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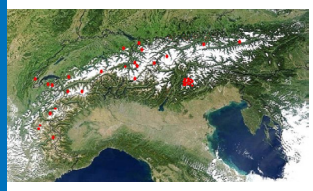

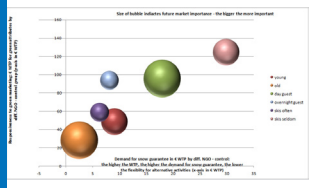

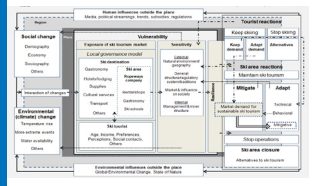

SkiSustain

Vulnerability to global change and sustainable adaptation of ski tourism

Tobias Luthe

SkiSustain was initiated by the Board of Environment and Sustainable Snow Sports Development of the German Ski Federation (DSV-Umweltbeirat) and co-financed by the Foundation Safety in Skiing (SIS).

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Die Stiftung Sicherheit im Skisport wurde 1975 vom Deutschen Skiverband (DSV) und den Freunden des Skisports (FdS) gegründet. Über alle Aspekte eines sicheren Schneesports hinaus widmet sie sich den relevanten Rechtsfragen, den medizinisch wissenschaftlichen Zusammenhängen und nicht zuletzt der Umweltvorsorge - als einer der wesentlichen Voraussetzungen, Skisport auch in Zukunft nachhaltig betreiben zu können.

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SkiSustain wurde initiiert vom DSV-Umweltbeirat und kofinanziert von der Stiftung Sicherheit im Skisport (SIS).

Institut für Natursport und Ökologie
Deutsche Sporthochschule Köln
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Content

Abstract

Global change, in particular changes in demographic patterns, in socioeconomic developments and in climate, significantly affects alpine tourism, especially ski tourism. The higher average temperatures and more frequent extreme events force the ski tourism industry to act.
In response, mainly technical means of adaptation in ski areas are being applied to maintain a status quo of alpine ski tourism. After the analogue winter of 2006/07 as the warmest winter on records, the current kind of adaptation proofed to be not sustainable, neither in its effectiveness, nor in its ecological impacts or its economical perspectives.

To increase the adaptive capacity for long-term success in a sustainable way, additional adaptation measures are required, such as behavioural and mitigative strategies. In the coupled human-environment system of ski tourism sustainable adaptation also has to involve the customer more in adapting the demand side consumer behaviour to changing services of ski areas as opposed to maintaining the status quo as the only approach.

Mitigational strategies in conjunction with demand side adaptation might lead to a potential new chance for suffering ski areas – a market of sustainable ski tourism where a blended mix of adaptation strategies leads to win-win situations in ski tourism.

In the research project *SkiSustain* we model the relation between global change, customer demand and supply side strategies to develop a vulnerability framework for ski tourism. It is meant to deliver a differentiated understanding of vulnerability and of sustainable adaptive capacity.

Abstrakt

Globaler Wandel als die Summe demografischer, sozioökonomischer und klimatologischer weltweiter Veränderungen beeinflusst den alpinen Tourismus, insbesondere den Skitourismus. Vor allem die direkten Auswirkungen des Klimawandels mit höheren Durchschnittstemperaturen, häufigeren Extremereignissen wie starker Niederschläge, Stürme, Warmlufteinbrüche oder Trockenheiten erfordern Reaktionen der Skigebiete und Skidestinationen. Den Schwerpunkt der Anpassung bildet die technische Adaption, insbesondere die Beschneiung und der Anlagenausbau in die Höhe, um den alpinen Skisport als Status quo zu erhalten.

Der analoge Winter 2006/07, der als bisher wärmster Winter der Aufzeichnungen gilt, zeigte jedoch die Grenzen der technischen Anpassung auf, sowohl aus ökonomischer, als auch aus ökologischer und sozialer Sicht. Für eine langfristig erfolgreiche, nachhaltige Anpassung an die globalen Veränderungen nicht nur klimatologischer Art ist der momentane Fokus auf die technische Adaption nicht ausreichend. Weitere Anpassungen auf Verhaltensebene sowie Vermeidungsstrategien sind notwendig und müssen vermehrt angewandt werden, wobei sich der Status quo des Skitourismus ändern wird.

In einem kausal vernetzten Mensch-Umwelt System Skitourismus sind Verhaltens- und Vermeidungsstrategien nur durch die direkte Zusammenarbeit von Angebots- und Nachfrageseite, von Skidestinationen und Skitouristen, erfolgreich umzusetzen. Eine Anpassung des Status quo auf Angebotsseite verlangt demnach auch eine Anpassung der Nachfrage an sich verändernde Angebote.

Erweiterte Formen der vernetzten Verhaltensanpassung und der Vermeidungsstrategien können mit Hilfe eines bewussteren, nachhaltigen Konsums zu neuen Chancen für den Skitourismus und den alpinen Tourismus im Ganzen führen, und dabei dessen Verletzbarkeit gegenüber globalem Wandel verringern.

Im Forschungsprojekt *SkiSustain* werden die Wechselwirkungen zwischen globaler Veränderung, Konsumentennachfrage und Angebotsstrategien modelliert, um ein Vulnerabilitätsmodell zu entwickeln und Möglichkeiten der nachhaltigen Anpassung zu testen.

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My family supported me throughout the time of this dissertation.

Extended summary with ten main findings

Ski tourism is facing significant changes through climate change, demographic patterns and socio-economic developments – referred to as global change. This study *SkiSustain* provides an assessment of vulnerability of ski tourism to global change after the winter 2006/07, the warmest winter on records in the European Alps and an analogue season for future climate change (Beniston, 2007a). We assessed vulnerability as exposure, sensitivity and adaptive capacity of ski tourism in the Alps after this unusually warm winter, both in a qualitative study with tourism stakeholders – ski area managers – and in a quantitative study on the demand side – with ski tourists. The research objective was to assess sustainable adaptation strategies and opportunities in order to maintain and support a sustainable kind and size of ski tourism, involving behavioral aspects and focusing on mitigation and the market demand for sustainable consumption. The real time happening of future climate change impacts in the winter 06/07 led most likely to a higher probability of true and expectable reactions both on demand and supply side. The experiences of this particular season can be used as a proxy for coming winters and the impacts they generate (Beniston, 2007b). Responses both on supply and demand side would most probably have been different after a rather *normal* winter in terms of snow cover and temperatures – and are valid forecasts if climate change is happening as foreseen (IPCC, 2007, OECD, 2007).

The current discussion of ski tourism vulnerability is focused on climate change, which is threatening ski tourism worldwide. Recent warming in the European Alps has been about three times higher than in the global average and is modelled to change even more in the coming decades (OECD, 2007). Direct impacts of climate change with increasing temperatures are leading to melting glaciers and a decrease in natural snow reliability especially in lower altitudes. Ski areas suffer from this lack of snow, and technical adaptation, such as the production of snow, expansion in higher elevations and landscaping, has become obligatory to cope with direct climate change impacts – leaving lower and smaller ski areas as so-called *losers*, higher and bigger ones, which can afford the high investments in technical adaptation, as *winners* from climate change. The emphasis has been put on preserving the *status quo* of ski tourism, leading to the focus on technical snow making as the main kind of adaptation (OECD, 2007). Technical adaptation is being criticised from environmental (CIPRA, 2006b) and economic aspects due to non-linearly increasing costs (OECD, 20007). Expansion, landscaping or snow making can amplify negative environmental impacts within a system of feedback loops on fragile mountain ecology and on the climate. The current emphasis on securing ski area services in the *status quo* with technical snow making is seen as not viable in the long term (OECD, 2007) and as not sustainable (CIPRA, 2006b, Mueller & Weber, 2008). This calls for other kinds of adaptation, such as

behavioral strategies – e.g. diversification of revenue – and avoidance or mitigation strategies – such as more efficient use of energy. Behavioral and mitigative strategies have been neglected in the adaptation discussion so far (OECD, 2007, Wolfsegger et al., 2008), but are seen to become of greater importance in the future (Roth et al. 2008, Abegg et al., 2007).

Results of *SkiSustain* show that snow making could cope with direct climate change impacts. Water availability, increasing costs of energy, ecological and legal aspects define limits of technical adaptation in the future. The classic factors of vulnerability, such as elevation, size and snow making capacity, proved their general importance for coping with direct climate change, but also their inadequacy to determine overall vulnerability to global change. The limited adaptation capabilities of technical adaptation to the indirect, social and economic effects of climate change as well as to demographic developments became obvious and require different strategic approaches. Socio-economic aspects and indirect effects of climate change lead to an extended view of vulnerability that is not adequately met by the current discussion of *losers* and *winners.* The focus on technical adaptation is not appropriate to cope with these developments. Vulnerability of ski tourism is more diverse than currently discussed, revealing new needs for, but also possibilities of sustainable adaptation (Mueller & Weber, 2008).

Sustainable adaptation of ski tourism requires a blend of technical, behavioral and mitigative strategies, and withdrawal from ski tourism has to be incorporated as one possible strategy. Behavioral and mitigative adaptation need to be included more, but will result in a change of the *status quo*, such as alternative activities to Alpine skiing and less snow guarantee. In order to secure economic feasibility, acceptance on supply side and thus success of sustainable adaptation, the customer is challenged to adapt demand to changing services (CIPRA, 2007a). Mitigation not only helps to lower negative impacts from ski tourism on the environment, but could also lead to new business opportunities of sustainable ski tourism. The added value of Alpine skiing in a natural winter environment as the *status quo* in ski tourism cannot be achieved yet by any other activity in ski area based mountain tourism. But despite of the general importance of snow, the scale of differences in customer demand, as well as the individual differences of ski destinations, provides space for alternative services and opportunities that can be marketed successfully.

Sustainable consumption is a market of the future, and the high economic market potential of sustainable ski tourism could lead to a *greening* of the ski tourism industry. The increasing importance of sustainability aspects in general opens up new chances for new forms of extensive tourism, with a business case for the tourism industry acting as a driving force.

Taking the conclusions from the qualitative supply side assessment – described in chapter four – and the quantitative demand side survey – described in chapter five – we summarize the following ten main findings of *SkiSustain*:

Ten main findings of *SkiSustain*

1. The direct impacts of climate change are only one facet of developments ski tourism is threatened by. Other global change impacts, like demographic, socio-economic and socio-graphic aspects, as well as the indirect, social effects of climate change, are becoming of similar or even greater importance in the future.
2. Direct climate change impacts on snow reliability in ski areas can be coped with by technical adaptation, in especial snow making. Technical adaptation is limited, though, by natural (water availability), economic (costs of energy and investments), social (decreasing demand and acceptance) and legal (regulations) aspects, with negative feed backs on the environment. Applied with the current strength and focus, it is not sustainable. Adaptation to global change requires different strategies.
3. The extended understanding of vulnerability differentiates the common discussion of *losers* and *winners*. The system of ski tourism affects itself and is affected in more complex and interrelated ways. Each destination is unique and different in its vulnerability, needing individual assessments and strategic approaches of adaptation. The international comparison of models of ski area governance reveals the effects of uncertainty and of different management approaches on adaptive capacity.
4. The market of existing ski areas, skier numbers and activities is changing quickly. Massive concentration processes of ski areas will further affect the system, as well as other human and biophysical external and internal influences, such as a decreasing customer demand with about two thirds skiing less in the future if climate change happens as foreseen. The shrinkage to a smaller and more sustainable size of ski tourism is happening and will continue.
5. The customer is getting more demanding for quality and services in general, the booking behavior is becoming more flexible. The oldest consumers are the least demanding ones, reacting the least to marketing. The youngest clientele with the highest income are the most demanding ones also reacting most to *green* marketing. Day skiers come for the snow. The overnight guest is less demanding than the day guest, although his choice behavior is becoming more flexible and tending toward that of a day guest. 95% of the overnight guests would stay in a ski destination even if there were no snow for up to 70% of a weeks' vacation, and if alternative activities met their demand. *Soft* mountain sports such as hiking are accepted, technical installations such as roaller coasters are not. The

youngest customers below 20 years of age show completely different demand patterns.

6. Diversification in a seasonal, in an activity oriented and from a kind of operations point of view is a key criterion of adaptive capacity to decrease dependency on Alpine skiing and to increase the share of revenue from the tourism supply chain for ski areas. Strategic partnerships inside the destination and with external stakeholders are required. Size still is and becomes even more a key success factor.
7. Change incorporates various chances of increasing adaptive capacity. New market niches can be developed by specifying and shaping destinations' profiles. The customer is partner in designing his personal mountain experience. More specific target group addressment, information and directed marketing increase booking and travelling flexibility, open up higher acceptances for less snow guarantee, for alternative services and activities, and a higher willingness-to-pay for what the ski destination will be able to offer in the future. Proactive communication and outreach to the media, combined with thorough market research, build the base for transparency, quality and trustworthiness in the business.
8. Mitigation is a business case in sustainable tourism, particularly for the smaller and lower areas more prone to direct climate change. Customers demand more sustainable services. The economic potential of sustainable consumption with an increased willingness-to-pay of up to 3100%, in average 200-600%, compared to conventional services, is high and of growing importance. *Green* marketing pays off, making mitigative adaptation a business case. Sustainability with a market potential of about one quarter of the German ski tourists today may well become the tourism market of the future, especially as a unique selling proposition for smaller and lower ski areas that suffer most. The bigger and higher ski areas will focus on snow competence, but have to inhabit the principles of integrative, sustainable tourism alike.
9. Successful adaptation has to more include the demand side adaption to changing services, in combination with blended behavioral, technical and mitigative adaptation strategies on supply side. Local governance is setting the institutional frame for successful adaptation and thus requiring more attention, calling for a *Model Europe* of ski area governance.
10. Further research is needed to decrease uncertainty of developments and in the relations within the vulnerability framework of ski tourism. The different demand of the youngest customers, downstream effects of upstream water management, the individual most efficient and effective cost-benefit ratio of snow making coverage, alternatives to ski tourism and alternate industries for mountain regions to diversify, models of ski area and destination governance, demand developments in emerging markets and transparent communication tools are research fields of key importance.

List of acronyms

ADEME	Agence de l'Environnement et de la Maîtrise de l'Energie
CIPRA	Commission Internationale Pour la Protection des Alpes
CJA	Conjoint Analysis
CSR	Corporate Social Responsibility
CV	Contingent Valuation
DSHS	Deutsche Sporthochschule Köln
DSV	Deutscher Skiverband
EMS	Environmental Management System
IPCC	Intergovernmental Panel on Climate Change
ISO	International Organization for Standardization
LOHAS	Lifestyle of Health and Sustainability
NGO	Non Governmental Organization
OECD	Organization for Economic Co-operation and Development
SIS	Stiftung Sicherheit im Skisport
SkiSustain	Name of this dissertation project
SWR3	Südwest Rundfunk 3 (German radio station)
TIES	The International Ecotourism Society
UNFCCC	United Nations Framework Convention on Climate Change
URL	Uniform Resource Locator (internet address)
USP	Unique Selling Proposition
WKO	Wirtschaftskammer Österreich
WMO	World Meteorological Organization
WTO	World Tourism Organization
WTP	Willingness-To-Pay
WWF	World Wide Fund for Nature

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1. Introduction

"The only question remains, who takes the initiative."
(Statement of a ski area manager to the future of sustainable ski tourism)

In the first chapter we introduce the background and goals of this study named *SkiSustain*, list the main research questions and provide an overview on involved and related scientific disciplines.

1.1. Background and goals of this study

Climate change leads to a warming of the climate that is observed and expected to be higher in the Alps than the world average (IPCC, 2007). The natural snow line is rising, leaving especially lower ski areas with less natural snow reliability (OECD, 2007). The lack of snow due to climate change can lead to fewer ski tourists visiting the ski areas, thus becoming an economic problem for ski areas and ski destinations (OECD, 2007, Abegg & Elsasser, 2007).

Snow making is the adaptation technique in focus, requiring high sums of investments (Müller & Weber, 2008). Lower ski areas are more exposed to warming temperatures, and smaller ski areas often cannot afford these investments. Smaller and lower areas are seen as *losers* from climate change (for example in OECD, 2007). Higher ski areas with more natural snow reliability are seen to be on the winning side, especially when they are big enough to afford the necessary investments. The elevation, size and snow making capacity of a ski area are the main factors when discussing adaptation to climate change (OECD, 2007).

Vulnerability of ski tourism, though, is not only made up of the direct outcomes of climate change that can be addressed by technical means. Snow making has a limited adaptive capacity that is necessary and a *must* for today's and for future ski areas, but the limits already have been reached in the season of 2006/07 (chapter four).

Global change affects ski tourism in multiple ways. Climate change is the main threat because of the direct dependency of ski areas on snow and weather events. Demographic developments and socio-economic changes will result in differences of customer demand. The traditional ski tourist market will shrink. Greater numbers of older skiers will arrive as fewer young tourists will visit the Alps, dividing customers into two spending groups: the wealthier and the budget class (Lohmann, 2007, Statistisches Bundesamt Deutschland, 2008). Changes and developments are perceived differently by ski area managements as their strategic responses are varied. The possible outcomes of global change, though, are diverse and complex. The uncertainty in these developments, the local differences in climate change impacts and the questionable future

customer demand require a bouquet of strategies, including adaption of human systems, such as consumer demand or traditions. Many new vulnerability factors arose from recent developments and ski areas' experiences (chapter four).

Little is known so far about the evolving demand of customers and how this demand interacts with global change. The diversity of customers might open up new potential market niches and unique selling propositions (USP) for ski areas, especially for the so called *losers,* the ski areas in lower altitudes and of smaller size, which cannot guarantee snow in the way the higher and bigger ski areas can.

In order to develop new ways of sustainable adaptation of ski tourism to global change, this study *SkiSustain* seeks to assess an extended picture of vulnerability of ski tourism after an analogue winter 2006/07 for future climate change, including the perceptions and strategies from a supply side and the evolving demand from a tourists' perspective. Sustainable adaptation and the potential for sustainable tourism are in the focus of this study. Managing and marketing a *green* resort that may not offer 100% snow guarantee, but instead alternative activities and a profound engagement in climate protection, could attract a growing number of customers and thus outweigh potential losses. Recent studies estimate the market of the so called *LOHAS* (Lifestyle of Health and Sustainability) in Germany to about five million households with higher incomes, and thus an estimated buying power with a minimum of 200 billion Euros with a strong growing tendency (Schulz, 2008). The customer most attracted by *green* ski areas does have a high financial income and could therefore be a real opportunity to ski areas going green.

Environmental competitiveness and environmental sustainability already are key success factors in tourism. The most successful countries in tourism also boast the highest environmental performance as the 2008 Travel & Tourism report reveals (Blanke et al., 2008). It can well become a more important factor for ski destinations and ski areas alike. Results of this study are intended to extend the scientific discussion of ski tourism vulnerability to global change impacts and to offer strategic recommendations how to decrease vulnerability. We seek to increase the awareness of the scientific community, as well as on an applied practical level both of the supply side and of the demand side of ski tourism, that the current practice of adaptation is not sustainable, and that alternative ways of sustainable responses to global change have to be found. As one such option, we seek to assess, test and discuss the market potential for sustainable tourism – including the adaption of consumer demand to changing services, making mitigation and behavioral adaptation a business case for ski tourism managements, which could then lead to win-win situations for ski tourism in economic, social and ecological aspects.

The overall perspective of this study is to maintain, to support and to develop a sustainable size and kind of ski tourism, but withdrawal from ski tourism has to be taken into account, too, when discussing sustainable adaptation to global change.

1.2.Study design and research approach

In this study we extend the current focus on climate change to global change impacts on ski tourism to understand other vulnerability factors. We assess experiences and strategies of ski area managements after the warmest winter in record so far to answer the question of current and future vulnerability of ski areas. We include ski areas in the four main Alpine countries: France, Italy, Austria and Switzerland. In qualitative semi-structured personal expert interviews we discuss the limits of technical adaptation and check behavioral as well as mitigative alternatives that could lead to more sustainability in ski tourism.

We then assess and model the demand for sustainable ski tourism on the customer side representing the world's biggest outbound tourism market, Germany, in an internet based standard questionnaire. Hereby we test the potential effects of green marketing and express the demand in economic willingness-to-pay data by adding an online choice experiment to this quantitative part. We then develop a strategic vulnerability management framework for ski areas and close with concrete recommendations for the sustainable adaptation of ski areas to global change. One intention is to picture a holistic view of the system of ski tourism to define further areas of interest needing more in-depth research in the future.

1.3.Fields of sciences contributing to this study

1.3.1. Sustainability science

The topic of this study opens up a vast field of different research disciplines that become involved or that are touched throughout this work. The character of this study is strongly interdisciplinary between the involved disciplines – sustainability science, global change and climate impact science, tourism science and sport science – and even transdisciplinary over research disciplines into the experiences of practical management. The emerging field of sustainability sciences describes best inter- and transdisciplinary research in human-environment systems, such as the system of ski areas, ski tourists and global change. The emergence of sustainability science builds toward an understanding of the human-environment system and covers the social sciences, natural sciences and political sciences (Turner et al., 2003a).

A key challenge of sustainability is to examine the range of plausible future pathways of combined social and environmental systems under conditions of

uncertainty, surprise, human choice and complexity. Scenario analysis – including new participatory and problem-oriented approaches – provides a powerful tool for integrating knowledge, scanning the future in an organized way and internalizing human choice into sustainability (Swart et al., 2004). Sustainable development is an inherently subjective concept, and for this reason requires deliberative forms of governance and assessment (Kemp & Martens, 2007). Sustainability science meets multidisciplinary topics that examine the scientific, engineering and social aspects of a problem. Trying to look at a challenge from a narrow, discipline-based point of view will most likely only highlight a part of it. It is therefore important to look at a particular subject in its entirety and from different angles. Sustainable development is a social issue. Physical and biophysical aspects must be translated into social science aspects (Pachauri, 2008). Successful sustainability science research is not only measured by pure scientific merit, but also by the utility of the resulting products and recommendations (Clark & Dickson, 2003, Polsky et al., 2003).

1.3.2. Global change research

Sustainability science addresses the interaction of humans and the environment in a holistic way. Global change research is sustainability research with the focus on time, change and development. It includes climate research but goes beyond this. The problem of climate change is only one part of the problem of overall global developments. Other aspects from a social perspective, such as demographics or socio-economic and ethnological issues, get involved into global change research as well (Pachauri, 2008). The vulnerability of coupled human-environment systems is one of the central elements of global change research and of the discussion on ski tourism adaptation (Turner et al., 2003b). The novelty of global change research is not so much the development of new conceptual domains, but the integration of many disciplines (Polsky et al., 2003).

The need to derive a global – or at least multi-national – overview of vulnerability in order to understand the problem of global change and of global climate change has already created a demand for vulnerability assessment on a more integrated level than just from a climate change point of view (Adger et al., 2004). So far the body of scientific work regarding impacts on tourism mainly focused on climate impacts, and only very recently more inter- and transdisciplinary studies are being published – for an example see (IPCC, 2007, OECD, 2007, Pachauri, 2008). An extended view can be found in very recent works, as in Abegg (Abegg & Elsasser, 2007) and Behringer (Behringer et al., 2000), who mention the indirect influences of climate change on customer demand and on skiing behavior in source markets. Global change vulnerability assessments not only include the analysis of vulnerability, but also the

identification of specific response options for stakeholders to reduce that vulnerability (Polsky et al., 2003).

1.3.3. Climate impact research

Climate impact research has a fairly young history with the first studies originating in Canada in the mid-eighties (Wall, 1985). Since then, a number of scientists have surveyed the impacts of climate change on tourism – mainly on sea tourism and on winter sport tourism (Viner & Agnew, 1999). In earlier times, a minority looked less at the reactions and influences on stakeholders of climate change, and more at the effects on the natural environment, although the long-term impacts are related to human adaptation processes (Abegg et al., 1998, Bürki, 2000). The roots of climate impact research are in the natural sciences, but expanded early to interdisciplinary and social sciences (Bürki, 2000). An increasing amount of studies follows this interdisciplinary approach in climate impact research on tourism. Examples in the topic of winter tourism are Hohermuth (Hohermuth & Meier, 1996), Breiling (Breiling et al., 1997), König (1998), Bürki (2000), Abegg (1996, 1998), Elsasser (Elsasser, 2005, Elsasser & Bürki, 2002, Elsasser & Bürki, 2003, Elsasser & Messerli, 2001), Beniston (Beniston, 2007b), the IPCC (IPCC, 2007) and the OECD report (OECD, 2007). These and other more recent studies understand climate impact research as a two-way street, seeing the reverse impacts of tourism on the climate. Within this system, neither adaptation nor mitigation can exclusively be successful strategies (Patterson et al., 2006). The public and political discussion, though, is opening up more toward a global change oriented research that incorporates social adaption and coping with uncertainty (Welzer & Leggewie, 2008).

1.3.4. Tourism research

There are many approaches to explain the phenomenon of tourism and different paradigms of tourism science. The question is whether tourism research is unique and whether an independent discipline of tourism science exists. In this case, the various aspects of tourism would have to be analyzed, starting from this discipline; other disciplines would serve as *contributing sciences* (figure one).

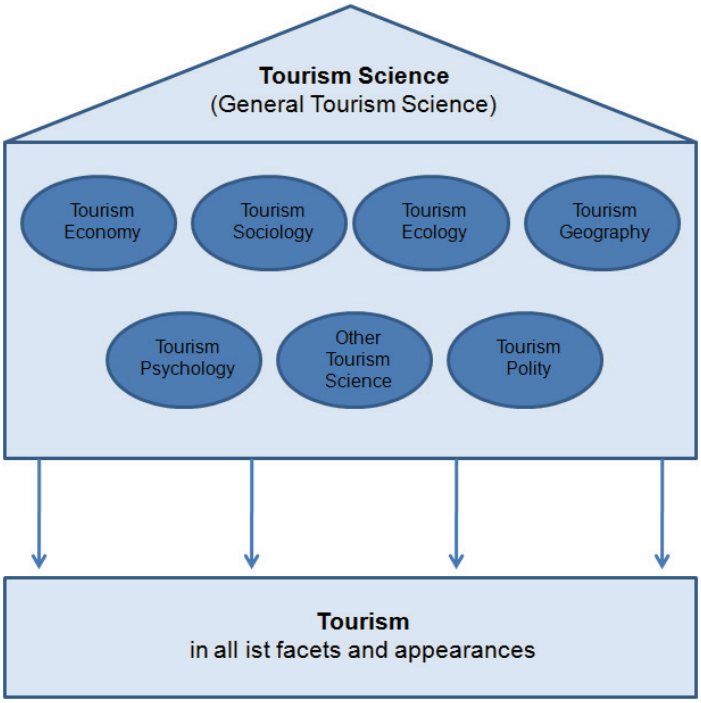

Figure 1 Independent tourism science with contributing disciplines (Freyer, 2006)

If there is no independent tourism science discipline, then tourism science is analyzed in the tradition of the *mother disciplines* as shown in figure two. The two different models argue from different points of view and with different methodological approaches.

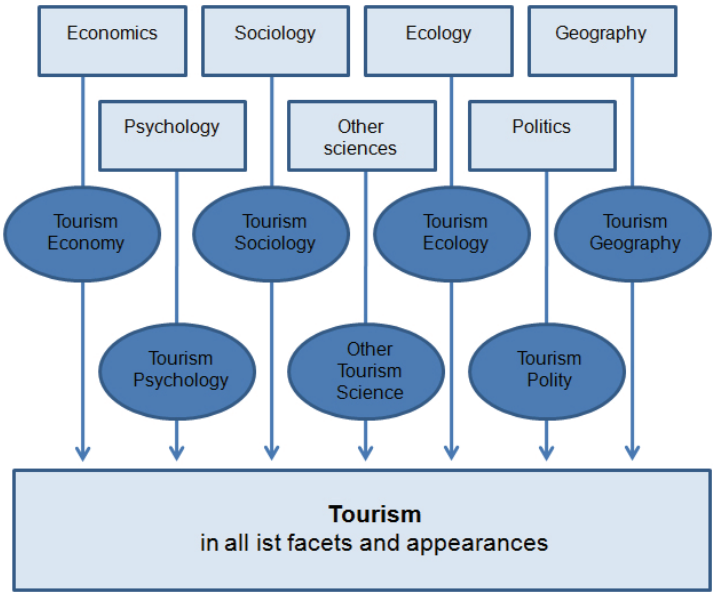

Figure 2 Tourism science as part of mother sciences (Freyer, 2006)

However, tourism research was established as an inter- and transdisciplinary science with the link to tourism practice (Freyer, 2006). The multiple, involved disciplines of tourism are shown in figure three.

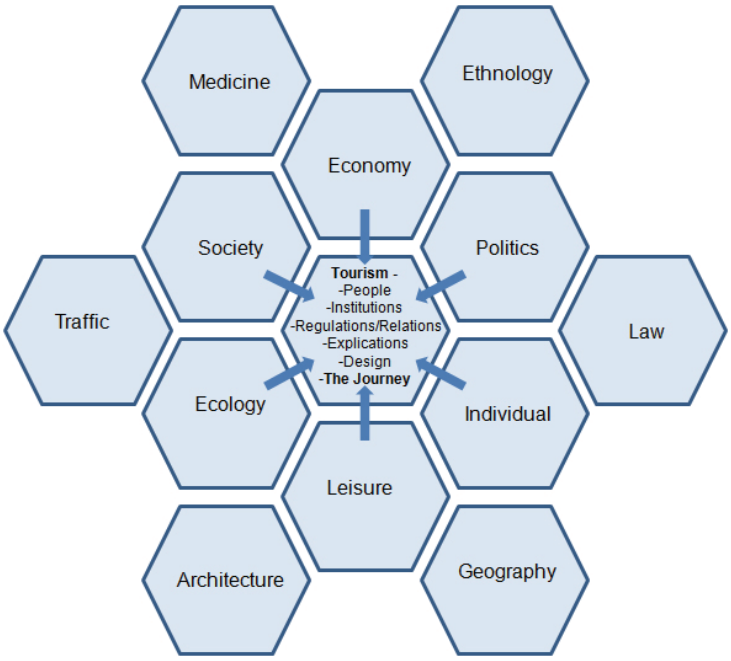

Figure 3 Extended (holistic) tourism model (Freyer, 2006)

1.3.5. Sport science and sport geography

Sport in general is a phenomenon of diversity that is difficult to define. It has been agreed upon that sport, as an expression, cannot be precisely defined at all (Röthig & Prohl, 2003). A narrow understanding of sport is oriented at the original idea of competition that is often bound to traditional sports and organizational forms (Rittner, 1991). A wider understanding of sport implies the social, cultural and spatial facets of sport as it is of relevance for sport geography. In this expanded understanding of sports we can include new or alternative forms, such as Yoga, Lacrosse or Canyoning (Peters & Roth, 2006).

Sport science is a rather young discipline that meanwhile was established in many Universities. Rösch (1978) divides an additive and an integrative understanding of sport sciences. The integrative approach is based on the multiple fields of problems or relations, such as *sport and training*, *sport and health* and *sport and environment*. An additive approach incorporates single sub disciplines, such as *sport medicine*, *sport history* or *sport ecology*. The additive understanding is the most established one (Rösch, 1986). Sport geography, as a new sub discipline between sport science and geography, has received very little or almost no attention so far. Geography has a long tradition in science, but

in spite of this, today it is very diversified and interdisciplinary too. Precise definitions are difficult to find (Peters & Roth, 2006).

The structural development of sports, from traditional organizational forms towards a wider understanding, led to new forms and uses of space and landscape. The spatial aspect of sport in the landscape has been picked up, for example, by tourism to market geographic regions in a sportive context (Peters & Roth, 2006). Sport geography, therefore, is understood by Peters and Roth as a scientific sub discipline in the context of spatial interaction of sport and space. The overlay of sport science and geography are mostly in the mother disciplines of biology, geology, climatology and ecology in the natural sciences, and philosophy, anthropology, sociology, psychology, leisure sciences, pedagogy and history in the human sciences (Peters & Roth, 2006). Peters and Roth understand sport geography as an interdisciplinary project in the overlay of sport, society, space and environment that incorporates perspectives and expertise of different scientific disciplines. Roth and Peters list ten thematic fields of post modern sport geography, as shown in figure four.

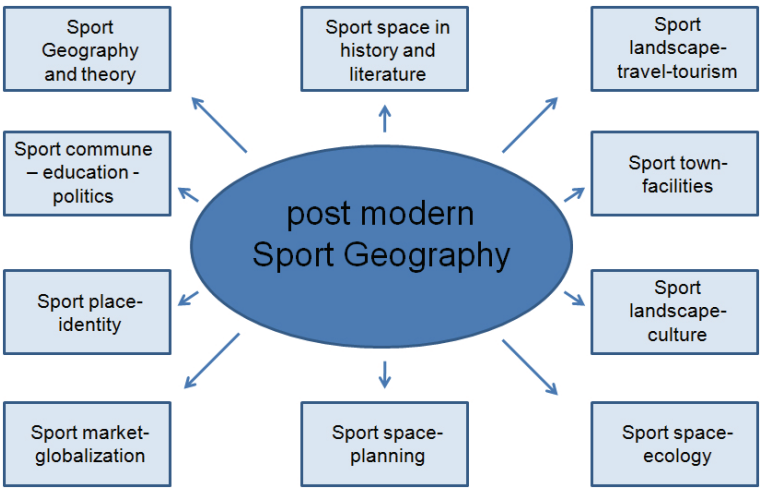

Figure 4 Ten thematic fields of a post modern sport geography (Peters & Roth, 2006)

These sub disciplines of sport geography, as well as other sub disciplines of sport science, such as sport marketing and sport management, interrelate and overlay with tourism and global change research. The sport and geography sub disciplines of *sport landscape – tourism*, *sport space – ecology*, *sport space – planning*, *sport market – globalization*, *sport landscape – culture*, *sport place – identity* and *sport commune – education – politics* are of relevance for the research scope of this study. The integration of many disciplines contributes to research in the holistic human-environment system of ski tourism and global change.

2. The human-environment system of ski tourism and global change

This chapter describes the role of ski tourism in the Alps and relates the impacts of global change to the system of ski tourism with its responsive capabilities. At the end of this part an overview on the current state of research is provided, and conclusions are followed by an outlook on open questions to address in this study.

2.1.The importance of ski tourism in the Alps

Tourism in the mountainous regions of the Alpine countries (as part of the Alpine Convention being Austria, Switzerland, Italy, France, Germany, Slovenia, Monaco and Liechtenstein) is of great importance for their local economic development. About 13.6 million people live in the Alps. The total number of tourists in the Alps per year estimated to be about 60-80 million people (OECD, 2007) and up to 100 million (CIPRA, 2006a). Italy, Austria, France and Switzerland have the biggest share of land and of population on the Alpine arc (Alpenkonvention, 2008).

Table 1 Area and population with shares of the treaty countries of the Alpine Convention (Alpenkonvention, 2008)

	Area	Population
Alpine space	190‘600 km^2	13.6 Mio.
Italien	27.3%	30.1%
Österreich	28.7%	23.9%
Frankreich	21.4%	18.0%
Schweiz	13.2%	12.8%
Deutschland	5.8%	10.1%
Slowenien	3.5%	4.7%
Monaco	0.001%	0.2%
Liechtenstein	0.08%	0.2%

Worldwide tourism is in the fourth economic position in exports after chemicals, automobiles and fuels. In 2005, tourism accounted for 2.8% of world direct employment and of 10.6% indirect employment. Germany is the country with the highest spending in tourism, and thus the most important source or outbound market of tourists worldwide (WTO, 2004). Some examples of the major four Alpine countries and of Germany as the main outbound market of tourists clearly indicate the general importance of tourism and of winter tourism,

especially in the Alps. Ski areas generate the major share of sales in winter tourism only exceeded by lodgement and gastronomy. Inside ski areas, the ropeways are by far the most important economic and steering forces.

In Austria, the direct added value of tourism accounts for 6.2% of the gross domestic product (GDP) in the year 2004. Winter tourism brings about 50% of the annual overnight stays with a growing trend in the last ten years and about 3/4 in sales (998 Mio. from a total of 1216 Million €; (WKO, 2005). In winter tourism, ski areas play a major role in attracting visitors, being the driving economical force in ski destinations. The mountain ropeways in ski areas account in 2003/04 for more 92% of sales; about 8% are gastronomy and related ventures. German guests are by far the biggest tourist group in Austria, before the inland guests (Seilbahnen Österreich, 2005).

In Switzerland, the share of tourism on the GDP was about 4.8% in 2004. In exports, tourism is in third position. Lodgement and gastronomy, at 45%, account for the biggest share; transportation, at 20%, accounts for the next biggest share, which includes the ropeways of ski areas. The German tourists make up the biggest tourist group after the Swiss inland guest (Tourismus-Verband, 2007). Ropeways generate about 50,000 direct and indirect jobs and about two billion Swiss Francs of added value with 84% in winter (Seilbahnen Schweiz, 2008).

In Italy, the turnover of ropeways transportation facilities was 431 million Euros (WWF Italia, 2006). The leading incoming tourist market is Germany, followed by the United States and the United Kingdom. Tourism is one of the three major economic drivers in Italy (ENIT, 2007).

In France, there were more than 17000 people directly employed by the French ropeways in 2006/07. Ski areas in France hosted 48 million skier visits in the season 2006/07 (SNTF, 2007). France has the highest winter season turnover among all four countries. The biggest share of tourists is made up of the German visitor (Tourisme France, 2006).

In Germany, the share of the Alps is the smallest compared to Austria, Switzerland, Italy and France. Still, tourism, with sales of 140 billion Euros and 8% of the total employment, is an important industry. Germany is the biggest outbound market for tourists worldwide (WTO, 2004). The most visited countries are Spain, Italy and Austria, with Italy and Austria being the two Alpine countries of special interest for this study (Deutscher Tourismusverband e.V., 2004).

The general importance of tourism is followed by the special meaning of winter tourism, specifically ski tourism in ski areas in the Alpine regions. With about 50% of total Alpine tourism, winter tourism is, for the most part, made up of ski

tourism in ski areas. In the ski areas, ropeways are the main economic bodies. In terms of visiting foreign tourists, the German market is the most important one. These general numbers, of course, can differ a lot in single regions, destinations or ski areas. In some Alpine regions, valleys or destinations, winter tourism may well exceed an economic importance in direct and indirect sales and employment of more than 80% (Müller et al., 2007). The Alps are a highly inhomogeneous unit with huge regional and local differences (CIPRA, 2007b).

2.2.Global change effects on ski tourism

2.2.1. Climate change as a threat to ski areas

Winter tourism in ski areas mainly means lift accessed alpine skiing. A ski area relies on cold temperatures and snow as the main *product* or *service*. Rising temperatures and changing precipitation patterns alter the climate. Climate change is considered to be the major threat for winter tourism destinations and is already affecting the European Alps (OECD, 2007, Schneider & Schönbein, 2006, Seiler, 2006, Zemp et al., 2006).

The world's mean temperature has risen about 0.8°C within the last 30 years. In the Alps, this change happened with 1.6°C two times faster (OECD, 2007). Climate models show that the world average temperature will rise about 2 - 4 degrees Celsius more until the end of this Century, whereas the mean temperature in the Alps will rise another 2°C already within the next 30 years. Precipitation patterns will change with less precipitation in early and midwinter and more precipitation in spring and summer. The total amount of precipitation will not change significantly, though. Extreme weather events, such as storms, floods, draughts or heavy snow falls will become more frequent (IPCC, 2007, OECD, 2007, Rolland, 2006, Schneider & Schönbein, 2006, Seiler, 2006).

The current number of 666 ski areas in the Alps will drop to 404 under a 2°C warming of climate measured by their sheer elevation and their natural snow reliability according to the OECD report. However, technical snow making is not taken into account in this calculation.

Ski areas will not be able to offer the same services as they used to and as customers were used to having. Tourists as consumers will face heavy changes in the winter tourism product as the reliability of snow is vanishing, which will affect their satisfaction (Elsasser & Bürki, 2003). The modelled and forecasted rises in temperature would result in significant reductions in snow pack and glacier mass within decades. The influence of any changes in precipitation on overall snow cover is small and will not affect the general trend resulting from temperature rises. By 2050, about 75% of the glaciers in the Swiss Alps are likely to have disappeared. Glacier retreat will increase slope instability and permafrost thawing will lead to more rockfall activitiy (Zemp et al., 2006).

Climate change will lead to more extreme events and natural hazards in the Alps too (IPCC, 2007, OECD, 2007). In response to this ski areas are challenged to adapt. Adaptation to climate change is of vital importance for ski tourism (OECD, 2007).

2.2.2. Natural snow reliability

Rising temperatures will lead to a decrease in natural snow cover. A set of different criteria have been discussed as to what natural snow reliability means. Witmer (1986) first mentioned the so-called 100-day rule which summarizes the discussion. It means that in order to operate a ski area successfully, a snow cover sufficient to operate should at least last for 100 days a season. The sufficiency of a snow cover differs from 30 cm to 1m, depending on the slope and the underground (Witmer, 1986). It should be seen not as a strict rule, but as a rule of thumb for ski area management (Abegg, 1996).

The natural snow line varies across the Alpine regions. Many aspects influence this line, particularly the continentality of the climate. The OECD report on vulnerability of ski areas bases its assumptions on this 100-day rule and on the natural snow reliability. However, more aspects need to be taken into account to analyze the snow reliability of a single ski area. *Foehn* influences, local cold air down streams, inversional valleys, slope aspects and others can have severe impacts and even change this general understanding of natural snow reliability, such as Schneider et al. showed for German mid mountain range ski areas (Schneider et al., 2006). Technical snow making potential of course, is not included in the view of natural snow guarantee.

2.2.3. Vulnerability - the winners and losers discussion

The impacts of climate change on ski areas have lead to a discussion of *winners* and *losers*, both in terms of regions and of ski areas themselves (OECD, 2007). It states that the ski areas in higher elevations will benefit from changes, such as profiting from the potential lower number of ski areas, if those in lower altitudes, the losers, disappeared. This winners and losers discussion is mainly based on the altitude of ski areas and thus their natural snow reliability.

2.2.4. Global change is more than climate change

Apart from climate change there are other changes in the social environment that can affect ski tourism. The demographic development in the example of the German market is leading to more people with the age of 50 and older, and to fewer people of younger ages below 30 years. Already in a very short term till 2015 the age class of 60+ will grow with 10% to about 30% of the population. The usual pyramid is growing to a mushroom shape showing the future majority of older people in the population by an increased heterogeneity of people with migrative backgrounds (Bundesinstitut für Bevölkerungsforschung, 2008).

The question is how an older population will affect consumer behaviour? Results of Lohmann (2007) show that the elderly will stick to their preferred destination more than the younger. Their decisions are made after about two thirds of their life span and merely change after. Seniors are a huge market potential if "caught" early enough so they can find their preferred destination. Schröder comes to similar results and recommend a special "senior" marketing of destinations (Schröder et al., 2007).

The economic development is leading to a higher percentage of lower income classes and of higher income classes, thereby dropping the mid incomes (Statistisches Bundesamt Deutschland, 2008). The general economic development can influence the willingness to spend money for tourism – if the economy is shrinking, tourism turnovers will drop as previously experienced for example by the Austrian tourism industry (MCI, 2006).

Higher costs of energy, water scarcity, new competing tourism markets worldwide are some more examples. The market of ski tourists is changing, diverse and affected by demographic, socio-economic and socio-graphic developments which in addition affect ski tourism in the Alps. The growing number of customers from the emerging tourism markets of China and of Eastern Europe leads to such a socio-graphic change. However, there is little literature on the outcomes of other than climate change factors on ski tourism. The scientific and the public discussions so far are centred on climate change impacts.

2.3.Adaptation and mitigation

2.3.1. The focus on technical adaptation

Ski areas already are adapting in expectation and in experience of climate change. The kinds of adaptation can be split in behavioural and in technical adaptations. Technical adaptations such as technical snow making, glacier skiing, an expansion to higher altitudes and on north facing slopes as well as landscaping and ski slope changes are the main discussed and applied means of adaptation (OECD, 2007). The major kind of technical adaptation today is the production of machine made snow. Many different kinds of technology have been developed, and a discussion of them would go beyond the scope of this study.

Technology is improving quickly, still for efficient snow making in terms of cost-use ratio temperatures below freezing are needed. Nature is setting the limit for snow making, but with ice making machines and vacuum technology it already is possible to produce snow in small amounts in warm summer temperatures – not for the amounts needed in ski areas though. Technical adaptation can cope with the direct outcomes of climate change, such as rising temperatures. It

cannot address other aspects of global change. More information on the technology of technical snow making can be found in Teich (Teich et al., 2007).

2.3.2. Behavioral adaptation

Behavioural adaptations are such as operational practices that change the way of ski area operations (four season tourism activities), financial instruments (snow insurances), financial support or subsidies from local authorities, co-operations and mergers with other ski areas or marketing partners, winter revenue diversification, all year tourism and finally withdrawal from ski tourism and a closure of the ski area.

2.3.3. Mitigation - avoiding environmental problems caused by ski tourism

The discussion how ski areas could react has been focusing on adaptation. Mitigation or avoidance strategies are understood as avoiding an even faster climate change by increasing the efficiency and by lowering the amount of greenhouse gases being emitted (OECD, 2007). Ski tourism is causing environmental problems. From a climate point of view the emissions of the greenhouse gas CO_2 by the ski tourism activities are a rather new aspect in the negative outcomes. The main source of greenhouse gases is individual traffic to ski areas with more than 70%, followed by lodgement and housing infrastructure in ski destinations with about 25%. The ski area itself is responsible for about 3% of the emissions, lifts and technical snow making for each about one percent. These numbers origin from a recent study of ADEME (Agence de l'Environnement et de la Maîtrise de l'Energie) and The Mountain Rider Foundation in the French ski resorts of Les Menuires and Val Thorens (Mountain Riders, 2007).

Other environmental aspects include land uses for slopes, lifts and parking space, water usage for snow making and others, ecological disturbances of habitats from wildlife and plants, noise and light pollution, earth and rock movements, erosions and others (see for example pro natura-pro ski, 2003). Snow making as the main kind of technical adaptation has various negative effects on the natural environment. The use of resources such as energy and water and the direct or indirect impacts on plants, wildlife and soil are described in Teich (Teich et al., 2007). Ski tourism has negative impacts on the environment and on our climate, thus organizations such as the CIPRA and the WWF demand for more avoidance activities that lower the impact instead of investing all available resources into adaptation that addresses the impacts of changes, not their sources (for example in CIPRA, 2007). Examples of avoidance strategies are less energy and water consumption, more efficiency in operations and use of resources, soft forms of mobility as well as compensation of CO_2 emissions (CIPRA, 2007b, Mueller & Weber, 2008).

Mitigation in a broader understanding should involve social mitigation too. The socio-economic impacts of global change on tourism have been discussed before. Ski tourism stakeholders do have opportunities to avoid some social changes too, such as the problem of losing the tradition of families teaching their children to ski. Special support programs for children and a family-friendly price policy are examples of social mitigation that cross the border to behavioral adaptation.

2.3.4. Adaptation in a sustainable way

Ski areas depend on landscape and nature as resources; infrastructure is built and has to be maintained; landscape is transformed, and ecosystems are affected as energy is used. The direct dependency on natural resources makes ski areas responsible to manage these public goods in a sustainable way. Global change impacts influence and alter ski tourism. Common ski area service consumers were used to buy are changing, being it snow reliability, the occurrence of extreme weather events, safety issues or faster rising costs of transportation.

The current kind of adaptation is attempting to maintain services as they were. Strategies of adaptation that focus on technical means, such as expansion or snow making, require the use of even more resources to maintain the common ski tourism product, which feeds back and even accelerates the cycle of human influences on climate change (see figure five). There are natural and economical limits of technical adaptation, being the availability of water or the increasing costs of energy for snow making. The sheer number of existing ski areas in the Alps and their expected disappearance due to climate change, indicate the technical limits of adaptation (CIPRA, 2006b, OECD, 2007). Ski areas cannot rely only on technical adaptation alone – it will not be sustainable, not from an ecological nor an economical point of view (CIPRA, 2006b).

Behavioral adaptation and mitigation instead would change the services offered by ski areas. They could be successful if they met customer demand, if the customer was satisfied with altering services in ski areas and adapted his or her consumer behavior accordingly – buying different services that could be provided with less technical efforts, such as less snow making or fewer changes in the landscape. Adaption from a demand side is a new facet that if we hypothesize, could help create a market for the supply side to increase mitigation and behavioral adaptation. The ski tourist is questioned to change his or her demand to more sustainable services that require less resource intensive technical adaptation from a supply side. The question is whether he or she is willing to adapt his or her demand accordingly.

All discussed types of adaptation focus on maintaining ski tourism. Withdrawal from ski tourism would be another strategy and alternatives must be found.

Tourism, though, is a growing industry that is the main economic drive in many Alpine regions, and in some less developed regions it is the only industry that cannot be substituted by any other kind of industry so far (Elsasser, 1995). Ski tourism makes up about 50% of Alpine tourism (see chapter 2.1). Withdrawal from ski tourism would thus, in general, not be sustainable from an economic perspective, and maintaining ski tourism should be the first approach. If, however, the ecological and socio-economic aspects speak against maintaining ski tourism, then the system should be open to withdrawals and the search for alternatives.

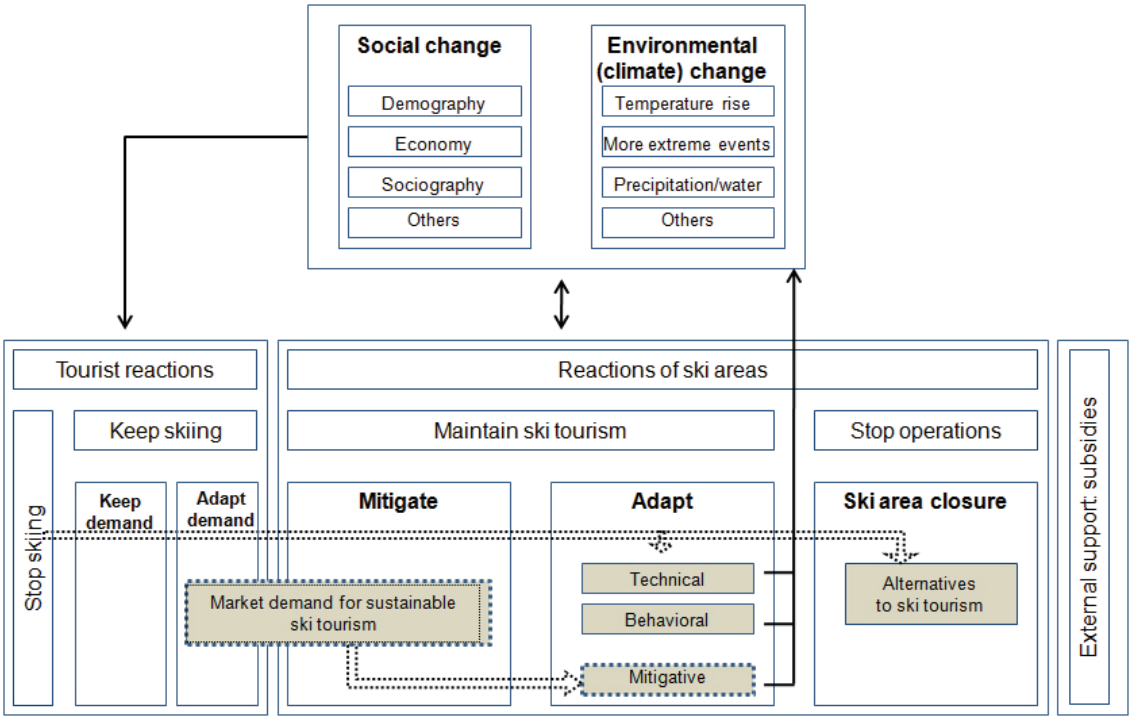

Figure 5 Relation of ski tourism reactions to global change

Therefore, adaptation efforts have to lead to a kind of integrative sustainability. Integrative sustainability minimizes impacts on the natural environment by meeting customer demand and maintaining an economically healthy business. All possibilities of adaptation have to be discussed in relation to the whole system of ski tourism to discover the most sustainable combination of technical, behavioral and mitigative adaptation. Adjustments in human systems, as part of general adaptation, could foster mitigation and a business of sustainable ski tourism, thus serving as an additional tool for sustainable adaptation.

Figure five shows the impacts of global change on ski tourism and the reactions of ski areas and ski customers. The kind of adaptation both in the demand of the tourist and in the reactions of ski areas influence each other and interrelate with global change. Currently, most technical adaptation feeds back and increases climate change. An adapting tourism demand preferring sustainable tourism could open up a business case for mitigation. Mitigative and behavioral

adaptation would then feedback positively on climate change as shown in figure five.

2.3.5. Uncertainty and governance

Because of the complexity and the uncertainty of many variables within global change – such as the socio-economic development, the local differences in climate change impacts, the advancement of new markets in the East or evolvement of customer demand – the risk for the long term success of ski areas is increasing (Lopez-Moreno et al., 2007). We therefore need to extend knowledge about the potential outcomes of global change, the related vulnerability of different destinations and means of adaptation and governance in a sustainable matter (Busch & Hoffmann, 2006).

The capacity to adapt to uncertain changes is to a high degree dependent on the model of governance being implemented in the destination (Beritelli et al., 2007). Beritelli discusses the contribution of corporate governance theories to explain destination governance structures and evolution. Beritelli proposes further research to address the integration of other theories. Validation of the findings for other countries and cultural settings could help to develop a general theory. More aspects of the operational reality of governance require broad empirical evidence. To sustain tourism, new models of destination governance are needed. The success and degree of sustainable development in ski tourism inside a destination is highly dependent on the acceptance and involvement of stake- and shareholders alike (Hohermuth et al., 1996). The model of governance should reflect these needs. Furthermore, we need more reflexive modes of governance to ensure that the trajectories of sustainable management are met (Kemp & Martens, 2007).

2.4.The system of global change, ski tourists and ski areas

Global change is leading to changing services in ski areas as well as to changes in the market. Adaptation focuses on action by the supply side, by the ski areas and the ropeways companies. How might other facets of change influence the system of ski tourism, and what is the role of the demand side, of the market and of the ski tourist in adaptation? The demand side of ski tourism seems to be neglected in this process. The product of ski tourism will be changing. Adaptation can only be successful if the customer remains satisfied with the services offered. Sustainable adaptation requires a holistic view on the whole system of ski tourism with the goal of assessing vulnerability to all expected changes and of increasing adaptive capacity in a long term successful, sustainable way.

