnerability to climate change. The vulnerability defined by Trawöger (2010) results from the combination of economic significance of winter tourism and snow reliability derived from the ski season model SkiSim 2.0 by Steiger (2010).

Thus, the sample used for the study's perception analysis includes representatives of ski resorts most at risk from changing climatic conditions, as well as from areas facing challenges only in the long term. This type of survey sample ensures a mix of ski resorts that significantly differ from each other in many respects (i.e., regional importance of winter tourism, tourism intensity, elevation, size, snow reliability).
A total of 24 experts were willing to participate in the study, selected from ski resort clusters in Trawöger (2010). The survey includes 13 Chief Executive Officers (CEOs) of cable car companies and 11 CEOs of regional tourism associations. Cable car companies are often among the leading companies in a region. They play a central role in the development of the respective regions, especially in destinations focusing on ski tourism. Tyrolean tourism associations are public corporations that develop tourism strategies and conduct marketing activities in their regions. Hence, representatives of two of the most important stakeholder groups in Tyrolean winter tourism were interviewed to assess how the growing issue of climate change is currently being addressed. The hotel industry, gastronomy businesses and ski schools also represent important stakeholder groups, but their individual significance varies regionally.

4.2. Perception analysis

Using a qualitative approach, face-to-face in-depth expert interviews were conducted in German between March and August 2010. Guidelines, in the form of a topical pre-structure, ensured interview comparability. The open and semi-open questions were grouped into four topic areas: destination positioning, market trends, perception of climate change and strategic planning. The findings presented in this paper focus on the participants’ responses to the latter two topics, including the following key questions:

- Do the stakeholders believe that some form of climate change is under way?
- Have they identified or do they expect signs of climate change in their regions?
- Have any climate change-related adaptation strategies been implemented or is their implementation at least anticipated?

Several pre-test interviews were conducted to exclude or identify initially problematic, overly complex or incomprehensible questions. The pre-tests showed that it was crucial to explain technical terms like adaptation in layman’s terms to ensure that the participants actually understood the questions. Moreover, the feedback, especially to the semi-open questions, was very important to designing the final interview guidelines. Here, the pre-test participants critically commented on missing or ambiguous items. Another important insight from the pre-test interviews relates to the manner in which the interviewees were addressed. Focusing on the viability of future ski tourism in a broad sense, rather than just discussing the controversial and often negatively connoted topic of climate change, served as an ice-breaker (see also 6. Discussion). The interviewees were assured full anonymity, which in many cases was a prerequisite for their willingness to participate. Consequently, the study results contain no direct references to individual regions, destinations or stakeholder identities. The sample building process ensured the inclusion of ski areas from throughout the study area, including about a third of all Tyrolean tourism associations (N = 11 out of 34).

The applied analysis procedure comprised a multi-stage coding process devised by Meuser and Nagel (1991) and included the following stages: transcription, paraphrasing, coding and topical comparison. The text analysis software MAXQDA was used for the evaluation.

4.3. Identification of opinion categories

To identify different categories of stakeholders with common sets of characteristics, a cluster analysis was performed. This type of explorative multivariate analysis aims to divide objects into groups using a designated list of variables (Everitt, Landau, & Leese, 2001; Kaufman & Rousseeuw, 1990).

For this purpose, a set of 10 indicators was defined that represented key attitudes of stakeholder perception of climate change (Table 2). These key attitudes were carefully identified from the respective literature (see 1. Introduction) by analysing the aspects in which perceptions of climate change and current ways of dealing with the issue among stakeholders differ from each other. Thus, the indicators allow a differentiated assessment of perceptions of climate change.

Using the coded interview transcripts, these indicators were determined to be present (scored 1) or absent (scored 0), which resulted in the formation of a binary presence/absence matrix (Table 3). This matrix served as input to the subsequent cluster analysis.

The term cluster analysis comprises different group-forming techniques that can be distinguished mainly by applied proximity measures and fusion algorithms (Everitt & Dunn, 2001; Hair, Black, Babin, & Anderson, 2010; Härdle & Simar, 2003). In this study, the
The cluster analysis was performed using the **simple matching coefficient** as a proximity measure and the **group average linkage** fusion algorithm.