2.4.1. Tourist satisfaction

Successful tourism destinations consider tourism satisfaction to be the most important source of their competitive advantage (Fuchs, 2004). Satisfaction is a customer-driven measure of destination performance where the customer is the main source of information for identifying those standards that should be established to achieve a high performance. Even more, in tourism, the customer is partly the producer, and the final product, the service and the experience, can only be processed with his or her help. The ability to constantly change its structure and services and adapt to actual consumer demand is crucial for the survival of ski areas (Fuchs, 2004).

In order to market changing services, ski areas are challenged to manage customer relationships by developing adjacent management and communication strategies. Partnering with the customer and involving him or her in the process of adaptation may open up new opportunities for ski areas. If customers were willing to adapt their consumer behavior to the changing services and supported the strategic approach of ski areas to more behavioral adaptation and mitigation (=adapting in a more sustainable way), then it is questionable if global change could lead to new opportunities of targeting a new market segment of sustainable consumption. If so, it could possibly change the common view on losers and winners of climate change and alter changes to chances (CIPRA, 2007a). These are two questions this study seeks to address throughout the next chapters.

2.4.2. Customer involvement and marketing

Little is known so far about ski tourists' preferences both in the light of global change and about the demand for sustainable consumption. Sustainability as a long term systematic concept is still fairly unknown to most people (Utopia, 2007). Ski tourists do not have trustful sources of information on sustainable ski tourism as there is not much existing yet. There are single cases of informing tourists on some environmental issues that either lack transparency, completeness or independent control. Existing benchmarking regimes are not providing scientifically based and trustful information that responds to the questions of customers and which are independently controlled, but still made to be understood by the majority of snow tourists (Luthe, 2007a). As none of these approaches are complete by presenting the majority of existing ski areas, benchmarking by sustainability performance is not possible for the general customer.

On the supply side, there are only a few ski resorts that recently started to actively communicate and market their sustainability performance, such as Aspen Snowmass or Whistler Blackcomb (Luthe, 2007a). Still, for the less informed customer, these efforts are difficult to place within the complex topic of

sustainable development, global change and ski tourism. The vast majority of ski areas remain silent about the threats and opportunities derived from global change and their efforts and responsibility to tackle these challenges in partnership with the customer. There is a lack of good practice examples of sustainable managed ski areas that also communicate and report what they have been doing. In the relationship between the demand and supply side, there is a lack of communication. Communication from a supply side point of view is important to

- react to global change by adapting in a sustainable way;
- match customer satisfaction with changing ski area services;
- raise socio-ecological awareness and build capacity in consumer behaviour adaptation, and
- develop and market specific USP to specific target groups.

2.4.3. The market of sustainable tourism

Marketing has developed over time from an understanding of a technique to sell existing products, to one of a strategic alignment of the business activities on the market and on market developments. Marketing begins with surveying the market (customer demand) and designing products to meet the demand in accordance with business goals and production possibilities. Marketing-management today is divided into operative, strategic and normative marketing. Normative marketing, as the youngest marketing discipline, implements corporate social responsibility (CSR) into the strategic alignment of the business (Luthe, 2007a). CSR can be understood as having social, ethical and environmental aspects. Sustainable tourism marketing involves marketing of sustainability and thus of CSR as normative marketing. Figure six shows the development of marketing in the nineteenth century.

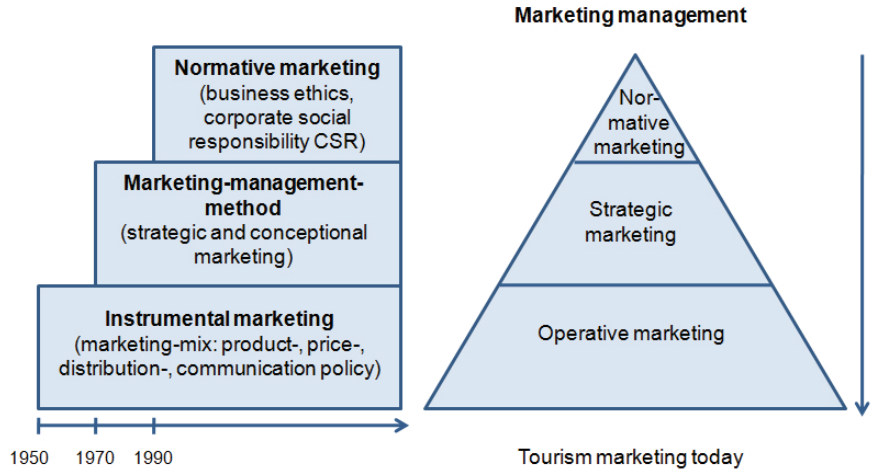

Figure 6 Development of marketing (Freyer, 2006)

The market of sustainable tourism today is based on the general demand for sustainable consumption in society. Recent studies estimate the market of the so-called *LOHAS* (Lifestyle of Health and Sustainability) in Germany to about five million households with higher incomes, and thus an estimated buying power with a minimum of 200 billion Euros with a strong growing tendency (Schulz, 2008). Sustainable tourism in skiing is already being discussed as a strong trend that is more than a niche and will be of growing importance in the future (CIPRA, 2007a).

Environmental competitiveness and environmental sustainability already are key success factors in tourism. The most successful countries in tourism also boast the highest environmental performance as the 2008 Travel & Tourism report reveals (Blanke et al., 2008). It can well become a more important factor for ski destinations and ski areas alike. The potential for sustainable ski tourism from a theoretical perspective seems to be possible if addressed by the right kind of normative marketing. We will have to assess the actual demand of it, though, later in this study.

2.4.3.1. Why sustainable ski tourism?

The goals and guidelines of sustainable ski tourism are discussed in the *Glossar*y chapter. The ski tourism industry makes a profit by drawing people into the natural environment and *selling* natural resources. This industry, more than others, is responsible for managing the fragile environment as well as social aspects with care (Mueller & Weber, 2008), often referred to as corporate social responsibility (CSR). The public demand and awareness on businesses held responsible for natural and social goods is constantly increasing and a major factor of entrepreneurial success (WBCSD, 2007, Utopia, 2007). There have been a number of examples where poor environmental or social performance led to public pressure and negative media with negative impacts on businesses, such as Shell and the Brent Spar oil platform off coastal Norway or Exxon Valdez in Alaska. Sustainable management, therefore, is also risk management, preventing negative impacts of business actions onto the business itself.

The current practice of adaptation to global change carries with it a focus on technical snow making while trying to maintain Alpine skiing in every elevation. Such an intensive resource use is not sustainable (CIPRA, 2007a). Other ways of adaptation have to be discovered and applied, including mitigation, a core element of sustainable ski tourism. Differences between elevations and regional aspects need to be taken into account when defining the individual strategic goals. Tourism, especially ski tourism that acts in a very fragile high mountain environment, is responsible for the protection of natural and social resources; even more so, this industry is directly dependent on a functioning environment in terms of natural hazards management and, simply, on cold temperatures and

precipitation. Sustainable management is thus a must in ski tourism, a mandatory goal for the skiing industry it has to include in its strategy (CIPRA, 2006b). The question then is whether implemented guide lines, goals and processes of sustainable management serve as a USP that is developed further and can be marketed as sustainable tourism.

Surveying the market potential for sustainable ski tourism is driven by win-win situations and four main objectives:

1. Sustaining the long term success of ski tourism in its local and regional economic importance in many mountain regions.
2. Gaining more ecological performance in the use of natural resources by ski tourism.
3. Developing new market niches for ski areas to better cope with global change.
4. Increasing overall public awareness for sustainable development in ski tourism and in general.

2.4.4. Ski tourism destination stakeholders

The supply side of ski tourism consists of different stakeholders forming the destination as shown in figure seven. Ski tourism stakeholders are companies or organizations mainly contributing related services to the touristic service bundle. The main stakeholders are the ropeways companies, hotels and other kinds of accommodations, gastronomy, services, such as sport animation and courses, rentals and repairs, supplies, tourist information and others (Michel, 2001). This system of a ski destination is governed locally in a certain manner and thereby strongly influences the management of uncertainty and of adaptive capacity.

The ski tourist, as a customer, is experiencing the whole supply chain of all stakeholders, referred to as the mountain experience. Michel (2001) divides the mountain experience into ten steps as listed in figure eight. He claims that due to the number and diversity of stakeholders, it is difficult to steer the service supply chain in its quality. Each stakeholder needs to provide and maintain a high quality to ensure the value of the experience as a whole. Communication between the stakeholders, the discussion of common strategies and the optimization of the service chain are important for the success of a destination.

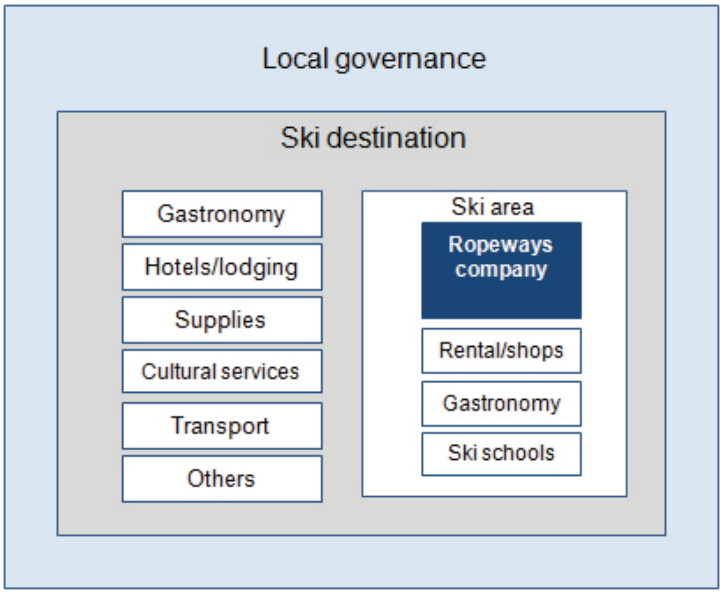

Figure 7 Stakeholders of a ski destination framed by local governance

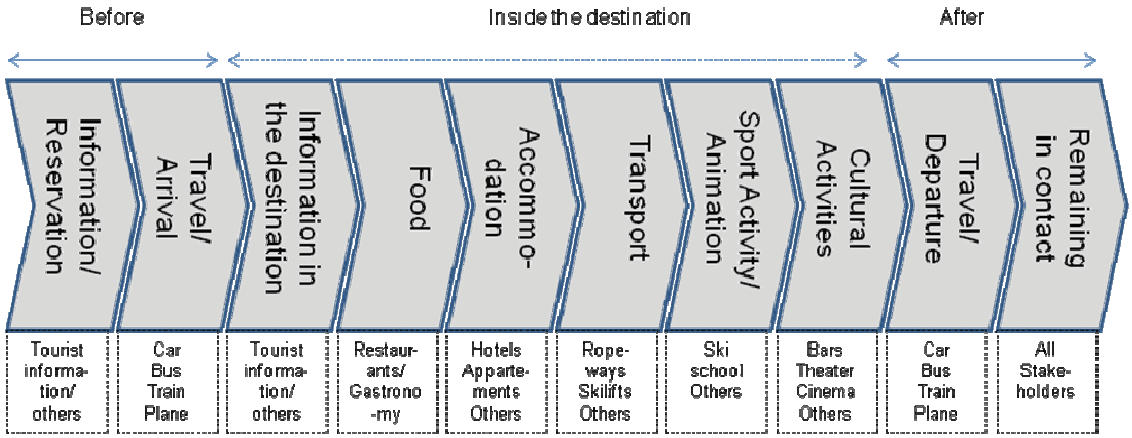

Figure 8 Service chain Mountain Experience and integrated stakeholders (Michel, 2001)

Kämpf and Weber (Kämpf & Weber, 2005) discuss ten success factors of mountain tourism destinations (figure nine):

1. Long term strategies of differentiation to develop a unique selling proposition (USP), which allows for higher market prices.
2. Strategies in diversification of services. Bigger destinations are successful if they provide many additional services. Smaller destinations should specialize in certain market niches.
3. Implementation of a strong and known brand.
4. Market-oriented relation of price and service. The better the service quality, the higher the price can be.
5. Economies of scale – competitive capacity increases with size.

6. Creative individuals are needed inside a destination to foster innovation.
7. Professional destination management makes implementation possible.
8. Competitive advantages have those who specify and focus on destination goods, such as famous scenery, if they exist.
9. High tourism intensity and density can lead to additional advantages from clusters of services and networks.
10. Regulative support has a high influence on competitive capacity.

The first seven factors can be influenced by the destination and its stakeholders, thus counting as endogenous factors. The last three are exogenous factors and cannot be managed directly.

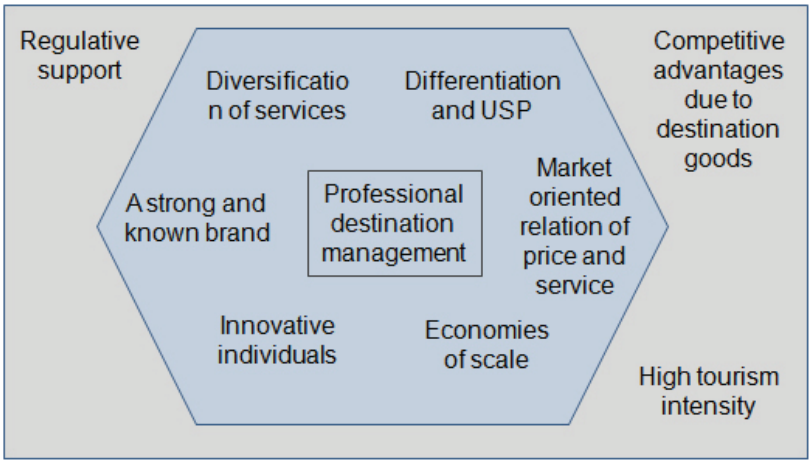

Figure 9 The system of ten destination success factors (Kämpf & Weber, 2005)

Kämpf & Weber found out that the more successful destinations can ask for higher prices for the ski tickets in the ski areas (Kämpf & Weber, 2005). The customer is willing to pay more for attractive services. In the tourist stakeholder section of this study (chapter four), we will return to this discussion of destination success factors.

2.4.5. *Mountain Experience* – the service bundle of ropeways companies

Ropeways companies are the main stakeholders in ski areas and in winter tourism. They have been working on extending their services from a supplier of transportation to a supplier of a whole bundle of services, a development that is still in progress. The expression *Mountain Experience* describes this bundle of offers and services providing the infrastructure for the experience of the mountain tourist (Michel, 2001).

These services are:

- Transports to, into and inside the ski area
- Construction and maintenance of transportation infrastructure

- Parking space
- Slope construction and maintenance
- Snow management
- Rescue and insurance
- Safety from natural hazards, such as avalanches
- Additional offers such as gastronomy, snow bars, hygienic services, shopping, events etc.
- Information, signs, brochures, lost-and-found services etc.
- Others...

Services, such as mountain gastronomy, ski schools and ski rental services are traditionally not offered by ropeways companies in the Alps. The tendency, though, is toward offering these services more by the same company to increase the added value of services.

Ropeways companies are the main motor of investments in ski tourism and the main generator of visitor volume. They account for about 92% of the sales in ski areas (Seilbahnen Österreich, 2005). Additionally, ropeways companies are the stakeholders suffering most from climate change. The growing costs of investments and operations in snow making have to be financed by the ropeways companies themselves.

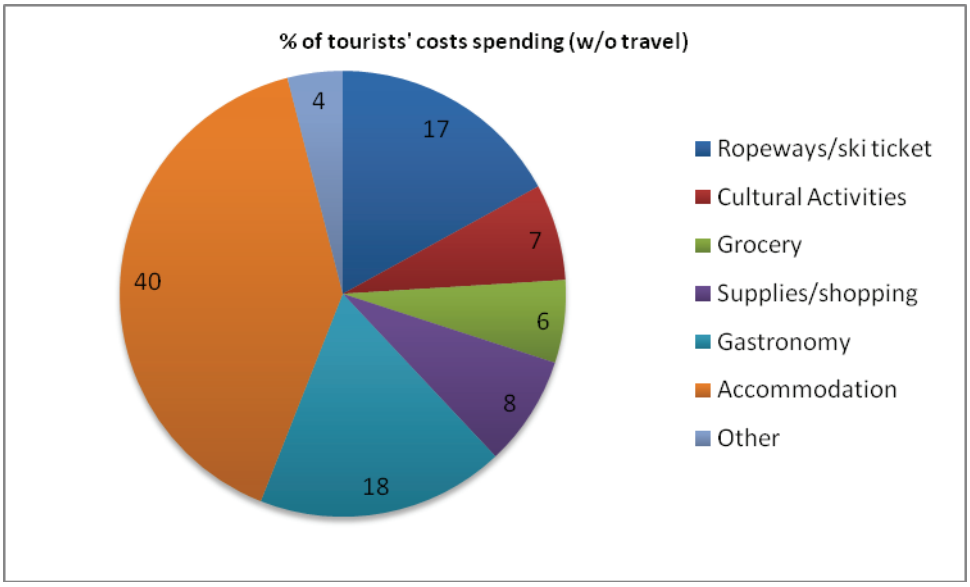

Figure 10 Added value of the service supply chain in ski destinations
The numbers show the tourist spending inside the destination in percent, without travel costs (numbers are based on results from chapter four of this study).

Yet, in the whole service chain of tourism stakeholders within the destination, ropeways companies receive only 17% of the total spending by the tourist. This number is based on the findings of the supply side research part described in chapter four (see figure 10). We see that there is an imbalance between risk,

services generation and revenue in the service supply chain. The increasing costs of global change on ski tourism cannot be stemmed alone by the ropeways companies. The situation is of greatest problem for the ropeways company, which is why our focus in this study is on the vulnerability and the adaptive capacity of ropeways companies.

2.4.6. Risk and the role of the media

The influence of the media on the public opinion and awareness in topics of public risks is subject to current discussions and research (Schnabel, 2008). The history of social or natural disasters or risks shows how the media and the public become aware of some topics more than others. The beef cattle disease BSE (*Bovine Spongiforme Enzephalopathie*), the lung disease SARS (*Severe Acute Respiratory Syndrome*), the bird disease, as well as the hole in the ozone layer and the *Waldsterben,* all show similar patterns in a faster or slower rising interest and coverage of the media and the public with peaks in interest followed by decreasing coverage, although the risk or the state of conditions might not have been decreased at all (Schnabel, 2008).

The current public awareness and media coverage on climate change and risks in ski tourism that showed a peak in the winter season 2006/07 and that harmed the industry (see chapter four) might follow similar trends and lose interest over time, although the actual problems and risks remain important. Furthermore, risk is an opportunity too. Media and press might often be irrational and exaggerate. Still, it leads to more public awareness and can incubate necessary developments and improvements of systems, which then can increase their risk management and their adaptive capacity before it comes to a break down or real harm (Schnabel, 2008).

In the case of ski tourism, public discussion made the extended exposure and sensitivity of ski tourism more overt in the winter 06/07, which might not have been the case in a row of *normal* winters at this time. This provided the industry the opportunity for *practicing* and adapting to future developments early on. Having proactive communication about negative impacts or accidents and taking over the responsibility for it can even have positive effects for an industry. Take, for example, the petroleum and energy company BP. After an oil accident off the Californian coast, it took direct responsibility and did not blame the captain of the tanker, which even improved its image (Schnabel, 2008).

The uncertainty and dynamics in developments of public interest and media activities does not allow for certain forecasts, but it also demonstrates the importance of working with the media and of proactive communication in the case of the human-environment system ski tourism and global change impacts. If we seek to find more sustainable ways of adaptation in ski tourism, then humans become more of the equation, both from a demand and a supply side.

We question the influence of information on consumer behavior and hypothesize that with the right type of information, the consumer is adapting his behavior.

2.4.7. A holistic approach

A holistic view on the coupled human-environment system of ski tourism and the scope of this study are shown in figure 11. The interrelation between global change impacts and the ski tourism market is direct and indirect. Global change affects ski tourism both from a supply side and a demand side. Customer demand and ski tourism stakeholder services influence each other. Within a frame of politics, policies and regulations, as well as further external and internal factors, the vulnerability of ski tourism is defined. The relations and factors influencing and defining exposure, sensitivity and adaptive capacity within the coupled human-environment system of global change are part of the focus of this study.

Global change is setting the natural and social frame for the scope of adaptive capacity. The perceptions and strategies of ski areas, the role of the customer in adapting his demand to changing services and the various relations and feed-back loops in this system need further assessment in order to develop ways of more sustainable adaptation.

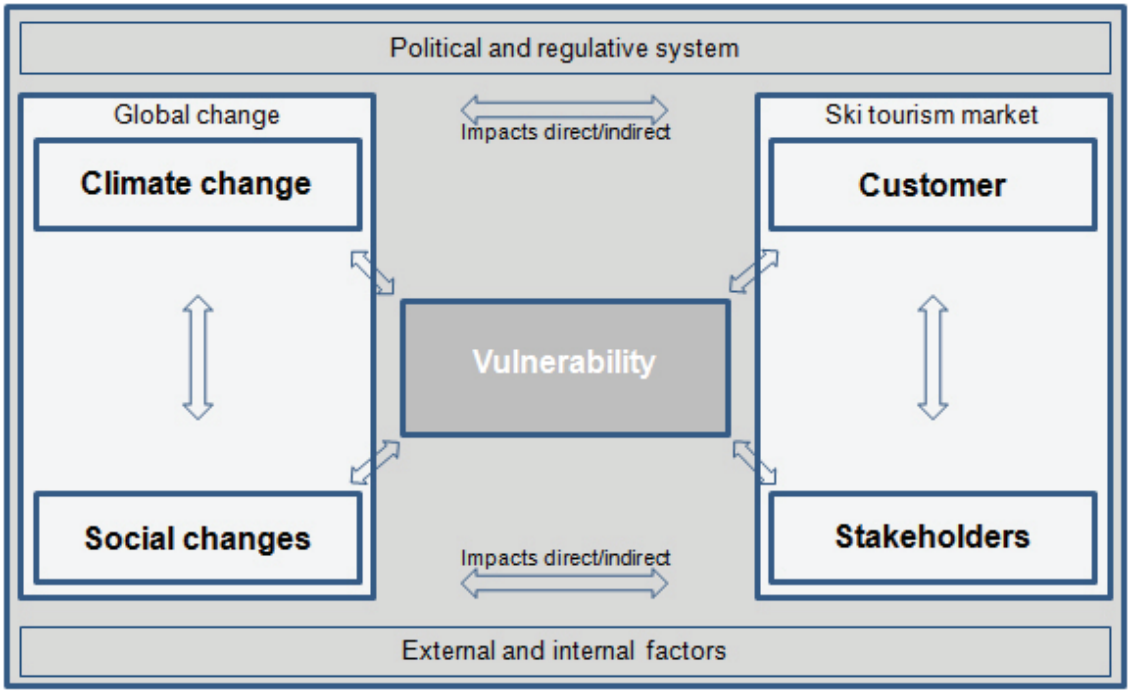

Figure 11 Research frame of SkiSustain
It shows the coupled human-environment system of ski tourism and global change in a holistic approach.

2.5.State of research

In the following two sub chapters we summarize the current state of research from a demand and a supply side of ski tourism and global change.

2.5.1. Ski customer demand in a changing climate

A number of scientists have devoted their research to customer demand in ski tourism, asking about the potential effects of climate change on customer satisfaction. The OECD (2007) divides demand side research into analogue studies and into surveys. Zeier (1993) wrote a survey on customer demand in Switzerland. In 1996 Hohermuth and Meier asked inhabitants of twelve Swiss destinations about their expectations on climate change (Hohermuth & Meier, 1996). Harrer (1996) asked skiers in Lenggries, Germany about their demand in winters with little snow. Day guests would much rather change their destination if there were no snow, but 44.9% of the overnight guests would remain and return and then accept alternative activities that are not snow dependent.

Abegg (1996) examined the impacts of three unusually warm and dry winters at the end of the 1980s in Switzerland, using them as an analogue to future developments. The experience of three consecutive “bad” winters lead to a 20% decrease of earnings from ski areas in average, with lower areas suffering much more than higher ones. The decreased number of open ski areas brought more tourists to the higher ones. Scott (Scott et al., 2006) carried out research in North America using the record-high temperatures from the winters 2000/01 and 2001/02 as an analogue for 2050. The results show a lower than expected decline in demand, which might be due to massive buffering with technical snow.

König (1998) conducted a survey on perceptions and demand of ski tourists in Australia in the context of climate change in 1998. The majority of skiers would ski less often (31%) or even stop skiing (44%) if less natural snow reliability became more apparent.

Bürki (2000) conducted a written survey in two Swiss cantons with a sample size of n=948 on skiers’ demand in a changing climate. Snow reliability and the actual snow conditions were the most important reasons in selecting a ski area. If snow were missing, then skiers preferred another area of similar size – size is an important factor. If there were snow in the lower areas closer to source markets, then these often smaller areas could generate high demand as long as they offered high quality in certain niches, for example, family friendliness or lower prices. Those skiing often would still stick to the higher, bigger ski areas. Bürki found a massive decrease in demand in a scenario of climate change with about one-third who would ski less often.

Michel (2001) tested quality demand of ski area visitors in ten Swiss ski areas (n=735). Safety and quality of lifts were the most important features, followed by easy access for individual traffic, friendly service and the size of the ski area with snow competency, while showing strong differences between guest groups.

A recent (n=538) survey by Unbehaun (Unbehaun et al., 2007) asked Viennese skiers about their demand in a changing climate. This survey was combined with a Conjoint Analysis (CJA). Another CJA survey was done in Greek ski resorts to inquire about customer demand (Siomkos et al., 2006). In the project, STRATEGE, Manova did a survey on the affects of media coverage about climate change on customer demand (Manova, 2007) in Austrian ski areas. This study did not show the expected effects of the constructed media coverage as proposed because of the unusually mild winter 2006/07 and total "natural" media coverage on climate change and ski tourism. Therefore a control group of skiers not influenced by media coverage was missing for comparative assessments. In a recent study Teich (Teich et al., 2007) asked skiers in Switzerland about their acceptance of technical snow making. The acceptances differ between summer and winter tourists, but are generally around 50-60%.

Environmental aspects have been included in some studies surveying the stated importance of environmental attributes. In more general tourism activities Mueller (Müller et al., 2001) have surveyed environmental behavior in Switzerland. About 30% considered environmental factors to be important. Interestingly, 74% were willing to buy a more expensive product that is more environmental sound – but only 56% would be willing to cope with less comfort. In the choice of the destination, environmental aspects are of importance for more than a third.

So far, and to the knowledge of the author, there has been no ski customer survey that tests the customer demand for sustainable ski tourism by implementing green marketing topics representative of a bigger outbound market. No study tested marketing effects expressed in economic willingness-to-pay data for sustainable ski tourism. Economic data is becoming even more important given the various global change effects apart from climate change.

2.5.2. Ski area perceptions of global change

From a supply side point of view, there have been a number of qualitative and quantitative studies surveying perceptions and strategies of tourism stakeholders.

Examples of supply side surveys are found in Abegg (1996), König (1998), Bürki (2000), Behringer (Behringer et al., 2000). More recent quantitative surveys have been done with the cableways in Switzerland by Abegg (Abegg et

al., 2007) and with the German cableways (Roth et al., 2008). In France Sfez (Sfez & Cauquelin, 2005) surveyed attitudes in French ski stations. Rolland (2006) assessed success factors of ski stations in France and in French Canada. Tettenborn (2007) looked at success factors of French ski stations.

The studies so far found out that tourism stakeholders are aware of climatic changes and recognize the ongoing and future impacts on winter tourism as relevant to their industry. In stakeholders' opinions the media exaggerates climate change and even seeks to publish bad news. Even science and politics exaggerate the topic, which is understood as being of minor importance. The behavior of stakeholders reveals ambivalence in downplaying climate change and still legitimate unpopular expansions and constructions, such as technical snow making and new lifts or widening of slopes.

In one of the latest studies Wolfsegger (Wolfsegger et al., 2008) found out that a majority of managers from lower ski areas in Austria expects some substantial changes from climate change in ski areas. Still, one-fourth believes the climate to remain stable. Extreme weather events are expected to have the most severe impacts. 39% could imagine the ski season to become shorter, not meaning that fewer tourists would then visit the ski areas. In general, the vast majority believes that they are able to adapt to climate change and therefore do not see it as a substantial threat. The most important adaptation strategies in a technical approach were snow making, expanding to higher elevations and avoiding southern exposures. For behavioral actions, "sharing the cost of snow making with the accommodation sector" was most named, then partnering and becoming members of agglomerations, diversification in winter, diversification in four seasons and "reviewing environmental regulations". Mitigation, though, was seen as only moderately important (OECD, 2007, Wolfsegger et al., 2008).

Huttner (2008) recently focused on the social construct in ski destinations, investigating three destinations in the Bavarian Alps. Local stakeholders were interviewed about their perception and strategies on climate change. Results proved the lack of communication between stakeholders in the same destination with often opposing goals and different stages of information and knowledge. The public media coverage has the greatest influence on stakeholders' knowledge and perception. Still, climate change as a fact is not questioned. The trust in further technological development of snow making is high, and along with expected legal and financial support of local and regional authorities, adaptation is seen as possible. New target groups and more marketing are understood as further strategies of adaptation.

A representative survey of Swiss ropeways companies was conducted in 2007 by Abegg (Abegg et al., 2007). Bigger companies believe to be better informed on climate change than smaller ones. Scientific publications and congresses

are important sources of information for the larger companies. In the future, 80% will incorporate climate change in their strategic planning, so far only 50% did. They expect a decrease in snow reliable winters of 20%, and 58% expect a decrease in snow reliability. For adaptation, the bigger ventures increasingly plan to organize events in winter on-mountain. In the summer, the construction of mountain bike trails and downhill parks is a main strategy. Financial aspects and behavioral strategies will gain in importance. The bigger and higher ventures will market snow guarantee and snow making, while the smaller and lower offer sustainable tourism. Mitigation, with increased efficiency and the use of energy from renewable resources, will be applied, especially by the bigger ventures in the future. Bigger companies, rather than smaller ones, are looking more positively into the future regarding their adaptation possibilities.

A representative survey of German ropeways companies carried out by Roth (Roth et al., 2008) and based on the questionnaire developed by Abegg, highlighted the circumstances of the smaller German ski lift operators. Roth also implemented global change impacts into the questionnaire. The vast majority is insecure about future climate change developments and impacts; only one-seventh is secure enough to plan strategically ahead. The majority believes in a decrease of snow reliability, followed by a shorter snow season and a decrease in customer demand. 29% expect a decreasing demand as moderately probable, 29% as probable and 5.6% as very probable.

Still, about one-third does not believe in a decrease in customer demand in the future. 65% see economic development as the biggest threat of the future, followed by demographic developments (23%) and climate change with only 5.5%. 61% do not see socio-graphic developments as a threat; 45.8% do not see climate change as a threat, followed by 13.9% demography and only 5.5% economic development.

From an adaptive point of view, about 30% see technical snow making as the main strategy so far, with 21% grading of the slopes to reduce the necessary snow pack height and 13% better physical snow management. In the future, snow farming, snow management and ground-free lifts are of growing importance. To secure the winter season, snow hiking trails, events and new trend sports are seen as the strategies of the future. In the summer, theme parks and water parks are becoming of most importance compared to today.

From a financial perspective the support by local authorities as well as by the accommodation sector and the increase of ticket prices are seen as the most important strategies. In marketing, sustainable tourism is of highest priority in the future. Mitigation, especially energy efficiency and the use of alternative energy is of increased importance in the future. Teich (Teich et al., 2007) asked experts in the Swiss ski destinations Davos, Scuol and Graubünden about their

experiences after the winter 06/07 and found out that higher elevations and snow making were the main adaptive elements securing that season, but that snow guarantee alone is not enough to adapt in the future.

Other authors have looked at ski tourism stakeholders from an organizational aspect of adaptation. Beritelli (Beritelli et al., 2007) discuss models of governance in destinations and find that the corporate-based model leads to advantages in adaptive management. Busch (Busch & Hoffmann, 2006) as well as Hoffmann (Hoffmann & Trautmann, 2006) discuss uncertainty management and the need for models of governance that fit to managing uncertainty. They see more need for research in this case. Breuer (Breuer & Pawlowski, 2007) discusses econometric models of price evaluation in winter sports with the goal to evaluate and benchmark ski ticket prices by their individual attributes. Bieger (Bieger et al., 2006) also discusses new pricing models to increase added value in the ropeways industry.

2.6.Conclusions

This chapter two discussed the unique importance of ski tourism in the Alps for the local economic wellbeing and development. It outlined the interrelations between the supply and the demand side of ski tourism and discussed the impacts of global change on this human-environment system. It delivered the current state of vulnerability research in climate change impacts on tourism and concluded that the foci in most studies are on climate change and its impacts on the natural environment. Perceptions, reactions, behavioral adaptation and mitigation from a more social perspective have been neglected so far. The scope of vulnerability assessment needs to be extended from current climate impact research to global change research.

Currently mostly technical adaptation is being applied in favor of behavioral adaptation and mitigation with the goal of maintaining services as they were. This practice cannot be sustainable in the future, thus more behavioral and mitigative adaptation are needed. The system of global change, of ski tourists and of ski areas is very complex, many variables are uncertain and result in risks for the governance of ski destinations. The ropeways companies as the main stakeholders on supply side in ski tourism as well as the most specialized and main threatened party from global change impacts are challenged to find a more sustainable business model based on more sustainable tourism. Sustainable tourism though requires the adaption of customer demand to changing services. In order to be successful, the satisfaction of the customer and its involvement in the services designing process are integral parts of destination governance.

2.7.Outlook

Because of the complexity and interrelations in this system of ski tourism, a holistic approach is needed to develop ways of more sustainable adaptation. In this study, we address these issues and research perceptions and strategies in ski areas of different countries with different regulatory frames and different models of governance. In addition we assess the evolving customer demand and the potential market of sustainable ski tourism. We hereby picture the broader relations and feed-back loops between global change, customer demand and supply side strategies.

3. Research concept and methods

Chapter three describes the focus and the scope of this study, what the goals and questions are and what methods are being applied in this research.

3.1.Study focus

The research concept of this study is accentuated in assessing the coupled human-environment system of ski tourism in its vulnerability and adaptive capacity to global change referred to as global change vulnerability assessment (see chapter six). The potential of reactions and adaptation in a sustainable matter, which include mitigation, are in the focus of this study. Hereby special emphasis is put on the potential of re-defining the understanding of direct adaptation – adapting the offered services from a supply side – to an adaption of consumer demand.

The ski tourist is questioned to change his or her demand to more sustainable service offers which require less resource intensive technical adaptations by the supply side. Figure 12 shows the study focus on vulnerability of the coupled human-environment system of ski tourism and global change and the possible adaptation responses of ski tourism, both from a supply side and a demand side.

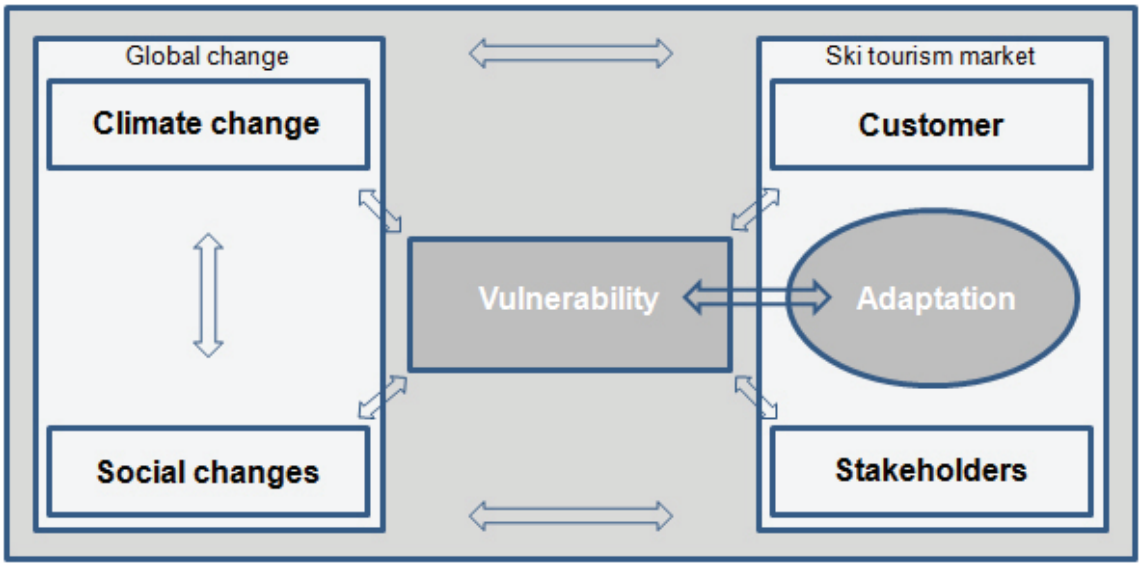

Figure 12 Study focus on the vulnerability of the coupled human-environment system
The figure shows the system of ski tourism and global change and indicates adaptation of ski tourism.

3.2.Choice of methods

In climate impact research there are three main approaches: the impact approach, the integrated approach and the interactive approach (Carter et al., 1994). The impact approach is based on mono-causality, which is not appropriate for a problem of sustainable development. For a recent example of an impact study on climate change and ski tourism in the Bavarian Alps see Steiger (2007).

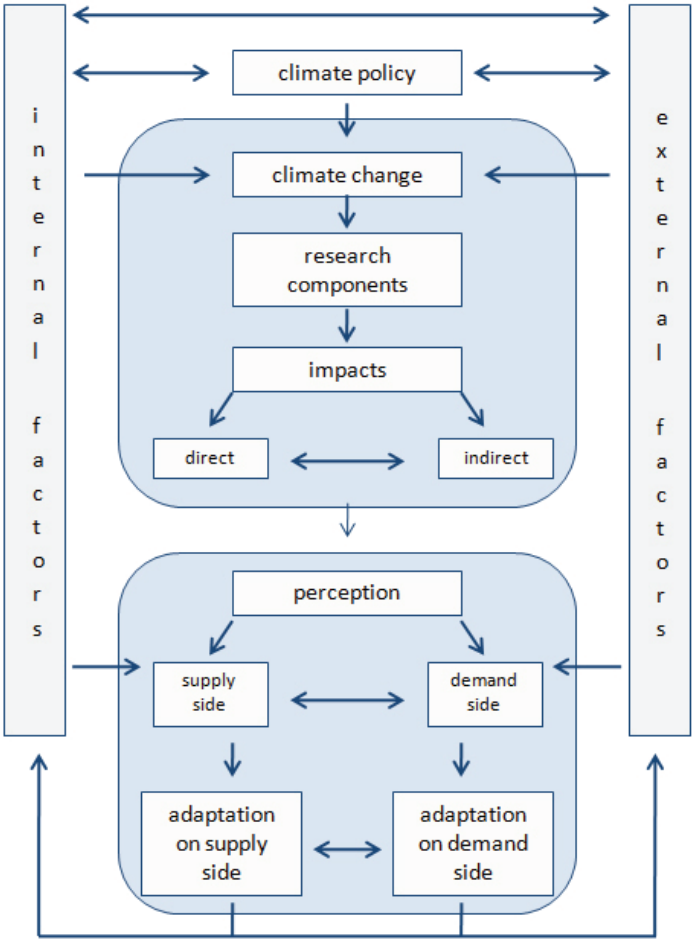

Figure 13 Model of the interactive approach in climate impact research (Carter et al., 1994)

The integrated approach seeks to reflect changes on the whole of a socio-economic system which would go beyond the scope of this study because our focus is on tourism (for the integration of only two industrial components from the whole socio-economic system, tourism and agriculture, see Behringer (Behringer et al., 2000). The interactive approach is appropriate for assessing impacts on one industrial branch, such as our case in tourism. In the first step it analyzes direct and indirect impacts of climate change on tourism. In the second step it concentrates on adaptation both on the supply and demand side.

The adaptation process is based on perceptions, as well as on internal and external factors, and feeds back into the system (figure 13).

The IPCC (2007) discusses advances in assessment methods and in the characterization of future conditions (see table two). The standard approach has been the climate scenario-driven impact approach. Other approaches discussed are the adaptation- and vulnerability-based approaches, integrated assessment and risk management (IPCC, 2007). The adaptation-based approach focuses on risk management by examining the adaptive capacity and adaptation measures required to improve the resilience or robustness of a system exposed to climate change.

The vulnerability-based approach focuses on the risk itself by seeking to maximize potential benefits and minimize or reverse potential losses. Both approaches are interrelated, especially with regard to adaptive capacity. Advances in assessment of the standard IPCC approach (IPCC, 2001a) have shown the importance of providing socio-economic components too.

Table 2 Characteristics of different approaches to climate change impact and vulnerability analysis
(IPCC, 2007)

	Approach			
	Impact	**Vulnerability**	**Adaptation**	**Integrated**
Scientific objectives	Impacts and risks under future climate	Processes affecting vulnerability to climate change	Processes affecting adaptation and adaptive capacity	Interactions and feedbacks between multiple drivers and impacts
Practical aims	Actions to reduce risks	Actions to reduce vulnerability	Actions to improve adaptation	Global policy options and costs
Research methods	Standard approach to CCIAV Drivers-pressure-state-impact-response (DPSIR) methods Hazard-driven risk assessment	Vulnerability indicators and profiles Past and present climate risks Livelihood analysis Agent-based methods Narrative methods Risk perception including critical thresholds Development/sustainability policy performance Relationship of adaptive capacity to sustainable development		Integrated assessment modelling Cross-sectoral interactions Integration of climate with other drivers Stakeholder discussions Linking models across types and scales Combining assessment approaches/methods
Spatial domains	Top-down Global → Local	Bottom-up Local → Regional (macro-economic approaches are top-down)		Linking scales Commonly global/regional Often grid-based
Scenario types	Exploratory scenarios of climate and other factors (e.g., SRES) Normative scenarios (e.g., stabilisation)	Socio-economic conditions Scenarios or inverse methods	Baseline adaptation Adaptation analogues from history, other locations, other activities	Exploratory scenarios: exogenous and often endogenous (including feedbacks) Normative pathways
Motivation	Research-driven	Research-/stakeholder-driven	Stakeholder-/research-driven	Research-/stakeholder-driven

The focus of this research is the exposure and the sensitivity of the coupled human-environment system of ski tourism to global change impacts, and its sustainable adaptive capacity. Both a vulnerability and an adaptation-based approach are appropriate as we seek to

- discover actions to reduce vulnerability and
- improve actions of adaptive capacity to be more sustainable.

However, we seek to approach vulnerability not only from a climate change point of view, but also from global change aspects by incorporating changes in the social environment. A methodological approach for general vulnerability research has been proposed by Polsky (Polsky et al., 2003) as shown in table three.

Table 3 Eight-step methodology for vulnerability research (Polsky et al., 2003)

Steps	Description	Tasks
1. Select people and places	▪ Choose scale ▪ Select stakeholders	Steps prior to modeling
2. Get to know places over time	▪ Review literature ▪ Contact researchers ▪ Spend time in field ▪ Explore nearby areas	
3. Hypothesize who is vulnerable to what	▪ Identify people ▪ Identify places	
4. Develop a causal model of vulnerability	▪ Describe factors ▪ Describe pathways ▪ Examine adaptation ▪ Formalize into model	Steps that involve modeling
5. Find indicators for the components of vulnerability	▪ Exposure indicators ▪ Sensitivity indicators ▪ Adaptive capacity indicators	
6. Weigh and combine indicators	▪ Combine rigorously ▪ Represent results ▪ Validate results	
7. Project future vulnerability	▪ Choose scenarios ▪ Run model	
8. Communicate vulnerability creatively	▪ Be rigorous about uncertainty ▪ Trust stakeholders ▪ Use multiple media	

In the *SkiSustain* research concept, we seek to combine this methodology with the interactive approach in climate impact research to develop a methodological approach that fits our research goals (see table four). The advantages for the goals of this study in combining the interactive approach of climate impact research with a broader methodology of vulnerability research are:

- It is crucial to incorporate additional aspects along with climate change impacts to extend and differentiate the common view on vulnerability.
- Our focus is on the testing of adaptive elements to increase adaptive capacity in a sustainable matter, more concrete mitigation and the market of sustainable consumption.

We therefore set up a combined methodological approach as shown in table four where we

- derive global change impacts on ski tourism from the body of literature,
- assess experiences and perceptions on the supply side,
- develop a hypothetical causal model of vulnerability for ski areas,
- extract effective sensitivity and adaptive elements of vulnerability,
- form ski area scenarios of future services,
- test these scenarios with customer preferences,
- model the demand for sustainable adaptation,
- refine the model of vulnerability for ski areas, and
- derive recommendations on how to increase adaptive capacity in a sustainable manner.

Table 4 Combined methodological approach of SkiSustain

Steps	Sub-steps and description	Tasks
Get an overview on the system of global change and ski tourism	▪ Widen scope from climate change to global change ▪ Hypothesize who is vulnerable to what ▪ Hypothesize about sustainable adaptation ▪ Choose scale and select stakeholders	Steps prior to modeling
Assess stakeholder experiences	▪ Focus on main steering and suffering stakeholders ▪ Assess experiences after an analogue winter ▪ Discuss vulnerability ▪ Discuss current kind of adaptation ▪ Discuss strategies	
Test customer demand	▪ Develop a hypothetical causal model of vulnerability to extract sensitivity and adaptive elements ▪ Develop scenarios of future ski area services ▪ Survey perceptions and preferences ▪ Test information treatment effects and WTP for adaption in demand	Steps that involve modeling
Build up a vulnerability management framework for sustainable adaptation	▪ Discuss role of “losers” and “winners” ▪ Define extended exposure, sensitivity and adaptive capacity ▪ Portray the system of global change and ski tourism ▪ Demonstrate opportunities ▪ Give recommendations for sustainable adaptation	

3.3.Scope of this study

The discussion of the various and uncertain outcomes of global change on ski tourism, the resulting vulnerability and the necessity of sustainable adaptation require further insights into the human-environment system of ski tourism. New strategies to increase adaptive capacity need to be defined taking global change, correlating consumer demand and ski area strategies and their possibilities into account.

In this study we start with a theoretical overview on global change impacts on ski tourism. We then take a closer look on the supply side of ski tourism and assess experiences and strategies, as well as the sustainability of current adaptation in ski areas after an analogue winter 2006/07. We include ski areas of different countries and cultures in the Alps to widen the scope for effects of models of governance as required in vulnerability assessment (see chapter two). We visit the four main Alpine countries, Austria, France, Switzerland and Italy, which share the major part of the Alpine arc while all benefiting from the German customers as the biggest incoming visitor group. In the ski areas we focus on the ropeways companies as the main stakeholders in ski tourism.

On the tourism demand side we assess the preferences of ski customers representative for the German market as the biggest outbound tourism market in the world. We model the demand for sustainable ski tourism and test effects of green marketing in order to adapting customer demand to changing services.

Supply side experiences and its interference with the demand side lead to an extended understanding of vulnerability to global change and opportunities of increasing the adaptive capacity. According to the extended sensitivity elements and the resulting adaptive factors, we set up a framework with concrete recommendations for ski areas to increase their adaptive capacity in a sustainable way.

3.4.Time horizon

Global change has been occurring over time and adaptation is a dynamic process that currently responds to these changes and will continue to do so. The uncertainty of developments both in changes of the climate and of society, as well as in responses, makes extrapolation of results necessary, which leads to even greater uncertainty (Giddens, 1997, IPCC, 2007). Most climate impact surveys extrapolate the climatic development in the future by neglecting extrapolation of societal effects. These external effects, such as demographic, socio-graphic and socio-economic aspects, are part of global change and should be incorporated in extrapolation.

Analogue studies instead use the results of an unusually warm or dry winter for reflection into the future where winters, such as the one researched, will become much more common. In the case of this study we investigated customer demand and supply side experiences in a winter that was unusually warm and reflected the potential future developments in the Alps well (Beniston, 2007a). The winter 2006/07 has been a real time example of future climate change impacts and thus counts as an analogue to future developments.

Results lead to a real time experience of stakeholders and of customers who could feel, and therefore imagine better how future winters will affect their decisions and preferences. We therefore needed no extrapolation of climate change effects in this study. We have to keep in mind, though, that perceptions and responses both of supply and demand side would most probably have been different in a winter that were more *normal* in terms of snow cover and temperatures.

3.5.Research goals

Summarizing the need for further insight into the human-environment system of ski tourism and global change, there are a number of research goals this study seeks to address:

1. *Obtain* an overview of the interrelated human-environment system of ski tourism and global change from a holistic perspective, reaching beyond the current focus on climate change (see figure 11);
2. *Extend* the focus on climate change impacts on the natural environment to a holistic understanding for the relations and feedback loops in the coupled human-environment system of ski tourism and global change;
3. *Assess* supply side experiences and strategies of vulnerability to global change. Focus on ropeways companies in ski areas as the traditional, main driving and the most suffering stakeholders in ski destinations. Access the topic from an international scope to broaden the national focus in an international and very mobile tourism market;
4. *Extract* sensitivity and adaptive elements to develop future ski area services scenarios, focusing on behavioural adaptation and mitigation;
5. *Assess* customer preferences representing the German market. Model customer demand for sustainable ski tourism and test directed *sustainability* marketing. Develop consumer profiles based on economic willingness-to-pay data;
6. *Discuss* a differentiation in sensitivity of ski areas and possibilities of sustainable adaptive and mitigative capacity;
7. *Build up* a vulnerability management framework for ski areas; and

8. *Define* further fields and questions of more in-depth research from the holistic system of ski destinations and global change of this study.

Furthermore, we can conclude the goals of this study with two overall main goals:

1. **Extend and differentiate the understanding of vulnerability of ski tourism to global change.**
2. **Develop and test opportunities for sustainable adaptation.**

3.6.Hypotheses

Addressing the research goals we seek to test the following hypotheses with this research:

- Climate change is not the only threat to the system of ski tourism. Other facets of global change, such as the sum of socio-economic and demographic developments, are currently underestimated in their potential outcomes on ski tourism and could become an even greater threat in the future.
- We therefore need to extend and differentiate our understanding of vulnerability. The *winner* and *loser* discussion of ski areas needs individual reassessment.
- So far adaptation is not sustainable. Technical adaptation is limited in its capabilities to cope with global change. New ways of adaptation are needed that put more focus on behavioral means and mitigation.
- There are opportunities resulting from changes. The growing market of sustainable consumption is a prospect for ski areas to develop mitigation as a business opportunity.
- Regarding the holistic system and the uncertainty of developments in global change and ski tourism, there are other main steering factors of adaptive capacity, such as the model of local governance, which need further research.

3.7.Research questions

A set of questions arises from the stated goals and hypotheses of this study. We divide questions as well as the methods into subsystems of an empirical supply side and demand side, followed by a strategic integrative part.

3.7.1. Supply side questions

On the supply side we picture the destination as a system, but focus on the ski area and there on the ropeways companies as the main driving forces and the

main threatened stakeholders. The qualitative expert interviews reflect the experiences of the unusually warm winter 2006/07.

- How do ski areas perceive global change after their experiences of an analogue winter for future developments?
- How vulnerable do they think they are, and which are sensitivity elements?
- How do they estimate their adaptive capacity, and what are their adaptation strategies?
- What is the willingness for mitigation?
- Where do ski areas see the need for action, and where do they see opportunities in global change?
- Would ski areas believe and invest in sustainable ski tourism?

3.7.2. Demand side questions

All demand side question shall address and represent the German market of ski tourists with the combination of a quantitative online questionnaire combined with a choice experiment.

- What are preferences of ski tourists for services and products in ski areas today? How important is snow guarantee even if achieved by technical snow making as the main kind of applied technical adaptation?
- What are the consumers' acceptances to adapt their demand to changing services and for alternatives to skiing*?*
- What are the ski tourists' awareness and perceptions of climate change impacts and of general environmental aspects in ski tourism considering the experiences after the unusually warm winter of 06/07, and which indicators describe this environmental awareness best?
- What is the willingness-to-pay (WTP) for specific ski area attributes related to sustainable tourism?
- How is WTP affected by additional consumer information and by green marketing?
- How are different socio-economic groups reacting in their demand to information treatments and green marketing?
- What is the customer demand for sustainable ski tourism?

3.7.3. Integrative questions

In the integrative section we join stakeholder and consumer results to arrive at a holistic picture of global change and ski tourism, and to discuss vulnerability and strategic opportunities.

- What are the feedback processes in the coupled human-environment system of ski tourism and global change?
- What vulnerability factors are of future relevance?
- What strategies are adjacent to manage and increase adaptive capacity in a sustainable matter?
- Is sustainable tourism a feasible and real opportunity for ski areas?
- What are other opportunities or aspects of key interest that need further research?

3.8.Study design

The raised questions are addressed by designing a research process that is divided into four methodological steps (see figure 14):

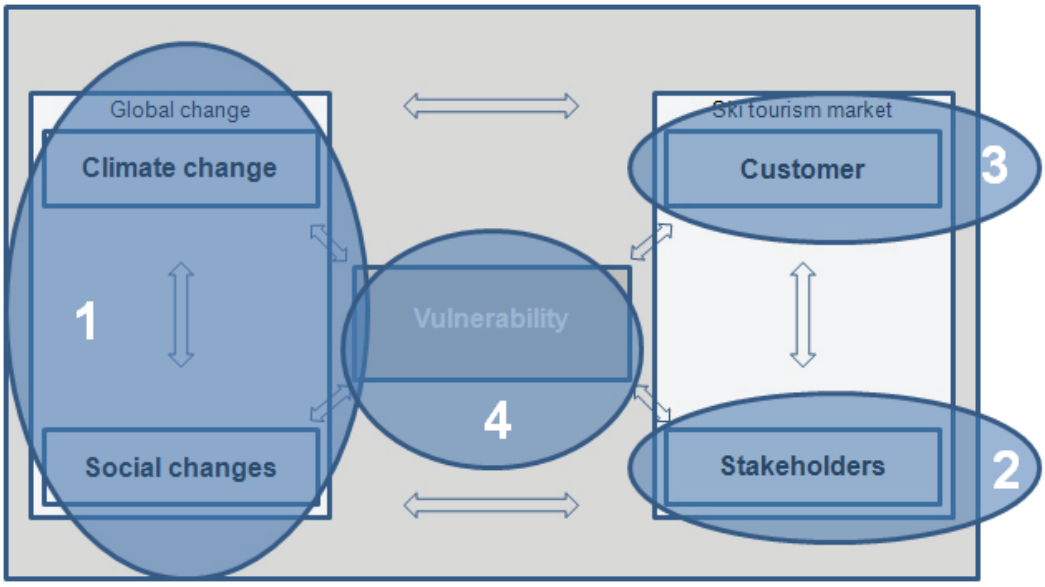

Figure 14 Methodological research frame of SkiSustain

3.8.1. Step 1: Overview on the system of global change

A review of the current state of climate impact research on tourism and of global change research, as well as consumer demand surveys, enables hypotheses about a causal model of vulnerability to global change and the development of guidelines for the semi-structured interviews of step two (chapter two).

3.8.2. Step 2: Experiences and strategies of tourism stakeholders

In step two we assess experiences and strategies by interviewing the management of ropeways companies, who are the main steering and suffering stakeholders in ski destinations and ski tourism. We discuss sensitivity, adaptive capacity and the potential of sustainable adaptation and mitigation in

personal in-depth interviews. Methods used are qualitative, open guide-lined expert interviews with duration of about one hour.

Ski areas are selected to represent a mean of ski areas in the Alps and a current understanding of vulnerability *(*see chapter four). We select ski areas in France, Italy, Switzerland and Austria. The total number of interviews is twenty. Some of these interviews are held with representatives of a group of ski areas, for example, Dolomiti Super Ski as a marketing aggregation, and Remy Loisirs as an investment corporation. In total, the supply side interviews reflect 36 ski areas in four Alpine countries (chapter four).

3.8.3. Step 3: Consumer demand for sustainable ski tourism

From the hypothesized causal model of vulnerability, outlined in steps one and two, we construct scenarios of future ski areas described by attributes and their levels. Attributes and levels are based on indicators of sensitivity and of adaptive capacity, which are derived from the ski area experiences in step two, as well as from iterative literature review about expected outcomes of global change in the theory chapter two of this study (chapter five).

Among the scenarios, we test effects of green marketing and add variations in external ratings of destination profiles as *recommended*, *disapproved* and *neutral* from environmental and consumer perspectives. The contents of these information treatments and their kind – if recommended, disapproved or neutral – are developed in expert discussions in ski resorts with experiences in marketing sustainability. Some ski resorts in North America are internationally leading the way in terms of actively communicating global change and sustainability issues (Luthe, 2007a). For these reasons we interview experts and practitioners in North American ski resorts:

- Mammoth Mountain Ski Area, Mammoth Lakes, California, USA
- Aspen Snowmass, Aspen, Colorado, USA
- Copper Mountain Ski Area, Copper, Colorado, USA
- National Ski Areas Association (NSAA), Denver, Colorado, USA

This sub step leads to a number of attributes and levels describing future ski area scenarios and to two kinds of information treatments, with the focus on supporting sustainable adaptation of ski areas. The final nine attributes and three information treatments are shown in chapter five (table 14).

We then use the validated indicators and scenarios of future ski areas to empirically analyze and model customer demand. Methods used are stated choice experiments from the group of Conjoint Analyses (CJA) in combination with a quantitative questionnaire, both performed online (*Save-Snow*). The online study, *Save-Snow*, consists of a section with 64 choice set questions,

allocated to eight blocks of respondents answering eight questions each. A set of 27 general questions is added as a standard quantitative questionnaire addressing a variety of topics matching the research questions.

3.8.3.1. Part 1: Quantitative questionnaire

The quantitative questionnaire investigates customer preferences for different kinds of ski area services. We base this on a representative sample of German ski tourists in regard to age, gender, skills, origin and income. We recruited respondents in ski areas incorporating small, big, low and high areas in different countries of the Alps. A group of students was trained to do short interviews and randomly collected email addresses in different ski areas in the winter of 2006/07. Dressed officially with a team jacket and a University logo, the students collected more than 2000 email addresses. Ski area newsletters from Mayrhofen (Austria) with 7330 recipients, and Oberstdorf (Germany) with about 8000 recipients, were another main source of recruiting participants for the study.

Other sources were chosen to reach more general customers interested in the topic of skiing. Live interviews were broadcasted in one of the biggest radio stations in Germany, SWR3, and in a local television station. The German Ski Federation sent approximately 12000 email newsletters to ski instructors, and an article was placed in the member magazine of the Ski Federation with a 220'000 publication. A CIPRA (Commission Internationale pour la Protection des Alpes) newsletter was sent out too. The latter three sources were meant to also reach customers potentially serving as opinion leaders in the topic of skiing.

The customers recruited by radio, television and the member magazine had to actively type in the URL of the web survey, which was purposefully easy to spell and to remember (www.Save-Snow.com). All other respondents generated in the interviews and by the newsletters could click on the given link about ten days after they either completed the interviews or received the newsletter.

Extensive pre-testing of the online survey was done with about 100 customers before starting the actual survey. Feedback was generated and some of the visual choice set design and explanations were changed according to the experiences of those tested. In general, the first results showed no unexpected irregularities in the experimental design.

The online survey *Save-Snow* was combined with a lottery to win ski day passes for the season 2007/2008 in different ski areas of the Alps.

3.8.3.2. Part 2: Choice experiment

The demand of customers is analyzed using a discrete choice model from the group of Conjoint Analyses. Choice experiments are a variance of the original Conjoint idea developed for market research, which is why they are referred to as *choice based Conjoint*. There are numerous definitions of choice experiments with some joint principles:

- The respondents choose between given alternatives: the discrete variable (*choice*) is qualitative (yes/no decision or selection of alternative A from the possible alternatives A,B,C,D,...)
- Choice experiments are based on the assumption that goods or product is reflected by many attributes (*attribute-based*). The theoretical base is given in Lancaster (Lancaster, 1966) with the so-called *Characteristics Theory of Value*.
- Choice experiments generate data by stated methods.

A choice experiment allows computing tentative willingness-to-pay (WTP) for the different ski area services and scenarios indicated by the attributes and levels. The experimental design includes a treatment factor that provides a sub sample of participants with additional information on the ski areas to choose from. The three different information treatments we chose are listed in chapter 5.2. The treatments serve to test the effects of additional knowledge and of direct marketing on customer choices.

3.8.4. Step 4: Vulnerability management framework

A vulnerability management framework assesses the sensitivity and the adaptive capacity of the coupled human-environment system ski tourism to global change. A framework delivers opportunities and guidelines on how to increase the adaptive capacity in a sustainable matter under uncertainty in expected changes. It captures the stakeholder and the customer perspective of sustainability and portrays the central role of communication linking the two. Such a framework can help to support different models of governance, monitor and react to changes in the system. In this fourth step we provide concrete recommendations for ropeways companies and ski tourism stakeholders for sustainable adaptation to global change (chapter six).

4. Ski area experiences and strategies on global change impacts

Chapter four is the first of two results chapters, addressing the supply side of ski tourism. We describe the goals and questions of the supply side research in detail and list the statements and the experiences the ropeways companies provided in the qualitative interviews throughout the Alps. The qualitative interviews with the ropeways companies reflect their perceptions and experiences after the unusually warm and analogue winter 2006/07 which provided for a very realistic outlook in future developments. The responses would most probably have been different in a winter that was more *normal* in terms of snow cover and temperatures.

4.1.Summary

Climate change is seen as the main threat to ski areas. The main impact is the rise in average temperatures with a decrease in natural snow reliability, especially in lower elevations. The main kind of adaptation applied is the technical production of snow. Ski areas in lower elevations and of smaller size are seen as losing from the impacts because of less natural snow reliability, less snow making potential and less investment opportunities. Higher and bigger ski areas are seen as the winning ones. Forecasts for the future development of ski tourism focus on direct impacts of climate change and of technical adaptation, mainly snow making, expansion and landscaping. Higher and bigger areas, therefore, are forecasted to remain, smaller and lower ones will disappear (OECD, 2007).

After the winter 2006/07, we examined the experiences and perceptions of twenty ski area managements in four Alpine countries. The winter of 2006/07 showed to be among the warmest winters on record and was characterized by a sharp reduction in snow amount and duration at elevations below 2000 m. Many low to medium sites suffered from significant shortfalls in revenue, resulting from a reduction in the number of days where skiing is possible by a factor of two to three (Beniston, 2007b). It happened that our time of study fell in line with this winter, allowing for the chance to use it as an analogue. The anomalously warm season of 2006/07 allows a *preview* of climatic conditions that may occur with greater frequency in the future (Beniston, 2007b). It should be kept in mind that responses of the interviewed persons might have been different after a rather *normal* winter in terms of snow cover and average temperatures.

The goals were to evaluate the season and discuss experiences of vulnerability and of possibilities for adaptation. The results show that indeed those in higher elevations suffered much less, if at all, from the lack of snow because of their potential for snow making. The lower ski areas had huge losses due to either not enough snow making capacity and/or too high temperatures for snow

making. Thus, for coping with the direct impacts of climate change technical adaptation is adequate. But, the majority of higher areas instead experienced problems of social kinds, being indirect impacts of climate change and other aspects of a broader development referred to as global change.

These effects are seen as being of even greater importance in the future, requiring an extended view on vulnerability. The current focus on technical adaptation proved not to be appropriate and even unsustainable. Even more, the limits of technical adaptation from a resource point of view and the looping of accelerating feedbacks on climate change and general environmental degradation demand for a more systematic adaptive toolbox with a shift to different kinds of behavioural adaptation. This includes mitigation aspects with technical adaptation remaining an integral part of it.

4.2.Research questions and goals

On the supply side we picture the destination as a system, but focus on the ski area and the ropeways companies as the main driving forces and the main threatened stakeholders. The interviews reflect the experiences of the unusually warm winter 2006/07. The main questions we focus on center around the experiences of ski area management after this winter:

- How do ski areas perceive global change after their experiences of an analogue winter for future developments?
- How vulnerable do they think to be and which are sensitivity elements?
- How do they estimate their adaptive capacity and what are their adaptation strategies?
- Where do ski areas see the need for action, and where do they see chances in global change?
- What is their willingness for mitigation, and would ski areas believe and invest in sustainable ski tourism?

We seek to address a number of ski areas being representative of the various kinds of existing ski areas in the main Alpine countries.

4.3.Methods

4.3.1. Qualitative personal interviews

The research objectives of the supply side aspect of this study asked for a qualitative approach with the advantages of receiving more individual and in-depth information than would have been possible with a quantitative survey. The goal here was not to get representative results of the ski areas in the Alps. It was, rather, to discuss the experiences of the analogue winter 06/07 in more depth and to include the personal experiences and visions of the ski area

managers. In such a discussion it is possible to inductively adapt and develop the topics according to the personal experiences and visions of the interview partner, and to discover topics or issues the scientist might not have thought about in advance (Bogner, 2005).

A qualitative method opens up more space for exploring and does not limit the possibilities in advance. Quantitative or representative results were not intended. The intent was to include experts representative of ski areas for the Alps and to picture the variety and the scope that exists as explained later in this chapter. Referring to the research questions the exploration should, of course, not leave the main topics and address the questions in mind. Therefore, the qualitative experiment aims to achieve two things: while being exploratory, it still follows a well-defined procedure trying to prevent accidental outcomes and results (Diekmann, 2003, Häder, 2006).

Qualitative interviews can be structured or unstructured (Bogner, 2005, Lamnek, 2005). Unstructured interviews involve direct interaction between the researcher and the interviewed person. It differs from structured interviews in many ways. There is no formal structured instrument or protocol, although the scientist may have some initial guiding questions or core concepts to inquire about. The interviewer is free to move the conversation in any direction of interest that may arise.

Consequently, unstructured interviews are useful for exploring a topic broadly. But there is a price for this lack of structure because each interview tends to be unique with no predetermined set of questions asked to the interview partners. This usually makes it more difficult to analyze the unstructured interview data. Interviews that are completely structured, on the other hand, leave less space for exploring any related direction that may come up during the conversation.

In order to include advantages of both kinds we chose to follow semi-structured interview plans that were created by a lined-up set of topics and questions that allowed for enough space to dive into one topic or another. We thus were able to be available for the individual experiences and situations of the interviewed partner and still came to comparable results that would be structured enough to be analyzed and compared with each other.

Our method of choice was thus the qualitative, semi-structured, personal interview with a planned duration of about one hour each.

4.3.1.1. Questionnaire development

The guiding topics for the interviews were developed in accordance with the research questions focusing on the experiences of the winter 06/07 and the resulting view of vulnerability and adaptive capacity. Hereby we took results of

earlier interviews and focus group discussions from other researchers into account (for example Bürki, 2000). After the first interviews the structure of the guidelines was slightly adopted to better fit the flow of the discussion and the given time frame of about one hour. Each interview partner responded differently, though, and the order of questions posed needed constant adjustments. The guiding structure of the interviews is shown in appendix A.

4.3.1.2. Selection of ski areas and interview partners

The ski areas were selected in order to find an even distribution in the four main Alpine countries: Austria, Switzerland, France and Italy. Furthermore, there are five categories we chose to represent an average of ski areas in the Alps and to cover the main existing kinds of ski areas. The selection criteria were based on elevation, size, access, if glacier skiing is offered and the image of the destination as follows:

- Elevation low or high
- Size big or rather small
- With a glacier and without
- Distance to source markets – direct easy access or remote and difficult access
- World known leading destination
- Destination of local or regional importance

Table 5 Elevation and skier days of the selected ski areas

	Elevation min	Elevation max	Skiers days
Arosa	1750 m	2653 m	578.000
Davos	1194 m	2844 m	1.110.000
Diedamskopf	655 m	2050 m	220.000
Dolomiti Super Ski	12 areas	12 areas	10.000.000
Flumserberg	1200 m	2222 m	<1.000.000
Gstaad	948 m	2156 m	1.000.000
Kitzbühel	789 m	2000 m	1.550.000
Les Arcs	1200 m	3226 m	1.618.905
Morzine/Les Gets	900 m	2000 m	750.000
Orcieres	1850 m	2725 m	<1.000.000
Planai & Hochwurzen	752 m	2000 m	1.000.000
Scoul	1250 m	2783 m	400.000
Sölden im Ötztal	1377 m	3249 m	1.430.000
St. Anton am Arlberg	1304 m	2811 m	1.250.000
St. Moritz	1856 m	3057 m	1.300.000
Toggenburg	900 m	2262 m	350.000
Val d'Isere	1850 m	ca.3300 m	1.240.000
Verbier	821 m	3330 m	>1.000.000
Wilder Kaiser/Brixental	650 m	1892 m	>1.000.000
Zermatt	1524 m	3899 m	1.368.000

We draw the line between a low and a high ski area with the major part of the lift equipped, and available terrain being below or above 2000m asl. A big ski area in this understanding has more than one million skier days per year. The elevations and the skier days are shown in table five. The reach ability within two hours of time from towns of fifty thousand people to one million, as well as the direct train access and the distance to the next public airport, was further criteria in our selection. The travel times are based on current free online route planners (www.map24.de) and indicate the reach ability for day tourists.

We combined these factors to five categories of selection:

- Low and small
- Low and big
- High and rather small
- High and big
- Glacier skiing (high and big)

We matched these categories with the two classes of a world leading destination (12 ski areas) and a destination of local or regional importance (8 ski areas) within the four countries. The reputation, whether a destination is of world reputation or not, is subjective to a certain degree. We picked seven ski areas from the group *Best of the Alps* (http://www.bestofthealps.com) as having a world reputation and added Gstaad, Les Arcs, Val d'Isere, Arosa and Verbier because of their international reputation as ski areas. Within the high areas with world reputation we include five areas with glacier skiing. The easiness of access and the distance to source markets is about evenly distributed between the selected ski areas. Table six shows the selected ski areas and the included categories and classes.

From the management of these ski areas we selected interview partners from leading positions, usually the CEO, who in some cases were also part of the tourism management of the destination in general (table seven).

The selected ski areas were called by phone and asked for an interview partner for the topic of this study. There was only one ski area that was not willing to schedule an appointment for an interview because of too many requests for interviews from the media and from students and others alike. In two cases the interview partner needed to be convinced to schedule an interview – not because of a lack of interest but because of too many request of such a kind. With the remaining eighteen partners an appointment was easy to plan as they were very interested in this topic. Because of the distances between the ski areas, we tried to plan geographical clusters to visit at one time, starting with Eastern Austria, followed by Western Austria and Eastern Switzerland, Central Switzerland, Western Switzerland and France, and finally, Italy.

Table 6 Categories and classes of the selected ski areas

	small + low	big + low	small + high	big + high	glacier	world known/ leading destinations	less known/ local importance
Short indicator for citations	sl	bl	sh	bh	g	w	l
Arosa			x			x	
Davos				x		x	
Diedamskopf	x						x
Dolomiti Super Ski				x		x	
Flumserberg	x						x
Gstaad		x				x	
Kitzbühel		x				x	
Les Arcs					x	x	
Morzine/Les Gets	x						x
Orcieres			x				x
Planai & Hochwurzen		x					x
Scoul			x				x
Sölden im Ötztal					x	x	
St. Anton am Arlberg				x		x	
St. Moritz				x		x	
Toggenburg	x						x
Val d'Isere					x	x	
Verbier					x	x	
Wilder Kaiser/Brixental		x					x
Zermatt				x	x	x	

4.3.1.3. The interviewing

"Marketing, yes. Marketing is not my term, I am a technician."
*(*Statement of a ski area manager)

The interviews were held at the end of the ski season 2006/07 from May through September, 2007. The timing proved to be right because the experiences of the last winter were still fresh, but the economic data had already been analyzed. The summer is the time of the year when the ski area personnel has the lowest work volume and thus is more likely to have the time for interviews.

In the interviews, we introduced ourselves, the research group, the goal and the scope of the whole research project and of the supply side part. We asked to record the interviews with voice recorders (Olympus VN-3100PC) for later transcriptions. It was obvious that the position and the educational background of the interviewed partner led to different kinds of responses. Someone with a technical background usually waited for the whole question to be asked, and then responded clearly and directly to the stated question in a rather short and structured time.

Table 7 Interview partners, duration of interviews, transcribed contents and displayed codings

	Function of interviewed person	Interview duration	Transcipted A4 pages	Relevant codings displayed in results
Arosa	CEO	1h03min	11	17
Davos	Head Marketing	1h01min	9	6
Diedamskopf	CEO	0h48min	7	10
Dolomiti Super Ski	CEO	1h46min	16	20
Flumserberg	CEO	0h45min	4	12
Gstaad	Managing Director	0h59min	8	16
Kitzbühel	Member of the Executive Board/CFO/CMO	1h0min	8	17
Les Arcs	Directeuer général	1h11min	8	5
Morzine/Les Gets	Directeur Communication	1h32min	5	5
Orcieres	Directeur Technique/ Responsable Qualité	1h20min	3	5
Planai & Hochwurzen	Head of Sales, Maketing, PR	1h07min	10	12
Scoul	Director	1h01min	9	7
Sölden im Ötztal	Head Marketing	1h17min	12	6
St. Anton am Arlberg	CEO	0h56min	7	9
St. Moritz	Managing Director, Member of the Executive Board/CFO/CMO	1h09min	9	18
Toggenburg	CEO	1h03min	10	10
Val d'Isere	Directeur d'Exploitation adjoint	0h48min	6	8
Verbier	Directeuer général	0h54min	6	13
Wilder Kaiser/Brixent	CEO	0h58min	9	4
Zermatt	CEO	0h52min	10	15
sum		**17h7min**	**126**	**215**

Someone with a marketing background responded differently, often starting right away with talking before the questions were asked and digressing while answering a question. Such interviews needed much more re-structuring by the interviewer and were more difficult to do. It showed that interview partners in marketing positions often did not have sufficient insight in key business strategies, which negatively influenced the scope of responses given. The functions of the interview partners, the duration of the interviews and the length of the transcribed texts are shown in table eleven.

4.3.1.4. Introducing the core question on sustainable tourism

One of the main goals of *SkiSustain* is to test opportunities of sustainable adaptation. Behavioral adaptation and mitigation on the supply side as well as adaption of consumer behavior are possible steps to follow in developing sustainable tourism. On supply side we intended to discuss the feasibility and the acceptance of establishing such sustainable ski tourism. The concept of sustainable development is complex and might not be clear to everyone, the same with sustainable tourism. In order to secure that the interview partner

knew about this concept and its underlying contents, so he could respond honestly, we first asked how he understood the expression sustainable development and the concept of sustainable tourism. We then provided definitions of sustainable development, sustainable tourism and sustainable tourism development to each interview partner:

Sustainable development implies "meeting the needs of the present without compromising the ability of future generations to meet their own needs" (World Commission on Environment and Development, 1987).

Sustainable tourism is, "Tourism that meets the needs of present tourists and host regions while protecting and enhancing opportunities for the future" (World Watch Institute, 2005).

"Sustainable tourism development requires the informed participation of all relevant stakeholders, as well as strong political leadership to ensure wide participation and consensus building. Achieving sustainable tourism ... requires constant monitoring of impacts, introducing the necessary preventive and/or corrective measures whenever necessary. Sustainable tourism should ... ensure a meaningful experience to the tourists, raising their awareness about sustainability issues and promoting sustainable tourism practices amongst them" (WTO, 2004).

This way we made sure that all responses to the following questions on their acceptance, willingness and feasibility for establishing sustainable ski tourism were trustful and based on their own knowledge and opinions. More background information on the understanding of sustainable ski tourism in this study can be found in the *Glossary* chapter.

4.3.2. Qualitative content data analysis

The qualitative content analysis described is a set of techniques for analyzing texts that were developed in the nineteen eighties in the context of a large psychological study on unemployment (Mayring, 2000). The main goal of the qualitative content analysis is to combine the advantages of quantitative content analysis developed in communication sciences with qualitative-interpretive steps (Brosius & Koschel, 2001). Qualitative content analysis is appropriate to work with any kind of fixed communicational material, being it written texts, videos or transcripts. The method embeds material into a communicational model to make specific inferences from text to other states of properties of its source. In a qualitative content analysis the data is reduced to extract the relevant aspects of the content (Mayring, 2000, 2002, 2003).

The four categories of quantitative content analysis (fitting the material into a communication model, rules of analysis, category centred, criteria of reliability

and validity) will be preserved to be the fundament for qualitative oriented procedure of text interpretation. In the procedures of qualitative content analysis, there are two central kinds of category development: inductive and deductive application. In the inductive approach the categories as aspects of interpretation are developed as close as possible to the material, formulating them, while the analysis is in progress. The material is worked through and categories are tentative and step by step deduced, revised and eventually reduced to main categories (Brosius & Koschel, 2001).

In the deductive approach aspects are formulated prior to analysis, connecting them with the text. The qualitative step of analysis consists in a methodological controlled assignment of the categories to the text passages. Within the last years, several computer programs have been developed to assist the process of interpretation to handle the texts and the coded passages. We were using content analysis software MAXqda2 for the coding and the handling of the transcriptions and text bits. The categories are the core of any content analysis. Categories should be disjunctive, complete and precise. Categories of one variable should not be overlapping. Each unit of analyzed text is referred to a category and can be referred to other categories at the same time (Mayring, 2003). Figure 15 shows the working steps of a qualitative content analysis.

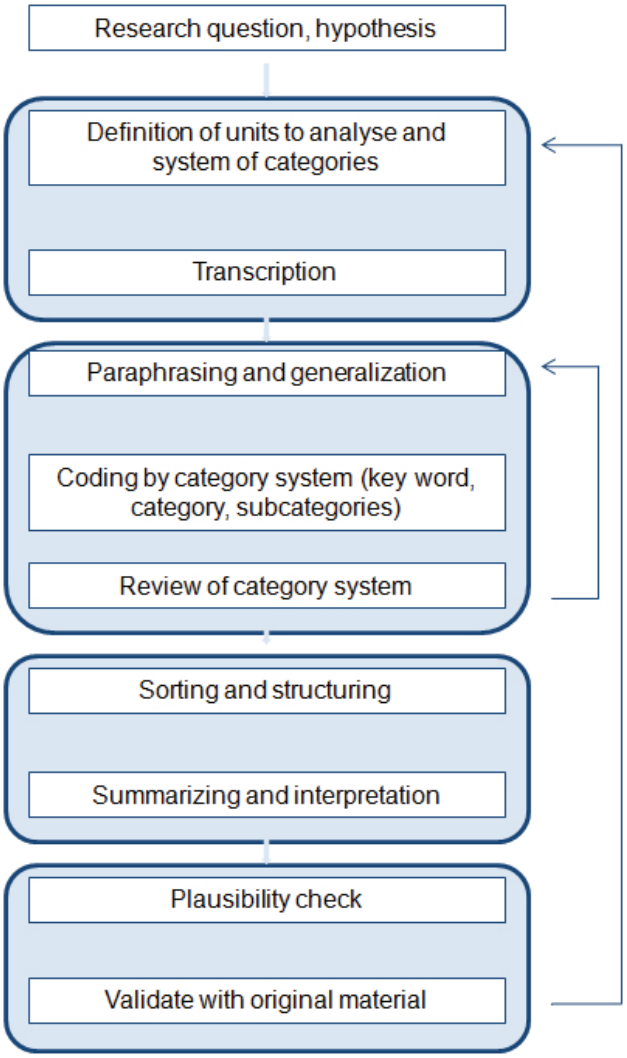

Figure 15 Working steps of the qualitative content analysis (Mayring, 2003)

4.3.2.1. Step one: Definition of units to analyze and system of categories

Starting from the research question and the hypotheses, the units to be analyzed and the system of categories were set. The units of analysis were the twenty ski areas interviewed. The categories were deductively developed according to experiences of earlier research in the field of climate impacts on ski tourism (see chapter two) and according to our research goals and questions (chapter three). Still, they were open for inductive changes throughout the analysis. The seven main categories were further divided into 26 sub categories, again addressing our research goals and questions. The seven main categories of this analysis are:

1. Description of facts about the ski area
2. Experiences of global change after the analogue winter 06/07
3. Estimation of general vulnerability
4. Sensitivity elements

5. Adaptive capacity
6. Strategies and action to cope with global change impacts
7. Outlook on the future of the ski area and of ski tourism in general

Further divisions in up to three sub categories were made in some cases as shown in table eight.

4.3.2.2. Step two: Transcription

The complete recorded interviews were transcribed using Dragon Naturally Speaking software 9.0. The seventeen hours of interviews resulted in 167 pages of transcribed texts.

4.3.2.3. Step three: Paraphrasing and generalization

The transcribed texts were mostly (16 out of 20) in the German language and not translated into English to keep the original spelling of the material. The two French transcriptions were translated into German while the two English texts remained in English, again to keep the original spelling where possible. The texts were paraphrased and generalized, dropping irrelevant text bits and bringing it into a similar grammar and expression. Because of the scope of languages and dialects of the four visited countries, this step required major work.

4.3.2.4. Step four: Coding by category system (category, sub category, key word)

Before coding was started key words were defined that addressed the research questions and described the sub categories. On the basis of the preliminary system of categories, we referred the text bits (codings) to categories and sub categories with help the defined key words, using content analysis software MAXqda2 for the coding and the handling of the transcriptions and text bits. In total 1908 codings were made (table eight).

4.3.2.5. Step five: Review of category system

Throughout the coding process we inductively refined and extended the categories and sub categories where necessary, meaning where the existing sub categories could not be matched with new codings found.

Table 8 Categories and sub categories of content analysis
Shown are the numbers of codings from the interviews with twenty ski area managements.

Categories and sub categories of content analysis				
Category	1st sub category	2nd sub category	3rd sub category	Codings
Description				**Sum 207**
	Snow making	Percentage		21
	Price day ticket	Price		20
	Operating days	Days summer		20
	Operating days	Days winter		20
	Diversity	Bed capacity		11
	Diversity	Day visitors		27
	Diversity	Sales winter	Summer	20
	Diversity	Visitors winter	Summer	29
	Diversity	Gastronomy		18
	Diversity	Hotels		21
Experiences after the winter 06/07				**Sum 78**
	Winter 06/07	General		38
	Winter 06/07	Loss		20
	Operating days needed			20
Estimation of general vulnerability				**Sum 224**
	USP	Winter		21
	USP	Winter	Snow	23
	USP	Summer		18
	USP	Other		29
	USP	Environment	Sustainability	12
	Target groups			37
	Performance key factors			21
	Climate Change			26
	Demographics	Socio-graphics	Socioeconomics	37
Sensitivity elements				**Sum 174**
	Media			18
	Regulatory System			16
	Economics	Prices		21
	Water availability			12
	Infrastructure	Gastronomy	Hotels	10
	Infrastructure	Housing	Cold/warm beds	13
	Access			11
	Dependency on day guest			24
	Diversity factor			18
	Summer sea tourism			11
	Ski area competitors			20
Adaptive capacity				**Sum 431**
	Resort structure	General		53
	Resort structure	Shareholders		14
	Destination communicaton			30
	Destination communicaton	Hotels and gastronomy		7
	Internal resort communication			10
	Customer Relationship Management(CRM)	General		70
	Customer Relationship Management(CRM)	E-commerce		23
	Environmental Management Systems (EMS)	General		95
	Environmental Management Systems (EMS)	Environmental report		19
	Environmental Management Systems (EMS)	Environmental performance		44
	Benchmarking			30
	Partnering Destination			36
Strategies and action				**Sum 662**
	Education	Personal		18
	Venture capital			3
	Marketing	Partnering		34
	Marketing	Marketing CSR		61
	Marketing	Club of CSR destinations		26
	Marketing	Target group adressment		40
	Adaptation	Prices		16
	Adaptation	Regulatory system		21
	Adaptation	Other activities		14
	Adaptation	VIP skiing		24
	Adaptation	Cheap skiing		11
	Adaptation	Snow in towns	Ski domes	22
	Adaptation	Summer tourism		30
	Adaptation	Flexibility season tickets		12
	Adaptation	Snow making	Water management	38
	Adaptation	Ecotourism		14
	Adaptation	Snow farming	Covering glacier	3
	Adaptation	Upsizing	Concentration	14
	Investments	Hotels	Gastronomy	12
	Investments	Snow in towns		11
	Investments	Access		16
	Investments	Green energy		12
	Investments	Expansion		27
	Investments	Summer tourism		21
	Investments	Lifts		11
	Investments	Snow making		18
	Investments	Reservoirs		11
	Investments	Optimization resort		2
	Mitigation	Examples		4
	Mitigation	% of ticket for CSR		34
	Mitigation	Move season later		19
	Chances			29
	Sustainable tourism			34
Outlook				**Sum 132**
	Future of station	Lifts renewing		58
	Costs ticket price			25
	Services demanded			49
Sum of codings, by the seven main categories				**1908**

The questionnaire with the guiding questions, divided by categories and sub categories, is shown in appendix A.

4.3.2.6. Step six: Sorting and structuring

The high number of key words, categories and sub categories made a re-structuring and a sorting for relevance necessary. The order of the system was matched with the relevance for addressing the research questions. The total content needed multiple steps of structuring and sorting. We extracted the contents several times to bring them down to a readable length, filtering the main contents and codings that addressed the research questions to become as dense as possible. In total 215 codings (citations) were then displayed in the results chapter below as shown in table seven. Codings were selected that provided new information responding best to the research questions and the category system. All stated opinions are included in the displayed citations with at least one display per opinion. This sorting process led to the final structure of the results presentation applied in chapter 4.4.

4.3.2.7. Step seven: Summarizing and interpretation

The contents of the text bits were summarized as the basis for later interpretation within each category and sub category. Again, several loops of summarizing were necessary to reduce and compact the amount of data to a relevant and manageable depth that addressed the research questions sufficiently, without repetitions. Because all stated different opinions are included in each sub category, a measure was needed of how to come to general interpretations of results. In this case a general opinion was interpreted as such if at least half of the twenty interviewed persons stated to be of that opinion. Table eight presents the number of codings for the sub categories, and table seven shows the number of relevant citations selected and displayed from each interview.

4.3.2.8. Step eight: Plausibility check

The interpreted results were checked for plausibility with results of other studies (described in the literature review of chapter two) and with consistency of the theoretical concept of the method and of the research goals.

4.3.2.9. Step nine: Validate with original material

Already in the process of sorting and structuring, the results were validated consistently with the original material. Some of the interview bits were repeatedly listened to, to validate the meanings and the personal expression of the interviewed person. In this last step, and after interpretation, we anonymized the codings in the final text by eliminating the original name of the interviewed ski area. Instead we added a short indicator to the end of the codings that

consists of an internal reference number for the ski area from one to twenty and a combination of letters, describing the class of the ski area as shown in table six.

For example, *S1shw* stands for the ski area with the internal number one that is of small size, high and world known. *S2bhw* with internal number two is big, high and world known. *S9sll* is small, low and of local importance. *S17gw* has a glacier and is world known. *S19bll* is big, low and of local importance. The short indicators are listed as well in table six. With this short indicator one can see from what class of ski areas the citation is derived from and thus valuate it in the right context. The internal reference number also guarantees a quick reference back to the original interview data.

4.4.Results

This chapter presents the results of the qualitative content analysis in eight headlined chapters matching the initial six supply side research questions and addressing the seven categories defined for the content analysis, as shown in table nine. The eight headlined chapters of presentation match key words included in the research questions for direct reference.

Table 9 Research questions, categories and presentation headlines
Shown are the six initial research questions, matched by seven categories in the content analysis, and presented in eight headlines in the Results chapter 4.4.

No.	Research questions	No.	Categories of content analysis	No.	Presentation headlines of results
1	How do ski areas perceive global change after their experiences of an analogue winter for future developments?	1	Description of facts about the ski area	1	Perceptions of global change after the analogue winter 06/07
		2	Experiences of global change after the analogue winter 06/07		
2	How vulnerable do they think they are, and which are sensitivity elements?	3	Estimation of general vulnerability	2	Estimation of general vulnerability
		4	Sensitivity elements	3	Sensitivity elements
3	How do they estimate their adaptive capacity, and what are their adaptation strategies?	5	Adaptive capacity	4	Adaptive capacity
4	What is the willingness for mitigation?	6	Strategies and action to cope with global change impacts	5	Strategies and action
				6	Willingness for mitigation
5	Would ski areas believe and invest in sustainable ski tourism?			7	Chances and sustainable tourism
6	Where do ski areas see the need for action, and where do they see opportunities in global change?	7	Outlook on the future of the ski area and of ski tourism in general	8	Outlook and external support

Within each of the eight main headlined chapters, sub headlines are defined according to the finalized structure that came up during step six of the content analysis as described earlier, slightly differing from the initial set of sub categories. The sub headlines are formulated to summarize the main contents of these sections. Within these sub chapters the results are presented in altering segments of original codings of the interviews in *italic* letters – being citations – and our interpretive summaries of the citations. At the end of each main category we provide a summary in **bold** letters.

4.4.1. Perceptions of global change after the winter 06/07

This first category is divided into three sub categories, which are then structured by summarizing headlines, finalized by a summary each:

1. Experiences of the winter 06/07

   - Lower areas suffered more
   - Higher areas gained – but not always
   - Snow making saved the season
   - Absent day visitors as the main cause
   - Communication effects on skier demand
   - Diversification helped – gains in gastronomy
   - Surviving is not surviving
   - A minimum number of operating days
   - Summary of experiences

2. Perception of climate change impacts

   - No doubts about climate change
   - The major threat for lower ski areas
   - Snow making as the solution
   - Glacier resorts equal higher ski areas
   - Local differences of impacts
   - Advantages of lower ski areas
   - Indirect impacts being more problematic for higher areas
   - Summary of climate change perception

3. Perception of demographic, socio-graphic and socio-economic changes

   - Loosing clientele is a greater threat...
   - ...or coping with too much demand?
   - People forget about snow
   - Socio-graphic opportunities
   - Flourishing the market with service
   - Feedback loops from fewer tourists
   - Decreased interest in skiing
   - Public support is missing
   - Demography and cold beds
   - Uncertainty or just no awareness yet
   - Summary of perception to indirect and social changes

4.4.1.1. Experiences of the winter 06/07

The reported losses of the winter 06/07 are especially high when compared with the winter before (05/06) because 05/06 was a record high in the last century in terms of sales and visitor numbers as stated by the interviewed ski areas. The comparison with a ten year average reveals a result of 06/07 of total sales that is about average.

> *„Wir haben einen Umsatzrückgang zum Vorwinter von knapp 21%. Allerdings muss man sagen, man vergleicht einen sehr schlechten mit dem bisher stärksten Umsatzrekord-Winter. Im zehnjährigen Schnitt liegen wir exakt in der Mitte. Fast auf den Euro genau." (S7blw)*

The experiences of the analogue winter are seen as helpful by some ski areas for the future to demonstrate probable threats and opportunities.

> *„Und ich denke doch, der letzte Winter war nun nicht gerade optimal und hat auch gezeigt, was eben möglich ist oder eben nicht möglich ist. Das war für das Geschäft sicherlich gut." (S5sll)*

Lower areas suffered more

The lack of snow was severe in the lowlands and the lower ski areas. Ski areas suffered from a lack of snow and a resulting drop in visitor numbers. Depending on the elevation, though, some areas suffered much more than others and some even had no loss at all. The highest losses are reported from those areas in lower elevations, such as Diedamskopf, with a minus of about 40%, also in the lower French stations. Other lower areas had losses between 15% and 35% compared to 05/06. In some lower stations even the year 05/06 was not a positive record year because all the small ski areas in the lowlands were open and the flexible day guests chose the closest areas with the shortest travel distance. The day guests stayed away.

> *„Wenn man die gesamten Wintersportorte betrachtet, haben diejenigen, die in niedriger Höhenlage liegen von dem Schneemangel gelitten. Sie haben nämlich sehr umfangreiche Verluste, zum Beispiel La Bresse ungefähr 40%, Praz sur Arly ungefähr 35%." (S10shl)*

> *„Das Jahr davor war für uns kein Spitzenjahr. Es war ein gutes Jahr, aber kein Spitzenjahr. Weil im Jahre davor natürlich alle Skigebieten bis ins Allgäu hinaus gegangen sind. Damit haben sich die Skigäste natürlich gut verteilt. Was wir an und für sich schon sehr befürworten. Weil wir glauben, dass das längerfristig das Skifahren erhält. Der Rückgang zum Durchschnitt ist etwa bei 40%." (S3sll)*

> *„Ja, wir hatten etwa 24% Umsatzeinbußen. Und das geht nur auf die Tagesgäste zurück, weil im Bereich der Aufenthaltsgäste hat es sogar eine leichte Zunahme gegeben." (S6blw)*

Higher areas gained – but not always

Most of the ski areas in higher elevations only had a small reduction of about 2-3% compared to 05/06, but some even had a reverse season with gains in sales. Losses originate from dropping numbers of day guests.

> *„Wir haben es analysiert, weil letzter Winter wirklich ein Ausreißer war. Wir haben sehr gut gearbeitet mit den Destinationsgästen, die gebucht haben und dann auch gekommen sind. Von denen wir auch sehr gute Rückmeldungen erhalten haben. Das kleine Minus von rund 2%, das wir letzten Winter eingefahren haben, stammt von den Tagesgästen." (S14bhw)*

Verbier and Zermatt both made a bonus, 10% in Zermatt and 3% in Verbier, which could have even been higher with better communication in the media. These higher areas profited from day skiers who could not ski in the lower areas closer to the source markets and instead visited the higher areas. Many of those visitors were surprised about the great snow conditions higher up where it was cold enough to make snow.

> *„Das ist richtig. Wir haben das bereits letzten Winter gehabt, wir haben 10 % mehr Umsatz gemacht. Eine Umsatzsteigerung von 10%. Das ist enorm." (S20gw)*

> *„Nein, sogar höher. Circa 3% mehr. Wir hatten hier ganz gut Schnee. Mehr Schnee als vielleicht irgendwo anders. Ich glaube viele Leute konnten im Jura und in den Voralpen nicht Skifahren, und sie kamen zu uns. Trotzdem waren wir nicht zufrieden. Ich glaube wir hätten plus 15% haben können und nicht nur plus 3%." (S18gw)*

Snow making saved the season

The twelve ski areas of Dolomiti Super Ski had a reverse season to the average too. The winter there was warm and dry with a lack of natural snow, but through technical snow making they could save the season and even had a result in sales that was one of the best so far. Dolomiti could open 100% of the runs on Christmas by technical snow making, although the beginning of the season was more difficult with some losses to report.

> *„Letzten Winter, wo alle sagten, dass er so schlecht war, war bei uns der Beste. Letzter Winter!" (S4bhw)*

Gstaad in the Berner Oberland suffered from not being equipped with sufficient snow making.

> *„Unser Nachbargebiet Adelboden-Lenk hatte einen wesentlich geringeren Einbruch. Der wunde Punkt bei uns ist, wir haben das Thema Beschneiung verschlafen. In Adelboden-Lenk haben die 60 bis 70% der Pisten beschneit. Wir haben gerade einmal 25%. Da hat man gesehen, was das ausgemacht hat. Das ist brutal." (S6blw)*

In the higher elevations snow making was possible from the beginning and continued, not in the lower areas though.

> *„Ja also man konnte sehr spät schneien und in den tieferen Gebieten war es zu warm, um die Schneianlagen laufen zu lassen. Wir haben sehr viele gehabt die verwundert waren, die hier zum Skilaufen kamen." (S20gw)*

Absent day visitors as the main problem

The biggest drop in sales results from the missing day visitors. The overnight guests were mostly uncompromised and stuck to their usual destination. The drop in day guest numbers was the main cause of losses in the ski areas with lower sales in that season 06/07.

> *„Also, wir machen etwa 50% von unserem Umsatz mit Tagesgästen. Sogar ein bisschen mehr. Von diesem Umsatz mit Tagesgästen ist letzten Winter ungefähr die Hälfte weggebrochen. Also wir hatten wirklich markante Einbrüche." (S6blw)*

> *„Wir haben sehr gut gearbeitet mit den Destinationsgästen, die gebucht haben und dann auch gekommen sind. Von denen wir auch sehr gute Rückmeldungen erhalten haben. Das kleine Minus von rund 2%, das wir letzten Winter eingefahren haben, stammt von den Tagesgästen." (S14bhw)*

Communication effects on skier demand

In St. Moritz, the snow conditions were quite good, but there was a lack of communicating the conditions to the media, so not enough tourists knew about it. Their small reduction of 2.6% still meant about 1.4 Million Euros less in sales.

> *„Wir hatten zahlenmäßig im letzten Winter 2.6% weniger Umsatz gehabt. Also etwa 1.4 Millionen haben wir weniger eingenommen. Gegenüber dem Jahr davor. Obwohl wir gute Bedingungen hatten, wir hatten von Anfang an immer Schnee. Nicht in Haufen, aber wir hatten super Bedingungen. Aber das Problem das wir hatten, wir haben es nicht geschafft, in der Kommunikation das so rüberzubringen." (S15bhw)*

The problem of missing communication is also reported from other ski areas, which had quite good snow conditions, but could not communicate it. The overnight guests were stable, but the day guest did not believe in the good ski conditions because he did not expect it and he did not know about it.

> *„Das heißt, Nächtigungsgäste an sich waren gleich, es ist nur der Tagesgast ausgeblieben. Weil es uns nicht gelungen ist, aufgrund der medialen Inszenierung mit der Kernbotschaft durchzudringen, dass bei uns alles läuft." (S11bll)*

Diversification helped – gains in gastronomy

The more diversified ski areas gained from a growth in the gastronomy, for example, in Davos or St. Moritz. The gastronomy sector seemed to benefit from visitors who skied less due to the lack of snow, but instead visited the gastronomy more often and consumed more there. The losses from skiing were buffered to a certain degree.

> *„Aber von den Einnahmen her, wir konnten später starten in die Saison. Seit langer Zeit erst am 13. Dezember. Wir haben 0.1% verloren in dem gesamten Verkehrsbereich,*

haben aber in der Gastronomie zugelegt. Und das gesamte Ergebnis ist sogar ganz schwach höher." (S1shw)

Surviving is not surviving

Surviving some seasons like 06/07 would be possible for most ski areas, but the necessary cash flow for investments cannot be generated any more. Renewing of old lifts, snow making infrastructure or investments in more diverse activities have to be postponed or financed by bank credits. Interest for the credits has to be paid at once, and amortization of investments from earlier years is then becoming problematic too. With more winters like the one in 06/07 resulting in insufficient cash flow, no investments can be made anymore. The ski area then looses either on attraction or, for example, on allowances of operating older lifts that require replacements. Surviving for the short term is thus different to surviving for the long term.

„Naja, wenn die Einbußen nicht schlimmer werden, können wir das praktisch ewig aushalten. Letztes Jahr ist an fünfter Stelle im 10-Jahresschnitt. Schlimmer darf es nicht werden. Also das ist auch irgendwie die Versicherung von Anlagen." (S7blw)

„Ja gut, das Problem ist, überleben können wir wahrscheinlich ein paar Jahre. Aber es würde sich niederschlagen in den Investitionen, im Ausbau der Beschneiung. Im Unterhalt der Anlagen, im Austausch der Anlagen. Irgendwann ist dann einfach kein Geld mehr da. Da sind die Ressourcen aufgebraucht. Und irgendwann kommen sie in eine Situation, wo es einfach eine neue Bahn braucht, weil sie die Sicherheitsbedingungen nicht mehr erfüllen nach 30 Jahren. Wir haben das jetzt in Pischa. Um den Betrieb zu erhalten müssen wir 2 Millionen investieren. Und wenn sie halt dann keinen Cashflow mehr haben, dann können Sie das nicht mehr, können keine Abschreibungen mehr machen, sie haben kein Geld mehr um zu investieren. Und irgendwann drehen dann die Banken auch einfach den Hahn ab. Das anzunehmen, wäre fahrlässig, das kann ich Ihnen nicht sagen. Aber ein paar Jahre könnten wir es bestimmt." (S15bhw)

„Das würde sich sofort niederschlagen. Jedes Jahr. Also wir haben dafür jetzt als Beispiel mit dem schlechtesten Winter, da haben wir das Soll-Cashflow erreicht. Also die notwendige Million, die Million Cashflow, die wir erreichen müssen, um die betriebsnotwendigen Abschreibungen zu machen. Das haben wir erreicht. Das heißt konkret, es war ein schlechter Winter. Uns bringt das keinen Schritt vorwärts. Aber auch keinen zurück. Das ist eine wichtige Rechnung, und da streuen sich viele Sand in die Auge. Die sagen, eine Million Cashflow ist doch eine Million verdient. Aber du brauchst ja die Millionen um allein das zu erhalten, was es gibt. Das heißt, mit so einem Winter, wie wir jetzt gehabt haben, können wir noch lange, könnten wir noch lange den Betrieb aufrechterhalten. Aber nicht massiv in die Zukunft investieren." (S16sll)

A minimum number of operating days is needed

The question is not so much to operate on a minimum number of days to generate enough sales. It is more so the time when an area can open. A regression from 120 opening days back to 100 days would be fine as long as ski areas can open on the high season days. The risk, of course, is that around

Christmas (as one of the main visitor periods of the winter), poor snow conditions have been increasing. Ski areas could even earn more if they just opened at the high season days. The closure date in most destinations could be extended to the end of April or even to the beginning of May, but from an economic perspective it does not make sense. After Easter and before Christmas the ski area spends money. An ideal season from an economic point of view would start at Christmas and finish with Easter.

> *„Also wir haben 120 Betriebstage im Winter. Wovon es sicher 30 starke Tage braucht." (S16sll)*

A better indicator thus is the number of visitors per season needed.

> *"I think it is not a good question, a good question is how many visitors or so. I don't think it is the number of the days." (S8gw)*

4.4.1.2. Summary of experiences

In the winter 06/07 the higher ski areas clearly had the fewest losses if not even gains compared to the year before. The colder temperatures and sufficient equipment with snow making technique helped those high areas over the season. Still, losses were reported resulting from day visitors staying away because they did not know about the good conditions higher up. The lower ski areas had high losses and could not produce enough snow – either because of the warm temperatures or because there was not enough snow making equipment. Diversification in gastronomy helped to buffer the losses from missing skiers.

4.4.1.3. Perception of climate change

No doubts about climate change

No one of the twenty interviewed ski area managers is denying climate change and impacts on ski tourism.

> *„Dass es langsam wärmer wird, das wissen wir." (S4bhw)*

> *„Ja gut, die Klimaerwärmung ist sicherlich nicht weg zu diskutieren. Da wird man sich sicherlich noch Gedanken darüber machen müssen und auch Strategien entwickeln." (S5sll)*

> *„Also sagen wir einmal so, wir unterscheiden uns ein bisschen von George Bush, der den Klimawandel für nicht existent hält." (S11bll)*

Some though see the climate change discussion being overrated by the media and by scientists.

> *„Es war im Grunde genommen keine Klimadiskussion, sondern eine medial inszenierte Diskussion." (S11bll)*

Many interview partners are uncertain about what they should or should not believe. The opinions of the media and of scientists differ from the experiences of long-term locals saying that such winters had been there before.

> *„Das andere war das Klimatologische. Das ist natürlich auch schwierig zu sagen. Die einen sagen so, die anderen sagen so. Der Winter war natürlich speziell und jeder hat sich auf das eingeschossen, auf Klimawandel. Ich glaube, wenn man bei uns im ORF eingeschalteten hat nach 19:00 Uhr, da ist jeden Tag etwas gelaufen von Klimawandel. Das ist furchtbar und schlimm. Ich wage es nicht zu beurteilen, ob das stimmt oder nicht. Nur, die alten Leute sagen, die sagen, das hat es immer schon gegeben. Ich bin der Meinung, dass in der nächsten Zeit auch wieder sehr schneereiche Winter kommen werden. Dass sich generell etwas ändert, das wird sicher so sein. Aber dass wir das so schnell sagen können von einem Winter zum anderen, das wage ich zu bezweifeln." (S19bll)*

Ski areas observe more extreme weather patterns and quicker changes of weather cycles, though independent from a general warming trend of the average temperature.

> *„Was wir allerdings feststellen ist, dass wir in kürzeren Abständen verschiedene Klimas haben. Früher hatten wir, ich habe das einmal nachgeschaut, aber auch einmal erst im Februar Skibetrieb. Und das Jahr davor war dann aber ein Rekordjahr mit am meisten Schnee. Und die Zyklen werden immer etwas kürzer. Was sicher ist, dass wir immer mehr Schnee haben am Ende der Saison. Was wir früher nicht hatten, sprich im April. Und weniger am Anfang der Saison. Auch mehr Wärme. Wobei das irgendwie komisch ist, wir haben oft im November viel kälter als den Dezember." (S1shw)*

> *„Man spürt sicher, dass es einfach keine Regelmäßigkeit vom Winter gibt. Einmal kann er sehr stark sein, dann wieder einmal nicht mehr so. Oder teilweise viel Regen. Dass es einfach einmal regnet bis ganz hoch, bis über 3000 m. Das war früher nicht der Fall. Da hat es schon einmal geregnet, aber nicht so, dass es einfach diese Schwankungen hat. Und wie will man vergleichen? 2003 hatten wir einen sehr intensiven Winter, 1999 hatten wir einen starken Winter mit viel Schnee. Das war der Lawinenwinter. Die Regelmäßigkeit des Winters ist nicht mehr da." (S2bhw)*

The major threat for lower ski areas

For the lower and smaller ski areas, climate change and warmer temperatures are a major threat of the future. They expect the costs of technical adaptation getting too high and ski areas in lower and middle elevations to diminish, because companies only invest into the higher ones.

> *„Die hauptsächliche Bedrohung ist die Abnahme des Schnees, der sich wiederholende Schneemangel. Man fürchtet, nicht mehr in der Lage zu sein, ein Skigebiet anbieten zu können, das den Kundenerwartungen entspricht. Man fürchtet auch, keine ausreichende finanzielle Kapazität mehr zu haben, um trotz kürzerer Saisonen „leben" zu können. Die großen Konzerne kaufen nur Wintersportorte, die im Hochgebirge liegen. Mehrere Wintersportorte, die in mittlerer oder niedriger Höhenlage liegen, werden verschwinden." (S9sll)*

Snow making as the solution

Most ski areas see their elevation and the possibilities of technical snow making as adequate enough to cope with the direct outcomes of climate change in terms of lacking natural snow. The technological development is expected to find solutions for snowing in even warmer temperatures. The trust in snow making to combat the outcomes of climate change is high.

> *„Aber das haben uns auch die Klimatologen vor 20 Jahren gesagt, wir sollen aufhören, da zu investieren. Und jetzt haben wir inzwischen 20 Jahre, vor allem in den letzten Jahren, immer Rekordergebnisse gehabt. Wir hätten hier schon seit 20 Jahren nicht mehr arbeiten sollen. Wir haben keine andere Möglichkeit, wir haben eben rechtzeitig investiert in Schneeanlagen, die Technologien werden auch immer besser. Muss man eindeutig sagen." (S4bhw)*

> *„Klima ist nicht das Problem. Bis jetzt. Wenn wir Schneekanonen kaufen." (S18gw)*

Even the higher ski areas cannot imagine opening the area without snow making. It has become common practice to produce snow up to the highest elevations to guarantee the season.

> *"It is in our strategy now. We cannot imagine opening the resort without. It is not possible anymore. Like 10 years ago, the strategy was to make some snow on the slopes back to the stations, so you can return to the stations. And now it is different. Now you need to make snow also in the altitude and some slopes where it is easy to make snow early in the season." (S17gw)*

> *„Bis hierhin bauen wir dieses Jahr die Schneeanlagen, bis zur Mittelstation haben wir sie schon. Hier ist die Bergstation auf 3000 m." (S13gw)*

Glacier resorts equal higher ski areas

Even glacier resorts are experiencing climate change and in spite of the "backup" of the glacier, the strategies and the necessity to act are no different. Snow making today happens on glaciers, and summer skiing has already been stopped on some glaciers.

> *„Ja. Also wir sind jetzt zum Beispiel auf der Diavolezza am investieren. Eine Million kommen um die Beschneiung auszubauen. Zusätzliche 1.4 km. Wir wollen da den Gletscher mit aufbauen. Weil der uns wegschmilzt." (S15bhw)*

Local differences of impacts

Ski areas see local differences in the impacts of climate change, depending, for example, on the exposition North-South, the exposure to western weather systems or local cold air influences. For snow making the absolute elevation is not always the determining factor because local inversions can lead to colder air in lower elevations and thus better snowing potential in the valley. Detailed studies for each individual area are needed to then base decisions on.

Landscaping, grading and levelling the meadows of the slopes are techniques to come along with less snow cover in winter.

> *"Wir haben zwar keine detaillierten Untersuchungen hierzu, aber wir haben hier diese klassischen Nordstaulagen, wir sind eigentlich ein Schneeloch. Wenn der Winter auch ein Winter ist, dann bleibt hier bei uns in der Regel mehr liegen als anderswo. Zum zweiten haben wir eine sehr gute Mischung, unsere Handlagen sind zum Teil Nordost und Nordwest also relativ schneesicher." (S7blw)*

> *„Ganz genau. Am Beispiel im Pustertal, es kommen kalte Strömungen, und deswegen haben die einfach durchschnittlich drei oder vier Grad kälter. Auch auf der Höhe. Und so ist es einfach total unterschiedlich." (S4bhw)*

Advantages of lower ski areas

Lower elevations can have advantages for snow making because of inversions, but also because the terrain is less rocky. With more even, grassy slopes less snow is needed and costs for snow making, as well as for water supplies, are lower.