The simple matching coefficient is one of the most commonly used similarity coefficients for binary data formats and is usually employed when co-absences of attributes provide information about the similarity of two objects (Everitt et al., 2001; Johnson & Wichern, 1992; Kaufman & Rousseeuw, 1990). This means that both co-presences (indicator score = 1 for two stakeholders) and co-absences (indicator score = 0 for two stakeholders) provide equal evidence of similarity. Other similarity coefficients discount 0–0 matches or even disregard them completely (Johnson & Wichern, 1992), which would have been counter-productive in the present analysis.

The group average linkage fusion algorithm is an agglomerative hierarchical fusion method. Agglomerative algorithms start a merging process from each single object as a separate cluster (bottom-up) and identify successive clusters by means of formerly established clusters. Thus, objects of already existing clusters are not separated during the further clustering process (Everitt et al., 2001; Johnson & Wichern, 1992). The group average linkage algorithm is also known as the **unweighted pair-group method**. It uses an average approach that computes all distances between pairs of objects in any two clusters and fuses the nearest two clusters. It tends to join clusters with small variances and is considered to be relatively robust (Everitt et al., 2001).

The cluster analysis was conducted using PASW Statistics 18 software. The final number of clusters was determined by analysing the resulting dendrogram that illustrates the fusion process. The four-cluster solution was found to provide a reasonable summary of the data, corresponding to a 70% similarity level of fused groups. This means that combined clusters show at least 70% similarity, as is the case until stage 20 of the fusion process.

In the last step, the four clusters were labelled to reflect the nature of cluster members. The attributed adjective describes the members’ general attitude towards climate change (convinced, annoyed, ambivalent), whereas the noun refers to their current way of dealing with the issue (planners, deniers, optimists, wait-and-seers). To illustrate the cluster characteristics, some remarks made by the participants are presented in the cluster description.

### 5. Results

#### 5.1. General perceptions

All CEOs have already encountered the topic of climate change in their everyday work. They are mainly involved with calming the debate on the issue in communications with the banking industry and – in snow-poor winters – also with their markets and the media. In the context of capital budgeting, investments and ecological aspects (e.g., water quality and availability), climate change persistently plays only a tangential role.

The vast majority of the interviewees (22 out of 24) stated that they do not trust studies on climate change and snow-based winter tourism. Analysis of the interviews reveals that this is primarily due to feelings of confusion caused by conflicting expert opinions depicted in the media and problems in differentiating between weather and climate, as the following statement shows:

> "We are confronted with conflicting opinions. A few years ago they said we would have less snow. We had a lot of snow and they told us it was an exception. We had five exceptions in a row. They also said it would get warmer and then we had a freezing cold winter. That doesn’t increase our confidence in studies. We can’t estimate the long-term effects of climate change from the results we have received so far."

**CEO, cable car company**

Despite their scepticism toward the results of studies on climate change and the ski tourism industry, the CEOs indeed believe that some form of climate change is under way. Of the study participants, 20 out of 24 believe there is a trend toward (global) warming, although only 10 can already identify clear signs of climate change in their regions or ski areas, other than receding glaciers and melting permafrost. However, a majority of 14 interviewees anticipate signs of climate change in their region or ski area in future. Most CEOs expect a likely increase in extreme events but do not believe in highly negative consequences for ski resort operations.

Climate change is not perceived as a real and immediate threat to ski tourism in its present form. Coping with the issue is currently not an integral part of risk management nor will it be in the next few years for 19 of the interviewees. Consequently, tangible adaptation efforts have as yet not been discussed in most of the areas. Only one adaptation strategy is mentioned by some CEOs, namely the improvement of snow production techniques. There is unanimous agreement on the importance of snowmaking when operating a ski resort, even though not all managers believe in its adequacy as a means of adapting to climate change, as will be shown in the following section.

#### 5.2. Opinion categories

Four categories of CEOs with shared characteristics were identified: convinced planners, annoyed deniers, ambivalent optimists, convinced wait-and-seers. An overview of cluster characteristics is given in Table 4 by listing the modes of the respective indicators (columns I1, I2, …, I10) and the stakeholder group (column Group).