> *„Der für mich wichtigste Faktor ist, ich formuliere es einmal so: dieser vermeintliche Nachteil der moderaten Höhenlage bis 2000 m ist auch ein großer Vorteil. Durch die moderate Höhenlage ist bei uns jeder Gipfel bis ganz hinauf grün. Nicht steinig, nicht felsig. Anders formuliert, wir brauchen ein Bruchteil des Schnees der höheren Skigebiete, um perfekte Skibedingungen bieten zu können. Weil wir einfach den besten Untergrund dafür haben. Bei uns fährt man mit ordentlichem Raureif besser Ski als irgendwo anders mit 1 m Schnee." (S7blw)*

> *„Eigentlich nicht, nein. Wir stellen fest, wenn Schnee liegt, dann liegt er einfach. Wir kommen auch mit sehr wenig Schnee aus. Wir haben nicht so einen steiniges Gebiet wie im Oberengadin." (S12shl)*

Indirect impacts being more problematic for higher areas

The diminishing demand for skiing as an indirect outcome is seen to be more problematic by the higher ski areas. The high areas also see the link to snow in the lowlands and in the lower ski areas. They would lose in the long term too if snow in the source markets got more scarce.

> *„Die Affinität zum Schnee verschwindet. Wenn man keine Affinität hat oder die Leute wissen nicht mehr, was man im Schnee machen kann. Wenn man diesen Schneesport nicht einfach ausüben kann hinter dem Haus, dann wird es auch schwierig, die dann hier hoch zu kriegen. Sie können dann nicht mehr Skifahren…" (S15bhw)*

> *"Weather in the low lands. It's better if there is snow." (S8gw)*

4.4.1.4. Summary of climate change perception

Climate change is not doubted any more. The scale of changes is unclear, though, for many of those interviewed. For lower ski areas the direct effects of climate change are among the biggest problems, especially because the costs

for technical adaptation are getting too high. The higher ski areas come along with snow making so far, but understand the link to the indirect effects on losing customers in the source markets, something technical adaptation on-site cannot cope with.

4.4.1.5. Perception of demographic, socio-graphic and socio-economic changes

Loosing clientele is a greater threat…

The majority understands demographic changes as a main problem of the future for ski tourism, often even more important than climate change. Children who do not learn to ski because their parents or schools do not support it anymore are a major problem. It is more the indirect effects of climate change on society than the direct ecological effects themselves that scare the ski areas on the long term.

> *„Ich glaube, es werden morgen weniger Skifahrer sein als heute." (S18gw)*

> *„Das ist ein großes Problem. Ich habe jetzt eigentlich weniger Angst vor den ökologischen Auswirkungen und der Klimaerwärmung, sondern vielmehr vor deren Wirkung und Rückkopplung auf die Gesellschaft und die gesellschaftliche Entwicklung generell. Wir wissen zum Beispiel, in der Schweiz, dass wenn beide Eltern Schweizer sind, dann fahren 86% der Kinder Ski. Wenn beide Eltern Ausländer sind, sind es nur noch gut 30%. Das ist zum Beispiel ein Problem." (S6blw)*

> *„Also die größte Bedrohung eigentlich ist nicht naturmäßig, sondern personenmäßig. Das werden andere Destinationen auch sagen. Je weniger Skifahrer, ich sage immer Skifahrer ist das falsche, je weniger Schneesportler wir haben, desto schwieriger wird es sein, in der Wintersaison erfolgreich zu arbeiten." (S1shw)*

> *„Aber, da kommt der tragische Aspekt, wenn das eben nicht mehr in den Köpfen wäre. Das ist meine Befürchtung, noch viel mehr, als dass wir keinen Schnee mehr haben." (S16sll)*

…or coping with too much demand?

On the other hand there are higher ski areas that had quite a good season. They are seeing another indirect effect of a demand that is getting too high to cope with in the ski area and in the destination as a whole. New clientele from lower ski areas, where snow reliability is too low and from new markets, could overrun the remaining higher areas.

> *„Wir haben sehr viele gehabt die verwundert waren, die hier zum Skilaufen kamen. Das haben viele gesagt, nächstes Jahr buche ich in Zermatt und komme den ganzen Weg mit dem Auto. In Zermatt wird die Hauptaufgabe sein, wie bewältigen wir den Ansturm?" (S20gw)*

> *„Ja es sind natürlich die großen Märkte, die jetzt aufgehen oder aufgegangen sind, wie etwa China. Also Asien ist für die Schweiz ideal. Dort ist natürlich China ein großes Potenzial. Und wenn einmal das Abkommen funktioniert, dann ist Russland natürlich*

> *wichtig. Da wird eine Mittelschicht in Russland heranreifen und wir haben früher schon viel mit Russland gemacht, da war die Mafia, die gekommen ist vor 10 Jahren. Und jetzt haben wir den Mittelstand, Familien mit Kindern, die das ganze Jahr über hier sind zum Skifahren. Die fallen nicht mehr auf, man hört irgendwo russisch. Sie sind integriert. Und ich bin der Meinung, durch uns, durch die Schweiz und diese Position dieser kommenden Märkte, werden wir einfach Wachstum haben. Dann wird die Frage sein, wo ist die Grenze, dass wir das überhaupt bewältigen können." (S20gw)*

People forget about snow

With less snow in the lowlands and close to the source markets people forget about snow and skiing. This is seen as a problem of the future. Snow is in focus, not skiing as an activity alone.

> *„Es geht heute nicht mehr darum, Skifahrer zu kreieren, wir müssen die Leute auf den Schnee bringen. Das ist ganz einfach. Ob die nämlich Skifahren, Schlittenfahren, Schneeballwerfen, Snowboard fahren oder Langlaufen, das spielt keine Rolle." (S1shw)*

Socio-graphic opportunities

Socio-graphic changes with new target groups from other cultures, for example, from Eastern Europe, are seen as a new chance to make up losses from the traditional markets. This clientele is "hungry" for exploring new terrain and thus could be a new market, even for the leading destinations of the Alps in terms of reputation and prestige. Some parts of Austria already benefit to a high percentage from this clientele.

> *„Mit der ganzen Geschichte Osteuropa, da bin ich eigentlich ein wenig anderer Meinung als sie gesagt haben. Ich habe eigentlich festgestellt, dass in Osteuropa die ganze Entwicklung von Wintersport erst richtig angelaufen ist. Sieht man auch mit den eigenen Skistationen, die die haben. Beispielsweise das ganze Kärnten lebt von diesen Gästen. Und ich bin überzeugt, dass die typischen sagen wir einmal alten Destinationen wie Kitzbühel, Engadin und bei uns usw., dass wir dazugewinnen von diesen Gästen. Weil die ja auch einmal hierhin gehen wollen, in die altbekannten Stationen. Ich glaube, das ist ein sehr großer Markt, der uns auch neue Schneesportler bringt. Weil der Markt wohl teilweise gesättigt ist, in Zentral-Europa. Aber absolut nicht in Osteuropa." (S1shw)*

Eastern Europe is seen as a growing outbound market for skiers, as well as Asia and China. Other countries, like Africa or Southeastern Europe, are less affinitive to skiing. It depends on the ratio in the different Alpine countries and regions and the access to those markets, whether ski areas can benefit directly from it or not.

> *„Alle Bevölkerungsgruppen, ob sie aus Afrika kommen, der Türkei oder dem Kosovo, sie fahren kein Ski." (S18gw)*

Flourishing the market with service

More quality, service orientation and specific target group addressment are needed to maintain a necessary market and a number of people because the total sum of skiers is not growing, but rather shrinking.

> *„Wir sind hier noch auf einem guten Weg. Wir müssen einfach Sorge tragen für den Kunden. Den Gästen etwas bieten, Qualität bieten. Und demographisch genau gleich, da müssen wir das eben etwas auseinander nehmen. Durch das sie auch diese fünf Gebiete haben, können wir das auch ein bisschen schleusen oder streuen, dass wirklich jeder Kunde sein Bedürfnis befriedigt bekommt." (S2bhw)*

Feedback loops from fewer tourists

A diminishing population in the mountains can also lead to environmental problems. No more active agriculture or forest management and an increasing risk of landslides could harm the local economy even more and would make the area less attractive for tourism.

> *„Wir haben das in Italien im Apennin zum Beispiel, wo es Abwanderung gibt. Dort gibt es größtenteils auch Umweltprobleme im Gebiet. Während hingegen wenn die Bergbevölkerung in den Gebieten bleibt, in unserem Gebiet zum Beispiel, in Südtirol sehen Sie das vielleicht am besten, dass dort die Berggebiete gut erhalten sind. Wenn die gut erhalten sind, dann kommen auch keine Muren runter. Es rutscht alles wenn man die Berggebiete nicht erhält." (S4bhw)*

Decreasing interest in skiing

Skiing lost some of its uniqueness, its sexiness and exoticism of the past. There are now so many trendy sports, and with the variety and the competition so great, people get distracted from skiing. In combination with less snow in the vicinity of the towns, the whole interest in the sport is decreasing.

> *„Skifahren ist auch irgendwie nicht mehr sexy. Also diese Zeiten, die sind vorbei. Es sind neue Trendsportarten gekommen. Die man auch wegen der Globalisierung des Tourismus im Sommer, respektive auch im Winter ausüben kann. Man fliegt heute im Winter nach Kapstadt und geht in Südafrika Golf spielen, man geht nach Mauritius oder auf die Malediven zum tauchen, da war früher überhaupt nicht die Rede davon. Im Winter war man in den Alpen, man hat den Schneesport ausgeübt. Und heute ist das eben nicht mehr der Fall." (S15bhw)*

> *„Wenn die Städter keine Möglichkeit mehr haben, relativ schnell in die Voralpen-Skigebiete zu kommen, auf 1000 m, auf 800 oder 900 m, dann gehen die nicht mehr Skifahren. Weil ich habe Skifahren im Prinzip auf einem Hügel gelernt bei mir hinter dem Haus. Und das ist vorbei, und dann sind wir irgendwo im Züricher Oberland, im Wald Skifahren gegangen, da hat man sich bewegt zwischen ungefähr 800 und 1000 m. Diese Skilifte, die stehen still. Weil es keinen Schnee mehr gibt dort unten, und beschneien können Sie nicht, weil sie ein Klimaproblem haben." (S15bhw)*

Public support is missing

It is also a problem of the political regulatory system. Savings in sports and youth programs are leading to a diminishing number of school camps and ski offers for kids, pupils and students. The ski areas see the need to act.

> *„Dann kommt dazu, dass im Bereich Jugend und Sport von allen Seiten gespart wird. Nicht nur in der Schweiz, auch im Ausland. Wir sind früher mit der Schule noch zum Skifahren gegangen, oder man ist in ein Skilager gegangen. Das wurde gefördert, das ist heute nicht mehr so." (S15bhw)*

Demographic development increases number of cold beds

Demography and an aging class who own homes is a problem because of an increasing number of cold beds. Generally, older people utilize the internet infrequently and become less active with renting their homes in the destinations.

> *„Zum Beispiel die Demographie bei den Ferienwohnungsbesitzern. Ein Thema sind sicherlich die kalten Betten. Keine Bewirtschaftung der Betten. Teilweise veraltete Hotelinfrastrukturen. Themen, die auch andere alpine Destinationen zu schaffen machen. Wir haben teilweise Ferienwohnungsanbieter, die etwa vor 30 oder 40 Jahren ihre Wohnung gekauft haben und 60 oder 70 sind. Die dann einfach mit dem Internet nicht mehr so arbeiten." (S5sll)*

> *„Und das sind auch die Anstrengungen, die wir überall machen. Damit wird die Jugendlichen ansprechen können, das fängt schon bei etwa 12 an bis etwa 22, darum auch die ganze Entwicklung bei uns in Snowboard-Bereich. Wir sehen heute, dass das eigentlich der richtige Weg sein wird. Um die Familien abzudecken. Sonst würde sich mit der Zeit eine Überalterung des Gastes einstellen, das darf auch in Arosa nicht geschehen."* (S1shw)

Uncertainty or just no awareness yet

Some ski areas do not collect data so far on demography, and knowledge tends towards zero.

> *"We do not analyse these changes and impacts really." (S8gw)*

> *„Also von wegen Herkunft und demographischen Daten ist es etwas schwierig zu sagen, weil wir da keinen Datenbestand haben." (S19bll)*

4.4.1.6. Summary of perception to indirect and social changes

Indirect effects of climate change, such as demographic, socio-economic and socio-graphic aspects are seen as threats of higher importance in the long term. People in the source markets lose interest in skiing, children are not taught skiing anymore by school camps or by their parents. Emerging markets are generally seen as a chance to equalize losses in the common markets. A fewer number of ski areas could lead to over-demand in the remaining ski areas.

4.4.2. Estimation of general vulnerability

This second category is structured by summarizing headlines, followed by a summary:

- Vulnerability is perceived with big differences
- Limited market and fewer ski areas
- Uncertainty in the long term
- Summary

Vulnerability is perceived with big differences

On a scale of one (not vulnerable to global change) to ten (most vulnerable) ski areas estimated their vulnerability. The overview shows surprising differences where high and big areas, like St. Moritz or Sölden, guess their vulnerability with 5 and 7.5 out of 10 as higher than small and low areas like Toggenburg with 2.5 or Diedamskopf and Flumserberg with 3 out of 10 as shown in the table. The reported losses of the season show differences with the self-estimation of the ski areas. Eleven out of twenty ski areas or 55% estimate their vulnerability correctly compared with the actual losses of that year. Four ski areas or 20% overestimate their vulnerability; the losses of that season were less or even gains. Instead, they more so pointed out the demographic and indirect aspects as threatening most. Five or 25% underestimate their vulnerability; losses here were very high. These ski areas all guessed themselves at about three out of ten on that scale, but had losses between 20% and 40% (table 10).

Table 10 Self-estimation of vulnerability and real losses in 06/07
Also shown are elevation, skier days and day guest percentage of interviewed ski areas.

	Self estimation of vulnerability to global change (1 low to 10 high)	Loss in 06/07 to 05/06 %	Estimation quality	Elevation min	Elevation max	Skiers days	% day guests*
Arosa	2,5	0,10%	about right	1750 m	2653 m	578.000	<10%
Davos	7,5	plus 4% (50%)	over (about right)	1194 m	2844 m	1.110.000	middle
Diedamskopf	3	40%	under	655 m	2050 m	220.000	high
Dolomiti Super Ski	5	0%	over	12 areas	12 areas	10.000.000	7%
Flumserberg	3	10%	about right	1200 m	2222 m	<1.000.000	high
Gstaad	6	24%	about right	948 m	2156 m	1.000.000	50%
Kitzbühel	4	21%	under	789 m	2000 m	1.550.000	20%
Les Arcs	3	2,50%	about right	1200 m	3226 m	1.618.905	low
Morzine/Les Gets	4,5	33,70%	under	900 m	2000 m	750.000	high
Orcieres	2,5	plus 0% (40%)	about right	1850 m	2725 m	<1.000.000	high
Planai & Hochwurzen	3,5	1,20%	about right	752 m	2000 m	1.000.000	15%
Scoul	3	8%	about right	1250 m	2783 m	400.000	low
Sölden im Ötztal	5	1%	over	1377 m	3249 m	1.430.000	5%
St. Anton am Arlberg	2,5	2%	about right	1304 m	2811 m	1.250.000	6%
St. Moritz	7,5	2,60%	over	1856 m	3057 m	1.300.000	low
Toggenburg/Wildhaus	2,5	35%	under	900 m	2262 m	350.000	65%
Val d'Isere	3,5	1%	about right	1850 m	3300 m	1.240.000	low
Verbier	1	plus 3%	about right	821 m	3330 m	> 1.000.000	middle
Wilder Kaiser/Brixental	3	20%	under	650 m	1892 m	> 1.000.000	20-25%
Zermatt	1	plus 10%	about right	1524 m	3899 m	1.368.000	low

* low, middle, or high % of day guests: exact numbers were not retrieved but estimated by the interviewed stakeholders

When we look at the correlation with the elevation, then the highest ski areas had the best results of that season, the lowest the highest losses. Surprisingly the underestimating areas are the lowest, smallest and have the highest

dependency on day guests, thus objectively the highest vulnerability. Orcieres, owned by the investment group Remy Loisirs, is a ski area in high elevation that finished the winter with a small plus in sales. The other ski stations from Remy Loisirs are in lower elevations and report losses around 35% (table 10).

Limited market and fewer ski areas

The market in ski tourism is limited, and if one destination grows it takes more of the total market volume where others might suffer from. Verbier sees a diminishing number of ski areas that are lower in elevation and smaller in size, declining to 30% within the next ten years.

> *„Aber sicher, die kleinen Gebiete werden viel mehr Probleme haben. Ich glaube, es wird 1/3 der Skigebietes in 10 Jahren nicht mehr geben. Jetzt sind alle Installationen, die Bahninstallationen, sie sind ungefähr 30 Jahre alt. Man weiß, dass die Lebensdauer noch maximal 10 Jahre ist, und dann was?“ (S18gw)*

Uncertainty in the long term

Some ski areas are not sure about what and how much will change in the long term. They wonder if this uncertainty should count as a threat or if conditions are just changing normally – which would then ask for a standard process of adaptation of services. Because of the elevation and the climatic forecasts, some high areas do not see climate change as a threat within the next 50 years. Local climatic influences can change the classic view on vulnerability of lower destinations, but there is a general lack of information and knowledge about climate change. There are extensive differences between the single areas where more information is demanded.

4.4.2.1. Summary of general vulnerability

Ski areas in the lower elevations perceive the direct effects of climate change as the main threat. The lower the elevation, the more important is climate change. The losses of the last winter were highest there – despite of better knowledge these ski areas totally underestimate their vulnerability when asked. One must wonder if that is part of a strategy to deny the reality. The higher the elevation, the less climate change is perceived as a threat in its direct outcomes. Higher and bigger areas that might not suffer that much from climate change more so believe in demographic and socio-economic changes to be the main future challenges. The dependency on day guests proved to be a big problem, even for a ski area in a high elevation. Still, uncertainty of local differences is high.

4.4.3. Sensitivity elements

This third category of sensitivity elements – making the ski area sensitive to exposure – is structured by these eleven summarizing headlines, followed by a summary:

- Water availability is key
- Media and communication link to the customer
- Ski area in-house communication needs improvement
- Costs are on the rise
- The ratio of cold to warm to hot beds needs to be optimized
- Ease of access
- Dependency on the day guest
- Competition by summer destinations is high
- Competition by emerging skiing markets
- Historic summer use is a plus
- The system of local governance is setting the frame
- Summary of sensitivity elements

Water availability is key

All interviewed ski areas produce snow to a more or less high degree with the goal of strong increases in the future. The water consumption is high and will increase in the future. Today there is a shortage of water in the later part of the season in some dryer regions, like the Engadin or the Dolomites. It is expected that – with more snowing equipment – the demand for water will exceed the existing supplies. Almost all interviewed areas are planning to build new and more water reservoirs because water shortage is the limiting factor of snow making. Water supply is becoming a main factor of vulnerability for a ski area and for the destination itself.

> *„Das einzige was wir brauchen, ist Wasser.“ (S13gw)*

> *„Ja, er ist enorm gestiegen. Das Engadin ist auch das niederschlagsärmste Gebiet in der Schweiz. Wenn es einige Wochen schönes Wetter ist, dann wird da sofort nach Wasser gerufen.“ (S12shl)*

> *„Wir haben nicht vor, eine 100% Beschneiung des Skigebietes zu erreichen, da der Wasservorrat begrenzt ist.“ (S9sll)*

Media and communication link to the customer

The role of communication is exceptionally important for the success of a ski area. The winter 2006/07 proved that despite excellent skiing conditions in many higher ski areas, people living remote from the mountains were not aware of it. The media was mainly communicating that the “catastrophic” signs of climate change and the pictures of brown-green slopes were in people’s minds. Ski destinations missed the chance to advertise and market their message actively. They see the role of media as a key factor for the future and are working on more active and effective communication plans.

> *„Ja, die Kommunikation war schlecht. Aber nicht unsere. Dass viele Skigebiete zu waren, wenn man in Freiburg oder in Genf sitzt, jeden Tag hört man von einem Gebiet, das zu bleibt. Alle zwei Tage: zu, zu, zu. Und die Leute dachten, dass es so schlecht ist.*

> *Ich glaube Verbier war letztes Jahr mit die beste Lage für Schnee in ganz Europa." (S18gw)*

The less likely snowy winters in the lowlands and towns become, the more likely people forget about snow. Instead, snow and skiing will increasingly be reduced as normal topics or activities in winter, resulting in other activities people are looking for.

> *„Und die haben gesagt, bei uns in der Stadt heißt es, man kann nicht Ski fahren. Die haben davon gesprochen. Normalerweise ist es so, dass es zumindest einmal im Winter oder im November oder im Dezember auch in der Stadt schneit. Dann sagt der Gast, der Kunde: toller Winter. Da kriege ich wieder Lust. Wer aber in der Stadt 20° hat, der sagt, das kann nicht sein. Von Mailand zum Beispiel sieht man die Alpen, die Berge. Wenn sie dann da herüberschauen, und nicht alles weiß sehen, dann glauben Sie gar nicht, dass man hier Ski fahren kann." (S4bhw)*

Ski areas admit that they missed the opportunities to pro-actively communicate the conditions on-mountain. Still, the problem is the sensational reporting of the media who looked for negative examples.

> *„Ja ich glaube, wir haben schon etwas geschlafen. Aber das Problem ist, die Medien bringen nur Sensationen. Die Sensation ist, es ist kein Schnee da. Wenn Sie die Meldung bringen, die Pisten sind wunderbar, das ist einfach keine Sensation. Das ist das Problem." (S20gw)*

If the media is not more cooperative in transporting neutral or even more positive messages, ski destinations will have to buy in to transport the messages needed, which are real. Costs for a television spot are high and only the biggest destinations or ski area aggregations will be able to afford it.

> *„Aber das Problem das wir hatten, wir haben es nicht geschafft, in der Kommunikation das so rüberzubringen. Respektive es hat uns das niemand geglaubt. Weil die Botschaft war immer, im ganzen Alpenraum liegt kein Schnee. Wenn sie dann gekommen sind und gesagt haben, wir haben aber Schnee, den haben sie alle ausgelacht. Das hat keiner geglaubt. Leider haben wir nicht die Mittel, um kurzfristig 2 Millionen aus der Schublade zu ziehen und die Medien zu kaufen." (S15bhw)*

Ski area in-house communication needs improvement

Ski areas are aware of the importance to invest into their personnel. Still, in terms of new topics like global change or sustainable management, the information paths and in-house trainings are not perfected yet. Tourists demanding information would, most times, not get what they asked for. More in-house training is needed if ski areas wanted to more actively make this a reality to be prepared working better with the media and partnering with the tourist in designing sustainable tourism services.

> *„Und das ist sicher, und wir haben viel investiert in unsere Mitarbeiter, das ist sicher ein wichtiger Punkt für uns, das ist die ganze Mitarbeiter-Philosophie. Sage jetzt einfach mal die Mitarbeiter-Auskunfts-Bereitschaft usw.“ (S1shw)*

> *„Nein. Keinesfalls.“ (S13gw)*

> *„Schlecht. Ich glaube, da sind wir schlecht aufgestellt. Aber das ist überhaupt ein Branchenproblem.“ (S3sll)*

Costs are on the rise

High and rising prices are a problem. Energy, for example, is more financially stressed; green energy is not affordable for some areas. They already have a hard time to make up for inflation costs.

Ski ticket prices are seen as way too low. Internal customer surveys show that too many customers are satisfied with the ticket prices in some areas – it should be around 50% satisfaction; in Verbier it is 65%. So, tickets are too cheap from a customer perspective too, not only from a ski area point of view.

> *“The point is we have to do more and more investments to keep our service. And to keep the snow, the snow-making equipment, to maintain. That costs more and more, regulations are more strict. Lifts are more expensive. They are bigger and they are faster. It is more difficult to maintain them. That’s why our fees raise. And our income decreases.” (S17gw)*

> *„Es ist zu billig, massiv zu billig. Ein Tagespass kostet 58 Franken. Also es ist sicherlich, wenn man das vergleicht, mit anderen Erlebniswelten usw. dann ist eigentlich der Preis relativ günstig. Für die kapitalintensiven Leistungen, die man erbringen muss. Also etwa 36,50 € für die Tageskarte.“ (S6blw)*

The ratio of cold to warm to hot beds needs to be optimized

Ski areas attempt to increase the ratio of overnight guests to decrease dependency on the day guest, a key factor of vulnerability. Cold beds in the destination are mostly privately owned, secondary homes that most of the year are empty. Thus the construction of more warm beds that can be rented the whole time builds capacity for overnight stays, a strategy that almost all interviewed areas are anticipating and supporting together with the destination.

> *„Wir haben hier kein Hotel mehr, wenn die Leute kommen möchten, da können sie nur für ein Wochenende kommen. Ein Wochenend- oder ein Tagesticket. Übernachten in Verbier ist schwierig. Darum haben wir Projekte, neue Hotels zu bauen.” (S18gw)*

A narrow valley can limit the construction of hotels and thus warm beds by its topography.

> *“So the bed capacity is not going to increase for sure. It is not Tignes where is more space, also following different strategies but with more help of the geography.” (S17gw)*

The high number of private homes (secondary homes = cold beds) leads to increasing land prices. That makes living in the destination for local people and for those working there too expensive, and they have to move further down the valley. That again changes the character of a destination more towards a “dead” ghost town in the off-season.

> *„Gut, also es muss natürlich die Unterkunft auch stimmen. Wenn ich schaue, im Winter sind wir praktisch ausgebucht. Man hat ja noch Landreserven, um neue Hotels zu bauen. Zweitwohnung haben wir gedrosselt, weil das kalte Betten sind.” (S20gw)*

> *„Wir sind im Moment in einer Situation, also wir haben hier wahnsinnige Grundstückspreise. Das führt zu verschiedenen Problemen. Also es ist für Leute, die hier wohnen und arbeiten kaum möglich zu leben. Was zur Abwanderung in die umliegenden Gemeinden führt.” (S6blw)*

More and more hotels are being refurbished and sold as secondary apartments. Land prices are already too high in some places to build new hotels. A hotel is worth selling, but not maintaining and renting as a hotel.

> *“Bis jetzt haben wir alte Hotels und es lohnt sich nicht, ein Hotel zu bauen. Das ist unser Problem. Nur wenn man hier wirklich ein super Luxushotel baut, aber ein Zwei- oder Drei-Sternehotel, das kostet zu viel.“ (S18gw)*

If local farmers and land owners sold their land, then prices would increase even faster with all negative effects of a decreasing ratio of warm to cold beds and the “dying” of the daily life in a destination town.

> *„Aber ein Mann der hier zum Beispiel Bauer ist, und hat sein Haus. Land, das drei Franken pro Quadratmeter wert ist. Und jemand kommt und sagt, ich gebe dir 8 Millionen. Was macht der? Nimmt das und geht weg. Da brauchst du vielleicht lebenslang nicht arbeiten mit 8 Millionen, kein Problem. Und das Land ist weg, niemand bearbeitet das mehr.” (S18gw)*

Cold beds – as seen in the light of demography – tend to increase in the future, because of the growing age of their owners not renting their places anymore, calling for the discussed problems.

> *„Zum Beispiel die Demographie bei den Ferienwohnungsbesitzern. Ein Thema sind sicherlich die kalten Betten. Keine Bewirtschaftung der Betten. Teilweise veraltete Hotelinfrastrukturen. Themen, die auch andere alpine Destinationen zu schaffen machen.“ (S5sll)*

Ease of access

Accessibility is an important factor for ski areas. The better and easier the access, the higher the percentage of the day guests is – which proved to be a disadvantage. More remote areas might have a more tranquil atmosphere, an advantage for overnight guests. However, easiness of access is meeting customer demand in a time of increasing prices and environmental awareness.

A minimum percentage of day guests are needed and poor access is a sensitivity element.

> *„Aber das Thema Tagesgast, ist bei uns eigentlich kein Thema. Weil es einfach von der Anreise her zu weit ist. Das sind 35 km das Tal herein, und das ist eigentlich kein Einzugsgebiet. Da ist dann Innsbruck, da sind im Umkreis viele Skigebiete, die einfach näher liegen.“ (S13gw)*

In very snowy years limited access can become a problem if the connections are closed because of extreme weather conditions becoming more likely. With rising prices for mobility and increased traffic, a closer access, especially with public transport, can become an even greater advantage in the future. Close access is both an advantage and maybe a disadvantage – because of more day guests with better access and the demand possibly getting too high – but the advantages are seen as being more important.

> *„Da sind wir eigentlich in einer super Lage. Das unterscheidet uns von anderen Skigebieten. Dass wir mit eigentlich allen Verkehrsmitteln leicht erreichbar sind, und das auch bei widrigen Wetterbedingungen. Zwar kein direkter Autobahnanschluss, das nicht, aber Straße, Bahn und sogar internationaler Flugverkehr. Mit München, Salzburg und Innsbruck. Eine sehr gute Anbindung also.“ (S7blw)*

> *„Ja gut, ein Schwachpunkt aber sicherlich auch eine Stärke ist die Anbindung an den öffentlichen oder privaten Verkehr. Wir sind eine Region, die in einer Stunde, sowohl mit öffentlichen Verkehrsmitteln und auch dem Auto, von Zürich aus zu erreichen ist. Dass der Tourist zum Tagestourist wird und nicht zum Aufenthaltstourist, das ist sicherlich ein Problem. Ein Vor- und ein Nachteil also.“ (S5sll)*

Access and mobility inside the destination are a criterion the destination can improve directly. If the destination can hardly influence the access to it, the inner traffic is an important issue to deal with, for example, with a good system of shuttle busses.

> *„Vom nächsten Bahnhof, von großen Hauptplätzen, von großen Hotels und der gleichem. Da betreiben wir eigenes für Schladming vier Citybusse, und zusätzlich eine große Menge von Linien. Das geht hin bis zu einer night-line.” (S11bll)*

The travel behavior seems to differ between the early and the later winter. In early winter more people come by train or bus, and in later winter by car. If the demand changed more towards springtime, car traffic might increase accordingly.

> *„Wir stellen zum Beispiel fest, dass im Frühjahr eher die Tendenz ist, dass die Leute mit dem Auto anreisen. Während im Winter, an Weihnachten, im Januar, im Februar, in der hochfrequentierten Saison, die Gäste eher mit dem öffentlichen Verkehr anreisen.“ (S12shl)*

Dependency on the day guest

The more dependent ski areas are on the day guest, the more losses they had in the winter 2006/07 as stated earlier in this chapter. Indeed ski areas see the dependency on the day guest as a problem. In other terms a high dependency on day guests can create opportunities too. If snow conditions are good there can be a very high number of visitor volumes. Ski areas with good access can then profit from the flexibility of the day guest if they communicate their conditions well.

> *„Nein. Also unser Dilemma hier im Berner Oberland ist natürlich, wir leben sehr stark vom Tagesgast. Und im Tagesgästebereich, haben wir eine sehr starke Konkurrenz. Wir haben in dem Sinne nicht eine riesige Großstadt als Quelle, sondern der ganze Raum von Basel und Bern usw., das sind vielleicht eine Million Einwohner in diesem Bereich. Und diese eine Million Einwohner, teilen sich fünf große Skigebiete. Wenn man hier den Großraum München nimmt, die 2 Millionen oder mehr, das ist eine viel größere Quelle." (S6blw)*

> *„Ja, wir sind wirklich auf die Tagesgäste angewiesen. Wenn im Wetterbericht vorausgesagt wird, dass es schön wird, dann haben wir viele Leute. Und nur eine Wolke irgendwo bei einer Wetterstation, oder einer Durchsage, es sei ein bisschen veränderlicher, dann zögern die Tagesgäste auf jeden Fall." (S2bhw)*

> *„Chance ist dabei, dass wir so nah an den Leuten sind. In einem Umkreis von 2,5 Fahrstunden haben wir 6 Millionen ‚gute' Leute, im Sinne von guten Wirtschaftsregionen. Das ist bis zum Bodenseeraum, all diese Gebiete. Das ist das positive daran. Bei guten Schneeverhältnisse, perfekten Bedingungen, haben wir so sehr viele Leute. Auf der anderen Seite haben wir bei schlechten Bedingungen relativ starke Probleme. Weil die Leute die, die gebucht haben, die kommen ja. Auch wenn es nicht optimal ist. Aber die Tagesgäste bleiben dann aus. Also ist es gleichzeitig unser Problem." (S16sll)*

One reason for these differences is accessibility. If access is difficult fewer day visitors will come. Still, there are other factors influencing the percentage of day visitors. St. Anton, for example, with an easy road access, only has 6% day visitors. The kind of ski area with its lifts and terrain distribution, the option of accommodation, the ticket prices and the reputation of the destination influence the kind of visitors too.

Competition by summer destinations is high

A majority of the interviewed areas sees all-inclusive summer and sea tourism to southern beach destinations as the biggest competitors in winter. Prices of these all-inclusive summer offers are just too low, and when the beauty of snow is not reaching the majority of people in the towns, then it is clear where they tend to travel to instead. This is problematic because the total number of tourists is not increasing, but the percentage of who skis is decreasing.

> *„Hauptkonkurrent ist das Meer, die Malediven oder so. Nicht die anderen Skigebiete.*

> *Wir merken einfach, wenn es zum Beispiel einen Winter hat mit viel Schnee überall, ist es besser. Weil im letzten Jahr, hat das überall geheißen, es gibt keinen Schnee und man kann nicht Skifahren. Wir haben das gespürt." (S4bhw)*

> *"Yes, also. Some destinations are really affordable, you buy a ticket and fly anywhere in the world for cheap. So some people take one vacation. And when it is winter, you will have bad weather and not being able to ski - but fly anywhere in the world. And being sure to have the sun and sometimes it is more affordable." (S17gw)*

Competition by emerging skiing markets

The major competition from ski areas is seen in the emerging markets of Russia, China and Eastern Europe.

> *„In Osteuropa, in Russland usw., da werden Milliarden investiert in Retortenressorts. Das ist zukünftige Konkurrenz. Kroatien und Ungarn mit super guten Skigebieten, da bezahlen sie 30% von dem, was Sie hier bezahlen. Da gibt es bereits jetzt schon Charterflüge von London, die gehen für 199 Pfund dort eine Woche Skifahren. Inklusive Unterkunft. Das sind unsere Kernmärkte, die nehmen uns die Kunden weg." (S15bhw)*

> *„Und wir haben noch andere Probleme. Wenn einige Skigebieten in der Schweiz schließen, gibt es neue Skigebieten in Bulgarien, Tschechien, das ist für uns eine große Konkurrenz." (S18gw)*

Historic summer use is a plus

Ski areas in traditionally developped villages with a long history of farming and a year-round population have advantages in being livelier in summer which attracts summer tourism and decreases the economic dependency on the snow season. Slopes in the lower elevations that have been used for agriculture and grazing are smoother and require less snow to ski on.

> *„Die Wirtschaft, die Tatsache dass bei uns alles Kulturland ist, und nicht Naturland. Sondern über Jahrhunderte Kulturland, mit Beweidung im Sommer, mit Pflege der Landschaft, gewährleistet, dass das bei uns nicht im Sommer verbuscht, versteppt oder zuwächst. Es wird bei uns jeder Stein herausgenommen, weil es im Sommer ja Wiese ist und Almfläche. Es unterliegt einer peniblen Pflege und das ist die beste Grundlage für perfekte Pisten. Das ist ein Faktor, der nicht zu unterschätzen ist." (S7blw)*

The system of local governance

The destination and the ski area often name different target groups they address. The ski area needs a high volume of people buying lift tickets. The destination is more so looking for well paying overnight guests in a lower number, but with higher incomes to increase the added value of housing and dining. Such opposing goals can lead to different strategies and marketing, thus negatively affecting each other. In general there is a lack of specific target group addressment and communication between the different tourism stakeholders.

> *„Also, ein USP ist es für uns als Bergbahnen nicht. Es ist ein USP für die 5-Sternehotellerie. Aber für uns als Bergbahn mit einer Förderkapazität von 65.000*

> *Passagieren pro Stunde erreichen wir die kritische Masse nicht mit dieser Spitze des Eisberges. Dieser Jetset ist zwar schön, das ist für uns auch ein guter Kunde, der konsumiert auch gut in der Gastronomie. Da ist egal was es kostet. Und er fährt Ski, und geht nicht auf die Langlaufloipe. Aber die kritische Masse fehlt. Und es wurde auch bewusst in den letzten 25 Jahren daraufhin gearbeitet, darum haben wir auch ein Image, ein teures Image, das viele Kunden abschreckt." (S15bhw)*

The local or regional regulations prove to be problematic for some ski areas in attaining permission for optimizing the area – although the economic and social welfare for the region has to be seen too. Still, regulations provide an important tool to prevent uncontrolled construction and environmental degradation.

> *"Now it is okay, but now the regulations are stricter on snowing water. It becomes more and more difficult. Regulations become more and more strict." (S17gw)*

The external regulatory system is setting the frame, but the internal frame within the aggregation of ski areas, within the destination and within the share- and stakeholders is important too. Stakeholder participation and a common business and marketing strategy often are missing key factors.

> *„Einmal die Rahmenbedingungen schaffen, es geht immer darum entsprechenden Standorte zu finden. Das ist das große Problem. Aber wenn man bedenkt, für die Landwirtschaft ist es wichtig und für den Zivilschützer auch, dann kann man das auch zusammen machen. Dadurch allein hat man schon einen dreifachen Nutzen. Dadurch bringt das wirklich etwas für alle." (S4bhw)*

4.4.3.1. Summary of sensitivity elements

The interview partners named a number of elements affecting the sensibility of ski areas to global change in addition to general exposure by their elevation. Among the most important were aspects such as the dependency on the day guest, accessibility, competing sea tourism in winter and from new ski areas in emerging markets, water availability for snow making, costs of inflation and operations such as for energy, local communication and governance of the destination and the ski area, regulations, media and outreach to customers, the ratio of cold to warm to hot beds and the history of summer use in the destination.

4.4.4. Adaptive capacity

This category is divided into two sub categories, which are structured by headlines and segments, finalized by a summary each:

1. Technical adaptation
    - Snow and water management
    - Landscaping
    - Expansion
    - Summary of technical adaptation

2. Behavioral adaptation

    - Customer relationship and specific target groups
    - Ticket prices
    - Other winter activities
    - Summer tourism cannot outweigh losses in winter in ski areas
    - Diversity in seasons in the destination
    - Diversity in the kind of visitor
    - Diversity in operations
    - Local governance – calling for a *Model Europe*
    - Destination communication
    - Communication and outreach
    - Subsidies and models of financing
    - Summary of behavioral adaptation

4.4.4.1. Technical adaptation

Snow and water management

Snow making is becoming an integral part of any ski area management. Technical snow making saved the season of 2006/07 for most of the interviewed ski areas. The equipment of the ski areas with snow machines in general and the percentage of slope surface equipped with snow making are increasing in a fast speed and up to the highest elevations. Opening a ski area after just 70 hours of snow making from a formerly bare ground is seen as new internal standard.

> *"Und die Vorgabe ist, in etwa 70 Stunden diese gesamte Fläche beschneit zu haben." (S7blw)*

The limits of snow making are obvious. It can cope with the lack of snow in the ski areas, but not with the social indirect effects in the source markets.

> *„Aber, da kommt der tragische Aspekt, wenn das eben nicht mehr in den Köpfen wäre. Das ist meine Befürchtung, noch viel mehr, als dass wir keinen Schnee mehr haben. Bei uns geht es ja bis 2262 m Meereshöhe und selbst nach den neuesten Studien wären wir noch bis 2050 relativ schneesicher. Ich frage mich nur, was hilft mir das, wenn das so wäre, dass der Kunde das gar nicht mehr sucht." (S16sll)*

The percentage of snow making does not have to be 100% of the pistes surface. From an efficiency point of view, the cost/use ratio of technical snow making and the expected quality by customers is estimated to be between 50-60%.

> *„Natürlich, ich muss sagen, damals hat jeder gesagt, 50%? Spinnt ihr? Und heute, Südtirol hatte auch schon damals 80%, Tirol mit heute 80 oder 90%. Ich bin jetzt überzeugt davon, dass es irgendwo eine betriebswirtschaftliche Effizienz braucht. Und ich bin überzeugt davon, dass ihr Niveau die Kurve von der betriebswirtschaftlichen Effizienz und der Angebotsqualität, dass sich die irgendwo bei 50 oder 60% kreuzt. Also*

> *natürlich, je mehr man macht, desto besser ist es. Aber desto mehr kostet es auch.“ (S16sll)*

Water is the main limiting factor of snow making because forecasts call for further water shortages in the future. Water usage in mountain destinations increased significantly. If the region has a dry climate things get even worse. 100% snow making thus is not always the goal.

> *„Wir haben nicht vor, eine 100% Beschneiung des Skigebietes zu erreichen, da der Wasservorrat begrenzt ist.“ (S9sll)*

> *„Ja, er ist enorm gestiegen. Das Engadin ist auch das niederschlagsärmste Gebiet in der Schweiz. Wenn es einige Wochen schönes Wetter ist, dann wird da sofort nach Wasser gerufen.“ (S12shl)*

Landscaping

The leveling and grading of ski slopes is a technique to come along with less snow coverage for opening a ski area. Ski areas are focusing more on incorporating North facing slopes being colder and better for snow making.

> *„Ja, hier müssen wir eine Korrektur machen. Da sind wir übrigens dran, im Herbst noch. Aber das andere restliche Gebiet ist nicht so steinig, auf den Wiesen braucht es wenig Schnee. Das ist der Vorteil und dass in dieser Höhe der Schnee bleibt. Einzig bei den Talabfahren haben wir Probleme, weil die südlich ausgerichteten, da sind die Südhänge wieder gefährdet. Diese Talstücke müssen wir einfach entweder umleiten oder das Gelände anpassen. Wenn die Hangneigung nicht direkt zur Sonne gerichtet ist, das merkt man dann gleich schon spürbar.“ (S12shl)*

Expansion

Expansions are planned in seven from twenty interviewed areas, even in ski areas of lower elevations. Reasons mostly are to enlarge the areas to attract more visitors, so the sheer size. Not one station questioned the shrinking markets of visitors or the risk of climate change as a reason not to expand and to grow bigger. Expansions may be prohibited but connections of ski areas to be more efficient can still be allowed. There seems to be space for declaring such regulations in different ways. The reason being to grow even bigger is to sell more lift tickets.

> *„Es gibt verschiedene Ideen. Es gibt die Idee der Verbindung zu Saas Fee. Da muss man natürlich überlegen, wie groß ist die Erweiterung. Da müsste ich fünf, sechs Bahnen bauen. Dabei wäre dann natürlich die ganze Seite vom Monte Rosa, die nicht erschlossen ist. Aber ich glaube, das ist nicht das Ziel. Wenn wir schauen, die zweite Idee ist die Verbindung zu Cerviglia. Cerviglia und das Monte Rosa Skigebiet. Da kann ich mit ein paar kleinen Liften etwas machen. Ein großes Gebiet erschließen.” (S20gw)*

> *„Beschneiung ist geplant und es ist eine Erweiterung des Skigebietes geplant. Mit Erweiterungen von Pistenflächen.” (S3sll)*

Once a certain size has been reached, then expansion is not in the focus any more. Still, if neighboring smaller areas wish to expand and connect with a bigger neighbor, then this may be a viable alternative for them. Limits of expansion plans may be when the highest points are reached or expansion is limited by protected areas.

> *„Von uns aus nicht, unser Skigebiet hat eine gute Größe. Das zeigen auch die Gästebefragungen, dass das groß genug ist. Was aber sein kann, dass andere versuchen, sich an uns an zuklinken.“ (S7blw)*

> *“No, because we are really on the top of the mountain.” (S8gw)*

> *“Also in Val d’Isere, the space is limited by the mountains. There are no possibilities to expand.” (S17gw)*

4.4.4.2. Summary of technical adaptation

Snow making is the main kind of technical adaptation, applied in all interviewed areas with the goal of opening the ski area after 70 hours of snow making, independently from natural snow occurrence. Water already is and will be even more the limiting factor for snow making, the construction of new water reservoirs part of the strategy. Landscaping is seen as an important cosmetic tool for optimizing the slopes.

Expanding is not only understood to get in higher elevations with cooler temperatures, but to gain in sheer size. Smaller areas might connect to bigger ones without the bigger ones necessarily supporting it financially if a sufficient size has been reached.

4.4.4.3. Behavioral adaptation

Customer relationship and specific target groups

Specific addressment of certain target groups is an opportunity. Ski areas need the mass of people, at least the mid-size and big areas. In general, more knowledge and market research is necessary on a constant basis to develop offers designed for specific groups or kinds of customers. All interviewed ski areas want to reach the better paying customer who demands quality tourism.

Discount offers and communicating budget skiing is not seen as a viable strategy because even cheaper ski tickets would not cover the actual operations costs. Budget skiing would then demand for higher volumes of skiers, but more crowded slopes are seen as contra-productive for customer satisfaction. Budget weeks in the off-season could instead be a way to push these low periods.

> *„Für etwas, das ein bisschen besser ist, der nicht in dieser Masse mit schwimmen will. Ich glaube auch, aufgrund dieser sozio-demographischen Verschiebung, die es gibt. Der Mittelstand schwindet, die Schere wird immer größer. Es gibt nur noch zwei Seiten. Aber entweder entscheiden sie sich, es als Billigdestination zu versuchen, die Masse zu*

> *generieren. Das wollen wir aber nicht. Oder Sie gehen auf die andere Seite und sagen, diejenigen, die kommen, kommen nur noch eine Woche lang, nicht mehr zwei oder drei Wochen. Aber die sind auch bereit, dafür ein bisschen mehr zu bezahlen. Und von denen gibt es weltweit schon noch genug." (S15bhw)*

Very Important Person (VIP) skiing with exclusive entry of well-paying club members, like some areas in North America are already offering, is not seen as possible or desirable in the Alps. Private skiing and the closure of ski areas or of part of the mountain would not be accepted by the interviewed ski areas. The ownership structures are too diverse in the Alps. Even if bought and owned by investment companies like in the French system, for example, local stakeholders would not accept such a system and a disclosure from public rights to enter the landscape. In addition, the transport concession for ski areas is public – a disclosure of certain people without a security reason is not allowed.

> *„Ja, die machen auch eins für die Afrikaner und eines für die Schwulen usw. Aber, Sie müssen es einfach so sehen: erstens sind wir nicht in Amerika, wo man einfache ein Skigebiet hat und macht was man will. Wir haben 3000 oder noch mehr, Beratungsbetriebe, das sind alle einzelnen. Andere Gebiete arbeiten natürlich gut, wenn sie alles der Compagnie des Alps übergeben. Und wir sind zufrieden, dass wir sie nicht haben, das ist unterschiedlich." (S4bhw)*

> *„Nein, das möchten wir nicht. Wir machen das zum Beispiel, wenn wir ein Rennen organisieren möchten. Aber ein Gebiet? Nein, niemals. Man hatte gesehen, ich glaube Gstaad hat das versucht eine VIP-Karte zu verkaufen. Bei uns sind alle Kunden VIP. Obwohl sie kein Geld haben, aber das sind alles Kunden." (S18gw)*

The interviewed partners see cheap offers as a viable chance to increase sales in off-season time, but not as a main and single strategy to position the area as a cheap mass ski area. There are limits of visitor numbers from a technical and security point of view, but still, energy and water, lifts etc. do have the same market prices for everyone. Ski areas could save on costs by offering fewer services, grooming and personnel but the market for it will be very limited. Customers in general are rather willing to pay a bit more than standing too long in line at the lifts.

> *„Ich glaube das Billig-Skifahren hat eine gewisse, aber relativ kleine Anzahl an Leuten. Wenn ich das billige Skifahren will, muss ich mit der Masse arbeiten. Die Leute sind eher bereit, etwas mehr zu bezahlen als in der Masse unterzugehen." (S20gw)*

> *„Ich denke schon, dass man die Zwischensaison belegen kann mit solchen Angeboten." (S12shl)*

Ticket prices

Global change in all its facets requires even more investments, being on a technical or a service level. Prices, especially those of energy, are rising. This puts even more pressure on ski areas to become more efficient.

> *„Wir müssen unbedingt jedes Jahr immer etwas über die Inflation anheben. auch wegen der ganzen Situation, wenn Beschneiung, Komfort usw. immer mehr angeboten wird. Damit wir das einfangen. Die Kosten der Anlagen sind horrend gestiegen, einfach weil es keine Monopolstellung mehr gibt und sich der Markt geteilt hat. Und die Energie natürlich, das brauche ich ihnen gar nicht zu sagen, was das mehr kostet. Das ist nicht nur die Inflation, das ist entschieden mehr. Natürlich auch gerade die Instandhaltung der Pisten, weil die Gäste das auch anders verlangen wie früher, die sind auch horrend gestiegen. Deswegen ist die Gewinnspanne der Gesellschaften bestimmt viel weniger geworden." (S4bhw)*

Ski ticket prices are seen as too low. Skiing will get more expensive and surely reach a level known in North America. Smaller ski areas either have to find the niche, upsize or most likely have to shut down if not increasing services and prices. Finding the right business model and investment strategies and sources will be the key.

> *„Das heißt, ungefähr 65% der Kunden sind mit unseren Preisen zufrieden. Das ist zu viel. Man sagt, sie dürfen nicht über 50% der Gäste haben, die unzufrieden sind. Sonst haben Sie ein Problem. Bei uns sind 65% mit den Preisen zufrieden." (S18gw)*

> *„Skifahren hat sich ein bisschen zur elitären Sportart entwickelt. Wie in den USA, in den USA können es nur die machen, die Geld haben. Und die andern können sich das gar nicht leisten. Und ich habe ein bisschen das Gefühl, wir laufen etwas um die eigentliche Richtung. Es läuft in die elitäre Richtung, in bisschen wie Golf, oder wie Tennis früher war. Um die eigentliche Richtung." (S15bhw)*

Other winter activities

Fostering other activities in winter season is a strategy of the future. Skiing alone cannot be the only focus anymore, but any kind of trend or activity with a lower entry step that requires fewer technical skills from the tourist. However, the added value of Alpine lift accessed skiing cannot be reached by any other activity.

> *„Man wird allerdings auch nicht nur auf die Skifahrer gehen dürfen, sondern auch auf die alternativen Wintersportangebote setzen müssen. Dass wir diese anbieten müssen. Und das tun wir. Wobei natürlich klar ist, die große Wertschöpfung wird natürlich nur im alpinen Wintersport erwirtschaftet." (S3sll)*

Summer tourism cannot outweigh losses in winter in ski areas

The total number of visitors on a winter day varies, depending on the size of the area, between an average of 1800 people with a maximum of 4900 in a small area, and an average of 9000 people with a maximum of 17000 in a big one.

The number of visitors in a ski area is much higher on an average winter day than on a summer day. The ratio changes from about 10% to maximum 50% in summer compared to winter. Ski areas could possibly imagine outweighing losses from winter by strengthening the summer. Summer activities could not replace snow related activities and sales, though.

> *„Nein, das spiegelt sich nicht wieder. Wie soll ich sagen, es ist doch eine Illusion zu glauben, den Sommer so ausbauen zu können, dass er den Winter ersetzen könnte. Die Sommerzahlen vervierfachen wäre noch vorstellbar, man kann aber den Winter lange nicht ersetzen." (S7blw)*

In summer ski areas operate a much smaller number of lifts. The area where visitors can move around is usually limited to paths and trails, it being for hiking, biking or other trail-based activities and, of course, restaurants and sun bathing places where people remain in a small spot. The total surface for people in winter is the slope and off-piste area, basically the whole mountain with some exceptions of protected or inaccessible terrain.

The limit to bring people up in the ski area in summer in an existing manner is a natural one of limited terrain use possibilities, unless other ways of land use are found. The numbers of winter cannot be reached in summer, but the ratio could be better from a summer perspective.

> *„Wir können unsere 80000 Personen Beförderungskapazität nie und nimmer mit Wanderern oder Mountainbikern auffüllen. Man stelle sich das vor, an Spitzentagen haben wir im Winter 28000 bis 30000 Skifahrer im Skigebiet. Man stelle sich das vor, 28000 oder 30000 Wanderer oder Biker, das würde sich selbst ad absurdum führen." (S7blw)*

From an environmental perspective and such of natural hazards management (for example preventing erosion and landslides), there is a general limit of the number of people on a mountain in summer, which necessarily is much lower than in winter because the surface is smaller.

Diversity in seasons in the destination

In most ski areas the ratio in sales between winter and summer is between 85-95% in winter and 15-5% in summer. Ski areas want to increase sales in summer.

> *„Ja, wir wollen die Wertschöpfung im Sommer erhöhen." (S3sll)*

The ski area itself generates income in winter, but spends it in summer. They call for more activities and marketing in summer, but not on cost of weakening the budget in winter.

> *„Im Winter verdienen wir das Geld, um im Sommer geben wir es aus, sage ich jetzt einmal. Im Sommer verdienen wir nichts. Wir möchten es natürlich auch im Sommer anders, aber nicht auf Kosten des Winters. Der Winter darf nicht auf Kosten der Sommer schwächer werden, dann haben wir ein Problem. Stärker werdende Sommer, ja, aber nicht auf Kosten des Winters." (S13gw)*

In the destination as a whole the ratio of winter to summer tends more toward 60:40, if there are offers and services existing in summer, like Kitzbühel or Gstaad, that have a historic summer use as discussed earlier. Ski stations, like Val d'Isere or Les Arcs, that are more developed for skiing cannot decrease this ratio in summer currently, and are thus much more dependent on the winter. A summer infrastructure does not exist.

The summer in the more specialized ski areas or in those that are not long time grown and traditional summer destinations, is very low on activities. Still, ski areas are trying to increase summer sales and visitors. Increasing the number of visitors is one thing, but limited for several reasons as explained earlier. The added value in summer is seen as catastrophic. 30% in visitor numbers generate an added value of only 10%. Here the ski areas themselves see a real problem if they want to increase the diversity of sales in four seasons.

> *„Ziel ist ganz klar, um den Sommer halten und erhalten zu können, dort einen große Sprung zu machen, im Umsatz. Weil wir derzeit bei annähernd einem Drittel der Gäste nur etwa 10% des Umsatzes machen. Die Wertschöpfung im Sommer ist eine Katastrophe. Dort gilt es natürlich auch anzusetzen." (S3sll)*

Traditional destinations with a history and life in summer tourism, like Zermatt or Kitzbühel, also show a better ratio for the ski area sales in summer.

> *„Circa 20% im Sommer." (S20gw)*

Diversity in the kind of visitor

The ratio of day skiers to overnight stays proved to be a key factor of success. Orcieres, owned by the investment group Remy Loisirs, is a ski area in high elevation that finished the winter with a small plus in sales despite a usual high dependency on day guests and very Southern latitude. The reason for the success is an increase in bed capacity and thus a higher rate of overnight guests that winter.

> *„Diese Umsatzsteigerung hat sich dank einer Erhöhung des Angebotes von Betten verwirklicht." (S10shl)*

The higher the dependency on day guests, the more flexible and spontaneous the booking and travel behavior of the tourist is. The overnight guest is more faithful in returning to the same destination. But he has become more flexible and shows a more spontaneous booking behavior too. The development of

more individualism leads to multiple activities the guest likes to do in a week and also during the same day. Overnight guests may still come for a whole week but decide to buy the ski pass every day again depending on the conditions. The overnight guest more and more equals the day guest in his preferences and behavior once he is in the destination.

> *„Aber auch da wieder, das Kaufverhalten des Gastes: er kommt hierhin, und die Bedingungen müssen einfach gut sein. Er muss in Stimmung sein, das Wetter muss stimmen, die Schneebedingungen müssen stimmen. Danach entscheidet er sich spontan. Ich habe es vorhin schon gesagt, wir verkaufen immer weniger Langzeit Abos. Selbst bei den Einheimischen, die vergünstigt Skifahren, merken wir, im Verkauf sind diese Einheimischen Tickets rückläufig. Selbst Einheimische picken sich nur noch die Rosinen heraus, sagen ich gehe vielleicht zehnmal im Winter Skilaufen, da kaufe ich mir eine Tageskarte.“ (S15bhw)*

The day guests are not interested in additional offers. If they come, then it is for skiing, and they only come when there is snow.

> *„Vor allem der Tagesgast, ja. Dem Aufenthaltsgast ist das egal. Dem Aufenthaltsgast haben wir natürlich viel mehr zu bieten.“ (S6blw)*

A ski area that has a high ratio of day guests could focus on this market and conventional Alpine skiing. Investing in alternative activities would not make much sense; it would not meet the demand. The overnight guest who stays longer and increasingly books in advance expects a variety of other activities. A high percentage of overnight guests thus make it necessary to offer alternatives and diversify much more than the areas with a higher ratio of day guests. The overnight guests can become easier satisfied with alternative offers if there were no snow.

Diversity in operations

The diversity in visitors and in sales is related to the offers in the destination and in the ski area. If ski areas owned hotels and gastronomy, they could design packages that individually addressed certain target groups and that offered a greater space for price developments.

> *„Weil wir eine eigene Gastronomie betreiben, eigene Hotels haben. Da haben wir einen sehr großen Einfluss. […] Und das Einsteigerprodukt wurde eigentlich mit den Hotels vereinbart, die wir von Anfang an direkt mit der Bahn hatten. Das waren dann Verträge direkt mit der Bahn und den Hotels. Das wurde dann immer mehr und irgendwann war die Grenze erreicht, wo man sagen konnte, jetzt packen wir es.“ (S1shw)*

From the complete added value of the visitor’s expenses – including the travel expenses – the cableways only generate about 10% for the lift tickets (see chapter 2.4). Most of the added value is generated by hotels and the gastronomy. A diversification in this direction could help the ski area for a better adaptive capacity and less dependency on classic winter ski ticket sales. The

success of diversification in hotels and gastronomy of a ski area is related to the success of the whole destination in summer.

A big ski area, like St. Moritz, already generates about 30% of its added value with gastronomy. Of course, the sales in gastronomy are related to and dependent on the volume of ski visitors, but still the cash flow is strongly increased and thus decreases vulnerability to a weak season. An increased number of warm beds can generate more overnight guests and thus catch up with a loss in day visitors.

> *„Wir generieren 72 Millionen Schweizer Franken Umsatz. 20 Millionen Gastronomie und 52 Millionen Transporteinnahmen." (S15bhw)*

> *„Von der gesamten Wertschöpfung verbleiben im Skigebiet 17%. Wenn ich die Anreisekosten nicht berücksichtige. Sonst komme ich auf 10 oder 12% runter. Für Unterhaltung und Kultur werden 7,3% ausgegeben. Für Sonstiges 2%, für Einkäufe von Waren aller Art 8%, Lebensmitteleinkäufe 6%. Essen und Getränke im Restaurant, das ist natürlich primär die Berggastronomie mit 18%. Und die Unterkunft macht ca. 40% aus." (S11bll)*

Ski areas with their cableways have been and remain the *engine* of investments in a ski destination. Still, their position in the added value chain of the destination is rather low, and they strive to increase it.

> *„Man versucht es zumindest. Sie kennen es, das Problem ist überall das gleiche. Der Motor sind in der Regel die Bergbahnen. Weil die größeren Bergbahnen einfach auch das nötige Kapital haben, um Projekte umzusetzen." (S11bll)*

Diversification works in other fields than hotels and gastronomy too. Events of any kind are such an important factor where a ski area could generate significant revenue. Still there is a lack of data and studies being done to learn more about the different sources of added value inside the destination.

> *„Also Sommerinvestitionen werden getätigt, aber mehr im Bereich Events etc." (S5sll)*

> *„Also beispielsweise haben wir vor fünf Wochen ein Schlager-Open Air gehabt oben auf dem Berg. 5000 Gäste, das war das erstemal. Einfach kleinere und größere Veranstaltungen wie Filmfeste etc." (S5sll)*

> *„Das kommt daher durch die Veranstaltungen, beispielsweise nur mit den Veranstaltungen machen wir im Jahr 25 Millionen Umsatz. Allein die Veranstaltungen machen ungefähr genauso viel Umsatz wie die Bergbahnen." (S6blw)*

Local governance – calling for a Model Europe

We find concentration processes in all interviewed areas to bundle resources and strategies and to make the management more powerful, efficient and successful.

> *„Also ich würde sagen, es wird da Veränderungen am Markt geben. Die kleinen Stationen gehen. Da kann ich nicht sagen, dass wir direkt Konkurrenz hätten. Oder befürchten müssen. Glaube ich nicht. Vor allem nicht, weil wir jetzt den Zusammenschluss hinkriegen mit Lenzerheide." (S1shw)*

> *"Wir versuchen, dass wir die Basis der Skifahrer vergrößern. Deswegen gibt es auch eine sehr reibungslose Zusammenarbeit zwischen den ganzen Seilbahnunternehmen. Wir betrachten uns nicht als Konkurrenten sondern eher als Partner, um den großen Kuchen Wintertourismus gemeinsam größer machen zu können." (S14bhw)*

> *„Im Rahmen dieses Verbundes werden unter anderem auch Strategien und Marketing versucht zu optimieren, entsprechend einer gemeinsamen Philosophie und Richtung zu entwickeln." (S14bhw)*

Smaller ski areas will have to close – the concentration process is happening – if they do not find adequate partners and investors.

> *„Das wird passieren. Es sind bereits sehr viele kleine Gebiete geschlossen, und es werden noch andere folgen. Also im Wallis hat gerade eine englische Firma das Skigebiet gekauft. Das ist klar, wenn ich einen Sponsor habe, der viel Geld hat, der subventioniert. Aber die können selber nicht überleben." (S20gw)*

Ski area managements opt for a different model of governance with more diverse operations. The resort model in North America, where the ropeways company owns and operates gastronomy, hotels, ski schools and sport shops, is an example for a model some call *Model Europe*. They are aware that the circumstances in the Alps are different with the traditionally grown land ownerships and the structures of the ropeways companies. Still, a European model where ski schools, sport shops and hotels have the possibility to become shareholders of the ropeways company to rise the stock capital and to increase the added value of the tourists' expenses is demanded.

> *„Wir haben auch noch einiges zu tun bei den Anlagen. Also Seilbahnen und Lifte. Mittelfristig wäre es ein Wunsch von mir, das Modell Europa, diese zerhackte Leistungskette zusammenzuführen, auf Kapitalebene. Nämlich die Bergbahn so zu konstruieren, dass die Beherbergungsbetriebe, Skischulen, Sportartikelhändler die Möglichkeit haben Aktionär zu werden. Wir dadurch Kapital bekommen und jeder in dieser Kette letztendlich durch unsere Aktivitäten profitiert." (S7blw)*

The biggest marketing aggregation of ski areas in Europe is Dolomit Super Ski. Inside this group of 450 lifts, single destinations like Cortina d'Ampezzo again consist of multiple companies in the lift sector. Although the market and the stakeholders there are extremely diverse and split, the aggregation in one marketing group helps to bundle forces and appear as one big ski destination to the customer.

> *„Nein. Dolomiti Super Ski ist gegründet worden, um dieses Gebiet gemeinsam zu vermarkten, werbemäßig zu verkaufen. Aber es ist kein Wohltätigkeitsverein. Es sind*

> *alles private Unternehmen, die selbst wissen müssen, wo sie etwas bauen und wie sie das bauen." (S4bhw)*

The North American system works differently. Dolomiti Super Ski is proud and successful to manage and organize their destinations in a way by keeping their individualities and still communicating them as one. Thus they keep local traditions and satisfaction of the local population, maintain the character of the region as well as seasonal jobs for the locals. Competition inside the marketing aggregation is a natural quality selector and controller. This model works well in Dolomiti without necessarily controlling each individual by one big ownership company - like in the French system with the example of the Compagnie des Alpes.

> *„Aber scheinbar haben wir mit diesen Systemen erreicht, dass diese Gesellschaften überleben können und zum Teil auch gut leben können. Deswegen gibt es wahrscheinlich keine Fusionen. Andererseits ist es für uns auch wichtig, wir haben dadurch die Qualität entschieden verbessert. Unser System ist dem Gast zu Gute gekommen. Jede Gesellschaft muss die Lifte verbessern, die Pisten verbessern, die Schneeanlagen verbessern, beste Pistenqualität anbieten, und der Gast geht eben nur dorthin, wo er das Beste findet. Das hat die Qualität enorm gesteigert im gesamten Gebiet. Das war unser Erfolgsrezept." (S4bhw)*

In the French model, investment groups such as the Compagnie des Alps own many ski stations. In this system the individual ski area managements do not necessarily know or get involved in strategic decisions, for example where investments are taken. It is done by the owning company.

> *"But I don't know about the strategy because we have been recently bought by Compagnie des Alps and I don't know about the way it goes. With investments, I do not know." (S17gw)*

Destination communication

The communication and partnering inside the destination between the various stakeholders is a key issue as discussed earlier. The ski area often is the motor of investments inside the destination. The destination tourism depends on the ski area in winter, in summer it is vice versa. If the destination manages to communicate and partner as one unit, then there are win-win situations for all partners.

> *„Im Sommer sehen wir uns eigentlich als Teil des Ganzen. Im Winter sehen wir uns als diejenigen, die den Ton angeben. Sonst sind wir eigentlich ein Teil des Ganzen, nicht diejenigen, die den Ton angeben möchten oder können." (S13gw)*

Communication and outreach

Supporting and subsidizing smaller ski areas in the lowlands or in the mid mountain ranges is a key issue for the Alpine ski areas with the goal to flourish

interest in skiing close to the source markets. Supporting families and schools so that kids can learn to ski is an investment into the future of ski tourism.

> *„Wir unterhalten zu Recht die Gebiete im Voralpenland, im Jura. Die sind dann in Solothurn und in Basel. Das sind einzelne Skilifte, sind aber die nächsten Skigebiete zu beispielsweise der Stadt Basel. Oder auf der Achse Aarau das andere. Mit denen machen wir zum Beispiel Kinderförderungs-Aktionen, mit Skischulen, mit Nachtskilauf und solchen Aktionen. Das sind wichtige Zusammenarbeiten. Und die Strategie dahinter ist schon, die Leute die dort leben, auf den Schnee zu bringen. Und von dem Schnee zu uns zu bringen." (S6blw)*

Subsidies and models of financing

Subsidies from the region or the destination where hotels and all stakeholders of the local economic system paid into would be a fair way of supporting the ski areas in taking the huge investment sums and the risks associated with it. The gastronomy and the hotel sector are seen as responsible to take their part in financing the growing costs of investments and operations in ski areas because they benefit from the ski area too.

> *„Das ist ein Topf. Das erfolgt eigentlich über die Abrechnung der Kur-Taxe. Ein Anteil der Kur-Taxe kommt den Bergbahnen zugute. Ein anderer Anteil wieder dem Tourismusverein. Der Tourismusverein betreibt wieder die Eishalle und das Pedalo. Das Schwimmbad ist auch mit inbegriffen. Und dann werden zum Beispiel auch das Tennis und das Golf. Golf an sich ist nicht mit inbegriffen aber die Driving-Range. Die werden dann separat abgegolten. Aber wieder aus diesem Topf heraus." (S1shw)*

> *„Weil wir die höchsten Infrastrukturkosten haben, wir haben die höchsten Personalkosten, allein wir als Bergbahnen haben 320 Mitarbeiter im Winter, und jetzt im Sommer auch noch 170 Mitarbeiter. Wir tragen derzeit die Beschneiung komplett alleine. Wir haben derzeit eine Beschneiungsmenge von 1.5 bis 1.7 Millionen m³ pro Jahr. 1 m³ kostet zwischen drei und fünf Euro. Da können Sie sich ausrechnen, was alleine die Beschneiung kostet. Und wir haben aber keine Mitleister. Und wenn wir keinen Schnee haben, dann kommt der Gast auch nicht ins Hotel. Dann kommt der Gast nicht. Die Wellness-Landschaft, die kann noch so schön sein, er kommt wegen dem Schnee. Da kann ich auch sagen, fahren sie auf dem Wörthersee aber er ist ausgetrocknet. Wer fährt dann hin - kein Mensch." (S11bll)*

4.4.4.4. Summary of behavioral adaptation

Behavioral adaptation opens up a whole set of different opportunities. Diversification is among the most important ones. Decreasing the dependency on the day guest, increasing the variety of activities in winter, increasing sales in summer and increasing the variety of operations and investments are strategies of choice.

The envisioned *Model Europe* of governance needs to support diversification and provide higher added value from tourists' expenses. Ticket costs will increase, communication and outreach have to be improved. Specific target

group addressment, diversification and others cannot replace classic Alpine skiing. Subsidies and investors are needed to increase the capital on stock.

4.4.5. Mitigation

Mitigation strategies help to buffer the speed and the strength of climatic change, lessen the ecological impacts and build up environmental awareness with customers. A social aspect of mitigation was mentioned in the interviews too. The mitigation category is structured by three headlines, finalized by a summary:

- Environmental management
- Financing mitigation
- Social mitigation
- Summary of mitigation

Environmental management

The interview partners value the quality of the natural environment as essential for customer satisfaction, whereas it is not only an untouched mountain environment but also an intact cultural landscape, for example, a functioning local mountain agriculture. The value of an intact environment involves the responsibility to manage the ski area accordingly, for example, hiding technical equipment in the ground and re-greening earth movements so there is no visual impact in summer. Keeping an intact environment involves leaving some areas untouched, some parts closed and enforcing such closures. It includes local traffic management and the support of non-motorized mobility. Good practice in environmental management is risk reduction.

> *„Sehr stark. Wir machen regelmäßig repräsentative Gästeumfragen, daraus wissen wir, dass das Thema Natur und Umwelt ein wesentlicher Mitentscheidungsfaktor ist für unsere Gäste. Jetzt muss man ein bisschen aufpassen, wenn man sagt Natur, ist das nicht unbedingt die unberührte Natur. Die Leute, was die schätzen, das ist eben auch die Kulturlandschaft. Uns ist es deshalb auch ein Anliegen, diese Kulturlandschaften zu erhalten.“ (S6blw)*

> *“We want to be certified on ISO 14001, it is in process, we get our certification in March. Because of the customers, because they want to be already in an environment protected area and also because of the risk of the company. Because in France companies have to be very careful about the environment.” (S8gw)*

There is a difference seen between the guests in winter and in summer. In winter the tourist has a minimal chance to control the environmental performance in the ski area when everything is covered with snow. In summer the outcomes of the winter season on the vegetation and the landscape become more obvious. Still, there are many other factors visible in winter too. It is a matter of communication and knowledge.

> *„Für die Zufriedenheit des Kunden ist das glaube ich wenig ausschlaggebend. Es ist sicherlich für die Entscheidung des Kunden ausschlaggebend. Er wird sich sicherlich im Vorfeld informieren, ob dort die Voraussetzungen vorhanden sind, dass also Umwelt und Tourismus in einem vernünftigen Verhältnis zueinander stehen. Oder dass man nachweisen kann, dass entsprechende Aufwendungen für Ökologie und Umweltschutz und solche Sachen getroffen werden. Wenn der Gast einmal da ist, speziell der Wintergast, hat er kaum die Möglichkeit einer Kontrolle solcher Kriterien. Im Sommer, da ist es natürlich anders, er sieht wie es im Gelände aussieht. Aber der Wintergast hat durch die Schneeauflage keine Möglichkeit, das zu sehen.“ (S14bhw)*

The majority does not have an Environmental Management Systems **(**EMS) in place. But all interviewed partners can imagine establishing such a system. Often they already have a Quality Management System (QMS) established that they garner some experiences with. Those without an EMS have been collecting some information that could serve as a base. Six stations are certified or in the process, five with ISO 14001, and Planai with the Auditing scheme specially developed for ski areas.

> *„Ja. Wir sind ISO umweltzertifiziert.” (S14bhw)*

> *„ISO 14001 UMS ist im Februar 2008 vorgesehen.” (S9sll)*

> *„Nicht direkt, nein. Wir haben ein großes Qualitäts-Management-System integriert.“ (S1shw)*

> *„Haben wir nicht, nein. Würden wir aber machen, ja.“ (S3sll)*

Financing mitigation

If the guest paid a small additional sum on top of the ski pass it could be a source of financing mitigation. The majority of the interviewed ski areas could not see the necessary acceptance with customers to pay even more on this topic. They believe that customers expect ski areas to invest in such issues from the income generated by the normal ski pass. If it worked, then the price would be increased and communicated to the customer who could then choose to take that extra amount off the pass if they wanted to.

> *„Das müsste dann unter dem Aspekt* permission marketing *kommen. Also ich sehe das jetzt eher weniger, dass man sagt, jeder muss das bezahlen. Eher auf Freiwilligkeitsbasis. Und zwar in einem umgekehrten System. Zu sagen, die Karte kostet so viel. Und wenn du es nicht willst, da nehmen wir es raus.“ (S6blw)*

> *„Da bin ich sehr skeptisch, weil zwischen Ökologie gutheißen und dafür zu bezahlen, da liegt immer noch ein Riesenunterschied. Ich glaube, dass man das nicht separat ausweisen kann. Ich glaube wir müssen unsere Aufgaben in puncto Ökologie sowieso machen. Es gibt da so etwas wie Öko-Abgaben, wir zahlen ja Umweltschutz-Abgaben. Wir zahlen ja für jeden Quadratmeter verwundete Fläche Umwelt-Abgaben obwohl wir das wieder herrichten und dann ist es wieder perfekt. Meistens sogar besser wie zuvor. Aber das auf den Gast umzusetzen, ich glaube das funktioniert nicht. Da wäre ich sehr skeptisch.“ (S7blw)*

Most ski areas believe that the guest expects the ski area to manage the environment well as part of their business and that he would not pay extra for it.

> *„Ich glaube, das setzt das voraus. Davon müssen wir ausgehen. Die Beispiele zeigen das auf, das ist schon so. Dass wir die Sachen begrünen, dass wir die Sache in Ordnung bringen." (S4bhw)*

Four interviewed ski areas can imagine that it would work. Les Gets already has such a comparable system in use which works quite well.

> *„Das kann ich mir sehr gut vorstellen, ja." (S5sll)*

> *„So ginge es. Oder so könnte es gehen. Das ist interessant." (S16sll)*

> *„Für die Leute, die per Internet gebucht haben, wird 1 € pro zurückgegebenem Skipass an einen Verein gezahlt (engagiert in sozialer, umweltrechtlicher oder nachhaltiger Entwicklung). Dieses Jahr wurden 300€ gespendet (beschränkt aufgrund des niedrigen Prozentsatzes von Internetbuchungen). Für jeden zurückgegebenen Skipass werden 3€ intern für die Umwelt investiert. Es ist nur ein kleiner Teil der hier kommuniziert wird, weil in Wirklichkeit viel mehr für die Umwelt investiert wird." (S9sll)*

> *„Ja, ich denke das wäre eine gute Idee. Ich denke schon, dass das zunehmen würde. Nur man müsste schon genau wissen, wie das Geld dann genutzt wird. Das möchte der Gast natürlich wissen, der möchte die Fakten dann dazu auch haben." (S12shl)*

Social mitigation

A social facet of mitigation in a broader understanding (see the *Glossary* chapter) includes engagement into the socio-economic problems related to ski tourism, such as the increasing land prices in ski destinations and the availability of hot beds. Some ski areas already invest in affordable accommodation for employees.

> *„Jährlich werden 18000€ in Wohnungen für die Saisonarbeiter investiert." (S9sll)*

4.4.5.1. Summary of mitigation

The protection of the environment is valued as very important for customer satisfaction, for the success of the ski area and for Alpine tourism in general. Sound environmental management is seen as mandatory. Those who have no Environmental Management System in place, about two thirds, are planning or willing to implement one. Mitigation in the understanding of avoiding climate change was not stated by the ski areas, but rather in the avoidance of negative impacts on the local environment the customer could recognize. Contents of mitigation are understood differently. Most cannot imagine the tourist paying more for mitigation. Still, a fourth of the ski areas believe in or even have positive experiences with customers valuing mitigative efforts.

4.4.6. Chances and sustainable tourism

Changes always inhabit chances, not only threats. With hotter and drier summers the majority of ski destinations see chances for fostering summer tourism in the mountains. The lower areas might have more chances in summer because the green and sound landscape might attract more people than the harsh alpine zone. Ski stations in higher elevations see a chance for them in winter when the lower areas have to shut down, and the demand concentrates on a fewer number of higher areas. New technology, diversification and new target groups can be opportunities.

This category is structured by ten summarizing headlines, finalized by a summary:

- Performance key factors
- Size matters
- The commencement of the season is crucial
- New markets in the East
- The long term is uncertain
- Grey panthers and golden agers
- Prestige and image
- It can be simple – it's the scenery
- Sustainability as a market niche – or a market entry?
- Club of sustainable destinations
- Summary of chances and sustainable tourism

Performance key factors

A governance model analogue to the North American resort system, where the ski area owns hotels, sport shops, ski schools and more gastronomy is desirable by the ski areas. The *Model Europe* where the ropeways company receives a bigger part of the tourism value chain was mentioned earlier.

> *„Ich sage einmal, schön wäre es. Also wir sind die größte Seilbahngesellschaft Österreichs, von den Anlagen her, nicht vom Umsatz. Das muss ich der Vollständigkeit halber dazusagen. Aber von der räumlichen Ausdehnung der Seilbahnen und Lifte, die wir betreiben. Das amerikanische Modell geht natürlich weiter. Das ist die klassische Skidestination mit allem was dazugehört. Skigebiet, Hotellerie und Gastronomie, Skiverleih, Skischule, Sportshops etc." (S7blw)*

Size, elevation and diversification both in summer and winter and in sales are seen as main factors of success, and of course snow making.

> *„Also ich persönlich bin der Meinung, dass es sehr wichtig ist für die Zukunft der Bergbahn, dass man diversifiziert ist. Wir haben Untersuchungen gemacht, die haben sie sicher auch gemacht. Wenn sie Stationen anschauen, die gleich gut gearbeitet haben oder besser, sind das alle Stationen, die diversifiziert sind und eine hohe oder noch höhere Lage haben." (S1shw)*

> *„Speziell in unserem Fall ist die langjährige Zusammenarbeit der einzelnen Gesellschaften sicherlich ein Schlüsselfaktor, der zu unserem Erfolg führt." (S19bll)*

The ratio of day guests to overnight guests is a key factor of success, mainly depending on the distance to travel and the accessibility. The more overnight guests the better, requiring sufficient bed capacity.

> *„Orcières ist ein Wintersportort, der im Süden in einer großen Höhen liegt (1850m NN). Sein Umsatz hat sich trotz einer sehr mittelmäßigen Saison von 15% erhöht. Diese Umsatzsteigerung hat sich dank einer Erhöhung des Angebotes von Betten verwirklicht." (S10shl)*

Size matters

The trend of superlatives and more spontaneity needs to be taken into account. Bigger ski areas with more variety and offers will rather meet the taste of the mass consumer.

> *„Vom Produkt ist für uns natürlich die Größe im Vordergrund. Die Anzahl der Pistenkilometer, und die Anzahl der Lifte. Was grundsätzlich die Marketing-Kooperation betrifft sind natürlich die Zusammenarbeit und die Synergien wichtig, die man hier erzielen kann." (S19bll)*

The commencement of the season is crucial

If the main holiday season or the booking behaviour could be moved some weeks to springtime, it would solve many problems of the ski areas.

> *„Ich könnte mir das vorstellen und das könnte auch möglich sein. Sicher war dieses Frühjahr eine Ausnahme, wirklich das einfachste, den Jahreskalender um 10 Tage zu verschieben. Dann würde alles wieder in etwa stimmen. Das ist das Hauptproblem, das alle haben." (S1shw)*

New markets in the East

The emerging markets in Eastern Europe, in China and Russia mostly are seen as an opportunity.

> *„Völlig klar, ein weiterer Trend ist Richtung Osten. Wir wissen bereits jetzt, dass in den nächsten 10 Jahren aus dem asiatischen Raum 100 Millionen Reisewillige sich in das Flugzeug setzen werden. Denen ist das egal, ob sie in Wien landen, in Salzburg, oder in Davos. Weil die sitzen ja schon 10 Stunden im Flieger. Nur von der Tourismusbranche als solches wird das nicht erkannt. Wir versuchen auch Fuß zu fassen über Bollywood, haben auch etliche Produktionen gemacht, auch jetzt wieder am Dachstein. Das sind aber Einzelkämpfer. Aber wir wissen, es orientiert sich in diese Richtung, weil da eine Erschließung neuer Gästeschichten möglich ist." (S11bll)*

The long term is uncertain

In general ski areas are thinking in the short to midterm – the long term developments are too uncertain and too far ahead.

> *„Und natürlich, andererseits sage ich, was soll man machen. Was in 100 Jahren passiert, wer weiß. Vor 100 Jahren hat es auch das Skifahren nicht gegeben.“ (S4bhw)*

Grey panthers and golden agers

The target group of seniors is attractive and of growing importance. But it is key to not market it as a senior offer because no one would come. Offers for kids and families fit together well with such for seniors.

> *„Wir fahren voll auf dieser Schiene. Ohne es zu kommunizieren. Es will kein Senior als Senior angesprochen werden. Es gibt nichts Schlimmeres als ein Senioren-Hotel. So dumm kann man gar nicht sein. Wir haben letztendlich diese Schiene, als Ausflugsgebiet, unsere Erkenntnis ist, dass eigentlich das, was für die Kinder gut ist, sprich die Zugänglichkeit, die Einfachheit, die Ungefährlichkeit, all diese Geschichten. Was für die Kinder gut ist, ist genauso gut für die Älteren.“ (S16sll)*

> *„Das ist etwas anderes. Natürlich darf man die golden agers oder die grey panthers, oder wie man das auch immer bezeichnet nicht vernachlässigen. Das ist eine Gruppe, die Geld hat, die auch Geld ausgibt. Und die nach wie vor sehr agil ist. Es ist nur ein Problem für diese Gruppe eigene Angebote zu schaffen, weil es will kein grey panther ein grey panther sein. Es fährt keiner dahin, der dann da tausend andere ältere Leute sieht. Jeder will dahin fahren, wo junge Leute sind. Nehmen Sie die Kurbäder, alle die sich als Kurdestination positioniert haben, das ist alt, das ist verstaubt. Die ältere, aktive Generation will nicht unter älteren Leuten sein. Sondern unter jüngeren Leuten und aus einem aktiven Angebot auswählen. Der Trend ist natürlich gegeben. Und das Schnüren von speziellen Produkten ist nicht einfach.“ (S11bll)*

Prestige and image

The prestige and importance of the tourism brand as well as the strength of the destination brand for marketing are important. Ski areas with a famous image benefit from their reputation. Also, the traditionally grown surroundings and landscape of the destinations are important. In the example of Kitzbühel, the atmosphere of the old part of the village together with its reputation as the birthplace of skiing in the Alps (together with the Arlberg) serve as a main tourist magnet throughout the year.

> *„Prestige der Marke.“ (S6blw)*

> *„Wo wir in der Vermarktung gar nichts aktiv dazutun. Nämlich dieses Promi-Image. Das uns als Bergbahn übrigens gar nicht ganz recht ist. Wir wollen es nicht verteufeln und wir wollen es nicht abschaffen. Andere wären froh, wenn sie es hätten und würden viel dafür ausgeben.“ (S7blw)*

> *„Und das zweite, der große Vorteil, den wir natürlich haben, ist natürlich die Bekanntheit von Arosa. Umfragen gestützt, verschiedene Umfragen, Skistationen in den Alpen, da kommt Arosa sehr weit vorne. Kommt weit vor Davos, Laax kennt überhaupt niemand. Aber Arosa kennt man, und das ist immer noch ein ganz, ganz wichtiger Punkt für uns.“ (S1shw)*

It can be simple – it's the scenery

Some areas benefit from a natural surrounding that has breathtaking and famous mountains, such as Zermatt. Davos instead is a destination that needs to develop alternatives much more, because famous mountains are missing. A natural magnet such as the Matterhorn in Zermatt does not exist. Those destinations with famous mountains have it much easier to attract visitors in summer and in general.

> *„Das wird nie so sein wie im Berner Oberland, oder in Wengen oder Grindelwald oder Zermatt. Die haben einfach Berge vor der Haustüre, da müssen Sie nicht viel machen. Dann haben sie im Sommer auch die Besucher. Titlis, das ist sehr nah. Asiaten werden da regelrecht durchgeschleust. Und das haben wir hier nicht." (S2bhw)*

> *„Die Dolomiten helfen uns natürlich ganz wahnsinnig. Das haben wir vielleicht den anderen einfach ein bisschen voraus. Also die Vermarktung findet überall statt, vielleicht auch in anderen Skigebieten sogar noch besser wie bei uns. Dass ist keine Frage. Aber die Dolomiten haben eben wir. Und wir sind uns immer schon bewusst, dass unser Kapital die Dolomiten sind." (S4bhw)*

> *„Wir können im Prinzip im Sommer nicht viel bieten, panoramamäßig. Also wir haben ein sehr schönes Panorama, von ganz oben sieht man sehr weit. Aber eben markante Berge haben wir nicht. Das spürt man schon." (S2bhw)*

Sustainability as a market niche – or a market entry?

The quality of the natural environment is understood as important for customer satisfaction and thus for the strategy of a ski area. It is seen as a growing topic being worthwhile investing in. No one named sustainability or being green as a destinations' Unique Selling Proposition (USP) though. Asked more concretely, the majority agreed that sustainability can be a USP of a ski destination – maybe not the only one, but still a complementary part.

In sum the answer to the potential of sustainability as a USP is yes. Those who inform themselves and who do their own market surveys agree with the potential of sustainability as a market. Even the biggest ski area aggregation Dolomiti Super Ski, would include these topics into its active marketing. The understanding of sustainability is mostly reduced to the ecological aspects though, and the social facets need to be developed. Economical topics are more understood as internal and not to be communicated.

Orcieres in France is again standing apart with its opinions from the others. Sustainability in their opinion is a fashion, not more. They are alone in this group of ski areas with this viewpoint.

> *„Nein. Die Umwelt ist keine Nachfrage der Touristen. Es ist kein Auswahlkriterium." (S10shl)*

> *„Nein. Aber man kann den umweltrechtlichen Prozessen nicht aus dem Wege gehen. Es bildet eine „Modeerscheinung". Damit sie aufgewertet werden können, müssen sie von den gesamten Wintersportortakteuren durchgeführt werden. Wie kann man wissen, ob es eine wirkliche Wirkung auf den Kunden hat?" (S10shl)*

Gstaad cites a Swiss study that the market share in Switzerland of summer tourists making decisions according to environmental criteria is about 50% (Müller et al., 2001). Again, the importance of such topics is seen to be higher in summer than in winter, the summer guest being more affinitive.

> *„Und das Interessante ist, wenn man dann noch in den Bevölkerungskreisen schaut, wo das genau ist, dann sehen wir es. Tendenziell genau die, von denen wir besonders viele haben. Es sind genau die, die besser ausgebildet sind, diejenigen, die es sich leisten können, die ökonomisch besser gestellt sind, es sind mehr die älteren. Um von denen haben wir besonders viele. Weil dort kommt das langsam in Mode. Man will zwar genießen und konsumieren, aber es ist nicht mehr das traditionelle Bild des Konsumverzichts. Konsum ja, aber dann schlau! Und hier sehe ich Chancen, besondere Chancen für die Region. Dann muss ich sagen, wir tun das noch nicht konsequent. Wir verkaufen das noch nicht konsequent, diese Ansätze, die natürlichen Ansätze. Wir investieren aber sehr viel, wir bauen gerade so ein Fernheizwerk. Das den ganzen Talboden von Saanen und Gstaad einmal versorgen soll und die Ölheizungen ersetzen wird." (S6blw)*

> *„Es wird immer wichtiger. Es gibt eine Studie, die von einem Schweizer Institut für Wirtschaft in Auftrag gegeben wurde, und dort versuchten zwei Hochschulinstitute herauszufinden, was Entscheidungsgrundlagen sind. Was ist naturnaher Tourismus? Wie entscheiden sich die Kunden, und eine der Erkenntnisse, wenn man von naturnahem Tourismus redet, denkt man als erstes an die ganz alternativen, mit Sandalen und so. Aber es gibt einen immer größer werdenden Kreis in der Bevölkerung, der sensibel reagiert auf solche Reize. Wo das eine Mitentscheidung bedeutet. Und in der Schweiz schätzt man den bei bereits etwa 50% ein." (S6blw)*

St. Anton understands that due to experiences from past public discussions on the practice of snow making, the topic of Corporate Social Responsibility (CSR) is a way to market. St. Anton estimates the market share of people interested in CSR aspects of 25-30%.

> *„Ja, das ist nicht neu, das Thema oder diese Strategie. Das hat begonnen mit der Verteufelung der Schneeanlagen, Mitte oder Ende der Neunziger. Wo man begonnen hat mit dem Ausbau. Wo wir uns eben Gegenmaßnahmen oder Strategien überlegen haben müssen. Und dann auch nachweisen mussten, dass es ökologisch eigentlich unbedenklich ist. Von daher stammen natürlich dann die Kenntnisse, auf dieser Informationsschiene dem Gast etwas bieten zu können. Entscheidungsgrundlagen und gewisse Sicherheit geben können. Dass er nicht zu den Umwelt-Sündern zählt, wenn der Skifahrer zu uns kommt." (S14bhw)*

> *„Schwierig. 25 bis 30%. Nicht ausschließlich aber diese Kriterien miteinbeziehend in die Entscheidung." (S14bhw)*

The question for one group of ski areas is if the topics the customer is interested in reflect the difficult and abstract expression of sustainability – as well as the diversity of all kinds of clients. Those who do not have snow, do not offer modern chair lifts or have poor slopes cannot outweigh the basics with any other content or image. The basic offers and services have to be in place and then a topic like sustainability can be saddled on top. There must be contents to develop trust in sustainability marketing. The preferences of a *sustainable* ski tourist are not known. But there are possibilities offering chances and niches.

> *„Ich glaube komplementär ja. Aber im Grunde geht es darum, dass man möglichst viel Leistung, einen guten Service, einen hohen Qualitätsstandard kriegt für möglichst wenig Geld. Und die Ökologie ist komplementär. Ich glaube nicht, dass die Ökologie entscheidend ist, bei der Entscheidung, wo verbringe ich meine Ferien." (S15bhw)*

> *„Das sind dann eben die Haushalte, die bewusst sagen, wir leben ökologisch. Und wir haben auch kein Auto und bewegen uns mit dem öffentlichen Verkehr usw. Das ist eine große Zielgruppe. Vor allem im städtischen Bereich. Die sind da zu finden, wo auch der Anschluss dementsprechend optimal ist. Da ist man überzeugt davon, dass das auch ein Potenzial ist. Und somit ein Markt ist. Die Frage ist aber auch, mit was für Angeboten muss man sie ansprechen. Auf was fahren die ab? Sind das auch diejenigen, die nicht mehr mit dem Flieger in die Ferien fahren? Wie sind die vom Reiseverhalten? Und dann, wenn sie da sind, was tun sie und was tun sie nicht? Was wollen sie eigentlich? Also wir kennen diese Zielgruppe nicht." (S15bhw)*

Sustainability by one group is seen as trendy, a fashion people talk about. The majority believes it will become normal and mandatory in the near future, after a couple of years. That may well be the difference to other fashions, but global change, climate change and a thorough management of finite natural resources will become even more important in the mid and long term. Strategic consumption as such might undergo a cycle like anything does, but the general trend will keep it as an important topic in the future.

> *„Irgendwann wenn sich dann die Null vor der letzten Zahl anfängt zu verändern und nach oben steigt ist man dann nicht mehr so freudig. Und je älter dass man wird, desto glücklicher ist man dann, wenn man gesund bleibt, und noch einen weiteren Geburtstag erlebt. Da denkt man viel weiter in die Zukunft. Und ich glaube, das ist so der Wertewandel beim Menschen. Je nachdem wie alt er ist, lebt er anders und denkt anders. Und gewisse Leute, die interessiert nicht, was in 30 Jahren ist. Die leben im Heute, im Jetzt. Im Momentanen. Und wir haben ein ganz anderes Denken." (S15bhw)*

Sustainability will become mandatory at some point with more and more ski areas following those leading the path and creating a market.

> *„Ja, ich glaube, das werden Einzelne stark aufgreifen und Vorreiter in diesem Gebiet sein. Und irgendwann werden alle mitmachen. Das gehört, glaube ich, heute einfach dazu." (S20gw)*

> *„Das ist klar, das Thema ist immer da. Aber irgendwann ist das auch out. Jetzt hat man Daten bekommen und relativ klare Sachen, die präsentiert wurden das war ein peak,*

> *aber der wird sich abflachen. Es ist klar, was ich gesagt habe, da muss man mit dabei sein. Wir ersetzen auch Heizung/Elektroheizung durch Wärmepumpen usw. Aber das wird nicht ausschlaggebend sein. Aber jemand der das absolut ignoriert, wird verlieren, das ist klar.“ (S20gw)*

Communication is the key. Zermatt will continually communicate such topics in the future. If there were official third party certifications or statements/ recommendations, an adequate certifying partner should be neutral.

> *„Ja, das ist richtig, wir kommunizieren diese Themen zu wenig, auch wir. Wir sind diese Projekte gerade am vorbereiten, und wenn diese realisiert werden, wird das dann auch dementsprechend kommuniziert. Ich gebe Ihnen ein Beispiel: ich kann sagen, ich habe hier eine Piste, und die ist ökologisch präpariert, und wir schauen, wie viele Leute diese Piste fahren. Kann ich Ihnen sagen, es fährt praktisch niemand.” (S20gw)*

There are many ideas for filling the topic of CSR with contents in a local context, for example, keeping local traditions and remaining real – which are more the social facet. It is seen as an ongoing process.

> *„Da sind wir glaube ich noch in einem, gesellschaftlich gesehen, im Prozess. Aber es kommt verstärkt. Man sehe sich nur an, was Hofer oder Aldi versucht, mit regionalen Marken, mit Frischwaren ihr Image aufzubessern. Ich glaube, dass wir in Zukunft mit diesen Dingen sehr wohl stark punkten werden. Und auch die Wahl für den Gast, weil er in einer gesunden Region urlauben will, sich aufhalten will. Dann fällt die Wahl auf dem Bregenzerwald und somit auch auf den Diedamskopf.“ (S3sll)*

The importance and the demand of this topic in the future will depend on the general development in society. If life cycle analysis and climate impact assessments became an asset for tourism in general, then it will, of course, become more important for ski tourism and ski areas too.

> *„Wenn die Entwicklung in die Richtung geht, eine Öko-Bilanz für den Urlaub zu erstellen. Das gibt es teilweise schon, in der Schweiz macht das schon eine Destination: Arosa. Dann wird das eine viel größere Bedeutung bekommen. Wenn das in diese Richtung geht, wenn die Indikatoren so bleiben wie sie sind, dann wird das latent bleiben.“ (S11bll)*

Interview partners have different objectives and understandings of sustainability. Some think of it as contradictive to fun and excitement – and do not imagine that it would work.

> *„Weiterer Trend ist der Superlativ: weiter, schneller, kürzer, intensiver. In kürzerer Zeit noch mehr, noch intensiver erleben. Einen Trend zum sanften Tourismus ist von uns aus nicht auszumachen. Denn das ist ein Widerspruch in sich. Sanfter Tourismus ist nichts anderes wie ein Deckmantel für eine Region, wo sich Fuchs und Hase gute Nacht sagen. Es wird keiner auf Urlaub fahren, um dann zuhause zu sagen, ich bin auf Urlaub gewesen und habe nichts erlebt. Das ist ein Wunschdenken.” (S11bll)*

Club of sustainable destinations

All interviewed ski areas apart from Sölden could imagine to actively participate in a club of sustainable ski destinations that develops and markets the topic of sustainable ski tourism. The content must be clearly worked out and communicated. One objective would be to learn from each other and bundle forces in research and marketing while developing individual profiles.

> *„Ich denke schon. Man müsste genau sehen, was es beinhaltet. Aber prinzipiell schon." (S6blw)*
>
> *„Natürlich, warum nicht. Das eine ist sicher eher vermarktungsorientiert. Das andere ist eher imageorientiert. Wobei natürlich Image auch irgendwo die Vermarktung als Endzweck hat, als ökonomische Argumente." (S7blw)*
>
> *„Natürlich wäre das interessant." (S4bhw)*
>
> *"Maybe yes, sure." (S17gw)*

The question is – who is the first?

> *„Es bleibt einfach nur die Frage, wer ergreift die Initiative." (S20gw)*

4.4.6.1. Summary of chances and sustainable tourism

Global change indeed opens up chances for ski areas. New markets in the East, more specific target group addressment – such as seniors – and summer tourism are examples. Summer tourism is expected to increase with lower ski areas having advantages here. Famous mountain scenery, prestige and image of the destination brand are important success factors. Sustainability is seen as a complementary market niche now, which will become mandatory for any destination in the future. In general, size, high elevation and diversification are seen as main factors of success, and, of course, technical snow making. The model of governance and local regulations need to support diversification and investments.

4.4.7. Outlook and external support

The need for external services, knowledge and support is high in order to cope with global change. Each destination, and more specifically, each mountain is extremely different so solutions will have to fit to each case. The presentation of results in this category of taking action is structured by six summarizing headlines:

- Translating science into practice – local climate change studies
- Communication and media
- Sustainability and environmental management
- Strategies and benchmarking
- Customer Relationship Management and market research

- Regulative support

Translating science into practice – local climate change studies

Climate change can locally lead to very different patterns. Local climate scenario models would help to work out individual strategies. The available information on climate change and other developments of global change are very diverse. A service agency that collects and separates such scientific information and translates it into management language for ski areas could provide valuable decision support, including a scientific consulting service.

> *„Erstens einmal, was das Klimaszenario betrifft, Sie haben es eingangs erwähnt, es ist durchaus möglich, dass das kleinräumige Szenario ganz anders ausschaut als das großräumige. Wir haben zwar keine detaillierten Untersuchungen hierzu, aber wir haben hier diese klassischen Nordstaulagen, wir sind eigentlich ein Schneeloch.“ (S7blw)*

> *„Das ist ganz wichtig, weil aufgrund von Strömungen oder Unterschieden, jetzt gibt es eben nur diese Gesamtstudien, die gehen eben zu wenig auf das Einzelne ein. Aber man liest da andererseits auch immer etwas anderes. Jetzt habe ich wieder etwas gelesen, da schreibt einer, ab 2015 wird es wieder kälter. Man weiß es nicht.” (S4bhw)*

Communication and media

In-house staff training in CSR issues and global change is needed so personnel can better address customer questions and thus increase the involvement of the customer more, a prerequisite for better service orientation and individual target group addressment.

> *„Das ist ein absolutes Ziel. Mitarbeiterschulungen.” (S3sll)*

> *„Da ist viel möglich, und wir sind auch mit dem Umgang der Medien, da ist unsere Branche noch ziemlich schlecht. Also die harte Medienwelt, der harte Konkurrenzkampf, das ist uns noch zu wenig bewusst. Und wir müssen auch Storys liefern, aber nicht dass sie die falschen machen. Also ich denke da liegt viel drin.” (S16sll)*

Marketing and communication, with a focus on selling the product, not just advertisement, are demanded, as well as active media work.

> *„Wäre die ganze Vermarktung von mir aus gesehen. Das könnte ohne weiteres sein. Das ist jetzt teilweise gelöst und teilweise nicht gelöst mit Arosa-Tourismus. Weil ich sagen muss, der Tourismus-Verein ist für mich zu wenig vermarktungsorientiert. Vermarktung heißt nicht, einfach nur Werbung zu machen. Sondern Vermarktung heißt verkaufen. Das kann ich mir gut vorstellen. Dass das nicht funktioniert über Reisebüros, das wissen wir auch. Also müsste das irgendeine andere Stelle sein.“ (S1shw)*

> *„Marketingmäßig könnte man das sicher angehen. Man müsste sehen, was ist die Tendenz, die Altersgruppe, zwischen 25 und 45, global gesehen, was haben die für Interesse? Dass wir uns nach diesen ausrichten, weil das sind unsere Kunden. Und dann auch Familien, dass wir sehr nachhaltig arbeiten könnten. Das wäre sicher interessant. Was ist der Grund, warum die hier noch Ski laufen? Was ist der Grund,*

> *dass sie hierher gehen? Das wären sicher Services, die sind interessant. Da könnte man auch Schlüsse daraus ziehen." (S2bhw)*

The quality and the service of customer communication by webcams, snow reports and websites as such need further improvements.

Sustainability and environmental management

The majority would seek support in setting up a strategic plan to improve in the field of sustainability and how to communicate it.

> *„Ich würde sagen, ich kann die Initiative nicht ergreifen, ich habe einfach zu wenig Zeit. Dafür muss man sehr viel Zeit haben. Aber von der Idee her, würde ich das eigentlich sogar sehr gut finden." (S20gw)*

> *„Ich sage einmal so, wir zahlen ja heute schon recht viel für erneuerbare Energien. Die Kraftwerke, die über das Energiegesetz schon sehr viel erneuerbare Energien in das Netz speisen. Die natürlich dann der Verbraucher und somit wieder wir bezahlen. Und dafür mehr bezahlen als andere Bewerber in anderen Regionen. Man muss aber natürlich schon darüber nachdenken, was man alles tun kann. Sei es ein Biomasse-Heizwerk, sei es an Solaranlagen, sei es wenn man an die Beschneiung denkt, auch im Sommer, wenn man dann das Wasserangebot für ein Kleinkraftwerk mitnutzen könnte. Sei es, in der Verbrennung von Ölen, die in der Gastronomie anfallen, da gibt es vieles. Wobei wir das nicht alles alleine bewältigen und andenken können." (S3sll)*

Those who do not have it in place yet want to implement an Environmental Management System (EMS). A minority of them would install an EMS only if there was a system fitted directly to the specific needs of a ski area. One interviewed person is skeptical towards ISO certification.

> *"Aber derzeit hat man eigentlich kein System gefunden, wo man wirklich einen Mehrwert daraus erwartet." (S11bll)*

If destinations wanted to become more active and attractive in environmental topics, then they would need consulting in this topic too, for example, in energy efficiency and how to generate direct savings from being more efficient. External support and views are needed in general to not become blind for the own situation.

> *„Das ist schwer zu sagen, also wenn wir zukünftig etwas in Richtung Umwelt machen möchten, dann bräuchten wir auch hier diese Beratung. Weil ich glaube, unser eigenes Know-how wäre gar nicht groß genug." (S1shw)*

> *„Also was noch näher liegt, ist natürlich die Energiefrage, die Energieeffizienz. All diese Fragen, die interessieren uns betriebswirtschaftlich noch mehr. Es geht alles ineinander über." (S16sll)*

Strategies and benchmarking

Ideas and offers for kids and families in summer and in winter and the idea for a summer Unique Selling Proposition (USP) are sought for. One group of ski areas see a limit of growth in summer already and do not want to follow inflationary ideas that are being picked up by more and more competitors. Shaping the local USP that really is unique is a challenge.

> *„Ja, seit Jahren haben wir das Konzept der Sommeridee. Sommer-Highlights zu finden. Aber die glorreiche Idee ist leider noch nicht aufgetaucht*.“ (S14bhw)

> *„Müssen wir, zu unserem Bedauern sage ich selber, zugeben, dass wir in puncto Familie nicht perfekt aufgestellt sind. Da gibt es andere Destinationen wie Fiss/Serfauss/Ladis. Da hinken wir hinterher, das wissen wir selbst. Da fehlt es auf der Produktebene, an Kinderangeboten usw. Können wir nicht von uns behaupten, dass wir da spezialisiert wären.“ (S7blw)*

At this point there are no internal and very limited external benchmarking tools in environmental topics applied in the ski tourism industry. The development of such tools could help to create and foster a market for sustainability in ski tourism. Some of the interviewed ski areas seek for support in evaluation and monitoring economic success and customer demand. Local studies to examine and to evaluate the added value of events, for example, are the very services sought after. Market studies on customer demand are needed to generate strategic decision support data.

> *„Ich weiß nicht, mit wem das gemacht wurde, aber ich glaube, das sind so 11 Millionen, die diese Woche bringt. Aber wir haben noch nie eine Wertschöpfungsstudie gemacht auf Seiten der Bahnen.“ (S15bhw)*

Some of the smaller resorts could need support in benchmarking with other ski areas, a field with many criteria.

> *„Benchmark betreiben die Bergbahnen und wir als Tourismusdestinationen eigentlich nicht. Es ist schwierig, weil es einfach sehr viele Kriterien gibt, die einfach nicht messbar sind. Und bei den Bergbahnen ist es sicherlich möglich. Das ist immer die Diskussion. Im Benchmark-Bereich kann ich ihnen schlicht und einfach keine Auskunft geben.“ (S5sll)*

A major group of ski areas need support in defining a long term strategy for the destination and the ski area, even in communication inside the destination.

> *„Ist nicht in Planung. Wird auch keine Diskussion darüber geführt. Also grundsätzlich denke ich, dass es zuerst eine Strategie braucht oder eine solche erarbeitet werden muss. Dass in der Touristikbranche noch keine Gedanken gemacht werden über die nächsten zwanzig Jahre, das ist bei uns nicht besser.“ (S5sll)*

CRM and market research

Customer Relationship Management (CRM) solutions would be bought if they were standardized and simple to implement and to manage. If destinations installed a CRM system then they needed support in handling the data, the transactions and the whole management of this system.

> *„Ja, denn wir sind überzeugt: wenn wir so etwas starten, dann sind das sofort zigtausend Kunden, die da mitmachen. Und das handeln wir nicht. Da ist eine große Administration dahinter, auch wenn es automatisiert ist. Das ganze Controlling und die ganzen Verrechnungen, das muss man einfach doch machen. Das können wir einfach nicht derzeit.“ (S13gw)*

> *„Ja. Also vorstellbar wäre das. Nur ist es mit sehr hohen Kosten und auch mit human resources verbunden. Das ist zwiespältig, relativ viel Aufwand und ich denke wenn man es betreibt müsste man es wirklich professionell betreiben. Und nicht nur einfach eine Kartonkarte haben und Punkte sammeln.“ (S5sll)*

Regulative support

Support from the local authorities is needed to ease up regulations, such as for water management and snow making construction. The regulatory frame should provide more support for the ski areas.

> *„Hilfe fragen wir an, wir haben das auch getan derzeit. Die öffentliche Verwaltung müsste verstehen, dass die Speicher eine wesentliche Bedeutung haben. Und es nur durch Speicher möglich ist, den Winter aufrechtzuerhalten.“ (S4bhw)*

> *„Einmal die Rahmenbedingungen schaffen, es geht immer darum entsprechende Standorte zu finden. Das ist das große Problem.” (S4bhw)*

4.4.8. Summary of results

The winter 2006/07 as the warmest in records so far (Beniston, 2007a) has shown that ski areas high in elevation and with sufficient snow making equipment can cope with the direct impacts of climate change quite well. Lower and smaller ski areas with less natural snow reliability and warmer temperatures preventing snow making in combination with less investment power suffer much more from direct climate change impacts. Losses in the lower areas range around 15% to 40%, in the higher from zero percent to three percent. Some of the high and big areas even had positive results with a gain of up to 10% relative to the season 05/06.

The main problem for the lower ski areas was the temperature – snow making often was not possible. The higher areas took advantage from spontaneous skiers who stayed away from the lower ski areas. All ski areas believe in the advancements of technical snow making to cope with warmer temperatures as long as they can stem the investments – something that will be possible only for bigger ski areas and such with investors. In general, higher and bigger ski areas

can be seen as less vulnerable to the direct impacts of climate change than lower and smaller ones. Losses of one to three percent in the higher areas still result in a lower cash flow of some million Swiss Francs or Euros. This cash flow is the guaranty for making new investments which are necessary for operations or for increasing the diversity.

Climate change impacts vary from place to place. Some lower ski areas might have completely reverse circumstances than generally expected. Global change impacts, though, are much more interrelated, diverse, complicated and different in every locality. The factors making a ski area sensitive to changes are much more diverse than currently discussed. Higher ski areas expect the indirect and social aspects of global change to become a problem of greater importance in the future. The investigated season has shown a first taste of indirect impacts of climate change in the source markets and towns. The lack of snow or winter atmosphere where people live makes them forget about the existence and the beauty of skiing.

Decreasing numbers of skiers cannot be tackled with technical adaptation. The limits of snow making have been experienced in the higher ski areas despite the overall good results. Water shortages are just another limiting factor. Fewer skier numbers are expected in the future, due to a break in traditions of skiing and kids education in skiing, a lack of snow in the source markets, rising prices and many alternative competing activities. The media and communication proved to be very important in outreach to the customer. The negative reporting of the press in the winter 06/07 led to a decline in day guests. Ski areas with high dependencies on day guests are thus more vulnerable than others.

Behavioral adaptations focus on diversification in many aspects. A targeted increase of overnight guest ratio demands for more bed capacity. Demographic and socio-economic developments lead to an increase in secondary homes or cold beds, to rising land prices and together with topographic constraints limit the bed capacity. Diversification in summer activities and in snow independent ones cannot replace the revenue of Alpine skiing. Events seem the only real option to generate the needed volume of clients. Concentration processes will carry on; small and low ski areas are expected to diminish. Partnering and aggregating is more important than ever.