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### Table 2

Indicators of stakeholder perception of climate change.

<table>
<thead>
<tr>
<th>Indicator Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indicator 1</td>
<td>I have already been involved with climate change in my everyday work.</td>
</tr>
<tr>
<td>Indicator 2</td>
<td>I feel well informed about climate change.</td>
</tr>
<tr>
<td>Indicator 3</td>
<td>I trust climate projections and impact studies dealing with climate change and winter tourism.</td>
</tr>
<tr>
<td>Indicator 4</td>
<td>I believe there is a trend toward (global) warming.</td>
</tr>
<tr>
<td>Indicator 5</td>
<td>I can identify signs of climate change in my region/ski area (apart from receding glaciers and melting permafrost).</td>
</tr>
<tr>
<td>Indicator 6</td>
<td>I expect signs of climate change in my region/ski area in the future.</td>
</tr>
<tr>
<td>Indicator 7</td>
<td>I am convinced that climate change poses a real and immediate threat to ski tourism in its present form.</td>
</tr>
<tr>
<td>Indicator 8</td>
<td>Climate change is a topic of discussion in my region/ski area.</td>
</tr>
<tr>
<td>Indicator 9</td>
<td>Coping with climate change already is or will soon be part of our risk management.</td>
</tr>
<tr>
<td>Indicator 10</td>
<td>Snowmaking is an appropriate means of adapting to climate change.</td>
</tr>
</tbody>
</table>

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### Table 3

Presence/absence matrix of stakeholder perceptions.

<table>
<thead>
<tr>
<th>Stakeholder</th>
<th>Indicator 1</th>
<th>Indicator 2</th>
<th>Indicator 3</th>
<th>…</th>
<th>Indicator 10</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>B</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>C</td>
<td>1</td>
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<td>0</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>…</td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

---
5.2.1. Cluster A — convinced planners (N = 5; 5 cable car companies, 0 tourism associations)

Cluster A is made up of cable car company CEOs only and its members appear well informed about climate change. All of them are convinced that (global) temperatures will rise. The CEOs observe and expect signs of climate change in their ski areas:

*For my part, I believe that something is under way. [...] Apart from all these scientific investigations the most genuine signs — anyone can identify — are found in nature. Things like plants moving up in elevation, you once found only on the valley floor, or new species — animals and plants — at higher altitudes, where conditions are cooler. It’s things like that I believe.*

**CEOs, cable car company**

Although — like all other interviewees — convinced planners do not consider climate change to be an immediate threat to ski tourism, they are convinced that changing climatic conditions will affect the ski industry in the mid- and long-term. They report that climate change is a topic of discussion and they believe that they will need to cope with it as part of their companies’ risk management in the near future (for two out of five, this is already true). The managers in Cluster A feel prepared because they are constantly improving snow production techniques with the aim of maintaining services as they are. Snowmaking is considered an appropriate means of adapting to climate change. The risk that temperatures could be too high for snowmaking is met by a focus on what they call snow management. This term designates further improvements in snowmaking and slope-grooming techniques as well as attempts to reduce snow production time. The snowmaking facilities in a ski area should be able to complete base-layer snowmaking (i.e., the production of 30 cm of snow) in only 72 h. The CEOs in Cluster A are convinced that climatic conditions in the early part of the season before Christmas will in the future ensure adequate temperatures for snowmaking in this short period of three days:

*We can control an increase of 1°C, even 1.5°C with snowmaking facilities without using chemical additives. Here, the snowmaking possibilities grow with the problem. If we consider an increase of 2°C then, if you pardon my saying so, the world will have other problems than whether skiing is still possible in the Alps. If temperatures increase more than 2°C, winter tourism becomes a luxury.*

**CEOs, cable car company**

They show themselves to be nearly independent of natural snow, as the following statement emphatically underlines:

*In fact we don’t need snow, we make snow. Too much natural snow is bad for our business, because it means higher costs for slope grooming. Skiers only complain about natural snow pistes. They want smooth slopes that we can only provide with the help of machine-made snow. It sounds absurd, but the best scenario for us is less natural snow, low temperatures for snow production and lots of sun.*

**CEOs, cable car company**

Asked about their estimations of the potential for all-year tourism or increases in summer season figures, the CEOs in Cluster A voiced their doubts that snow management can save the day if climate change should cause real problems for ski tourism:

*As far as increases in summer season figures are concerned, there are limits. In summer we sell nature, silence and relaxation. Even if we manage to get 30,000 hikers or mountain bikers in the area, that’s not manageable. For us summer can be a nice extra income, but it can’t — in any way — compensate for big problems in winter. We have ideas on how to work around the problem, but definitely no idea how to solve a real problem for ski tourism.*

**CEOs, cable car company**

Mentioned forms of behavioural adaptation are cooperatives and mergers with other areas as well as improvements in media communication and service quality.

5.2.2. Cluster B — annoyed deniers (N = 3; 1 cable car company, 2 tourism associations)

Cluster B has only three members and is thus the smallest group. Like all other interviewees, the managers in this cluster have already encountered climate change, but only in the sense that they calmly down the debate on the issue in communications with the media, the tourism markets and the banking sector:

*We try to calm down the debate, to state that there have always been snow-poor winters and that they will happen again and again and show that we have taken precautions in the form of snow production. The worst thing was the banks: they set altitude limits for snow reliability in their risk assessments.*

*That was really dangerous.*

**CEOs, cable car company**

The two CEOs of tourism associations do not feel that their tourism organisations keep them well informed about climate change, while the CEO of the cable car company feels well informed. However, none of them believes that a (global) warming trend is under way or has yet recognised signs of climate change in their regions or ski areas. The annoyed deniers do not expect any negative consequences for ski tourism in the future and view climate change as mainly a media topic and accuse scientists of inciting panic:

*For me climate change is a media catchphrase. Moreover, many would-be scientists are playing to the gallery and misusing the issue for their own benefit. I had discussions with some of them and couldn’t believe my ears. We live in nature, we live off the snow and we are not blind to what is happening. Nothing is happening. Temperatures and snow conditions always follow an up-and-down pattern.*

**CEOs, cable car company**

Climate change is not discussed in their regions or ski areas and is also not an agenda for risk management, neither now nor expected to be in the future. The CEOs in Cluster B generally feel annoyed by climate change discussions and do not see any reason or need to implement any kind of adaptation or mitigation strategies.
5.2.3. Cluster C – ambivalent optimists (N = 5; 4 cable car companies, 1 tourism association)

The ambivalent optimists feel they are well informed about climate change and believe that a (global) warming trend is in progress, although they cannot observe any signs in their regions or ski areas so far. Moreover, they do not expect any relevant future changes to occur in their region due to climate change. They are staying calm and, although they can imagine unfavourable global consequences induced by climate change, they do not think that ski tourism in its present form will be adversely affected.

According to the ambivalent optimists, climate change is repeatedly a topic of discussion in their everyday work, but mainly in the field of communication with their markets in snow-poor winters. None of them sees climate change as a risk management priority. The persons in Cluster C agree with the convinced planners (Cluster A) on the importance of snowmaking, but do not perceive it as a means of coping with climate change. For them, large-scale snowmaking is a pre-requisite for a competitive ski destination and predominantly a matter of quality management:

Nobody wants to ski on the natural snow slopes of the 1970s. We have to produce technical snow anyway to meet our customers’ demands. That’s why snowmaking developed — long before there were any climate change discussions. We do large-scale base-layer snowmaking in autumn anyway, no matter how much natural snow the winter brings.

CEO, cable car company

Some of the managers in Cluster C regard their optimistic attitude as a necessity in their profession. Finding themselves in a competitive environment may force managers to show some form of calculated optimism, which hampers a profound discussion of climate change matters:

If we acknowledged problems caused by climate change, we would be pegged as prophets of doom who foul our own nest. So, even if we already faced problems, I doubt that these would be discussed offensively for the time being.