However, opportunities are seen in specific target groups like seniors, in emerging markets, such as from Eastern Europe, and in summer tourism. Lower ski areas are expected to benefit more in summer. General key success factors for high adaptive capacity are the elevation, the size and the development space for accommodation. The model of local governance and regulations set the frame for any developments in the future, being it expansion plans, diversification or just the construction of water reservoirs. A *Model*

Europe is demanded that opens up new opportunities in investments and governance while sleeking the chain of added value from tourism spending – analogue to the North American resort model. Environmental performance is seen as a key success factor, sustainable tourism as a growing market that could become a niche for smaller ski areas, a complementation for big and high areas, and even mandatory for any ski area in the long term.

Vulnerability of ski areas to global change is more complicated and diverse than just the elevation, the size and the snow making capacity. The uncertainty in the knowledge and in forecasts of developments is high, as well as local and regional differences, and the many possible feedback loops affecting and changing the system. Every ski area is unique in its exposure, its sensitivity and its adaptive capacity.

4.5.Discussion

This chapter discusses the results of the experiences and perceptions of ski area managements after the analogue winter of 2006/07 and takes a closer look at other relevant studies on the supply side in ski tourism and global change. In each discussion point we highlight the main results in grey **bold** letters for better reading and understanding. The discussion is structured in three main segments: perception and vulnerability, adaptive capacity, and strategies and management.

4.5.1. Perception and vulnerability

The perception of global change is high within all interviewed ski areas. Because the interviews of *SkiSustain* were held after an analogue winter for future developments (see chapter two), the reactions and perceptions of ski areas probably were stronger and different in general, as opposed to interviews held after a rather *normal* winter in terms of snow cover and average temperatures. This circumstance leads to a high quality of the results for forecasting future developments, but the circumstances of this winter have to be kept in mind for making interpretations and conclusions.

Climate change is understood as the main threat, but the outcomes and the local and regional differences are often unclear. Abegg (Abegg et al., 2007) discovered that 70% of the ski areas in Switzerland feel well informed about climate change. Smaller ski areas are rather insecure with the outcomes of climate change, although Wolfsegger showed that a clear majority of managers from lower ski areas in Austria expects at least some substantial changes from climate change (Wolfsegger et al., 2008). Here still, one-fourth believes the climate to remain stable with a majority expecting more extreme weather events, which was reported in our interviews too. The high insecurity of especially lower ski areas is confirmed by Roth (Roth et al., 2008). Here only

about fifteen percent feel secure enough about future global change developments to plan strategically ahead.

A minority of the higher and bigger ski areas interviewed understand climate change as the main threat. Demographic and socio-economic changes as another facet of global change are seen as even more important by the higher areas who proved to outcome direct climatic problems with technical snow making in the winter 2006/07. In Roth (Roth et al., 2008), economic and demographic problems are seen as the main threat of the future followed by climate change.

The indirect outcomes of climate change on the sensibility of the guest in relation to his preferences and demand could just have been guessed in their future potential with more severe winters like 06/07. The guest did not have a sense of winter because of the lack of snow in the source markets, in the low lands and close to the cities. More than ten years ago, Abegg (Abegg, 1996) found out that about 60% of tourism officials in the Swiss region, Bünden, believed that three winters with little snow lead to more sensitivity in this topic. Abegg discovered that technical snow is limited in its adaptation potential to the ski area itself and cannot help in the source markets and in the minds of potential customers. People have to know about it; they have to be reached with this message. These quantitative results confirm our findings.

The dependency on the day guest who reacts spontaneously and is most affected by the media is understood as a sensitivity factor, related to the ease of access. This leads to the goal of more overnight guests and more warm beds. The development in many destinations is opposing that because an increasing number of secondary homes are being built. They count as cold beds and increase land prices for local inhabitants. They cannot afford living in the destination anymore, and in off-season and summer the destination is rather *dead* – being contra-productive for summer tourism. Diversity is a key vulnerability factor seen by the ski areas. The goal is to increase summer sales and decrease winter dependency. In summer the unique ideas are absent, looking for offers to the customer that no one else has. Wolfsegger (2008) found out too that diversification is among the most important kinds of behavioral adaptation in Austrian ski areas, as well as in German ski areas (Roth et al., 2008).

The added value in the ski tourism service chain is low for the ropeways companies compared to the high one for gastronomy and hotels. The less diverse the operations of a ski area are, the higher the vulnerability becomes. The winter 06/07 showed that the gastronomy could benefit from the milder weather when visitors skied less but instead spent more money for food and for

going out. This saved some ski areas in Davos, Arosa or Orcieres from more substantial losses.

The vulnerability of ski destinations is complex and interrelated. We have to take many more variables into account when guessing which destination will suffer and which one will profit from global change, not only from climate change.

4.5.2. Adaptive capacity

Ski areas mainly believe in technical snow making as the most effective kind of adaptation to climate change, and thus think that climate change inside the ski area is manageable to a certain rise of temperature as confirmed by results from Roth (2008), Abegg (2007) and Wolfsegger (2008), also Huttner (2008). Only water availability and energy prices will become the main limitations of snow making. If the temperature rose even further, then society would face other more important problems than not being able to technically adapt anymore.

In addition to this classic technical adaptation, ski areas try to invest more in co-operations, in diversity of activities in winter and in summer, as well as in diversity of operations. Some classic ski stations in France still focus mainly on the classic market of Alpine skiing, although a tendency toward more diversity was observed. Ski areas can significantly increase their added value if they own gastronomy. Partnering within the destination and with other ski areas is becoming more important. The Swiss ski areas are reacting in this manner (Abegg et al., 2007), and in Italy and Austria we found a similar attitude. Wolfsegger (2008) reports similar results from Austria, Roth from Germany (2008).

Higher ski areas see themselves in a winning position, benefiting from climate change, which is expected to weaken the lower ski areas and decrease their numbers. A similar result is reported by Abegg (2007). The lower ones also see their chances as rather positive because of technical adaptation. Still, some higher areas could imagine too much demand becoming a problem if the reputation of snow guarantee and a smaller number of ski areas in total focused and channelled the crowds into these higher areas. A significant decrease in customer demand is not expected by Austrian and German ski areas (Roth et al., 2008, Wolfsegger et al., 2008).

Adaptive capacity is not only or mainly made by the elevation and the size of the ski area, although these are and remain two very important aspects. But the system of adaptive capacity is quite complex, and the high number of vulnerability factors indicates how many responses there are.

Summer tourism is seen as an opportunity, especially for the lower ski areas that have a mellower and a greener surrounding than the harsh, high Alpine environment of the higher ski areas, thus being more attractive in summer. It proves to be illusionary to increase sales in summer in the ski area to regain the losses from winter or to become an alternative to winter. One should try to imagine a ski area in summer with about 30'000 hikers and bikers on a single mountain who all take at least ten ascents and descents. Events, though, are an alternative to reaching higher numbers of customers any time of the year. Events in their potential variety also work to target very specific clients and to form a reputation. Abegg (2007) reports the same importance of events in the diversification process of ski areas.

The natural limits of the natural environment just make the same revenue from a summer guest not possible, not even taken the discrepancy in the carrying capacity of the mountain environment into account. It is thus only possible to see the destination as a whole in four seasons – so better partnering is the key.

The dependency of the destination from the ski area in winter and the need of support for the ski area by the destination in summer is a given relation that needs equalizing. We therefore see partnering in the destination as one key to increase the overall adaptive capacity. The Swiss and the Austrian ski areas understand partnering and aggregating as very important means of adaptation (Abegg et al., 2007, Wolfsegger et al., 2008).

4.5.3. Strategies and management

We discussed snow making as the main adaptation strategy with its limits in finances, water supplies and from a mental and legal perspective. Climate change is not the only threat ski tourism has to face. The public discussion focuses on snow making adaptation to climate change, but ski areas need to do more to cope with all aspects of global change. The Swiss ski areas expect behavioral strategies to become more important (Abegg et al., 2007) as well as the German ropeways companies who as well see mitigation to be of more future importance (Roth et al., 2008). Mitigation and efficiency measures so far had not been in the focus of ski tourism. Rising energy costs and public awareness, as well as lack of alternatives, especially for the lower and more suffering ski areas is now leading to an increasing interest of stakeholders in mitigation. Mitigation will be applied more by the Swiss ski areas too (Abegg et al., 2007). Still, the small share of the ski area emitting the greenhouse gas CO_2 (about 3%) on the total emissions of an average weekly ski vacation, make it clear that effective mitigation is only possible when all stakeholders partner and work together. Transportation and travel make up about 70%, lodging and gastronomy about 25% (Mountain Riders, 2007).

The aspects of involving the customer more, of investing more into customer relationship management and partnering better with the customer are among the planned options.

We now take a look on some concrete adaptation strategies that proved to be of key interest for the ski areas interviewed, without seeking completeness.

4.4.9.1. Communication and media

The losses of the season 2006/07 were highest in the low resorts because of little snow making equipment and too warm temperatures. Some higher resorts still had losses, and despite good skiing conditions, the customer did not know about it. The media informed the public about climate change and the catastrophic winter in a narrow focus. They even looked for bad stories of closed ski areas. This kind of reporting was the biggest problem for ski areas in that winter.

Similar perceptions are reported from German tourism stakeholders (Huttner, 2008). Ski areas plan to invest more resources in the future into media work and marketing. More advertisements will be planned for as well as an *emergency plan* if conditions demand for it. Ski areas agree that the negative publicity of that winter 06/07 must not happen again. Kitzbühel started to actively advertise with snow guarantee by technical means the winter after, in 2007/08. Ski destinations will have to enlarge their marketing budgets and communicate more actively, not letting the media control the message alone.

The bigger Swiss ski areas will market snow guarantee and snow making in the future (Abegg et al., 2007). More control and a direct connection to the customer are essential. Costs of advertisements are high, though, and ski areas will have to partner with the destination and with other ski areas and destinations to generate the marketing power needed. It seems that the model of Dolomiti Super Ski, where the destinations remain individual but the marketing and the communication are done jointly, works well in these aspects. Still, the uncertainty in the interplay of media and public awareness has to be taken into account as discussed in chapter two.

4.4.9.2. Partnering with the customer

Ski areas describe their customers as becoming more demanding in quality, service, safety and more information. The day guest is very spontaneous, deciding where to go and what to do. The overnight guest shows a tendency of this behavior too. He used to buy a multiple day ski pass for the time being in the destination. Increasingly, the overnight guest now decides daily what he does, if he buys a ski ticket or not. This has a positive side and a negative one. It is positive when the customer remains in the destination if there is no snow or bad conditions to participate in alternative activities. It is negative when he does

not buy the multiple day pass in advance anymore but rather single day tickets for more flexibility.

Offering more flexible ski passes that are transferable to summer and remain valid for the whole winter could be one option to give the customer the feeling that it makes sense to buy a pass for the full stay because on a bad day it is not lost. Ski areas believe in this as being a possibility in marketing because only a minority would then actually come back and use the passes that are left. Once the cash is in the company the goal is reached.

So addressing the right kind of customer in the proper manner is key. Offering more flexibility, more quality and service in general, are goals stated by the ski areas. More marketing is a main strategy of Austrian ski areas too (Wolfsegger et al., 2008). In-house training is another key issue. Ski areas admit that, for example, in the topic of ski area management reactions to global change, the staff would not be in best position to answer customers' questions. That of course would be helpful in case of customers demanding this information. Constant market research and staff training are necessary. In the interviews we examined the need for more data on the customer and a lack of data, of experiences and tools in benchmarking and evaluation.

4.4.9.3. Sustainable tourism

The quality of the environment is understood as a key performance and success factor of ski areas, more so in the summer than in winter. The majority sees a chance in marketing a higher environmental performance. Only one French company owning six resorts believes it to be more of a temporary fashion. The majority would be interested in developing a better environmental performance and also in marketing it, thus becoming part of a possible sustainable ski area aggregation.

Ski areas understand sustainability as a general improvement in quality and service, as well as environmental. Some would even go so far as to see ecotourism as a possibility for a niche market of small ski areas. Ecotourism does not fit for the larger ones needing the masses of people. Most believe that a USP in sustainability would work, but only as complementary to others, not the main or sole one. Smaller ski areas could develop it as a niche market; for bigger ones it would be a mandatory issue they had to include anyway. Abegg and Roth report that Swiss ski areas, especially the smaller ones, as well as German ski areas, will market sustainable tourism more in the future (Abegg et al., 2007, Roth et al., 2008).

We should wonder now what the market actually demands in terms of sustainable consumption. What is the demand of skiers for ski areas that find a more sustainable way of adaptation to global change? Does it match the

expectations of the tourist stakeholders? The market of sustainable consumption, in general, is growing rapidly as discussed in chapter two. If this were the case in ski tourism too, then the willingness of ski areas to target this market more should reflect it. In chapter five we will test the actual market demand for sustainable ski tourism.

4.4.9.4. Uncertainty – global change and the future customer

The uncertainty of future developments is reflected in the interviews. The outcomes of global change are anticipated, but how strong and how fast, and in what varieties they will hit the ski destinations is unclear. The smaller ski areas in Switzerland Austria and Germany show a higher uncertainty (Abegg et al., 2007, Roth et al., 2008, Wolfsegger et al., 2008). The demand of the customer is hard to predict, but a general trend toward more spontaneity is felt, which even makes it more difficult to foresee the specificity of the customer.

Greater knowledge of the market, of the unpredictability of society and certain target groups could be better understood to help manage uncertain changes. In terms of climate change, there is uncertainty about the various studies published, the vast variety of information, and especially local differences in forecasts. Though managers often do not have time, more detailed, local climate studies and informative support with difficult scientific questions, could help to decrease uncertainty, also reported from Huttner (2008).

4.4.9.5. The European Model of governance - the destination and the ski area

The destination as such cannot be seen separately anymore from the ski area, nor the ropeways company, and will have to grow together much more. Combining small ski areas with bigger one has advantages in operations, in management, in marketing and also in customer demand. During the interviews we learned that communication inside the destination and especially between the ski area and the rest of the destination, in most cases is problematic. Often goals, target groups and USP differ like the strategies do.

Huttner (2008) describes the same problem. The ski areas seek to address masses of people all paying the same price for a ticket – the kind of customer is of secondary interest. The hotels and the gastronomy rather seek the well-paying guest in a lower volume, the added value then being higher. Controversial goals are problematic. Partnering inside the destination with the ski area is a key performance factor. If, for example, a ski area seeks to target a higher standard of quality and services, but the destination cannot keep the same standard the ski area does and vice versa, then it will be difficult to reach such a standard. Wolfsegger reports partnering and becoming a member of agglomerations as a main strategy of Austrian ski areas (Wolfsegger et al.,

2008). Diversification and investments are followed easier if the gastronomy sector and the hotel sector become involved more in the ski area and the costs of adaptation and mitigation – reported from Wolfsegger and named the *Model Europe* in our interviews.

Partnering is crucial and dialogues are necessary first. The social construct of the destination is also prone to preferences of individuals.

If people cannot work together on a personal level this may affect partnership opportunities. The majority of interviewed areas would welcome a model of governance that is close to the North American resort system, where one company owns the ski resort, ski schools, sports shops, gastronomy and hotels. That would be the most adaptable model to cope with changes. Because of traditional developments and the structure in the Alps, such a model will most likely not be possible in Europe. But some elements of it can be applied, and ski areas already walk the path in that direction.

Dolomiti Super Ski seems to be a well working example of a *Model Europe*, just as some called the model the Alps needed and could obtain. Each destination keeps its individualism, its identity and its freedom to act locally and close with the customer. The strength in communication and strategies on a larger, regional, national and international scale are achieved jointly in the marketing aggregation of Dolomiti Super Ski. This group functions as a mediator, a communicator between all the different destinations sharing at least one common goal and USP: the Dolomites.

Still, on a smaller scale, the individual destinations need to work out ways to incorporate the many different stakeholders and the patchwork of landowners and ski lift operators – a common European problem of developed destinations.

The *Model Europe* in the eyes of an Austrian and a Swiss destination is a ski area that partners with the destination and shares common goals and marketing, still remains individual and includes gastronomy and hotels to grow its own all-inclusive mountain with hotels, gastronomy and summer activities, more diversity in any direction.

There are many examples of the necessities for a model of governance that is meant to partner. Customer Relationship Management bonus card systems, for example, only work if all stakeholders partner. The management of day and overnight guests is strongly interrelated between the ski area and the village.

The example of the French investment company buying and owning many ski areas, like Remy Loisirs or Compagnie des Alps does, have clear advantages in financing new equipment inside the ski areas and joint procurement, thus allowing some areas to invest and to survive, raising capital and ensuring cash

flow. Some negative aspects, though, became obvious in the interviews. Even the management of the ski area often was not well-informed about the strategic direction of the ski area – strategy is controlled by the investment company.

That, of course, makes the linkage to the destination and partnering more difficult. The ski area is, to some point, steered more centralized and loses the direct, local contact and power to a certain degree. It may not be the right model for the future. Despite the different existing models of governance, there is a trend of becoming a member in many different marketing groups or other aggregations of ski areas and destinations for diverse reasons. Partnering is understood as important and will become of even greater future importance.

4.4.9.6. Supply side demand for external support

Given the complexity and uncertainty of developments and the diversity of possible adaptations, the interviewed ski areas communicate a very clear demand for external support, be it more in general to not becoming *blind* for the own organization or because specific knowledge or man power is missing internally. This demand confirms and reflects the problems ski areas have and the general market development. Specific aggregations for that purpose could help addressing these needs. Examples for such external demand are:

- in house training for more service quality;
- professional public relations work and marketing (marketing also in the meaning of sales);
- human resources in CRM and bonus card systems;
- ideas for summer activities and a USP in summer;
- contents and knowledge in environmental management;
- support in coping with regulations, especially environmental regulations for water management for snow making;
- mediation in the destination between the general tourism and the ski area to define common goals and strategies;
- market research and support in more specific target group addressment; and
- benchmarking and evaluation of strategies.

In general each destination and each ski area is very different and unique. There are many strategic aspects that can count for in general, but solutions will have to be found on an individual basis.

4.6.Conclusions

The conclusions are structured by the initial set of supply side questions posed in chapter three. To the end of this chapter the extended sensitivity factors and adaptive elements are presented that will be tested with customer demand in chapter five.

How do ski areas perceive global change after their experiences of an analogue Winter for future developments?

Climate change has been the focus of threatening ski tourism most. The unusually warm winter of 2006/07 proved that vulnerability means more than elevation, size of the ski area and snow making capacity. The customer did not know that skiing conditions were good in higher elevations – and the day guest stayed home. The media's commentary on this topic only worsened the situation. Climate change is not only directly affecting the snow conditions on the mountain, but also indirectly in a social way. Demographic, socio-graphic and socio-economic developments are interrelated problems and need to be taken into account more.

How vulnerable do they think they are, and which are sensitivity elements?

Snow making proved to be the most valuable technical adaptation most invested in and centred on. Technical snow making is a must for conventional ski areas, and no such ski area can afford not having it. This kind of technical adaptation is limited in its potential, though, and will not prevent even the highest and biggest ski areas from further problems that actually may well become of even greater significance in the future. Higher ski areas foresee demographic and socio-economic changes already as a greater threat than the direct outcomes of climate change.

How do they estimate their adaptive capacity, and what are their adaptation strategies?

Major aspects of increasing adaptive capacity are more diversity of operations and in seasons, pro-active communication with the customer and the media, as well as strategic partnerships inside and outside the destination. Hereby, thorough market research and benchmarking of quality and services need to be improved. More data on the customer and more data on the outcomes of global change should help to decrease the uncertainty that makes adaptation even more difficult.

A *Model Europe* of ski destination and ski area governance is being described and shall be of strong future interest. The North American resort structure can serve as an example that needs to be adapted to the European conditions. We found the model of Dolomiti Super Ski as a good illustration in a more open direction of strategic partnerships on a regional scale that needs to be filled with solutions on a local and individual level. More diversification of the ski area operations and ownerships, and more partnering with the destination will be of key intrigue. A shrinking number of ski areas will result from a massive concentration process.

The international scope of this qualitative study reveals very little differences in countries. The Germanic speaking countries are very close and equal in their

perceptions, opinions and strategies, as the interviewed ones in the Italian Dolomites are. In France, there are more varied opinions and more classic and conservative views on vulnerability and adaptation strategies. Classic alpine skiing remains the main focus. The French system of governance of ski areas by single companies with centralized steering as it is now may not be the model that copes best with the challenges.

The model of governance and local regulations affect the adaptive capacity of a ski area most. A *Model Europe* is needed in governing ski destinations successfully and sustainable into the future. The differences in the countries seem to reflect the market demand fairly well. Ski areas believe in the Germanic speaking guest to be more affinitive for sustainability and information or direct involvement while the Southern and Eastern European guests are much less affinitive. The French, Italian, Swiss and Austrian ski areas are noting these differences.

Where do ski areas see the need for action, and where do they see opportunities in global change?

The current focus on technical adaptation, mainly snow making, expansion and landscaping, is not sustainable for the environment, and not sustainable in its adaptive capacity. More sustainable ways of adaptation need to be developed with more importance of behavioral and mitigative strategies, incorporating technical adaptation as an integral part that cannot be missed anymore. The possible outcomes of global change are diverse and complex. The uncertainty in these developments, the local differences in climate change outcomes and the questionable future customer demand require a bouquet of strategies. Vulnerability is not only made up by the elevation, the size and the snow making capacity as still being discussed – many more new vulnerability factors arouse from recent developments and ski areas' experiences.

What is the willingness for mitigation?

The extended view on vulnerability and adaptive capacity opens up prospects too, such as developing new market niches and new partnerships. One example is the growing market of sustainable consumption, of going green. For a ski area this could open up new ways of operations, costs savings, efficiency, *soft* adaptation, of mitigation and new partnerships with the customer.

Would ski areas believe and invest in sustainable ski tourism?

Sustainable tourism is a way of sustainable adaptation and a market of the future ski areas will address. It is seen as a niche though for smaller ski areas and a complementary aspect on top of the basic services such as snow reliability, modern lifts and high quality ski runs. Sustainability as a strategic approach is expected to become mandatory for ski tourism. Still there is no

substantial data on the market of demand for sustainable ski tourism we can base assumptions on, a question we will address in chapter five of this study.

4.6.1. Extended sensitivity factors and adaptive elements

From the discussed state of research and the results of the expert discussions in chapter four, we summarize some global change impacts being of relevance for the future development of ski area scenarios to be tested with customer demand in chapter five of this study (table 11). They serve as a base matching ropeways companies' experiences to derive attributes from describing the ski area services the customer is asked to choose from in the choice experiment (chapter five).

From a stakeholder perspective there are specific means of adaptation to cope with these global change impacts. Table 12 shows selected adaptive elements derived from the expert interviews that will be taken to advance the definition of attributes and levels in the choice experiment fraction of the customer survey.

Table 11 Selected global change impacts and sensitivity factors
These factors are relevant for testing future ski area scenarios from the demand side.

- higher temperatures and less natural snow reliability
- increasing costs of energy, water, labor and technology
- demographic change: more customers in the senior age bracket of 60 years and older, fewer younger skiers
- socio-economic change: more people with either lower or higher income

Table 12 Selected elements of adaptation to test with customer demand

- technical adaptation: more snow making, expansion in higher altitudes, larger ski areas by combining smaller ones, glacier expansion
- behavioral adaptation: more diversity – alternative offers to snow sports and four season activities – more flexibility in offers
- mitigation: more efficiency in energy consumption, use of renewable energies
- increasing ticket prices
- longer distances to drive to the higher and bigger ski areas with more natural snow reliability

4.7.Outlook

This study of ski area experiences and strategies addresses the issue of global change in mountain tourism from a bigger scope, trying to work within the whole interrelated system and to understand the feed-back loops between global change, the market and the touristic infrastructure. The results show the complexity, variety and uncertainty of this topic. They open up many new questions that have to be looked at in more detail, something that clearly moves beyond the scope of this study.

In the discussion of *losers* and *winners* the highest ski areas – seen as *winners* – will suffer and lose in the long term from socio-economic and demographic developments as well as from indirect climate change impacts. Other vulnerability issues are, for example, the changing topography from glacier and permafrost melt with rock movements and a changing pitch resulting in more concave shapes of slopes. This would then require changes in topography of the whole ski area. More research should centre on this topic.

The management of uncertainty and an according model of governance, as well as a closer look into the emerging Eastern European and Asian markets, are proposed areas of future research. We also need to take a closer look into the social construction inside ski destinations to better understand the continual patterns. Still, each destination is unique, so at the end each problem requires specific solutions.

A focus should be more on the demand side too. Assumptions are often made based on what the product is and how it can be sold best. Tourism stakeholders should start again looking at the demand side more, understanding what is required, and then design the tourism service product accordingly. Maybe the customer is much more willing to adapt his preferences to changing services by becoming more involved and being part of the outcome of global change? In that case, much less effort in terms of costly technical adaptation would be necessary that seclude many smaller and lower ski areas. Adapting to changes could imply to mitigate and partner with the customer better who then adapts his behavior to changing services – which would then be a win-win situation.

5. Customer demand for sustainable ski tourism

The second results chapter, chapter five, addresses the demand side of ski tourism and describes goals, questions and methods of two dependent consumer research parts, the standard questionnaire and the choice experiment. Results are presented individually and then jointly discussed.

5.1.Standard questionnaire

5.1.1. Summary

Global change is already demonstrating severe impacts on the market of winter tourism. The unusually warm and snowless winter of 2006/07 was exemplified to learn about skier demand in an analogy of future winter seasons with a comparable snow situation. Responses showed that skier numbers will decrease significantly. Although snow guarantee remains the most important factor in customer demand, other factors have the potential to outweigh less snow guarantee for specific target groups within overnight guests.

In general, the customer is demanding more specific and higher quality services. The demand for quality, safety, service and responsible, sustainable management of the mountain resources is already of high importance with a growing tendency. Ski areas who suffer most from global change do thus have a number of strategic chances to address specific customers and target groups with alternative services and products. Transparent environmental management, thorough market research, specific target group adressment, more service and quality paired with communication, media work and marketing are strategies that in sum can become as vital as technical snow making is today.

5.1.2. Research questions and goals

Results are meant to reflect the awareness and the perceptions of ski tourists to global change impacts who just experienced an analogue winter season that will become more likely in the future. Main goals were to assess the understanding of skiers about global change impacts, their environmental awareness and preferences on classic ski area attributes and services, as well as their flexibility to adapt their demand and behavior to changing services. Hereby we wanted to generate data in different ski areas representing a mean of ski areas in the Alps being representative of the biggest outbound ski tourism market of Germany.

In the standard questionnaire of the demand side survey we focus on the following questions, being the first part of the overall demand side questions (chapter three):

- What are preferences of ski tourists for services and products in ski areas today? How important is snow guarantee even if achieved by technical snow making as the main kind of applied technical adaptation?
- What are the consumers' acceptances to adapt their demand to changing services and for alternatives to skiing?
- What are the ski tourists' awareness and perceptions of climate change impacts and of general environmental aspects in ski tourism considering the experiences after the unusually warm winter of 06/07, and which indicators describe this environmental awareness best?

5.1.3. Method

5.1.3.1. Quantitative online questionnaire

From the different kinds of questionnaires, being it oral interviews, manually filled out paper questionnaires or electronic questionnaires, we chose the electronic online version. The advantages of an online survey in terms of cost-use-time ratio are outstanding (Wright, 2005). With an internet-based survey one can reach a maximum number of people in the shortest time. Efficiency in respondent sample generation is an advantage, and the access to unique populations is easier (Wright, 2005).

Most users receiving an email with a link to a website either click on it right away of within the next few days (Manfreda et al., 2002). The reaction time is fairly short. In addition to the size of the survey, the number of questions can be maximized, although the survey should not be too long as in any survey research (Atteslander, 2006, Häder, 2006). Also, a well done and interactive web survey can be intiguing and motivating to click through. In the least, data generated in a web survey can get automatically formatted and stored in a database according to the specifications of the scientist. Statistical work can be applied right away without digitalizing the data (Wright, 2005).

One main reason why we applied a web based survey was the combination of the questionnaire with a Conjoint Analyses (CJA). The CJA demands for a more complex user interface to showcase the choice options. The total amount of information within such a combined questionnaire was easier to apply in an online version.

5.1.3.2. Questionnaire design

The internet provides multiple opportunities to design a questionnaire that is informative, easy to understand and fluent to work with. Still, one should take care that the design does not influence the clean and neutral scientific character of the survey (Wright, 2005). Colors and graphics were minimized and neutralized as much as possible and feasible. The choice of pictures should not

support a certain message, for example, a question on the outcomes of climate change on skiing paired with a picture of brown-green ski runs. We incorporated a clean and sleek design without altering pictures or graphics (see figure 51).

The survey was offered in three languages, German, English and French. Due to the collection of samples in international markets to not exclude international visitors being interviewed in the ski areas, the multilingual setup was a must.

In total the questionnaire consisted of 35 questions split into an introductionary block of eight questions addressing general behavior and knowledge, as well as awareness questions, followed by eight choice set questions and closing with the 19 remaining questions. Questions were mainly in multiple choice form where people could choose from one to several alternatives (Atteslander, 2006). Only very few open questions were posed.

5.1.3.3. Questions development

The contents and the questions of the survey were developed in order to match our research questions, according to general principles of questionnaire designs in tourism (Ryan, 1995) and based on experiences, results and questions of former customer surveys in ski tourism (chapter two). We mostly selected closed questions with multiple choice answers, both for easier online application, quicker finishing of the questionnaire for respondents and easier analysis of the expected high number of respondents.

We included three questions to test the environmental knowledge of the respondents, related to skiing, on technical snow making, glacier skiing and climate change impacts. The questions of the questionnaire are shown in appendix B.

5.1.3.4. Pre-testing

Before the start of the survey we did extensive pre-testing with about 100 respondents to check the reactions in terms of understanding the formulations of the questions and answers and the customer friendliness of the design. In addition, we checked if the data output met the criteria of data analysis. A main part of the pre-testing was the understanding and the design of the choice set section (chapter five). After some adjusting in the formulation of the standard questionnaire and in the design of the choice set interface, the survey was ready for application.

5.1.3.5. Determining sample size

To collect data representative for a population is a common goal in survey research. By collecting a sample we want to generalize findings and project them on the whole population. Ideally, one would test the complete population

with a full survey, but as this is not feasible because of cost and time, we seek to survey samples.

Determining the sample size is important before setting up a survey design on how and where to collect the sample. We use an equation described in Moßig (Moßig, 1996) and discussed in Bartlett (Bartlett et al., 2001) who refer to the formula of Cochran (Cochran, 1977). With one equation the minimum number of sample individuals to represent a given finite population can be calculated.

Equation 1 Formula to calculate sample size (Cochran, 1977)

$$n \geq \frac{N}{1+\frac{(N-1)*\varepsilon^2}{z^2*P*Q}}$$

n = smallest necessary sample size for finite populations
N = number of elements in the population
ε = acceptable margin of error for mean estimated as 0.03 (3%)
z = value for selected alpha level indicating the level of risk the researcher is willing to take that true margin of error may exceed the acceptable margin of error, here 0.99, then z=2.575
P = real mean of population respectively the part in percent of the population. Because n is increasing with an increasing P*Q, for a maximum product of P*Q both have to be chosen as 0.5.
Q = 1-P

We chose an acceptable margin of error as 3% and a *z* value for selected alpha value of 2.575. The population of skiers that our sample should represent is the number of skiers in Germany, which for 2006 is reported as being 8'710000 skiers (Allensbach, 2007). However, this number appears to be high in comparison to estimations of the ARAG insurance company and the Foundation Safety in Skiing based on the Society for Consumption Research (Gesellschaft für Konsumforschung GFK) which calculates for about four million active skiers in Germany (SIS/DSV, unpublished).

Equation 1.1 Sample size calculation

$$n \geq \frac{8710000}{1+\frac{(8710000-1)*0{,}03^2}{2{,}575^2*0{,}5*0{,}5}}$$

But because more rigorous numbers are missing we have to calculate the minimum sample size for this study with the population provided by Allensbach. Given the differences in estimations of skier numbers there is room for accounting also for skiers from the Germanic speaking countries Austria and the Germanic part of Switzerland. Equation two shows the calculation. The result is n=1842 individuals to represent the population in size with a potential error of 3%. Thus, the minimum sample size is n=1842.

With a sample size of n=3160 in total and after the eliminations as described in section 5.1.4 with a cleaned working sample of n=2430, the goal of n=1842 has been overreached. The sample size, however, is mainly dependent on the sheer size of the sample, not on the size relative to the population. With a bigger sample we can still minimize the existing error (Bartlett et al., 2001). The size of the cleaned sample (n=2430) of this study allows the acceptable margin of error for the mean to be even less than 0.03 (about 0.026); thus the quality of the results is even higher.

5.1.3.6. Sample collection

During the winter 2006/2007 we visited ski areas in Austria and France to do short interviews on the slopes, in the restaurants and in the chair lifts. After a brief introduction by the interviewed person about the affiliation to the German Sport University Cologne and the German Ski Federation, the main goals of the demand side study *Save-Snow* were outlined. People were asked to provide their email addresses so we could then send a follow-up email to them once they returned back home to fill out the online questionnaire.

The interviewing students were wearing an official green jacket with a logo and the name of the study printed, which made it easier to officially approach tourists and which helped to create some trust in those who were asking for their email addresses. In addition, interviewers were handing out small chocolate bars to create a positive attitude to those *disturbing* their freedom on the ski hill. The ski areas, St. Anton and Stuben in Austria (the Arlberg) and Les Arcs in France, were selected for these short interviews.

Secondly, we used existing email newsletters from ski areas to reach skiers. The ski areas Mayerhofen (Zillertal, Austria) and Fellhorn (Oberstdorf, Germany) each sent out about 8,000 email newsletters with the link to the study *Save-Snow*.

Thirdly, the radio station SWR3, one of the biggest in Germany and reaching the Northern part of Switzerland, and the television station HR broadcasted information with the link to the web survey.

We had an article in the member magazine of the German Ski Federation (about 220’000 copies). The CIPRA (International Alpine Protection Commission) sent out a newsletter by email and also an email newsletter of the University of Freiburg was used. In order to communicate with the expected variety of nationalities, the survey was offered in three languages English, German and French. The web survey *Save-Snow* was coupled with a lottery to win ski day passes for the next season 2007/08 in some participating ski areas. All participants finishing the survey had the same chances to win one from about 100 ski passes.

5.1.4. Results

5.1.4.1. Sample size and distribution

3160 participants filled out the online questionnaire (on *www.Save-Snow.com*). To filter the valid response data we defined a set of criteria that describes *valid* data for this study:

1. All 35 questions have to be completed;
2. The IP address has to be unique and only counted once;
3. The time stamp must indicate that the time taken to answer the eight choice set questions hast to be at least 60 seconds. Testing showed that with less time it is not possible to really read and think about the attributes of the ski areas within the sets. 40 questionnaires had to be deleted not matching the time stamp. It is possible that these respondents just clicked through the questionnaire to take part in the lottery, thus not providing valid answers.

Filtering according to these criteria led to a number of 2430 valid questionnaires, which was the set of data we analyzed. Statistical data analysis was carried out with the software package SPSS 15.0 (Statistical Package for the Social Sciences). Hypotheses testing were done by Chi-square significance tests with a p-Value of 0.05.

5.1.4.2. Age and gender

The mean age of all participants in this study was 37 years. The mean age of females (34%) was 34 years, of males (66%) 38 years. The oldest respondent was 80 years old, the youngest 11 years. The age distribution is shown in figure 16.

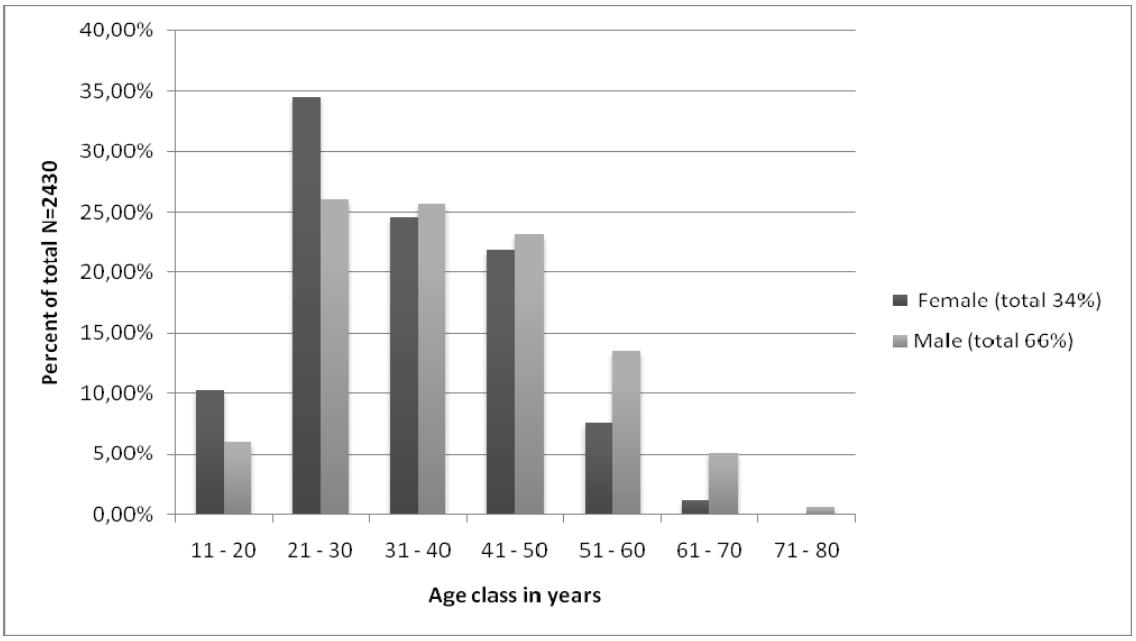

Figure 16 Distribution of age and gender

5.1.4.3. Origin and distribution of responses

The distribution of the responses from the interviews and newsletters is shown in figure 17. In sum, the rate of respondents generated in direct contact with ski areas is with 55.51% the majority of the total. The second largest group with – in sum – 26.86% is those of the general population derived by radio, television and the general internet. The third biggest group (17.61%) is made up from members and ski instructors affiliated with a ski federation.

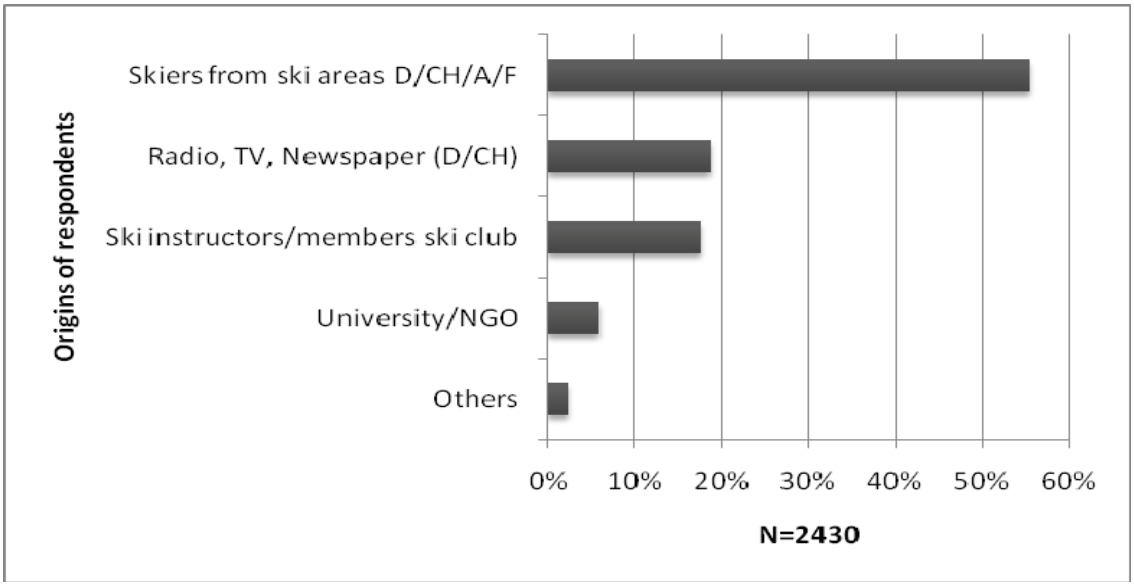

Figure 17 Origins and distribution of responses

The percentage of respondents from non-German speaking countries is less than fifteen percent, with the major countries being France (8%), England (3%), Italy (1%), Scandinavia (1%) and others (Belgium, Netherlands, Czech Republic, USA totalling 1.5%).

5.1.4.4. Household income

The monthly income of the household participants was classified into six categories, from less than 1000€ to more than 5000€. 16.4% have less than 1000€ per month available, and 8.5% more than 4000€ available. 24.3% are in-between 1000 and 2000€, another 24.5% between 2000 and 3000€, and 19.3% have an income between 3000 and 4000€.

In sum, 50% of skiers have an income between 1000 and 3000€ per month, or 34.6% have an income of more than 3000€ (see figure 18).

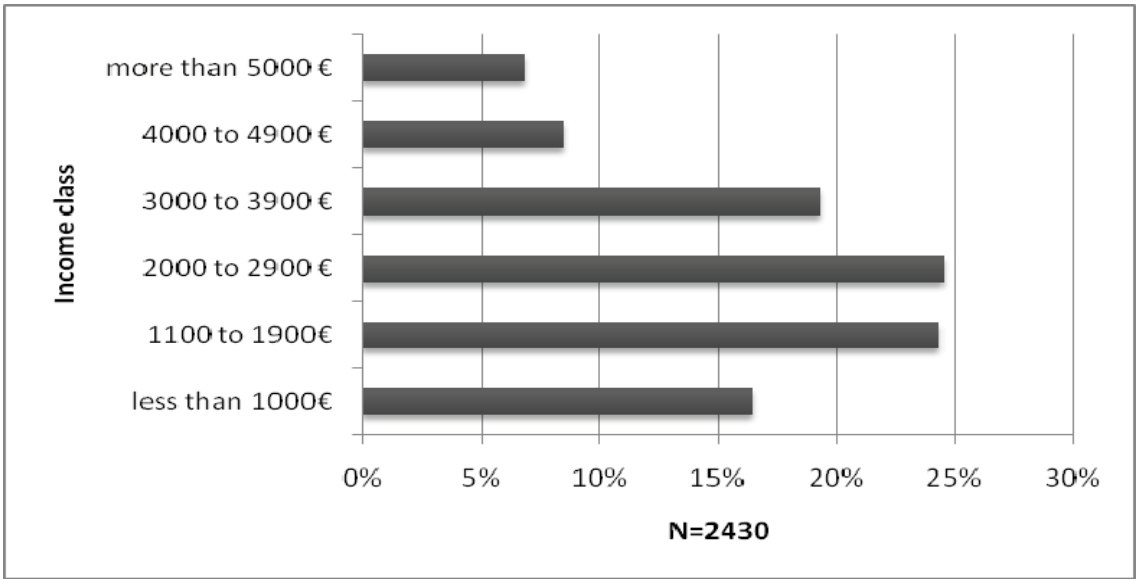

Figure 18 Income classes of respondents

Stratification by the frequency of skiing per year

If we compare the frequency of skiing per year to the income, we cannot find a significant correlation in which skiers with a higher income ski more often than those with a lower income (χ^2<15>=16.832, p=0.330). The majority of skiers with the frequency of one to two weeks per year do have a medium income of 1100 to 1900€ (11.3%) and of 2000 to 2900€ (12%).

5.1.4.5. Living distance from next ski hill

How long do you travel from your home to the next ski area (mid mountain ranges do also count)? (n=2430)

The majority of participants (60.8%) lives less than 2 hours from the next ski hill, mid mountain ranges counting as such. 19.4% live two to four hours apart, 13.3% four to eight hours, and about 6.5% have to travel more than eight hours to the next ski hill. From these 6.5% there are 2.2% taking the plane, the rest are travelling by ground transport. The majority of people with 60.8% live so close to ski destinations that they are potential day ski tourists or can count as such (see figure 19).

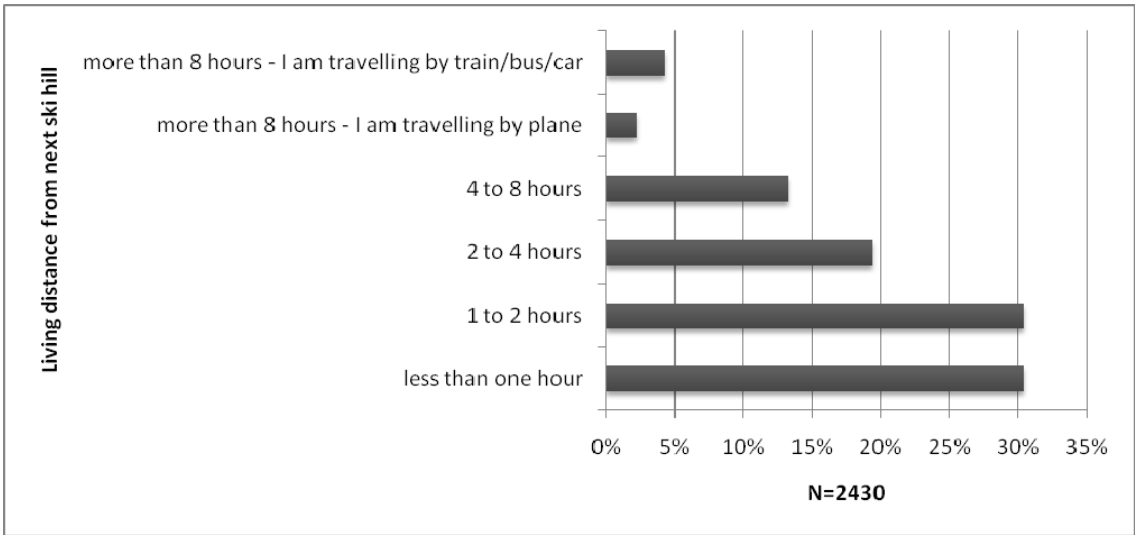

Figure 19 Living distance of respondents from ski hill

5.1.4.6. Activities in winter sports

What kind of snow sports do you do most often? (n=2430)

68% of the examples are alpine skiers, 14% snowboarders. The remaining participants fulfil activities like ski touring, cross country skiing, winter hiking, Telemark, snowshoeing and tobaggoning (figure 20).

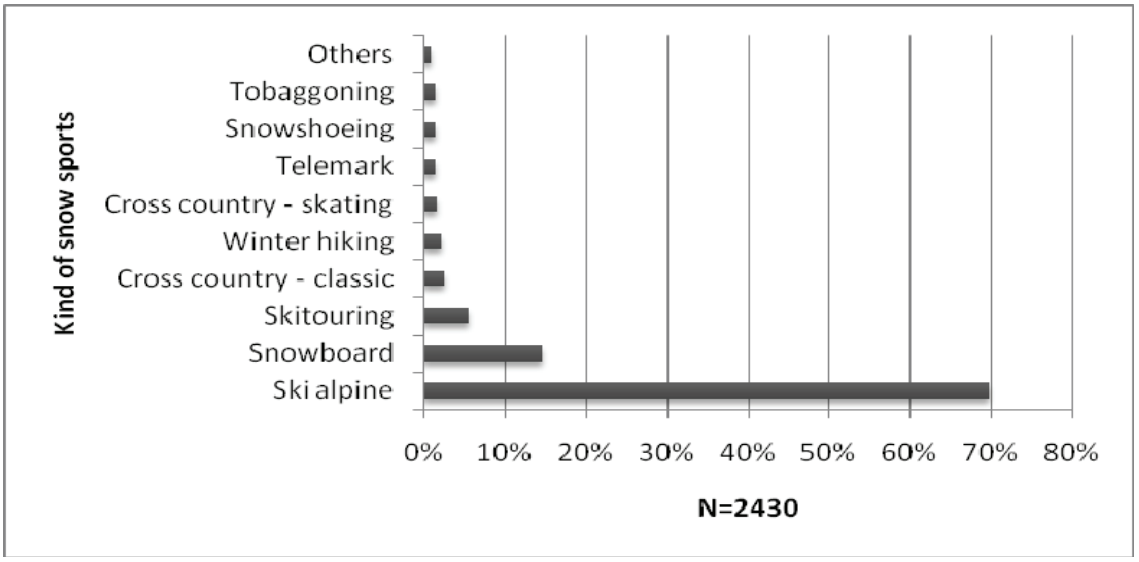

Figure 20 Snow sport activities of respondents

5.1.4.7. Frequency of participating in snow sports

How many days a season do you ski or snowboard? (n=2430)

A good half of the participants ski (or do any other snow sports activity) less than two weeks per year (54%); the other half (46%) skis more than two weeks;

27% ski three to four weeks; and 19% ski more than four weeks per year (see figure 21).

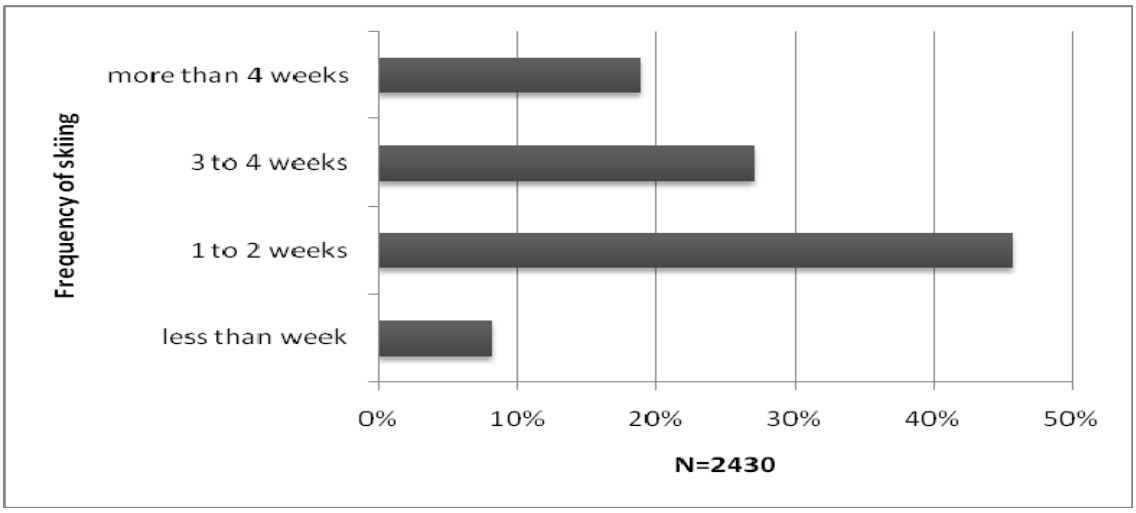

Figure 21 Frequency of skiing

Stratification by distance living from the next ski hill

If we compare the frequency of skiing per year with the living distance from the next ski hill, we cannot find a significant correlation that skiers who live closer to the mountains ski more often than others living further apart (χ^2<15>=13.046, p=0.599).

5.1.4.8. Skills in snow sports

How would you describe your skill level in snow sports? (n=2430)

59% estimate themselves to be very good or professional skiers or boarders skiing on and off-piste. 37% indicate they are skiing fair to good and still have to improve off-piste skiing, moguls and black runs. About 4% are novices or beginners (see figure 22).

Stratification by frequency of skiing

If we compare the frequency of skiing per year with skill level skiers have, we find a highly significant correlation (χ^2<15>=90.383, p=0.000). People who ski more often do have the better skills, not surprisingly. This correlation is an indicator for the quality of the self estimation of skiers' skills. Because of this correlation, both indicators can describe the skills of a skier.

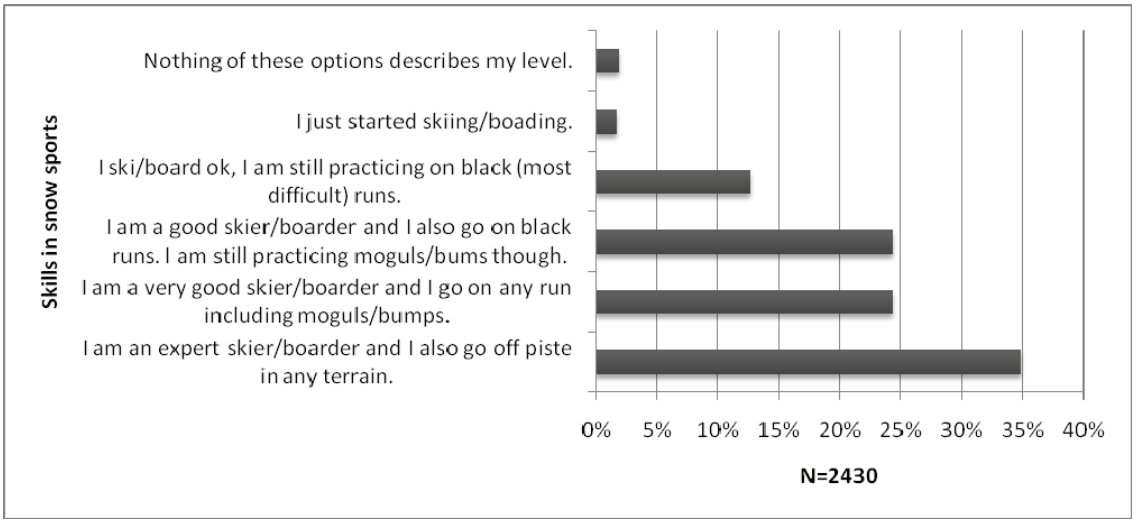

Figure 22 Skills in snow sports

5.1.4.9. Skiing abroad

Do you go skiing/snowboarding in ski resorts outside the Alps, for example in North America? (n=2430)

70% have never travelled to ski in mountain ranges in another continent, such as North America. About 15% have travelled and will also travel in the future to ski in other continents, and another 15% are planning to do so in the future (see figure 23).