CEO, cable car company

5.2.4. Cluster D – convinced wait-and-seers (N = 11; 3 cable car companies, 8 tourism associations)

This largest cluster is dominated by CEOs of tourism associations (eight out of 11) who do not feel well informed about climate change. Along with the ambivalent optimists they are convinced a global warming trend is under way, but cannot identify any signs of climate change in their regions. However, in contrast to the persons in Cluster C, the convinced wait-and-seers expect future challenges induced by changing climatic conditions. Some of them even question the focus on skiing and snow in the Tyrolean winter tourism industry. They also express their doubts about the effectiveness of snowmaking as a means of coping with climate change:

It would be presumptuous to say that the ski areas have taken precautions against climate change, because we haven’t, we are not prepared for it. […] Snow production may be a main strategy, but it is a strategy to compensate for a lack of snow, not for coping with climate change. We have not yet taken any real precautionary steps against a marked warming trend.

CEO, tourism association

Despite their recognition that climate change is under way and indications of a critical attitude towards technical means of adapting, they deal with the topic on a personal level and pursue a wait-and-see strategy. This is clearly shown by the fact that climate change is not a topic of discussion in these areas and is also not considered a risk management priority in the short- or mid-term. They agree with the convinced planners on the present lack of viable alternatives to ski tourism. Only one person in Cluster D expresses his visions more specifically:

There are no alternatives to skiing so far. We need intelligent, innovative products and specialisation, but there is little progress so far. We [Tyrol] should become pioneers in environmental management, but we can’t get enough political support with regard to climate protection. The stakeholders and politicians are too short-term focused.

CEO, tourism association

5.3. Differences between the stakeholder groups

The clusters differ significantly in relation to the predominant stakeholder group (Table 5). Cluster A (convinced planners) is made up of cable car company managers only. Cluster C (ambivalent optimists) is also dominated by cable car company CEOs (four out of five). Tourism association managers mainly play the role of convinced wait-and-seers in Cluster D, in which they account for eight of the 11 cluster members.

In addition to the cluster differences already mentioned in section 5.2, Opinion Categories, two aspects stand out. On the one hand, the managers of tourism associations tend to be more critical about technical adaptation strategies in general and snowmaking in particular than do CEOs of cable car companies. On the other hand, the CEOs of tourism associations do not feel well informed about climate change (10 out of 11), while cable car company CEOs generally do (10 out of 13).

6. Discussion

The findings of various perception studies (see 2. Literature review) indicate a growing awareness of climate change matters among stakeholders in the snow-based winter tourism industry. Swiss cable car companies have taken on a pioneering role in the European Alps as far as the implementation of climate change in corporate planning is concerned. Abegg et al. (2008) report that between 2002 and 2007 nearly half of all investigated Swiss cable car companies (49%) gave consideration to an ongoing warming trend in corporate planning, while a majority (79%) intended to do so in the upcoming years.

The present study documents differing views among Tyrolean stakeholders, with hardly any climate change adaptation strategies implemented or planned. Although a majority (83%) of the interviewees believe that a global warming trend is at least in progress, 79% state that climate change is not and will not be a risk management priority in upcoming years. This contradiction between a generally growing awareness of climate change and the non-existence of action has also been recently identified by Tervo-Kankare (2011) in two Finnish destinations.
But why do the identified risk perceptions deviate so strongly from scientific estimates of the challenge of climate change? Judging from the survey, there are various reasons for the current lack of interest and efforts to adapt to climate change. These range from very short planning cycles of less than 10 years and a still largely low degree of economic suffering in the ski industry to the general attitude of stakeholders, who feel obliged to believe in the future of ski tourism and to demonstrate optimism in a competitive environment (see also Trawöger, 2011).

However, another main reason for the lack of adaptation strategies is the fact that most stakeholders simply do not perceive climate change as a real threat, in many cases not even as a risk to their businesses or regions. What might at first appear to be contradictory to the generally growing awareness in the literature is explained by characterising the kind of awareness observed in the Tyrolean ski tourism industry. The stakeholders' awareness identified in this study seems to be mainly limited to the general issue of climate change in the sense of Yes, I believe that something is under way, primarily on a global level. Most interviewees are not aware of potential branch- or region-specific consequences of climate change.

Shifting perceptions and attitudes pose another difficulty in assessing stakeholders’ capacities in the ski industry. This crucial matter immediately prompts the question as to what major factors influence climate change perception and awareness among stakeholders. Is it really scientific publications, such as IPCC reports, information disseminated by authorities and media coverage that determine climate change perception on the supply side or is it tangible signs of climate change that are identified in the regions?