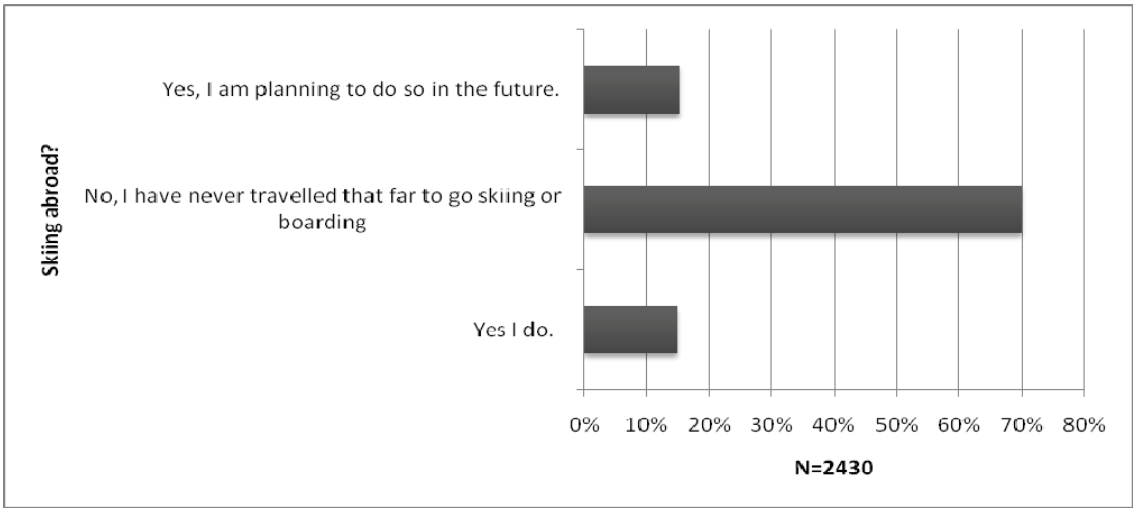

Figure 23 Behavior of skiing abroad

Stratification by income

If we compare those who ski abroad by their income bracket, we cannot find a significant correlation between income and the decision to ski abroad.

The income does not significantly affect the decision to ski abroad or not (χ^2<10>=14.131, p=0.167).

Stratification by the frequency of skiing

The comparison of the frequency of skiing per year with the decision to ski abroad shows a highly significant correlation (χ^2<12>=2522.548, p=0.000). People who ski one to two weeks a year most likely spend that week abroad in the most guaranteed snow conditions possible (20.1%). Skiers with up to one week are second (15.8%), with three to four weeks at 12.9% and skiers with more than four weeks travel with 9.4% to ski abroad (see figure 24). The more often people ski the less likely they spend this time abroad today, with the exception of those skiing less than one week. Those skiing with more than four weeks most per year are the most likely to ski abroad in the future.

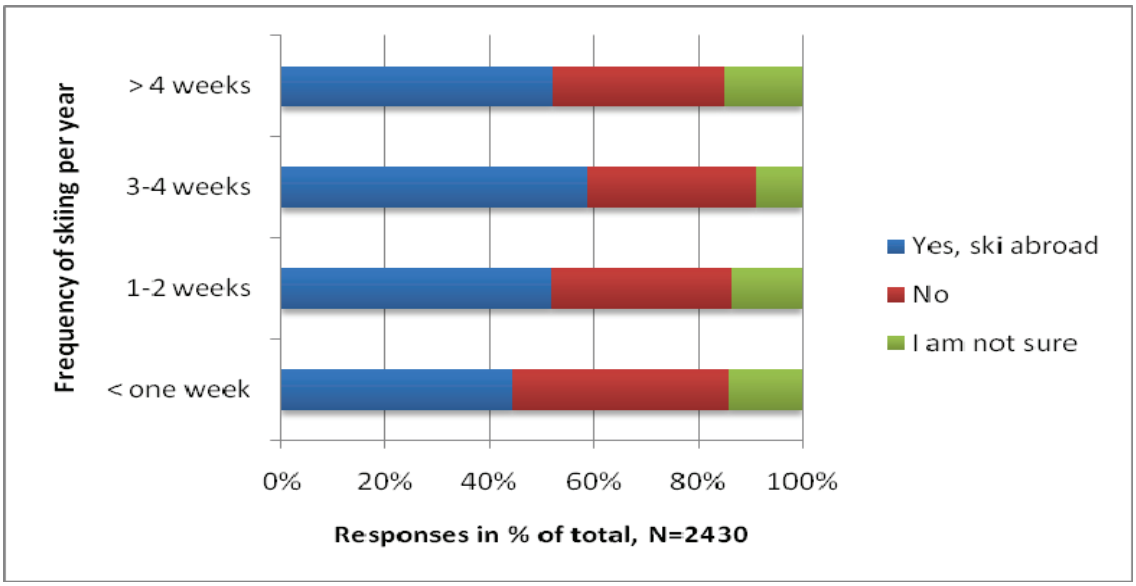

Figure 24 Skiing abroad by frequency of skiing

5.1.4.10. Reasons to travel abroad

What are reasons that you are travelling so far to go skiing/boarding – or why would you possibly travel that far? (multiple answers possible) (n=2430)

The main reasons why skiers travel abroad to ski or why they would travel that far are the amount of snow (76.8%), the snow quality, which is expected to be better in another climate (72.6%), to meet other people from different cultures (59.4%), less crowded ski runs (45.8%), no lift lines (41.3%) and cheaper prices (20.3%).The better service in ski areas abroad is a reason to go for 18.4%, the more friendly staff for 17.7%.

Still, about 49% will not ski abroad in the future even if the stated reasons of the others would be taken into account (multiple answers possible, see figure 25). The importance of not having long lift lines can be confirmed with the responses shown in figure 34. Not having lift lines was the second most important factor when skiing or boarding in a ski area.

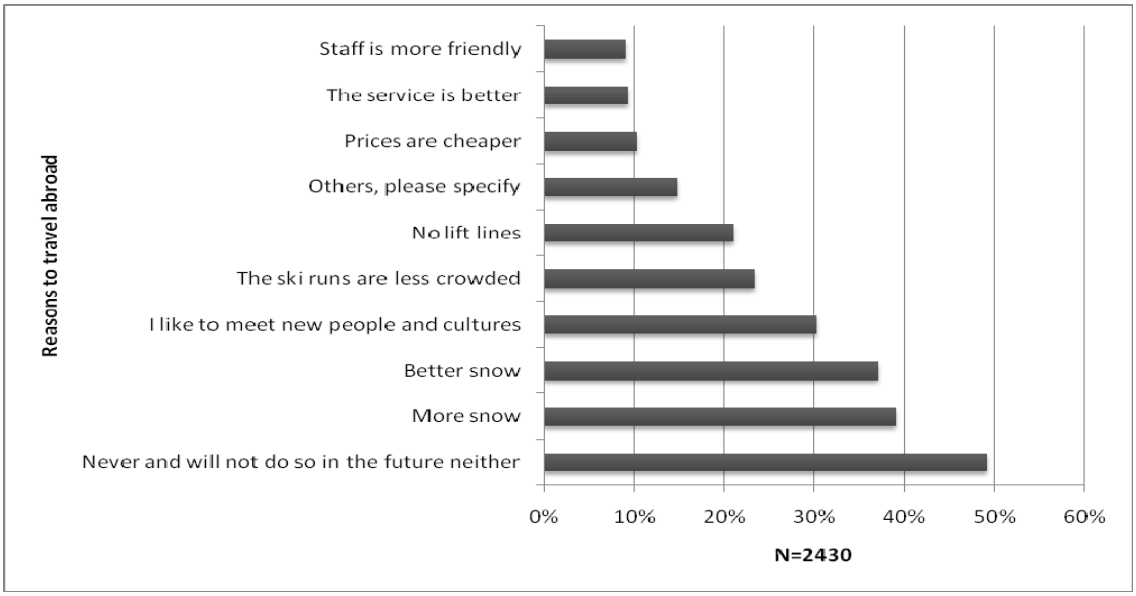

Figure 25 Reasons to travel abroad

5.1.4.11. Visit the mountains in summer

Do you visit the mountains in summer? If yes, what activities do you like to do there (multiple answers possible)? (n=2430)

The vast majority of skiers also visit the mountains in summer. Only 13% do not go to the mountains in summer, while 87% do. The most favorite activity is hiking with 74.4% who enjoy it, followed by 59.9% who take pleasure from the landscape, mountain biking (38.9%), sun bathing (24.8%), dining (23.8%), water sports like canoeing, kayaking, wind or kite surfing (21%) and rock climbing (19.5%). 12.7% enjoy Nordic Walking, 7.2% visit concerts or events, 5.2% prefer downhill mountain bike (ascent by cable car) and only 3.8% play golf (multiple answers possible, see figure 26). Interestingly, because 87% of skiers visit the mountains in summer already, only about 6% would visit the mountains in summer more often if they could ski less in winter due to climate change (see figure 46). There would only be a very little increase in summer tourism from winter tourists who changed their behavior, so the destination needed to attract new clientele to strengthen the summer – a clientele that basically has not been visiting the mountains before.

Stratification by the frequency of skiing

If we compare those who visit the mountains in summer with the frequency of skiing per year, we cannot find a significant correlation that skiers who ski more and visit the mountains more often in summer are more likely to visit the mountains also in summer or prefer a certain activity there (χ^2<36>=41.618, p=0.239).

Stratification by age

If we compare those who visit the mountains in summer by their age and their preferred activities, there is a highly significant correlation (χ²<60>=2225.481, p=0.000). In the age group up to 20 years (7.62% of total) 0.55% stated hiking, mountain bike, sunbathing, enjoying the scenery, and water sports (each one person), 1.1% dining. 96.13% selected “other activities”. This big group looking for “other” activities in this young generation cannot be further described but would be an interesting subject of further research.

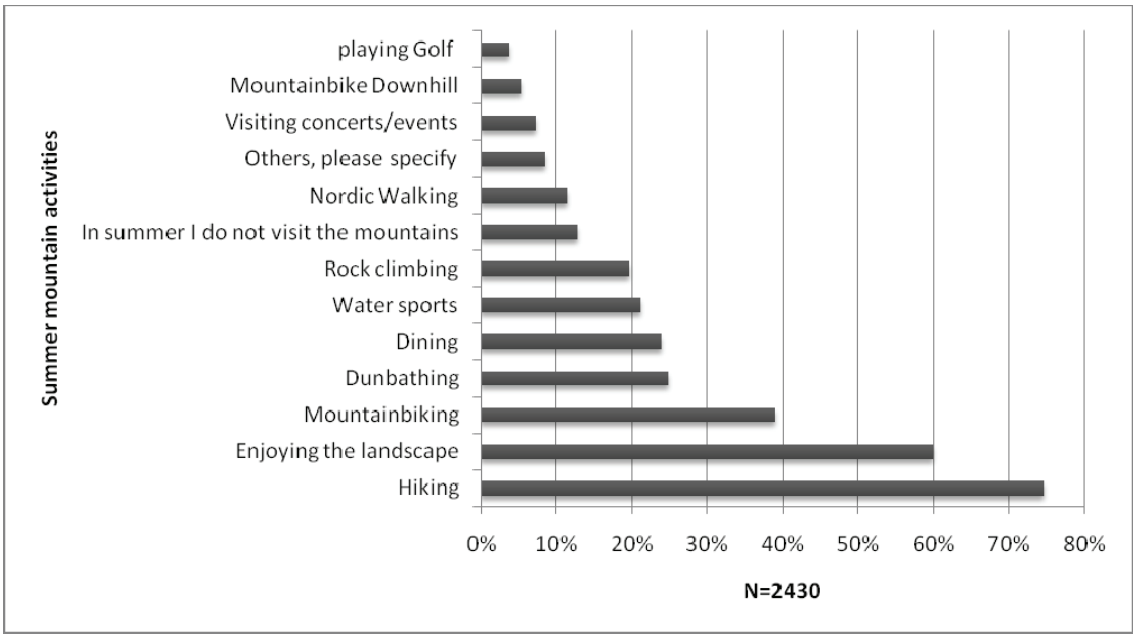

Figure 26 Summer mountain activities

Age class 21-30 (28.96%) is most interested in hiking (23.98%), enjoying the scenery (19.62%), mountain bike cross country (11.19%), sunbathing (10.47%), dining (8.14%), water sports (6.54%). 5.38% do not visit the mountains in summer.

Age class 31-40 (25.29%) most likes to go hiking (2629%), enjoying the scenery (21.63%), sunbathing (9.8%), mountain bike cross country (8.82%), dining (7.82%), water sports (5.66%) and rock climbing (5.32%). 5.32% do not visit the mountains in summer.

Age class 41-50 (22.52%) most likes to go hiking (23.18%), enjoying the scenery (18.5%), sunbathing (9.35%), dining (9.16%), water sports (7.48%) and rock climb (4.67%). 4.49% do not visit the mountains in summer.

Age class 51-60 (11.45%) likes most to go hiking (22.06%), enjoying the scenery (18.75%), mountain bike cross country (10.66%), sunbathing (9.56%), dining (8.82%), water sports (7.72%) and rock climbing (5.15%). 7.35% do not visit the mountains in summer.

Age class 61 years plus (4.17%) most likes to go hiking (23.23%), enjoying the scenery (22.22%), sunbathing (12.12%), mountain bike cross country (10.10%), dining (7.07%), Nordic Walking (5.05%). 9.09% do not visit the mountains in summer (see figure 27). The oldest visit the mountains in summer the least. They like Nordic Walking much more than the younger class. Mountain bike (especially downhill), rock climbing and water sports are more favored by the mid age bracket.

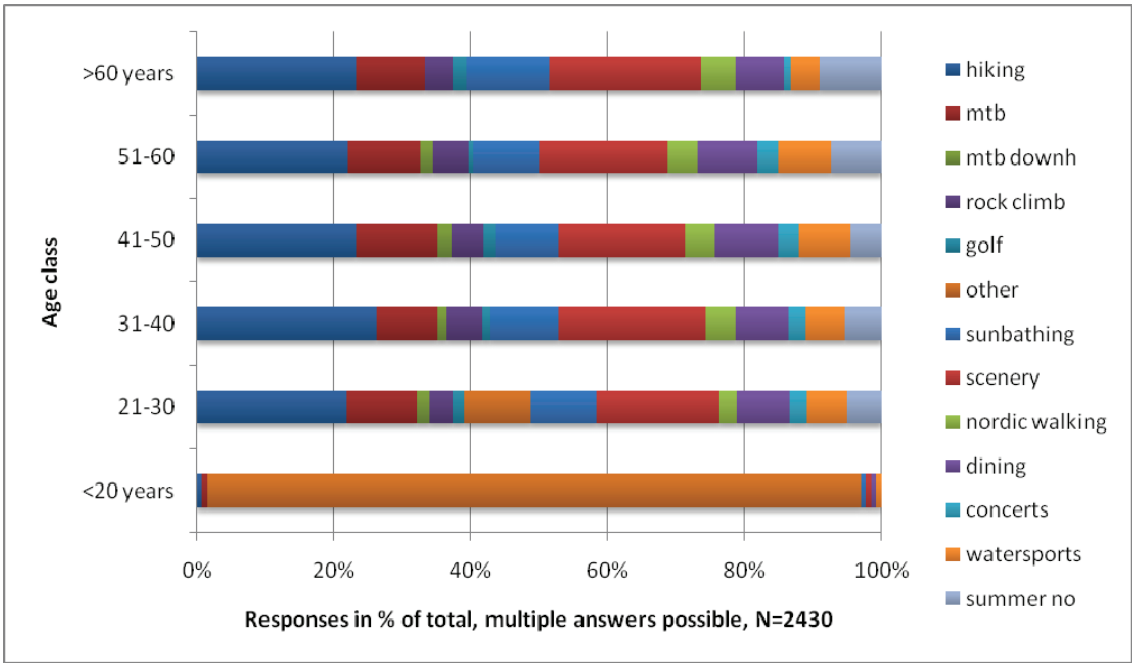

Figure 27 Summer activities split by age classes

5.1.4.12. Environmental knowledge/awareness – glacier expansion

Do you think that ski resort expansion on glaciers can have negative effects on society in general? (n=2430)

The question, if people think that the ski infrastructure built and used on glaciers could have negative impacts on society was answered positively by 50%. These 50% agreed that the use or construction of ski infrastructure on glaciers can negatively affect glaciers, their melting and thus the water regime and their storage function for drinking water in summer. 23.5% disagreed with this statement, 26.5% were not sure (see figure 28).

Stratification by the income

If we compare the environmental knowledge with the income classes we cannot find a significant correlation that with a higher income and thus potentially a higher education, skiers knew more about glaciers and the environment than others (χ^2<10>=5.54, p=0.852).This is similar with knowledge on climate change and technical snow, both being not significant compared to their income (χ^2<10>=7.166, p=0.71 and (χ^2<10>=9.084, p=0.542).

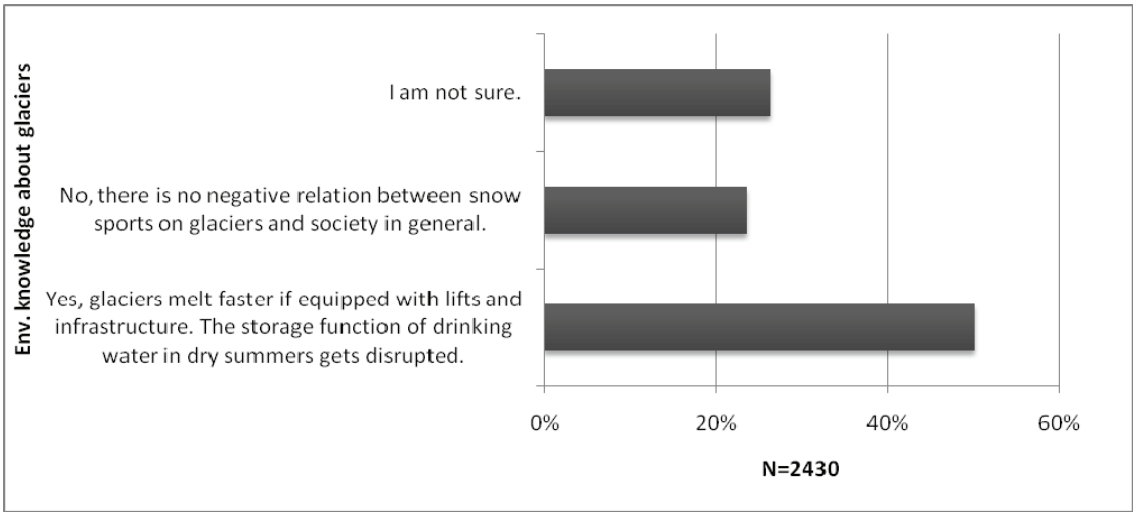

Figure 28 Environmental knowledge about glaciers

Stratification by the frequency of skiing

If we compare the environmental knowledge with the frequency of skiing we cannot find a significant correlation with a higher frequency of skiing and thus potentially more "approximation" or "feeling/interest" of those who spend more time in the mountains for the topic of glaciers and the environment than others (χ^2<6>=6.905, p=0.330). This topic has not been transported in the media recently, nor is it a topic that reaches the majority of skiers because the percentage of glacier ski resorts is fairly low with about 3-5% of glacier resorts from the total of Alpine resorts, depending on the definition of a ski resort.

5.1.4.13. Environmental knowledge/awareness – technical snow

Do you think that technical snow (machine made snow) can have negative impacts on the environment? (n=2430)

A similar question addressing environmental knowledge and awareness was about the possible negative effects of technical snow making on the environment. 52.3% agreed that technical snow can harm the sensitive mountain environment. Still, 34.2% disagreed, and13.5% were not sure about it (see figure 29).

Stratification by the frequency of skiing

If we compare the environmental knowledge of technical snow making with the frequency of skiing we find a very significant correlation with a higher frequency of skiing and thus potentially more "approximation" or "feeling/interest" of those who spend more time in the mountains for the topic of technical snow making and the environment than others (χ^2<6>=21.19, p=0.002). There is a higher lack of knowledge on the potential negative outcomes of technical snowmaking with those who ski less than two weeks than those who ski more than two weeks. 55.4% of those skiing more than two weeks a year believe that snow making

can have negative impacts, but only 48% of those skiing less than two weeks (see figure 30). A reason may be that technical snow making recently has not been a bigger topic for the media, but is still very much affecting those who ski. If the influence of the media is not there, then the proximity to nature is increasing environmental knowledge directly related to the activity being fulfilled.

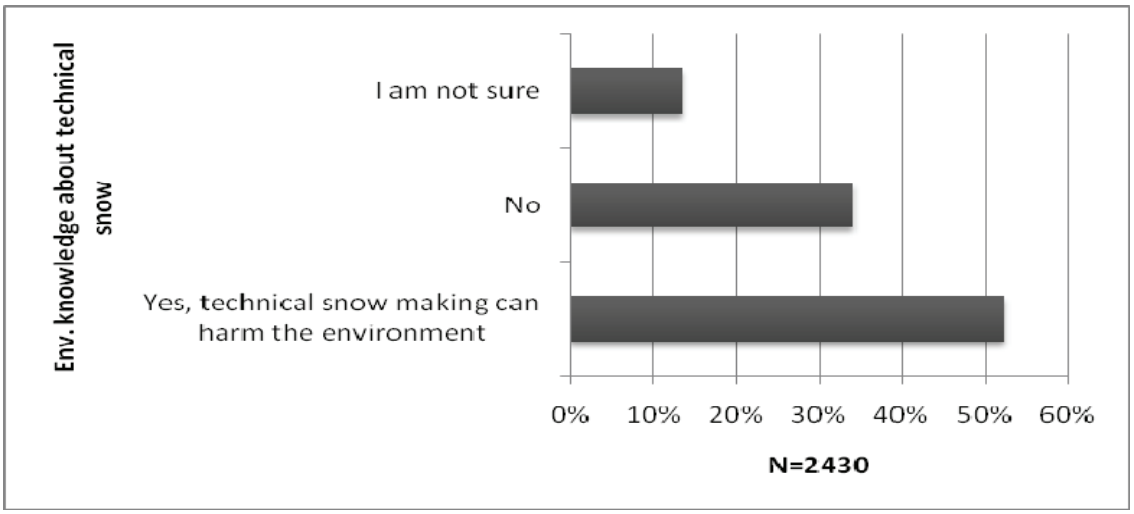

Figure 29 Environmental knowledge about technical snow

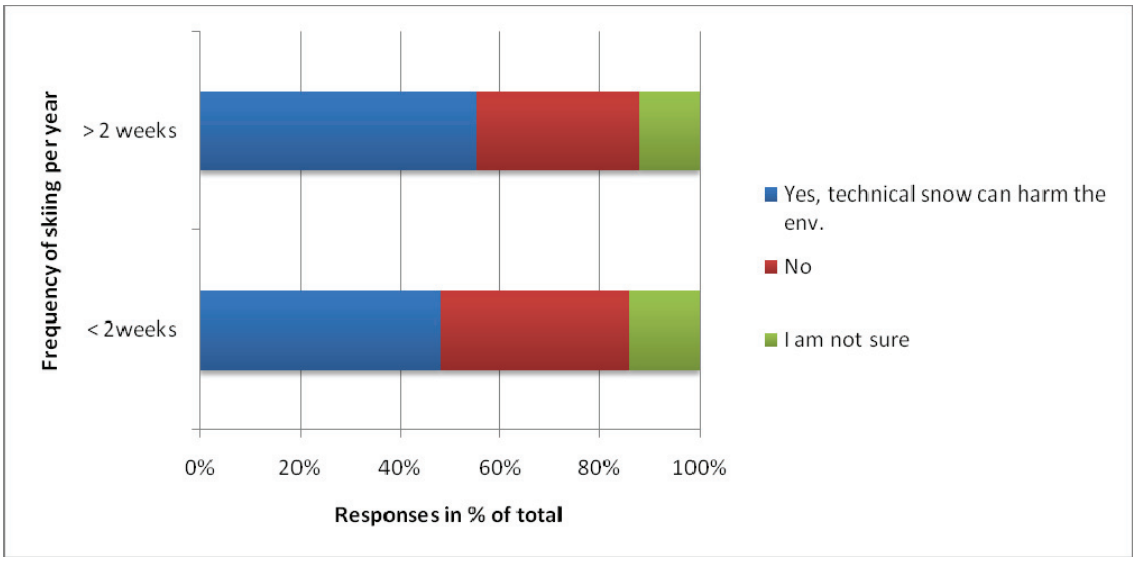

Figure 30 Knowledge on technical snow stratified by frequency of skiing

5.1.4.14. Environmental knowledge/awareness – climate change

Does climate change effect snow sports? (n=2430)

A very different state of environmental knowledge or awareness can be drawn from the question if climate change does impact snow sports. 83.7% agree that

snow sports will or already do suffer from climate change. Still, 13.4% indicate that each season is different and that even a winter like 2006/07 is normal. 2.9% were not sure (see figure 31). The influence of the strong media coverage of the winter 2006/07 on climate change explains why only 2.9% were not sure about it.

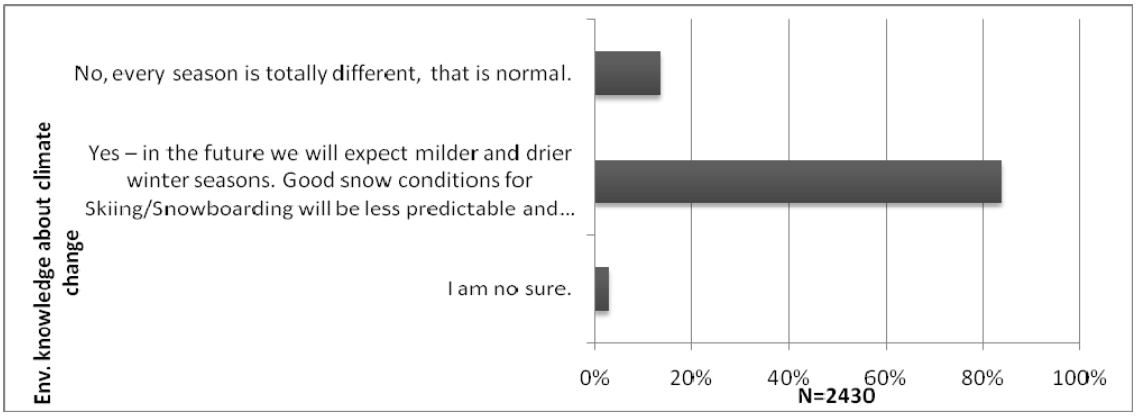

Figure 31 Environmental knowledge about climate change

Stratification by the frequency of skiing

If we compare the environmental knowledge in the example of climate change to the frequency of skiing, we cannot find a significant correlation with a higher frequency of skiing and thus potentially more *approximation* or *feeling/interest* of those who spend more time in the mountains for the topic of climate change and the environment than others (χ_2<6>=3.072, p=0.8). A reason may be that the topic of climate change has been in the media anywhere and everywhere, so there is no *advantage* in knowledge of those who ski more often and are closer to the topic or suffer more directly from climate change and vanishing snow cover.

5.1.4.15. Indicators for an environmentally friendly ski resort

To call a ski resort environmentally friendly, what actions should it take in your opinion (multiple answers possible)? (n=2430)

Skiers' opinions of what a ski resort should do to count as environmentally friendly vary a lot. The major indicator was with 77.9% to offer free shuttle busses to stop local car traffic. 73.4% expect the resort to use renewable energy for lifts, gastronomy etc. Forest sanctuaries (62.8%), wild life protection zones (54.8%) and the usage of bio fuel for all grooming machines (45.9%) are further important factors. 33.4% agreed the resort should offer environmental facts for the customer. 32.2% think that there should be no expansion on glaciers; 28.9% do not wish to see expansion with new lifts and new runs being built in general. Producing less technical snow (27%), environmental training for the staff (23.5%), less machine operations in general (22.4%) and less grooming of runs (19.3%) lined up thereafter in people's expectations. 15% said

that resorts should not use glaciers for skiing at all, and 9.8% said that there should be no technical snow making at all (multiple answers possible, see figure 32).
We see that technical snowmaking as such was widely accepted. The way snow is produced and the amount of necessary production still counts as an environmental factor of concern.

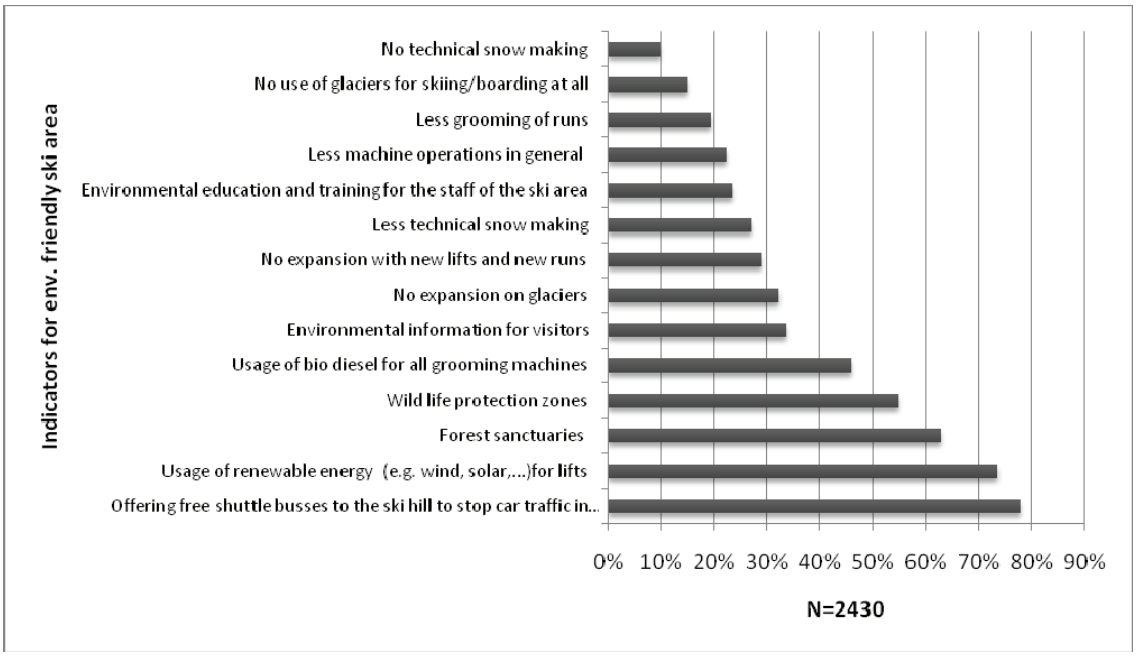

Figure 32 Indicators for environmentally friendly ski areas

Stratification by environmental knowledge about glaciers

If we compare the expectations for an environmental ski resort to the environmental knowledge in the example of glaciers and skiing, we cannot find a significant correlation (χ^2<26>=30.06, p=0.265) that, for example, skiers with a higher environmental knowledge would expect other indicators to be met by the resort.

5.1.4.16. Trust in certifications for an environmentally friendly ski area

Which of the certificates for an environmentally friendly ski area below would you trust (multiple choices possible)? (n=2430)

We asked what certifications indicating an environmentally friendly resort people would trust. 37.6% trust in the World Wide Fund for Nature (WWF Italia), 36.3% would trust the German Ski Federation (DSV), 30.8% Greenpeace and 28.9% the International Organization of Standardization (ISO & DIS).
14.6% would trust a self-controlled code of conduct by the ski area association.14% and 9.8% would believe in a certificate of the German Sport University Cologne, respectively the University of Zurich. Auditing in ski areas (5.5%) and The Natural Step (4.3%) are the least trusted – which of course has

to be seen in light of the 161% who don't know any of the certifications posed here in this question. 9.1% would trust none of these (multiple answers possible, see figure 33).
People trust in those certifications and names they know well or at least have heard about, even if these certifications do not exist and even if those not known are specifically developed for ski resorts.

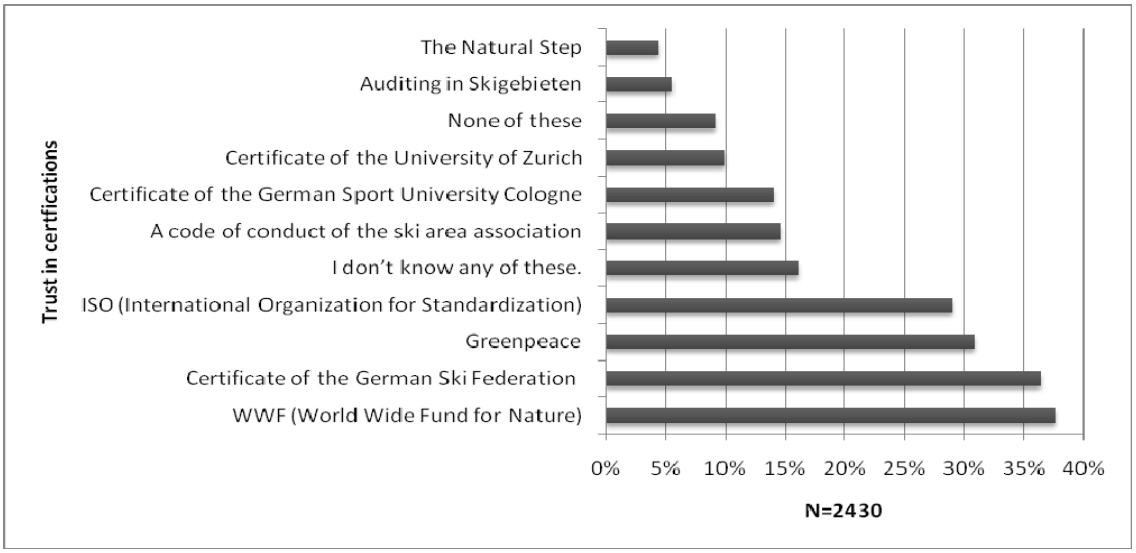

Figure 33 Trust in certifications

Stratification by environmental knowledge and income

If we compare the trust in certifications with the environmental knowledge there is neither a significant correlation (χ^2<20>=20.762, p=0.411) nor is there one concerning the income (χ^2<50>=43.897, p=0.716).

5.1.4.17. Important factors when skiing or boarding

What factors are most important to you when skiing or boarding in a ski area (please click the three most important ones)? (n=2430)

What factors are most important for skiers and boarders in a ski area? Not surprisingly it is the amount of snow. The most essential (54.9%) is that there is snow at all. Not waiting in lift lines is most important (53.1%). The quality of the groomed runs follows with 47.7%. The kind of snow, especially powder snow, is for 42.6% most important, followed by sunshine (39.2%), great mountain scenery (36.3%), good terrain for off-piste skiing or freeriding (28.3%) and carving runs (15.5%). Party music at the lift stations are favored by only 3.3% (multiple answers possible) (see figure 34).
The amount of snow, that there is snow at all, is most important. The quality of the runs and the kind of snow, though, are in a strong third and fourth position in customer demand, which indicates that technical snow that is not managed well and that increases icy conditions may not meet customer demand well. Technical snow making that guarantees skiing but leaves a poor quality of the

snow and the ski runs may not be enough for future demand, thus the focus should not solely be on guaranteeing the skiing, but guaranteeing skiing with a maximum in quality. In addition, skiers feel the differences of technical snow on their skis and boards. After a day of skiing on technical snow the ski or board base is dried out and needs a new wax service which usually is not the case with natural snow. The existing and potential further advantages of technical snow have to be taken into account, not just the sheer appearance.

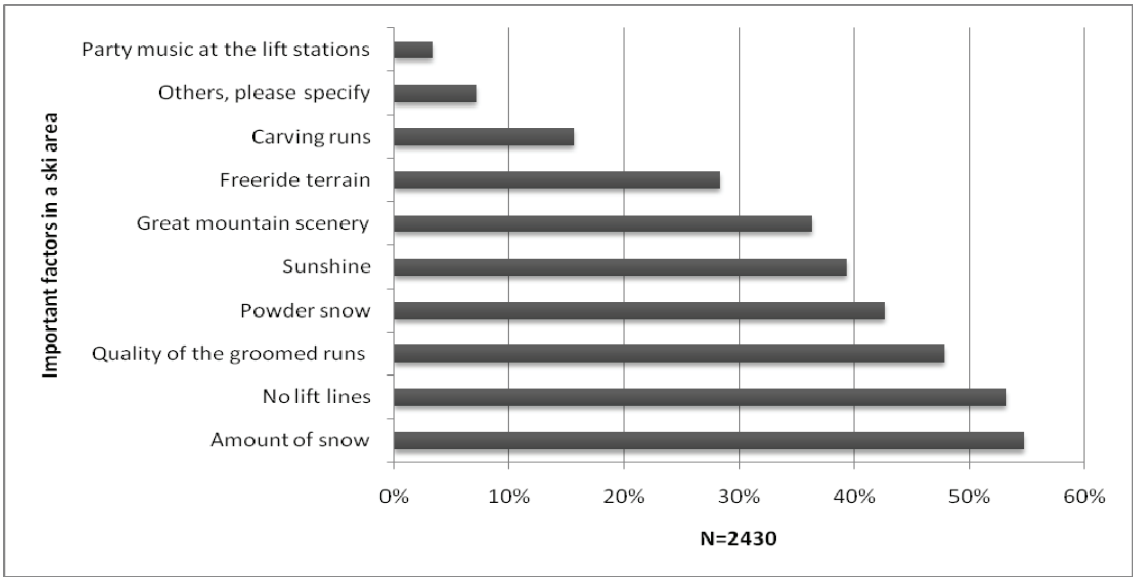

Figure 34 Important factors in a ski area

Stratification by age

If we compare the important factors when skiing or boarding by the age classes, there is a highly significant correlation (χ^2<45>=2013.281, p=0.000).

In the age class up to 20 years 83.43% selected *other*. This big group looking for *other* factors in this young generation cannot be further described but would be an interesting subject of further research. Watching kids in ski areas implies, though, that this focus group is looking for fun parks, pipes and music. 3.8% state the amount of snow at the same percentage to have no lift lines. Next is the quality of snow (powder).

Age class 21-30 is most interested in no lift lines (16.57%), the amount of snow (15.99%), the quality of the groomed runs (15.84%), sunshine (14.1%) and freeride terrain (6.69%).

Age class 31-40 is most interested in no lift lines (18.47%), the quality of the groomed runs (17.64%), the amount of snow (15.97%), sunshine (14.14%) and the quality of the snow (10.98%).

Age class 41-50 is most interested in the amount of snow (18.13%), no lift lines (17.01%), the quality of the groomed runs (1477%), sunshine (14.1%) and the quality of snow (12.9%).

Age class 51-60 is most interested in the amount of snow (18.38%), sunshine (16.54%), the quality of the groomed runs (15.81%), no lift lines (13.6%) and the quality of snow (12.87%).

Age class 61 years plus is most interested in the quality of the groomed runs (24.24%), the amount of snow (16.16%), no lift lines (13.13%), sunshine (11.11%) and the quality of snow (11.11%).

Interestingly, the younger age groups from 21 to 40 put more emphasis on not waiting in lift lines, whereas this attribute is less important for the older age groups. Time constraints and efficiency are more important for the younger groups who might just want to ski more and make more use of their time in a ski resort. Thus, when attracting younger people, ski areas should avoid and manage the crowds. Snow, then, is the most important factor for the age 41 to 60; thereafter, it is the quality of the groomed runs. If ski areas want to attract the older groups though, perfect runs are a must (see figure 35).

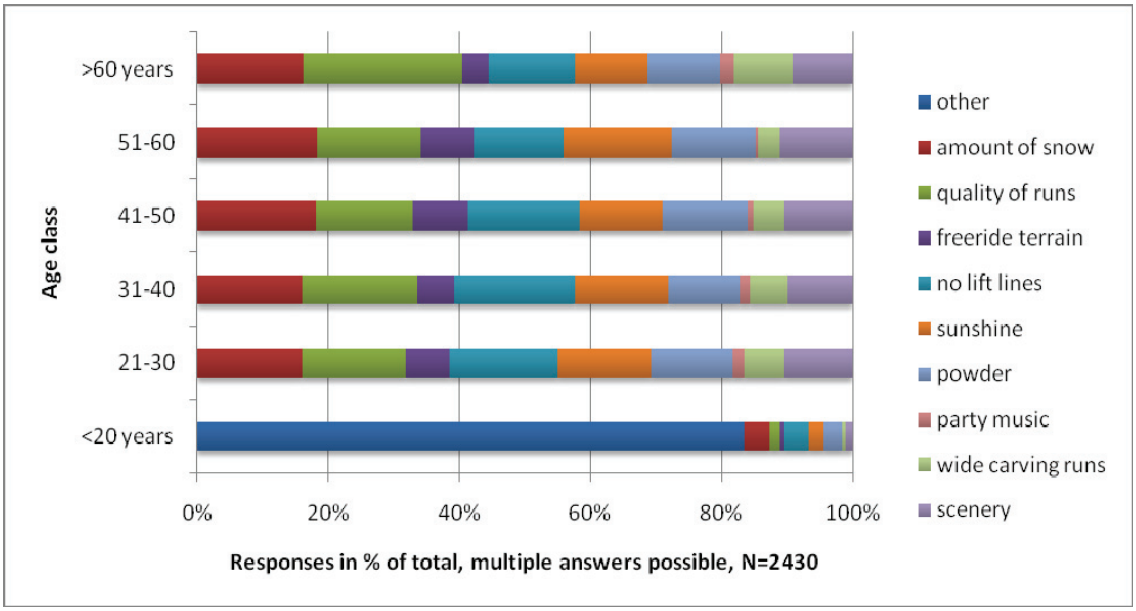

Figure 35 Important factors in a ski area split by age classes

5.1.4.18. Important services in a ski resort

What services in a ski resort are most important to you (please click on the three most important answers)? (n=2430)

When asked about the importance of services offered by the ski resort, 80.5% favored the free shuttle bus in town to leaving the car in the parking lot. 42.6% appreciate friendly greeting lift staff, while 40.4% prefer free parking at the ski

lift. 29% are interested in information about action on climate change and environmental preservation in the ski area, and 23.3% would look for a guide who can explain the surrounding mountains and scenery or a guide who can give information on plants and wildlife (20.3%). 14.5% would like to participate in free guided tours to learn more about the mountain. 10.8% favor après ski party at the lift stations (multiple answers possible, see figure 36).

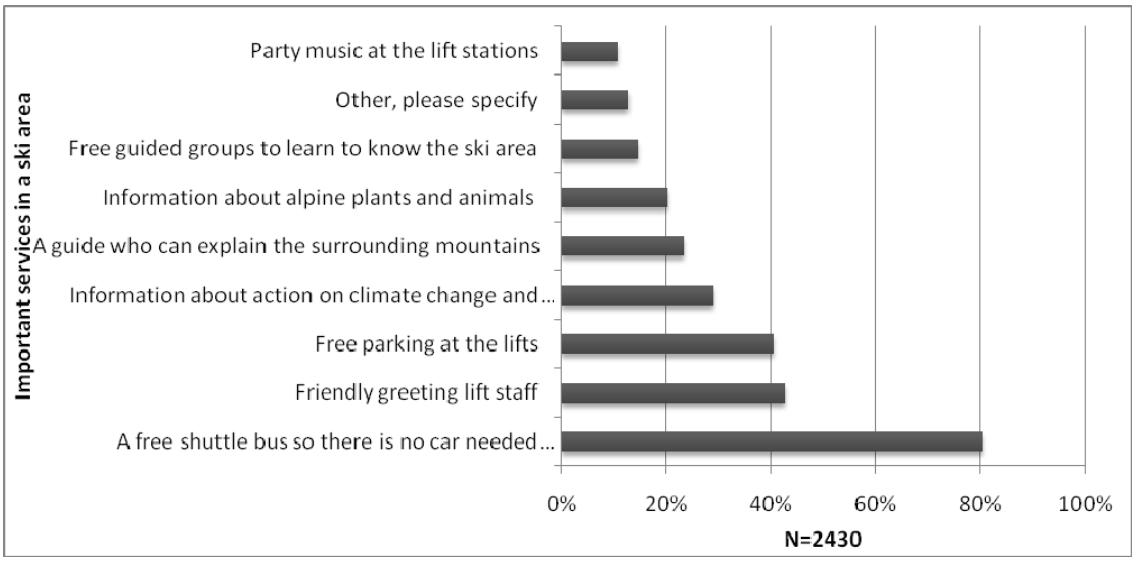

Figure 36 Important services in a ski area

Stratification by age

If we compare the important services when skiing or boarding by the age classes, there is a highly significant correlation (χ^2<40>=1488.95, p=0.000).

96.13% of the age class below 21 years prefers other services which we cannot define more. We can just guess from observations that social activities for the youth with music and fun parks would be part of such demand. Class 21-30 is looking for a free shuttle service (23.98%), other services (16.86%) and free parking (16.13%).

In age class 31-40, even more selected the free shuttle (32.45%), 16.96% friendly lift staff, 14.81% free parking and 9.98% information on environmental topics.

Age class 41-50 also prefer the shuttle (31.59%), followed by the free parking (18.13%) and the friendly lift staff (15.89%). The next age class 51-60 also chooses the shuttle as most important (28.41%) followed by the information on environmental topics (15.81%). The oldest class prefers the friendly lift (18.18%) after the free shuttle (31.31%). Party music is more popular with 5.05%.

The mid age classes 31-40 and 51-60 show the highest demand for environmental information.

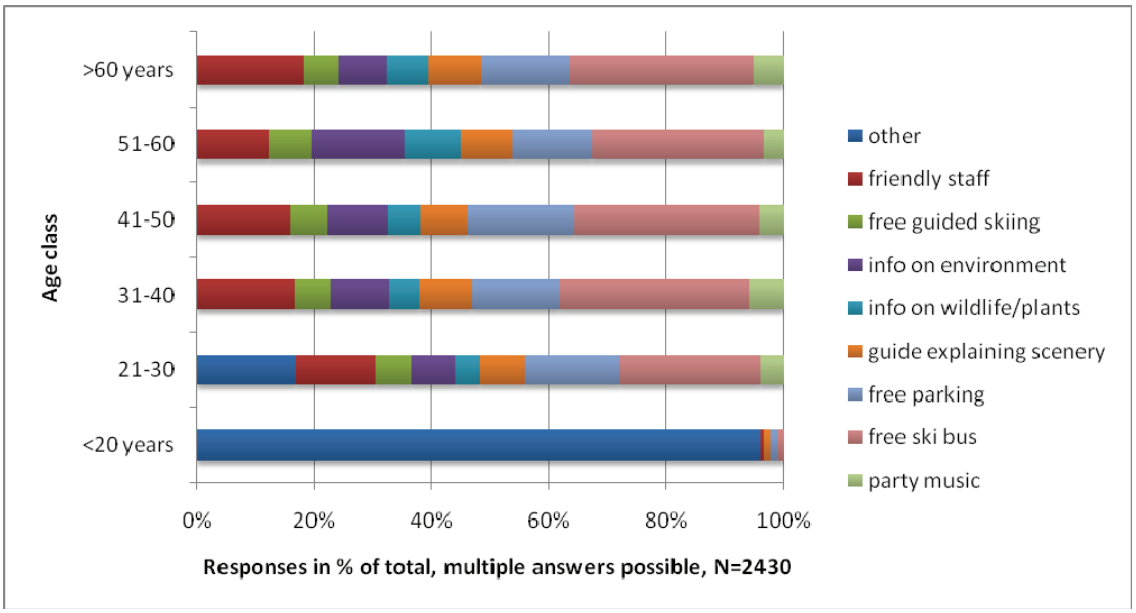

Figure 37 Important services in ski areas split by age

5.1.4.19. Alternatives if no snow

Imagine you spend one week of winter vacation, and on some days of that week there is no skiing or boarding possible – due to lack of snow. What would you like to do alternatively (click the most important three answers)? (n=2430)

If during a week of ski vacation there was no skiing possible due to lack of snow, what would people like to do as a an alternative?
59.3% would like to go hiking; 46.4% would prefer to visit a wellness spa; and 43.5% would like to go sun bathing, if possible high up on the mountain. 25.3% would take advantage of the extra time to participate in courses like avalanche rescue, outdoor photography and others. 23.5% would check out different activities like a high ropes course, or mountain bike on single trails (21.2%). Party and nightlife is favored by 19.9%, visiting concerts and events by 17.6%. A sled or tube descent from the mountain in a slide that does not rely on snow would be favored by 13.4%, Nordic Walking by 12%. 11.5% would buy a ticket to ski or board a day in the next higher mountain with snow, accessed by a helicopter. Back in the destination, 11% would visit an interpretive center on the mountain top or use free internet to surf the web or work (9.3%). Nordic Blading/Inline skating is an option for 9.1%, a romantic candle dinner in a gondola for 8.2%. 4.8% would visit a mountain bike downhill park, 3.4% would play golf. Interestingly, only 2.8% would be willing to ski or board in the next ski dome. Only a mere 2.5% would enjoy a high speed mountain coaster as a technical installation on the mountain top (multiple answers possible, see figure 38).

Soft mountain sport activities, wellness and sun bathing, as well as active participation in courses, indicate the modern demand of mountain tourists. Alternatives to skiing should involve the natural environment and soft sports. Again, there is a high demand for information and for communication.

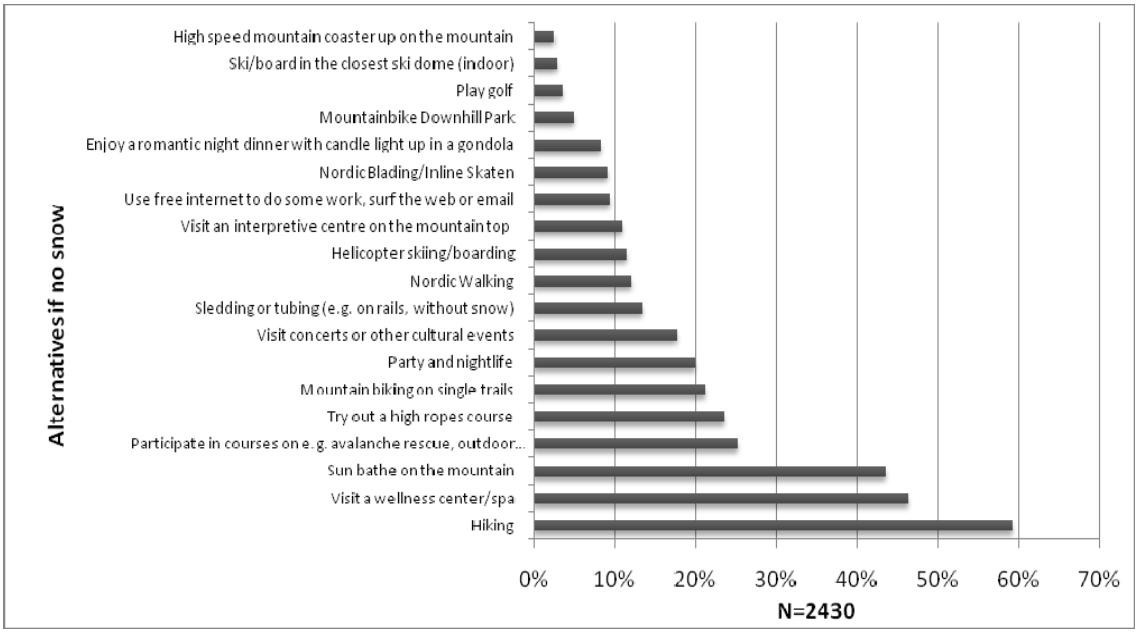

Figure 38 Alternatives if no snow

Stratification by the frequency of skiing

If we compare the desired alternatives with the frequency of skiing there is no significant correlation (χ^2<54>=43.265, p=0.852).

Stratification by age

If we compare the important factors when skiing or boarding by the age classes there is a significant correlation (χ^2<90>=115.546, p=0.036). In the age older than 50 years there is no response to skiing in a ski dome, also not to a mountain coaster. The ski dome is most attractive to the mid age class 31 to 50 years with 2.24% of the 41 to 50 years old stating interest into a ski dome as an alternative. The 51 to 60 years old have the highest interest in interpretive centres (5.88%), the respondents older than 60 years are most interested in helicopter skiing (5.1%). The age between 21 and 30 is the biggest party group with 6% who show interest in party and night life as alternatives. The youngest also prefer sun bathing the most with 18.7% (see figure 39).

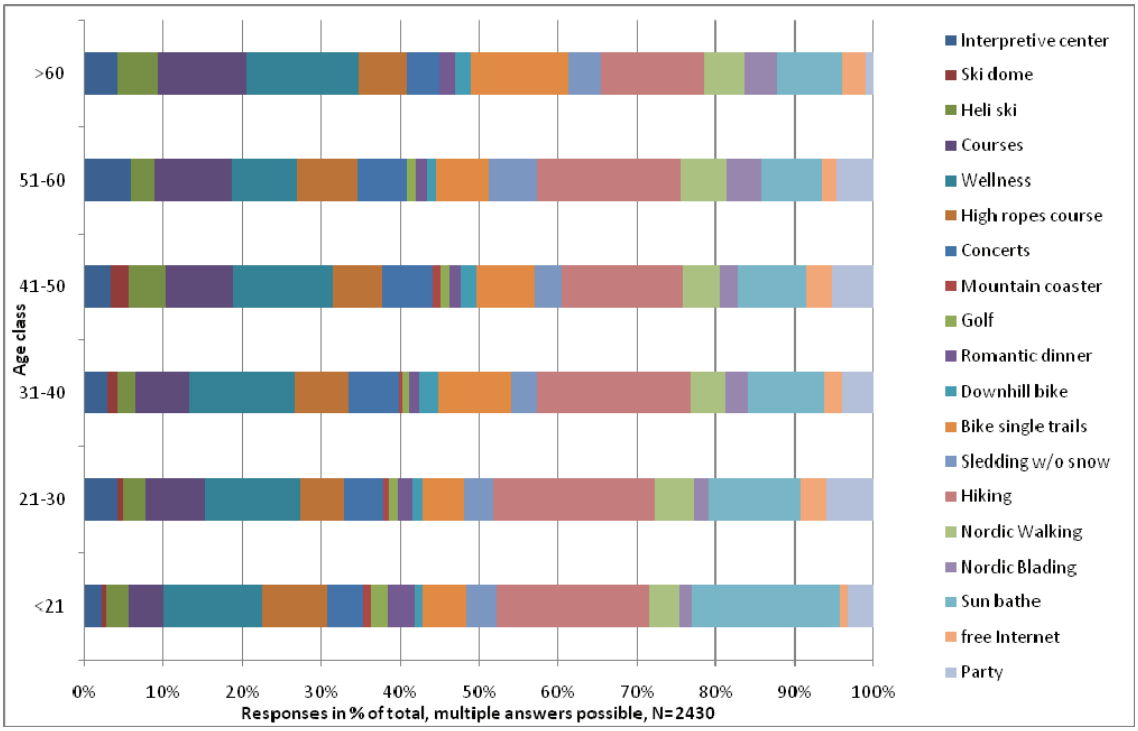

Figure 39 Alternative activities if no snow split by age classes

5.1.4.20. Staying how long if no snow?

How many days within your six days vacation (one week in total) would you stay at the resort doing something alternative due to lack of snow before you left back home? (n=2430)

If there was no snow at all in a booked ski vacation week, how long would people stay before they returned home without getting a refund from the accommodation costs? Only 5% stated they would leave right away. From the remaining 95% who stayed, 14.3% would stay one day out of six, 33.2% two days, 20.2% three days and 26.8% four days.
95% of the overnight visitors would stay between one and four days out of six if there were no snow but alternative activities offered (see figure 40).