As pointed out in 1. Introduction, perceptions of climate change are also likely to be influenced by the character of the winters preceding the surveys, with anomalously warm and snow-poor winters triggering a greater awareness. This also applies in the reverse case, with relatively cold and snow-rich winters reducing awareness of climate change. The findings of the present survey support this hypothesis, with many interviewees stating that discussions about climate change have petered out in the last five years, corresponding with no anomalously warm or snow-poor winters.

The immediate experience of winter weather in the region proves to be one of the key drivers of climate change perception among the interviewees. Many participants refer to recently experienced weather characteristics in previous winter seasons when asked about their perception of climate change. Although some interviewees already report direct effects of climate change in their regions, including rising tree or snow lines, receding glaciers or melting permafrost, it is the personal experience of winter weather characteristics that increases or decreases their awareness of climate change. This is confirmed in a recent interview with the head of the tourism board in Kitzbühel, who reduces the issue of climate change to a perception problem on the demand side. He stresses that, despite short-term losses, the coldness of the preceding winter was a huge benefit from a tourism perspective. Moreover, he states that potential consequences of climate change had been on peoples’ minds for years, including projections that there would be no more snow. He further mentions that this notion had completely disappeared and that people could be more than optimistic for the upcoming winter season. (Christler & Zierl, 2012).

These study results are consistent with the findings by Ratter, Philipp, and Storch (2012), who found a decline in attention to and concern about climate change in recent years in many parts of the world. The authors relate this development to various causes, including information fatigue by the media and influences of regional weather conditions. Their analysis shows that a long-term increase in scientific confidence and media coverage of the issue does not consequentially result in higher public concern. However, Ratter et al. (2012) note that the decline may be only intermittent. Recent studies by Krosnick, Holbrook, Lowe, and Visser (2006) and Li, Johnson, and Zaval (2011) also suggest a connection between local weather and concern about global warming.

The present study shows that knowledge about climate change as a global phenomenon does not automatically trigger action on a regional level. According to the interviewees, uncertainties and the lack of regional projections and local impact studies make it difficult for them to implement adaptation strategies in their planning. Assuming that anomalously warm and snow-poor winters are a determining factor, a series of such winters causing snowmaking problems is likely to heighten awareness among stakeholders. Saarinen and Tervo (2010) also assume a connection between the growing awareness of climate change within a short period of time and the immediate experience of two warm and snow-poor winters.

The literature on risk perception provides cognitive and cultural explanations for the failure to address climate change, which are also relevant in the context of this study. One cognitive bias, labelled unrealistic optimism, optimism bias or illusion of invulnerability, was first demonstrated by Weinstein (1980). He reported that people generally tend to be unrealistically positive about the future rather than objective (see also Bazerman, 2006; Berger et al., 2011; Wagner & Zeckhauser, 2012). Weinsteins (1980) ascribed individual unrealistic expectations about the future to errors in judgement, influenced by such factors as perceived probability and personal experience. According to Costa-Font et al. (2009), new risks like climate change seem to be especially influenced by an optimism bias.

Recent research in neuroscience dealing with unrealistic optimism found that this mechanism is tied to diminished coding of undesirable information in the human brain (Sharot, Korn, & Dolan, 2011). The authors suggest that positive illusions are the result of selective update failures. Consequently, people often underestimate future negative events even if they are confronted with information challenging their optimistic outlook. Cognitive dissonance is another closely related psychological phenomenon that helps to explain stakeholders’ attitudes toward climate change: confronted with uncertainty, people tend to view challenges in a way that makes them most comfortable (Wagner & Zeckhauser, 2012).

Moreover, high degrees of perceived control lead to lower personal risk estimates and increased risk denial (Bazerman, 2006; Klein & Helweg-Larsen, 2002; Sjöberg, 2000). Many stakeholders interviewed, especially the CEOs of cable car companies in Cluster A (convinced planners), think that they can control the risk of too high temperatures for producing man-made snow by further improvements in snowmaking and slope-grooming techniques. They also exhibit very optimistic views about ski tourism in a warmer climate. These findings are consistent with research on risk perceptions, which links optimism and perceived controllability over future events. For Gifford (2011), technosalvation – the belief that technology (nearly) alone can solve the problem – is one of the dragons of inaction limiting climate change mitigation and adaptation.

In the interviews, some other barriers to action and behavioural change were revealed that corroborate previous research. These include the lack of trust in scientific studies leading to risk denial (Gifford, 2008; Sjöberg, 2000) and the human tendency to maintain the status quo, which is closely related to loss aversion (Bazerman, 2006; Wagner & Zeckhauser, 2012).

The findings of this study also support previous research on public perceptions of climate change that identifies certain qualitative characteristics of the issue as sources of inaction. The majority of the CEOs could not make out clear signs of climate change
that directly threaten operations in their areas and anticipate challenges mainly in the distant future. Several studies found this delay effect to be a major barrier to adapting to climate change (Etkin & Ho, 2007; Heath & Gifford, 2005, 2006; Leiserowitz, 2005, 2006; Sunstein, 2006; Weber, 2006). People predominantly expect climate change to occur in the future and to affect geographically distant regions. Sunstein (2006) stresses that serious harms caused by climate change are not cognitively available to people, which prevents them from taking action.

For Bazerman (2006), the lack of vividness is one of the most fundamental sources of predictable surprises like climate change. The author uses this term to describe events that lead organisations and nations to react with surprise, despite people's general awareness of the challenge and strong scientific arguments for action. Weber (2006) argues that insufficient feedback from daily or yearly personal experience may prevent people from reacting to global warming – even those who are dependent on weather and climate like farmers or fishermen. These considerations also help to explain the inaction among Tyrolean winter tourism stakeholders. As long as effects of climate change are not resulting in direct consequences for tourism-related operations in the ski areas, they are unlikely to lead to climate change adaptation strategies.

This view is supported by Oppenheimer and Todorov (2006), who state that concerns are delayed until impacts are obvious and personal. Thus, Oppenheimer and Todorov (2006) stress the need to translate general concerns about climate change into local, personally relevant worries. Due to its complex, overarching and often abstract nature, the problem of climate change cannot be solved with traditional linear models (Etkin & Ho, 2007). It fits into what is labelled post-normal science, dealing with issues characterised by uncertainty, conflicting opinions and high decision stakes (Funtowicz & Ravetz, 1993).

The identified clusters in this study are quite homogenous with respect to the investigated stakeholder groups. While Clusters A and C are dominated by CEOs of cable car companies, Cluster D is mainly made up of CEOs of tourism associations. The interviews revealed that, apart from personal experience of recent and past weather conditions, the stakeholders tend to connect their attitudes to the ones predominating in their stakeholder group. This phenomenon of cultural polarisation is discussed by Kahan et al. (2012), who state that people consult others with whom they share close ties when acquiring scientific knowledge. Thus, they avoid dissonance and protect their standing within their groups. As Kahan (2012) argues, the individual is often confronted with partisan meanings of this kind: “if you are one of us, believe this; otherwise, we’ll know you are one of them” (p. 255). In their investigation, Kahan et al. (2012) refer to the tragedy of the risk-perception commons, reflecting the conflict between the individual and collective levels of rationality.

Closely related phenomena, which help to explain different attitudes among groups or even nations, are those of group polarisation and confirmation bias. Sunstein (2006) states that group polarisation inevitably occurs in the context of risk perception. In group discussions, like-minded people tend to end up accepting a more extreme version of their predominant views. Hence, fear or neglect of certain events is amplified. This process interacts with what is known as confirmation bias — the human tendency to memorise information that confirms original beliefs (Klayman & Ha, 1987) — and social bandwagon or cascade effects (Sunstein, 2006).

Many stakeholders interviewed have a negative emotional connection to the issue of climate change in the sense that they associate it with media panic, threat scenarios or downright pessimism. Some even consider offensive discussions about climate change to tarnish their region’s image and to befoul their own nest. An open-minded approach does not seem possible in many regions of the study area. Regarding the difficulties still surrounding the viability and validity of regional impact studies, new approaches on how to address stakeholder scepticism may pave the way for establishing adaptation strategies or at least generating discussion about climate change in the regions.

In this survey, the interviewees were addressed by focusing on the viability of future ski tourism in a broader sense, but also by discussing market trends, leadership in winter tourism destinations and matters of sustainability and risk management. These areas of interest served not only as an important source of information but also as ice-breakers for discussing the controversial and often negatively connoted topic of climate change. Such an approach may also be advantageous for studies in other areas characterised by hostile or indifferent attitudes towards climate change.

Tervo-Kankare (2011) identified a similar recommendation expressed by the representatives of local development agencies in Lapland who regarded climate change “with its complex cause and effect relationship to be too broad, scary and paralyzing an issue to handle, while pursuing sustainability, for example, was easier for tourism entrepreneurs to understand” (p. 408). Many quotations in the literature (e.g. Bürgi, 2000; Luthe, 2009; Saarinen & Tervo, 2010; Tervo-Kankare, 2011; Trawöger, 2011) — especially those cited in surveys conducted after anomalously warm and snow-poor winters — show how emotionally charged the topic of climate change is.

7. Conclusion

This article examines the perceptions of climate change among winter tourism stakeholders in one of the top Alpine tourism regions. Tyrolean CEOs of cable car companies and tourism associations currently show themselves to be quite calm and relaxed in the face of an ongoing warming trend. The findings of the present survey indicate that climate change is not perceived as a threat. Those interviewed either feel prepared due to snowmaking (convinced planners) or do not feel that serious consequences for ski area operations are likely. The general belief that climate change is a global phenomenon has not yet developed into an awareness of potential branch- and region-specific consequences, nor has it prompted action on a regional level.

No adaptation strategies could be identified that were primarily adopted as a reaction to an already changing climate or in anticipation of future temperature or precipitation modifications. Large-scale snowmaking and improvements in slope grooming are predominantly undertaken to reduce dependency on natural snow and to enhance slope quality. Advances in snowmaking have already enabled many destinations to kick off the ski season with no natural snow at all, as the well-known Tyrolean winter resort Ischgl impressively showed in November 2011. It is no longer the lack of natural snow that prevents ski destinations from opening the season, but — if so — the inability to produce snow due to high temperatures. However, tourism association managers tend to take a more long-term perspective than cable car company managers and also show a more critical attitude toward technical adaptation strategies like snowmaking.

There is reason to assume that in the short and medium terms, coping strategies in the Tyrolean ski industry will remain highly individualistic and reactive. Recent cold or snowy winters proved to be a reason for climate change discussions to peter out in Tyrolean winter tourism.

It is clear from the above discussion that further study is needed in several fields of research: (a) regional scenarios of climate change impacts on winter and ski tourism; (b) investigations of the most influential drivers of climate change perception and ways to
transfer scientific knowledge to practitioners; and (c) representative perception studies in various Alpine regions employing similar study designs in order to allow comparative assessment of adaptive capacities in different regions. With regard to perception analyses, particular attention should be given to the sampling process. The importance of certain stakeholder groups varies from region to region, and thus the selection of participants needs to follow the nature of the tourism systems in the investigated regions while considering the organisational structures and decision making processes in those areas.

There is evidence that particular attention should also be given to new forms of management that allow people to tackle complex problems like climate change successfully. Many current management models seem to have reached their limits. Being frustrated with management-as-usual, a group of scholars and business leaders recently defined “management moon shots” (Hamel, 2009, p. 1). They address a number of needs for behavioural change in management, which are also revealed in this study about ski tourism stakeholders. These include the priorities of decreasing fear and increasing trust to facilitate innovation and change, instead of mindlessly reinforcing the status quo, and to stretch executive time frames and perspectives.

The scientific task for and challenge of the upcoming years is to connect the general awareness of climate change as a global phenomenon to the already ongoing and potential branch- and region-specific effects of modified temperature and precipitation patterns. The results of the present survey suggest that only an increased knowledge of branch- and region-specific consequences of climate change related to snowmaking costs, water demand and the like will trigger a profound discussion of the issue and thus finally cause action to be taken.

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