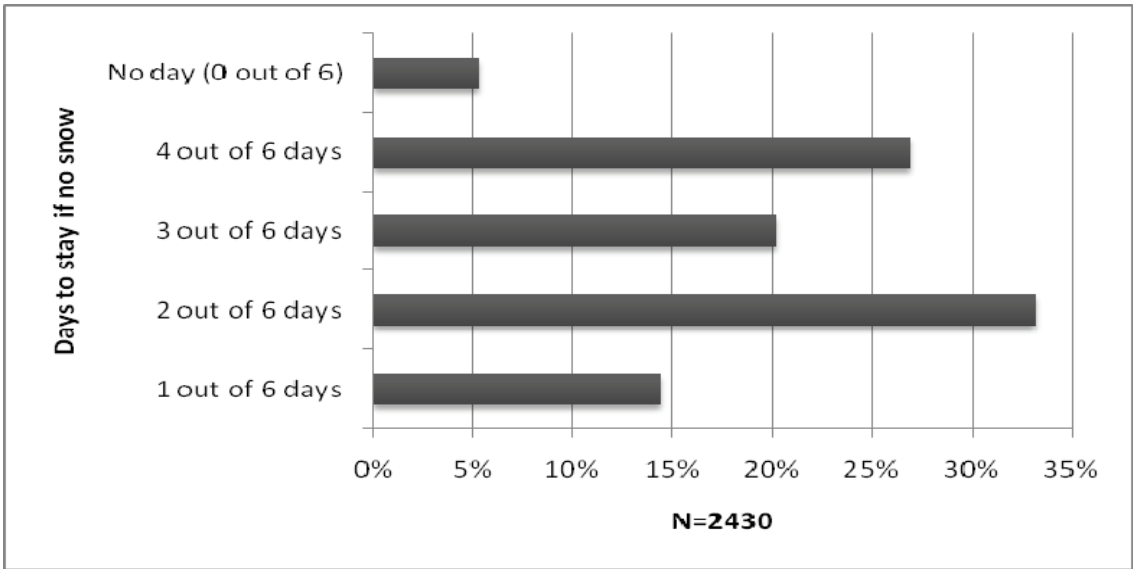

Figure 40 Days to stay if no snow

Stratification by the income and by frequency of skiing

If we compare the willingness to stay without snow with the living distance from the destination we cannot find a significant correlation (χ^2<20>=24.56, p=0.219).

The correlation with the frequency of skiing is non-significant neither (χ^2<12>=15.039, p=0.239).

5.1.4.21. How long to stay for kids if no snow

How many days would you wait (waive but stay) for skiing or boarding in the main ski area due to lack of snow, if instead your kids had enough snow in the fun park and in the learning area? (n=2430)

We posed the same question, but with a kids' area that has guaranteed snow, so the kids can take lessons or ski in the fun park. What difference would that make in the willingness to stay for the parents? From the 52.6% who do have kids, 28.5% would stay one out of 6 days in the destination. 34.3% would stay two days, 16.2% three days and 5.1% four days. 15.7% say they would leave because they expect 100% snow guarantee. So in total, 84.3% of the families would stay if there were no snow for them to ski, but a kids' area that could be used.

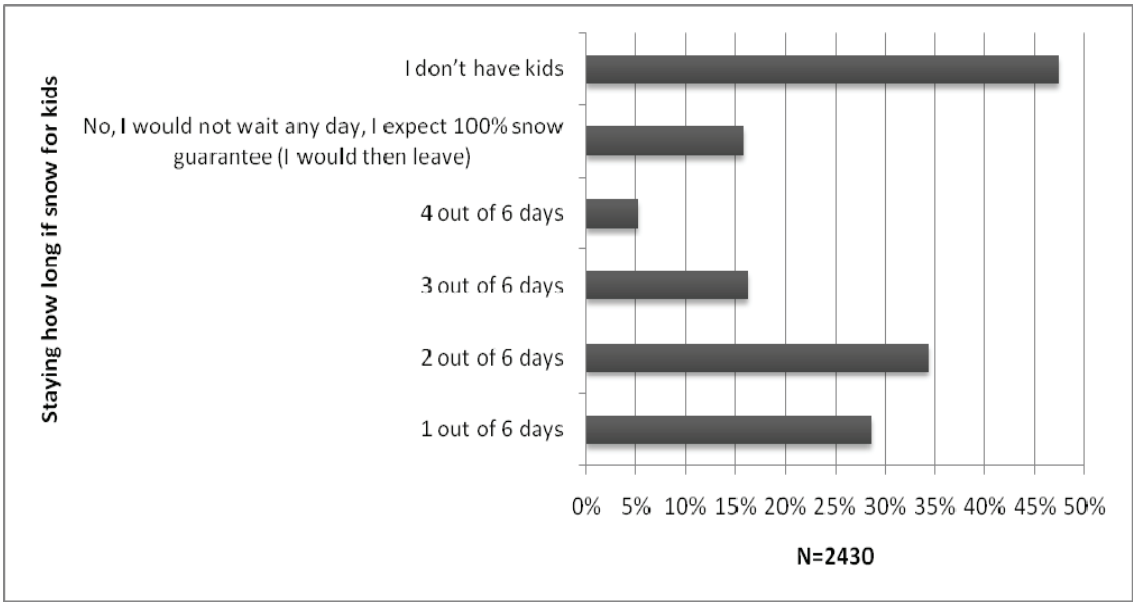

Figure 41 Staying how long if snow for kids

5.1.4.22. Importance of environmental action and donation of ski resorts

Is it of any importance to you if ski areas donate a part of their earnings to environmental organizations and invest it into conservation of the environment? (n=2430)

Asked if it is of any importance to skiers if resorts donated a part of their earnings to eco-social organizations or directly invested it into ecological restoration projects, 81.8% said that it is important. Only 8.6% said this is of no importance; 9.6% were not sure (see figure 42).

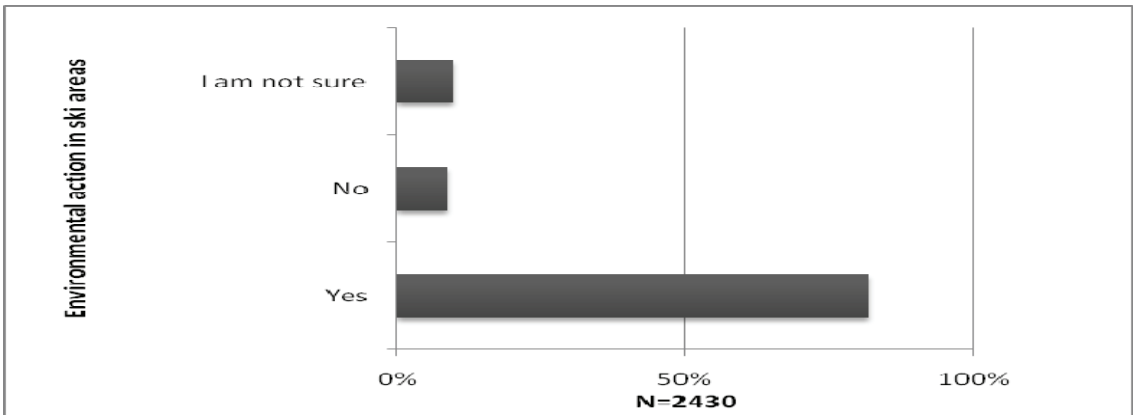

Figure 42 Environmental action and donation

Stratification by the income

If we compare the expectations on a ski area to donate money with the income there is no significant correlation (χ^2<10>=7.313, p=0.696).

5.1.4.23. Paying more on ticket for CSR

Would you be willing to spend an extra sum in addition to the ski pass for climate protection and conservation of the environment? (n=2430)

Building up that expectation, people were asked if and how much they would pay in addition to the ski pass if this extra sum were directed to the betterment of the natural and social environment in situ – for corporate social responsibility (CSR). 81.6% would be willing to pay between one and eight Euros more on top of the day ski pass. 18.4% would not be willing to spend more.
From the 81.6%, 18.8% would spend one Euro more, 22.6% two Euros, 13.9 three Euros, 17.5% five Euros, 2.5% eight Euros and 6% would spend more than eight Euros (see figure 43).

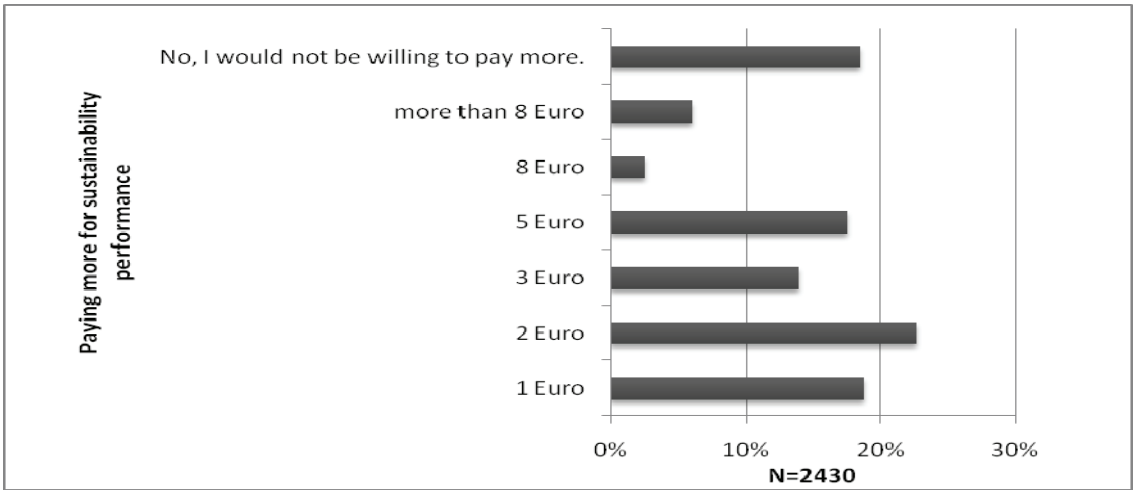

Figure 43 Paying more for sustainability performance

Stratification by the income and by living distance from the next ski hill

The comparison of the willingness-to-pay for extra CSR with *income* neither shows a significant correlation (χ^2<30>=31.247, p=0.403), nor with *living distance* from the next ski hill (χ^2<30>=22.888, p=0.802),

Stratification by age

If we compare the willingness to pay an extra CSR sum by the age classes, there is a very significant correlation (χ^2<30>=40.81, p=0.009). In age class below 31 years (36.49% of total) 18.24% would pay one Euro more per day ticket, 23.67% two Euros, 13.51% three Euros, 18.36% 5€, 3.23% eight Euros and 4.73% more than eight Euros. 18.24% would not be willing to pay any more for the topic of CSR (figure 44). In age class 30 to 50 differences are mainly that 6.16% would pay more than eight Euros. In age class over 50 years, even 8.36% would be willing to pay more than eight Euros more on the day ticket, whereas the other figures do not show a certain trend. The older the tourist the more he/she would be willing to pay for an increase of environmental performance.

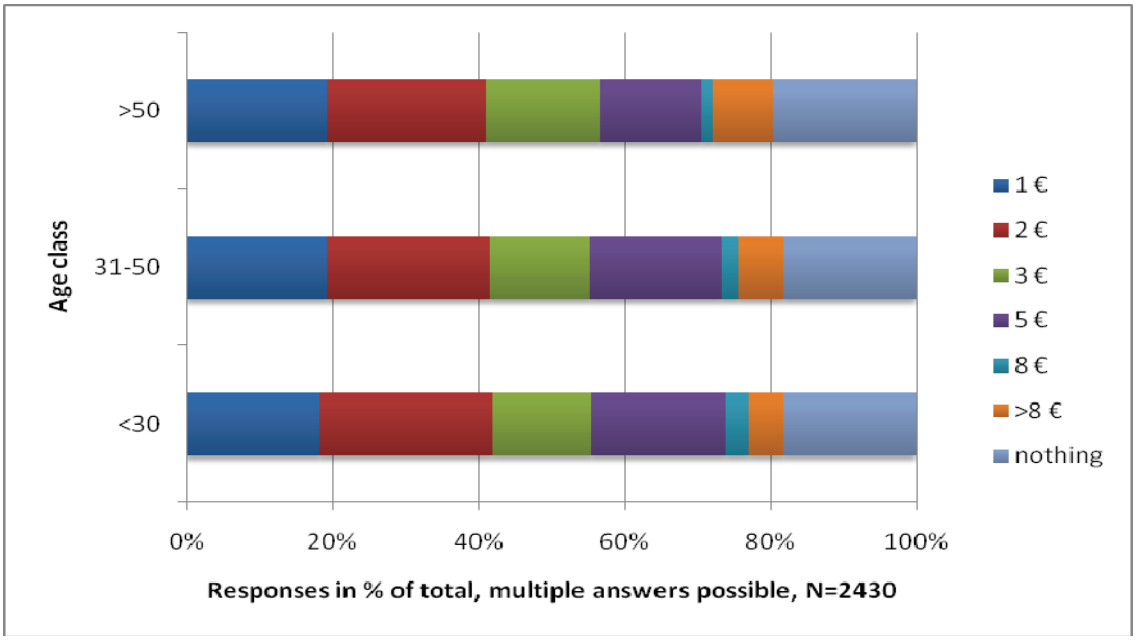

Figure 44 Willingness-to-pay more for CSR split by age

5.1.4.24. Main winter vacation period

When did you book your main winter vacation in the past? (n=2430)

People were asked when they used to book their main winter vacation week. 16.1% go to their main ski vacation week over Christmas, 20% in end of January, 21.3% beginning of February (Carnival), 25.4% in March and 17% over Easter. The period around Carnival, (end of January, beginning of February) with a total of 41.3%, is the most important ski vacation period of the winter (missing on 100%: rounding numbers, see figure 45).

Stratification with the living distance and the frequency of skiing

If we compare the vacation planning behavior with the living distance from the next ski hill there is no significant correlation (χ^2<20>=15.014, p=0.776). The correlation with the frequency of skiing is not significant either (χ^2<12>=7.559, p=0.819).

5.1.4.25. Changing vacation planning, taking climate change into account

When will you book your main winter vacation in the future if snow became less predictable due to climate change? (n=2430)

Taking climate change and a diminishing natural snow cover, especially the early winter months into account, people were asked if they would move their vacation later in springtime when snow conditions are better and more guaranteed.

Then, only 4.4% would book the vacation over Christmas, 8.5% end of January, 17.2% start of February/Carnival, 43.7% in March and 25.8% over Easter

(missing on 100%: rounding numbers). In this climate change-affected scenario, the main vacation period would then be in March and April with in total 69.5%. About 30.5% would remain booking an early vacation over Christmas and Carnival (see figure 45).

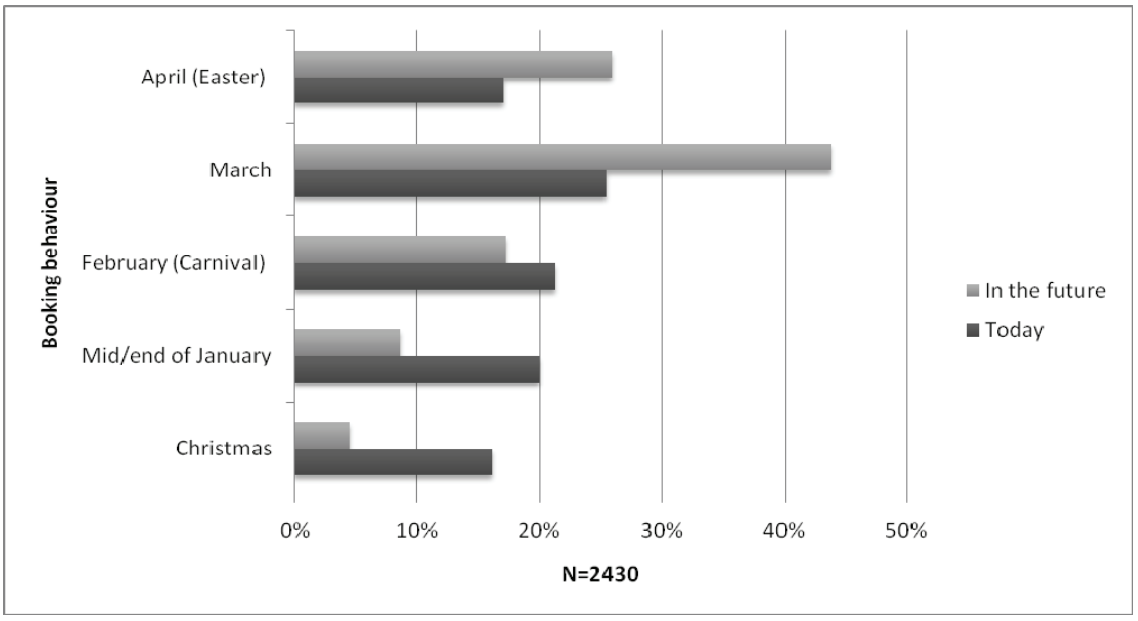

Figure 45 Main winter vacation period with (future) and without (present) climate change scenario

In total 28.3% would move their main holiday period from Christmas, January and begin of February to March and April (see table 13).

Table 13 Ski vacation booking behavior today and in the future
The future scenario has more natural snow guarantee in the late winter and in spring.

	Today (%)	Future (%)	Difference (%)
Christmas	16,1	4,4	-11,7
January	21	8,5	-12,5
February	21,3	17,2	-4,1
March	25,4	43,7	18,3
April	17	25,8	7,8

Stratification by the living distance and the frequency of skiing

If we compare the vacation planning behavior in the context of climate change impacts with the living distance from the next ski hill, there is no significant correlation (χ^2<20>=15,26, p=0,761). Those living closest to the next ski hill and thus counting as day guests can still imagine booking (and might even do so) an overnight vacation in a ski destination and are thus not significantly different in their answers from the guests not counting as day guests.

The correlation with the frequency of skiing is not significant either (χ^2<12>=12.569, p=0.401).

Stratification by age

If we compare the vacation planning behavior in the context of climate change impacts by the age classes, there is no significant correlation (χ^2<20>=30.249, p=0.066).

5.1.4.26. Reactions in skiing frequency if winters become less snow guaranteed

Because of climate change, ski passes will become more expensive in the future. Winters will become milder and there will be less snow most of the season. How will you react (multiple answers possible)? (n=2430)

Skiers were asked if and how their skiing frequency would change if future winters became more often like the winter 2006/07, with less natural snow, almost no snow throughout the year in the flat lands, which resulted in more expensive ticket prices for the ski pass.

64.3% would ski less often, and 2.6% would stop skiing. 5.6% would visit the mountains in summer more often instead of winter. This means that in case of a probable higher frequency of *bad* ski winters, more than two-thirds of skiers would ski less often or even stop skiing (66.9%). Still, 21.7% would ski as often as they used to and – if necessary – travel abroad to mountain ranges where a natural winter environment more likely exists. 5.7% would ski as often as they used to by visiting ski domes and artificial snow worlds.

Summing up the reactions in skiing frequency behavior, there were two-thirds of today's skiers that would ski less often or stop skiing. From those who would ski less often, 5.6% would instead visit the mountains in summer more frequently. The remaining quarter would ski as often as they used to – and most likely be willing to pay more for a ski vacation and even travel abroad to snowy places. Skiing in a ski dome only is an option for 5.7% (missing on 100%: rounding numbers, see figure 46).

Artificial skiing environments such as ski domes are no interesting alternatives for skiers who come to ski in the mountains. This result confirms the selected alternatives from figure 38 where ski domes were at the last position. The amount of skiers who would become summer tourists and who visited the mountains more in summer instead is very low – because 87% of skiers already visit the mountains in summer. If ski destinations wanted to attract more tourists in summer they would have to reach skiers differently and also target a new clientele that maybe did not travel to the mountains so far.

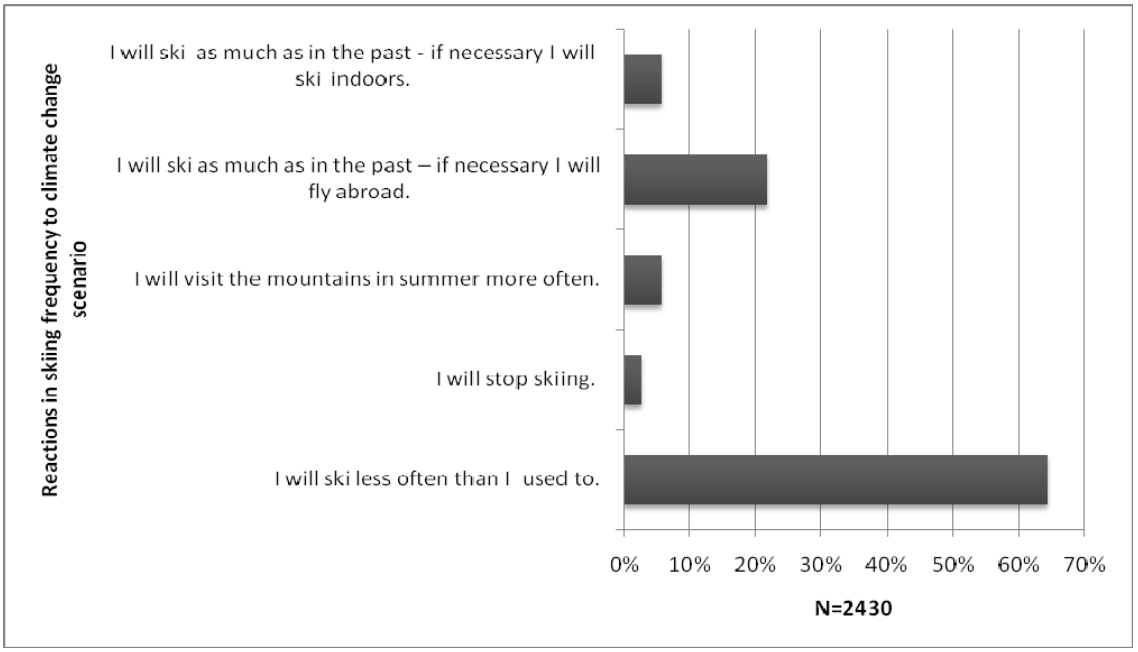

Figure 46 Reactions in skiing frequency with climate change scenario

Stratification by the frequency of skiing

If we compare the frequency reactions with the skiing frequency there is no significant correlation (χ^2<12>=13.184, p=0.356).

Stratification by the living distance from the next ski hill

The correlation with the living distance from the next ski hill is not significant either (χ^2<20>=22.957, p=0.291). 18.9% of skiers living less than one hour apart will ski less often (from a total of 30.4% in all answers with the same living distance), 7.3% will ski as often as before and even travel abroad. Of those who live one to two hours apart, 20.7% will ski less often (from a total of 31.9% in that distance), 6.2% ski like before. Interestingly, only 0.9% of those living more than eight hours apart and usually taking the plane will ski less often, but 2.7% of those with the same distance but not used to travelling by plane will ski less often.

Of those who would stop skiing, there are 1.7% of those living closer than two hours, 0.8% of those with a travel distance between two and eight hours, and 0.1% with a distance of more than eight hours, usually not travelling by plane. None of those who travel by plane state they would stop skiing.

The loss of skiers, those who will ski less often or even stop skiing, is higher with those living closer to the mountains, which is, of course, due to the total higher percentage of skiers living closer to the mountains. As said before there is no significant correlation between living distance and changing skiing behavior, but in total the number of day skiers or potential flexible day skiers

living less than two hours from the next ski hill will decline more than the number of less flexible skiers who have to book well in advance (see figure 47).

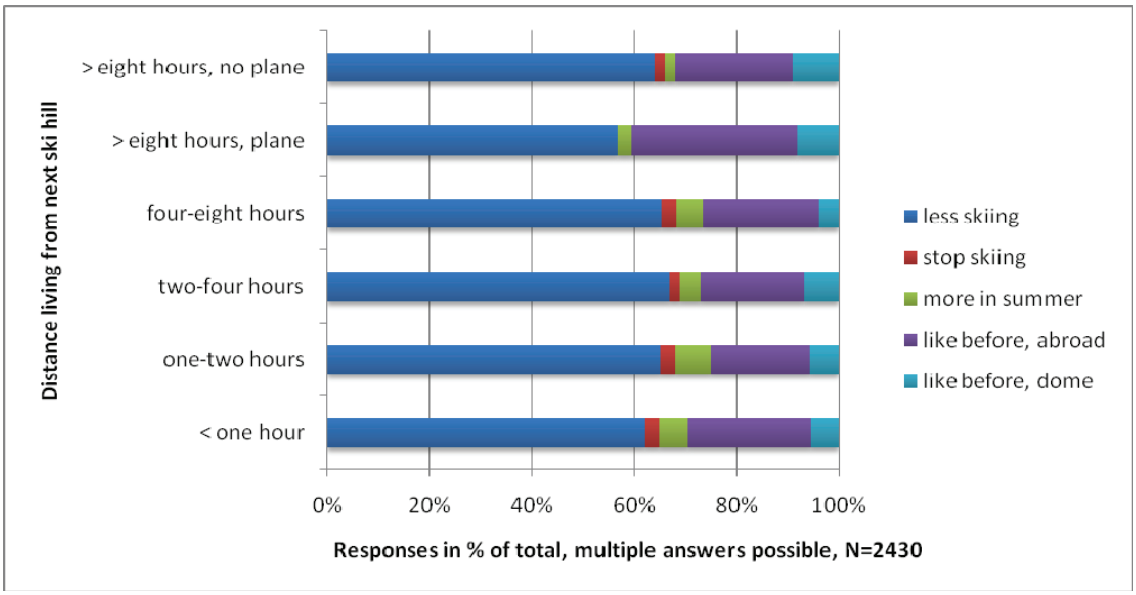

Figure 47 Reactions in skiing frequency split by living distance from next ski area

Stratification by age

If we compare the skiing frequency reactions by their age classes, there is a very significant correlation (χ^2<20>=41.05, p=0.004). The young age classes would more likely ski less often (66.74%) than the older ages (62.94% and 63.34%). Ages over 50 years would more likely stop skiing (3.5% to 2.42% <31 and 2.55% in age 31-50). More older skiers would visit the mountains in summer (5.93%) and more older people would ski instead in snow domes (7.01%).

In general younger skiers would ski less often, older people would rather stop skiing, or look for indoor skiing instead. The mid age class 31-50 would be the group most likely to ski somewhere abroad where there is more snow guarantee (see figure 48).

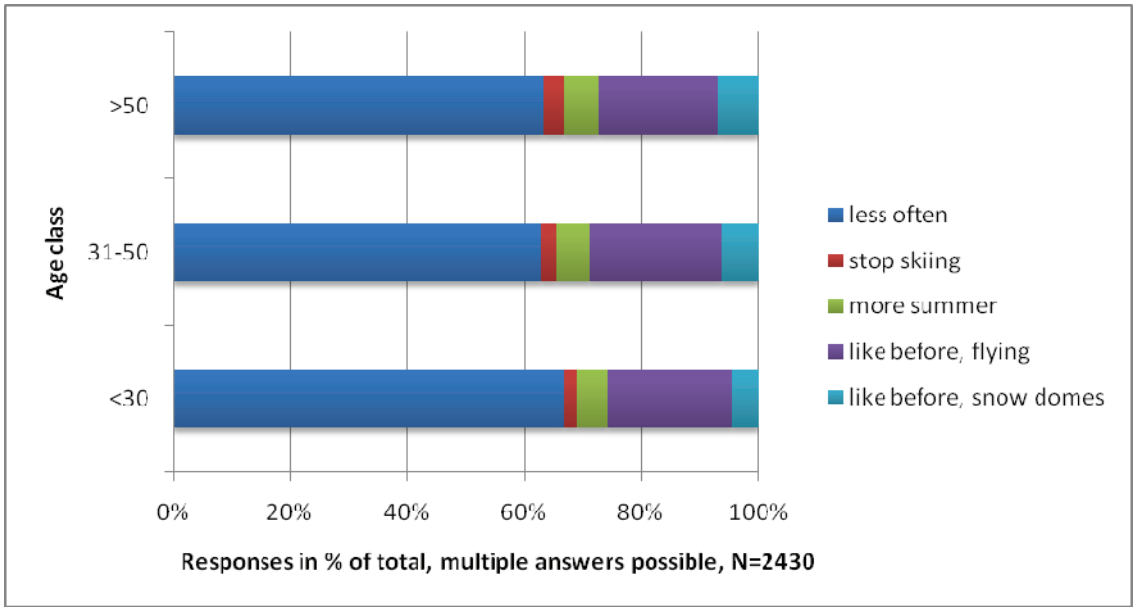

Figure 48 Reactions in skiing frequency split by age

5.1.4.27. Skiers selecting destination on environmental criteria

What percentage of skiers and boarders base their destination choice also on environmental criteria (e.g. distance to travel, environmental certification, green energy for lifts etc.)? (n=2430)

People were asked to guess what percentage of skiers and boarders selected their ski destination for their last vacation taking environmental criteria (like travel distance, resort management etc.) into account. The mean of skiers expected to decide according to such criteria was 16.1%. Thus, these criteria are not important enough to base a decision on for 83.9% (see figure 49).

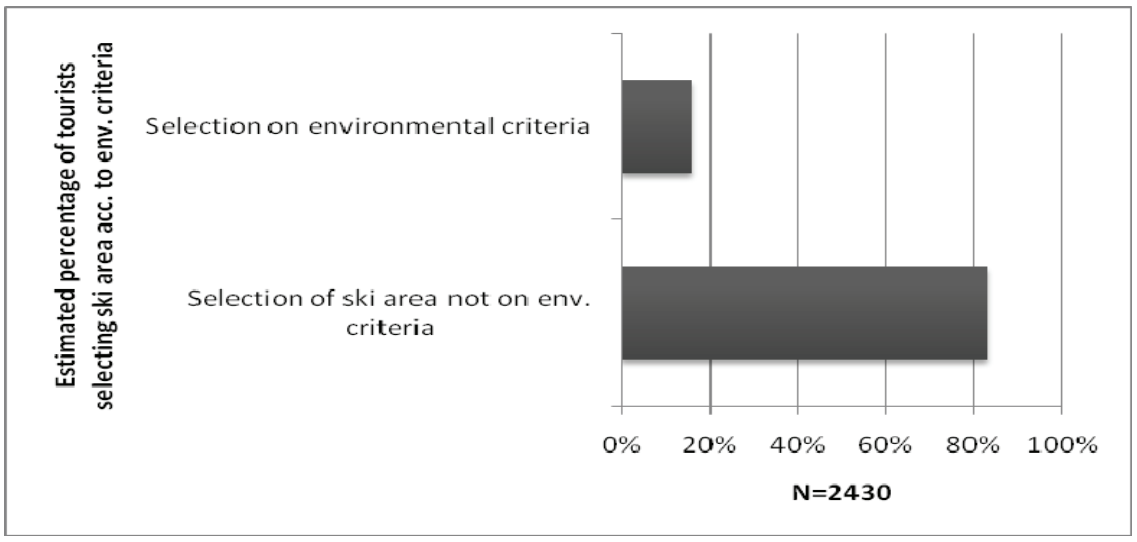

Figure 49 Selection on environmental criteria

5.1.4.28. Summary of results

Living close and being skilled

The majority (60.8%) of skiers live less than two hours from the next ski hill and count as potential day tourists, but can also become overnight guests, of course. 59% of skiers are very skilled, searching for challenging terrain and off-piste possibilities. Not surprisingly, people who are very skilled ski the most.

Travel for better snow and better skiing

30% of skiers have travelled or will travel to ski abroad in another continent, especially those who only ski one to two weeks per season. The main reasons why they travel abroad are the amount of snow, the snow quality, learning about a new culture, less crowds, no lift lines and cheaper prices. Those who mainly do one ski vacation per year of one to two weeks are most likely to take that vacation abroad wherever conditions are best.

Little potential in summer

87% of skiers visit the mountains in summer already. Only 6% from the remaining 13% would visit the mountains in summer additionally if they could ski less. The potential of attracting more skiers in summer is low. The main activities of summer visitors are hiking, enjoying the landscape, mountain biking, sunbathing and dining/going out. The youngest age class below 20 years looks for other activities which should be subject to further research. With the classic activities the young generation (kids) cannot be attracted in summer. The oldest visit the mountains in summer the least. They like Nordic Walking much more than the youngest who prefer mountain bike, rock climbing and water sports.

Environmental awareness is dependent on media influence and on spending time in nature

The environmental awareness and knowledge differs between topics. The awareness of negative outcomes of glacier expansion is the lowest, but with the highest percentage not being sure about it. The awareness of negative outcomes of snow making is slightly higher, but there are also more who believe it is not harmful at all. Skiers who spend more time on the snow have a higher awareness to the potential negative outcomes of technical snow on the environment. The highest awareness can be found in the outcomes of climate change on skiing also with the lowest percentage of people who were not sure. Climate change has been in the media in that winter more than any other ski tourism related topic showing the influence of media on awareness issues.

Mobility and energy are sustainability indicators meeting expectations

The most stated indicators for an environmentally friendly ski resort are free shuttle busses, use of renewable energy, forest and wildlife sanctuaries, use of

bio fuel and oil and environmental communication, such as a facts report. These are followed by no expansion plans, less technical snow making and environmental training for the staff. Technical snow as such is accepted, it is the last in the list – but not the amount of it and not the way it is produced or managed. It seems that people prefer environmental performance that does not affect their skiing too much.

Technical snow

Snow remains the most important factor in skiing, but the quality of the snow is almost as important. Technical snow is accepted even from an environmental perspective by 90%, but only to a certain *necessary* degree. The amount and kind of technical snow making is an important indicator for customers from a satisfaction aspect. Technical snow that leads to icy slope conditions decreases the acceptance of technical snow.

Trust in what you know

The most trusted certifications for an environmentally friendly resort are that of the WWF, the DSV, Greenpeace and the ISO – mainly because of the probable, greater knowledge of these labels compared to the others offered, although those might more specifically address relevant skiing issues. About one-fourth does not know the offered labels or does not trust any of them.

The quality of skiing in a natural environment

The most important factors when skiing or boarding are the existence of snow, no lift lines, the quality of the groomed runs, the kind of snow, sunshine, scenery, good terrain, especially off-piste and carving runs. Off-piste terrain is more important than groomed carving runs. Again, the youngest group below 20 years is mostly looking for alternative services, and we presume these are especially fun park elements. Younger skiers are more interested in no lift lines, while the mid age class looks more into the amount of snow. The oldest clientele of 60 years plus is mostly looking for groomed runs, not surprisingly the terrain and the amount or kind of snow are less important. The age dependences show a potential for different target group adressment. The kind of snow, natural powder, is seen as very important through all age groups, but that there is snow at all is more important.

Service and information

Most demanded general services are the free shuttle bus, service and friendliness, free parking, but also transparent information about environmental action, for example, with the help of local guides. Not standing in lift lines is generally very important but mostly for the younger and mid ages. Older clients rather prefer perfectly groomed runs but have more time to stand in line and

most likely do not ski as much time or runs per day anyway, so time efficiency is not such an issue.

Soft alternatives

Hiking, wellness, sun bathing, educational courses and soft mountain sports are the preferred alternatives if there were no snow. A ski dome is not interesting as it is with technical on-mountain installations like mountain coasters.

The young seek for different contents

Those in the age of twenty years and below demand different services and activities than the upper age classes, mostly responding with *others* to questions addressing topics of services preferred. We can only hypothesize that fun parks with music for winter and summer sports, where kids and youth can meet with each other, range amongst the most demanded factors.

Staying without snow

95% of guests who booked a week vacation would stay if there was no snow and do something alternative. 84.3% of the families would visit and stay if there was only snow guarantee for their kids, but alternatives offered to them.

Environmental action is paid for

The vast majority of 81.8% believes that environmental action of resorts is important. The same percentage would be willing to pay between one and eight Euros more for this cause on the day ticket. The older the clientele, the more they are willing to pay (see also the results of the choice experiment).The expected percentage of skiers to select a ski area in favor of such criteria are stated at 16.1%. The mid ages show the highest demand for environmental information.

Moving the season later

If winters were more often mild and dry guaranteeing snow, especially natural snow more in the spring season, 28.3% of the overnight guests would be willing to change and delay their main vacation period from the early winter to March and April. This does not include the day guests who decide spontaneously.

Less skier demand with climate change

In such a winter scenario, more than two-thirds of skiers would potentially ski less often or even stop skiing. About one quarter would ski as often as before and then become more flexible and pay more. Because of their generally higher number, day guests or those living closer to the mountains will have the greatest decrease in total skier numbers. The younger ages are the group to more likely ski less often, the older ages to stop skiing at all. The mid age is the group most likely to ski abroad where there is more snow guarantee.

5.1.4.29. Key findings

We further extract the summarized results to some key findings:

- Customer demand is decreasing: if more winters are like 2006/07 then two thirds will ski less often or stop skiing.
- Those skiing the least in winter will likely book their only vacation abroad where snow conditions are best.
- Most important factors in a ski area are the existence of snow, no lift lines, the quality of snow, high quality ski runs and safety issues.
- Most important services are ease of access, friendliness and service and communication with the customer.
- There are limits of technical snow: technical snow making is accepted, also from an environmental perspective, but only as much as necessary and only if managed well, if it does not, for example, lead to icy runs. Technical snow in a ski area cannot help to create a winter mood in people's minds in the remote source markets.
- There are alternatives to an expected 100% snow guarantee: 95% of the overnight guests would spend up to about 70% of their time doing something else if offers met their demand. 84% of the families would come and stay up to 70% of their holiday time if their kids had guaranteed snow.
- A later season: 28% would be willing to move their main vacation to late spring if natural snow was more reliable at that time.
- Alternatives to no snow are accepted to a certain degree but not ski domes or technical installations on the mountain.
- Consumers prefer soft mountain sports, wellness, outdoor adventure and educational courses on related topics.
- The youngest age class below twenty years demands very different services than the upper ages, and we hypothesize that these are for example fun parks for winter and summer activities.
- 87% of skiers already visit the mountains in summer. Only a few more skiers would visit the mountains in summer if they skied less in winter (about 6%).
- To finance sustainability, 80% would pay more on the day ticket for more socio-ecologic quality in the ski area – between one and eight Euros.
- Sustainability criteria that meet the demand are public transport, green energy, forest and wildlife protection, information and education about the environment and the ski area management.
- Trustworthiness of certifications is important – clients trust in known certificates or in popular brands – but they know little about it.

5.1.5. Discussion of standard questionnaire results

5.1.5.1. Sample quality and representativeness

Up to date there is only modest data on customer demand in ski tourism in the Alps available, as there is even less data on the mean of skiers and their total number. Estimations of the German Ski Federation (DSV) indicate a number of about four million active skiers in Germany (DSV, 2006). Data from the Allensbach Institute indicate a total of 8.71 million people in Germany (from a sample of n=2831) who skied in their life or who are active skiers (Allensbach, 2007). Representation from a sample size point of view is dependent on the sheer size of the sample, not on the size relative to the population. We calculated a minimal sample size of n=1842 to represent the 8.71 million skiers in Germany (Cochran, 1977). With n=2430 we overreached this size and minimized the acceptable margin of error for mean to 0.026.

Comparisons with other samples can indicate the quality of this random sample. Recent studies from Viennese skiers with 540 participants show a gender distribution of 53% male and 47% female with 74% in an age between 25 and 50 years (Unbehaun et al., 2007). In Unbehaun 75% were Alpine skiers, 8% Snowboarders. In a sample with 1825 participants in Austria (Jais, 2001) the average age was 37 years with 38% females and 62% males. Bürki (2000) shows the mean age of skiers in a Swiss region in the age class 31-50 years, with 59% males and 41% females.

The Allensbach survey for Germany shows 59% male and 41% female skiers and boarders. The mean in age is in the end of age class 30-39 years (Allensbach, 2007). Taking the sheer sample size of *Save-Snow* and the comparisons of the age and gender distribution with other studies, one can say that this provides for a representative sample for the total mean of skiers from Germany (Bortz & Döring, 2006).

The four selected main ski areas for interviews in this customer survey reflect an average of ski areas. Oberstdorf counts as a rather small and low area, Stuben as a small but high area, Mayrhofen as a midsize and mid-elevation area, St. Anton as a high and big one and finally Les Arcs as a high and big one with glacier access.

Online surveys have been criticized that they would not reach a representative sample of people because of different online user behavior as a disadvantage of web based surveys. The equipment with computer hardware and internet access in private and public places is rapidly increasing (Wright, 2005). In Germany 62.7% of the population in the year 2006 were using the internet (ARD & ZDF, 2007) even up to the ages of 60 years plus. Our interviews showed that even the very few elderly people we interviewed who had no

personal computer were able to access the internet through a relative or friend. Therefore we cannot speak of limited access to the internet that could have had a negative impact on this online survey.

Taking these figures and comparisons into account, this customer sample of *SkiSustain* does represent the general mean of German ski customers in ski resorts in the Alps in the winter 2006/2007 (von der Lippe & Kladroba, 2002). Even more, taking the responses from the supply side survey into account, the German customer is very similar to the Germanic speaking customer in general, including the German-Swiss and the Austrian clientele (Vielhaber et al., 2005). Differences are expected with the Italian and French customer because of the stronger differences in the cultures. The percentage of non-Germanic speaking respondents with less than fifteen percent is low. We thus conclude that the results of *Save-Snow* represent the Germanic speaking customer from Germany, Austria and the Germanic part of Switzerland.

5.1.5.2. Communication and media

The results show that there is high customer demand for communication and for information between the ski destination and the customer. There is a lack of environmental awareness and knowledge on the potential negative effects of ski area management on the environment. Information about the environmental performance is demanded, guided trips and tours on such topics, as well as educational courses, which are accepted as alternatives if there is no snow, are sought for. The role of the media on the awareness and on the opinion building process of tourists seems to be high. We showed that the knowledge on climate change and skiing is highest due to the general media coverage.

Bürki (2000) and König (1998) even discovered this relation already eight to ten years ago. In Michel (2001) information and communication for and with the customer were among the ten most important aspects in skiing expectations by customers. The impacts of media coverage on certain topics of risks affect the public as discussed earlier in examples like the *Waldsterben*. The winter when we performed this customer study was a winter with media hype on climate change and ski tourism, which increased public awareness in climate change topics as our results have shown in comparison to topics, such as snow making, that were not so much in the media then. In coming seasons the kind of media coverage and the public discussion will affect the awareness and the demand of skiers.

Information involves the marking and signalizing of the ski area and the runs too. Safety issues are very important for the guest.

5.1.5.3. Service and the partnering customer

Services such as free shuttle busses, free parking and friendliness indicate the importance of partnering between the supply and demand sides and understanding the customer as a partner in generating tourism services. The customer wants to get involved and expects service. Michel (2001) proves the high expectations of customers for service quality, especially in terms of transparent management and of professionalism of the personnel.

5.1.5.4. Mobility and access

Transportation, access and mobility are important figures in customer demand. We showed the demand for it in services, important general factors and as environmental indicators. Bürki (2000) found out too that access is among the most important factors in skiers demand. In Michel (2001) we also find the importance of easy access to the ski area and inside the destination. The access is more important for day skiers than for overnight skiers.

5.1.5.5. The quality of skiing and the limits of technical snow

The amount of snow, that there is snow at all, is most important. Following the amount of snow, the quality of skiing is most important, indicated by the wish for no lift lines and for a high quality of natural soft powder snow. The quality of the runs and the kind of snow are in a strong third and fourth position in customer demand, which indicates that technical snow that is not managed well and that results in icy conditions may not meet customer demand well.

Technical snow making that guarantees skiing but leaves a poor quality of the snow and the ski runs may not be enough for future demand; therefore, the focus should be not only on guaranteeing the skiing, but guaranteeing skiing with a maximum in quality. In addition, skiers feel the differences of technical snow on their skis and boards. After a day of skiing on technical snow the ski or board base can be dried out needing a new wax service, which usually is not the case with natural snow (citing from the author's own experiences as a ski instructor and ski guide). The existing and potential further disadvantages of technical snow have to be taken into account, not just the sheer appearance.

If, for example, ski runs were technically snowed in but stood out of a green and brown landscape because of no natural snow, then one would wonder about the influence on skiers demand and on their acceptance. To the author's knowledge there is no such study dealing with this issue of customer acceptance and technical snow bands in a green and brown surrounding that lacks winter atmosphere.

In general, one can say that the less crowded a ski area is, and the more natural snow it offers, the more demand it meets. Good off-piste terrain is more important than groomed carving runs which changes with the target groups – for elderly the groomed runs are more important than for the younger and mid age.

5.1.5.6. Technical snow acceptance

We showed that technical snow is accepted even from an environmental point of view by 90% of the customers. In Bürki (2000) the ratio was about 40% to 50% acceptance, a time when natural snow reliability was more common than today. König (1998) came to a similar result as we did with about 90% acceptance in Australia ten years ago – at that time the problem of missing natural snow in this warm country already led to more acceptances. Michel (2001) showed that snow guarantee of a ski area is less important than the environmental quality – but this is a result from the year 2000 when the discussion of climate change in a recent matter did not yet exist or recently commenced. The topic of snow guarantee is a more important one today because it is not naturally achieved anymore. The changing climate in the Alps seems to lead to a higher acceptance of technical snow, a pragmatic development in customer demand.

5.1.5.7. Snow and acceptance of alternatives

Snow remains the most important factor when visiting a ski destination in winter. Snow has to be there and is expected in a sufficient amount. Unbehaun (Unbehaun et al., 2007) found the same correlation. Bürki (2000) showed that snow guarantee is only second after the travel distance, and that it even gets less important the lower a ski area is – and other factors like the price becoming more important instead. Those guests who booked a whole week of vacation are most likely to stay and proceed with alternative activities such as hiking, wellness, sun bathing, educational courses and soft mountain sports if there were a lack of snow.

The accepted time to stay even without snow is up to four days out of six. Still, the willingness to stay in place once the tourist is there may not be equal to the willingness to travel there if from the beginning on, it is clear that there is no snow. If the alternative activities fit customers' needs, the willingness to get there even with poor snow conditions might be higher though. Guests have a contract with the rental agency and would have to pay for that period even if they left earlier because of a lack of snow. But it still indicates the general acceptance of doing alternative activities in the ski destination if they could not ski. It reflects the flexibility and also growing spontaneity of day guests.

In Harrer (1996) we find that overnight guests are much more flexible in terms of doing alternative activities in a destination if there were no snow. They would much rather travel to and stay at their favorite destination if there were a lack of snow. Their motivations are alternative activities. Day guests instead act differently. Bürki (2000) found similar demand of overnight guests and their higher acceptances of alternative activities.

Bürki showed that snow guarantee is among the most demanded factors, but it differs between the natural snow reliability of resorts. The higher the area is the more important is the expected snow guarantee. In lower resorts other factors like offers for children and families as well as prices are becoming more important. In the highest and most snow reliable places the price is much less important than in the lower resorts. People who want to ski are willing to pay more for that. Tourists visiting lower ski areas rather look for alternative services and simultaneously for cheaper offers. Bürki states that customers of lower and less snow reliable resorts would stick to this kind of resort if there is a lack of snow.

Those skiing more often and being better skilled will prefer the higher ski areas with a high reputation. In terms of alternative activities to skiing, rather soft and environmentally friendly services are demanded, technical installations like mountain coasters, vast expansions on glaciers or artificial snow worlds like ski domes do not meet skiers' demand. Soft mountain sports, such as hiking, mountain biking or high ropes courses, wellness and scenery meet the demand much more.

5.1.5.8. Demographics

Skiers' numbers are decreasing because of less snowy and cold winters which results in a change in skiing behavior – snow is not in people's minds anymore when there is no snow where they live, in the towns, the flat lands and in the nearby mid mountain ranges. Especially the numbers of those living close to the mountains and counting as spontaneous day guests will decrease the most. Bürki (2000) already showed that those living closer to the mountains and counting more as potential day guests will rather ski less often than others. Also those skiing less often per year are more likely to stop skiing at all.

Younger skiers tend to ski less often, older skiers tend to stop skiing, the mid age class is most likely to remain skiing by putting more time and money resources into travelling where conditions are best. Demographic changes will lead to even fewer kids in the future, thus increasing the lack of new young customers. In Bürki (2000) 4% stated they would stop skiing if winters became milder, and one-third would ski less often. The numbers from this study in the year 2006/07 indicate about 6% who would stop and two-thirds who would ski less often. König (1998) found out that in Australia, 44% of the responding skiers would stop skiing, 31% would ski less often if the winters became more snowless more frequently. These results underline the effects of snowless winters on decreasing customer demand.

Instead, new markets of skiers increasingly open up. The Eastern European countries are a new main market for the Alpine ski resorts, but there is little demographic data available yet. Already one can find time periods in some

Austrian resorts, like Mayrhofen or Stubaital, where the majority of skiers are from Eastern Europe. The decreasing demand from traditional markets might be outweighed by increasing demand from emerging markets, although there is more information needed here.

5.1.5.9. The demand for sustainability

Environmental criteria are important decision making factors for the choice of a ski resort. Although there are approximately 16.1% expected to select ski resorts according to environmental criteria, choice behavior of this study reveals up to 25.77% of skiers who base their choice on environmental criteria and agree to a positive recommendation of a NGO for a specific ski area. The willingness-to-pay (WTP) is even increased by a maximum factor of thirty one in some attributes (chapter 5.2).

Adversely, a decrease in customer demand will result from unsustainable management that is communicated, for example, by a customer rating. We find a maximum of 28.53% agreeing to such negative consumer information (see chapter 5.2). 80% are willing to pay more for an augmentation in environmental performance. Müller already found out in the year 2000 that 74% of Swiss tourists were willing to pay more for environmental performance (Müller et al., 2001). Recent studies estimate the market of the so called *LOHAS* (Lifestyle of Health and Sustainability) in Germany to be about five million households – a market share of 10 to 30 percent – with higher incomes and an estimated buying power with a minimum of 200 billion Euros with a strong growing tendency (Schulz, 2008). The customer potentially attracted by “green” ski areas does have a high financial income and could thus be a real opportunity of creating a green business.

5.1.5.10. Trust in certifications

In order to take advantage of such criteria, a well-known label needs to be in place to indicate and communicate the efforts. No labels exist that are made for that purpose and still are popular and familiar. There is a high potential and need to develop such labels (Luthe, 2007a). An exception is the ISO label that is well-known, accepted and applicable for the ski resort industry. Customers expect ski areas to invest in a sound and improved environmental quality. They are willing to pay for such improvements to a high degree.

5.1.5.11. Sustainability indicators and knowledge

Sustainability indicators that meet customer demand are: transportation, energy use, forest and wildlife management, machine operation, transparent information about destination activities, no expansion plans, less technical snow production and training for the staff.

Smaller and lower ski areas or such that do not have the capacity to invest in snow making have opportunities to reach specific target groups with alternative services or specific guest services in general, and can thus outweigh certain disadvantages from not offering a 100% snow guarantee. Families are a potential target group as long as children find a snow-covered, fun park and a beginner area. Bürki (2000) also found out that the smaller, lower and less snow reliable resorts can outweigh skier losses by more specific target group offers, services and better price value.

5.1.5.12. Moving the season

About a fourth of the overnight guests stated that they would be willing to move their main vacation from Christmas and the early winter more toward springtime. A move of the main vacation season toward the more naturally snow guaranteed springtime can be a chance for ski areas because it decreases the dependency on the Christmas period that is around 20-25% of the winter season for ski areas.

The risk of losing the Christmas period is highest because freezing temperatures are becoming much less reliable, especially in the early winter. The day guest of course is not included in this calculation; he decides spontaneously. So it seems that ski areas cannot escape the importance of the Christmas period, but they could decrease the dependency and aim to target more guests in the springtime. The potential of 28% of the overnight guests still is an undeveloped category to be worked with.

5.1.6. Conclusions

After summarizing our results and discussing them with other relevant customer surveys we come to the following conclusions:

- Ski areas do have a number of strategic opportunities to address specific customers and target groups with alternative services and products, thus opening up new chances despite of global change impacts. Instead of more technical adaptation, the focus should be shifted more toward behavioral adaptation and mitigation, a general path to follow.
- Developing and marketing mitigation as *green* efforts is such a prospect the customer would pay for. Especially those environmental criteria not affecting the actual skiing are most accepted, such as mobility, energy and conservation. Technical snow is accepted, but people react sensible towards the snow management on the mountain. This market is limited in numbers though.
- In order to meet customer expectations about environmental performance and service expectations, the communication of the ski

areas need improvement. The customer's willing to pay for these services can finance such efforts.

- A better general service orientation and understanding the customer as a partner who demands and deserves more transparency and information should be seen as an opportunity.
- Safety on the slopes and in the lifts is an important demand of quality. This includes all kinds of relevant safety information, such as signalizations, maps, etc.
- The role of media is important. More active public relations and marketing will bring the ski tourism into a controlling and steering position rather than a reacting one.
- A more specific service orientation to the different age classes does make sense as the demand differs from youngest to oldest ski clientele and as the demand for quality is rising.
- More flexibility in offers and better price value can help smaller, lower and less snow reliable resorts outweigh skier losses. From the overnight guests about a fourth is flexible in vacation time and about three-quarters accept an alternative activity for up to 80% of the time spent in a destination.
- More specific data on customer demand, especially on the younger age classes who seem to demand completely different services, needs to be generated. Only then the youngest can be won as future skiers and ski destination customers.
- Although snow guarantee remains the most important factor in customer demand, other factors have the potential to outweigh less snow guarantee for specific target groups. Families, older people and the youngest are such specific target groups. Especially in the lower resorts, the customer accepts less snow guarantee and alternative services but expects a better price value than in higher, more snow reliable ski areas. The day skier comes for the snow, not to forget.
- Those who ski most often and are most skilled in young to mid age classes are the customers who remain skiing even in a warmer climate and who pay more and travel further to ski. These demanding skiers will be a major clientele in the future with decreasing total skier numbers.
- Skier numbers will drop significantly with climate change. Decreasing skiers numbers from a behavioral or psychological perspective, especially in younger and older age classes, will even more so decrease by demographic and socio-economic changes, by an aging population and by rising inflation and prices, resulting in more richer and poorer people.
- The demand for high class and quality skiing will increase as the demand for cheap prices and affordable skiing will increase relative to today too, basically splitting demand in two directions. Total

demand, of course, will decrease from the traditional markets, not taking emerging markets e.g., from Eastern Europe, into account.

- The customer is willing to adapt his demand to changing services if he gets more involved, both in the reasons why things have to change and in more service orientation. The overnight guest is most willing to adapt his booking behavior, accept less snow guarantee and buy alternative environmentally soft activities – all to a certain degree and percentage. The majority of guests still demands classic skiing and snow guarantee, especially the day guest.
- The demand of new customers coming from the new Eastern European and Asian markets will add another component to the current developments. Here we need further research as well as on specific target groups, such as youngsters, families, singles and the elderly.

Global change will have severe impacts on the winter tourism market. Skier numbers will decrease significantly. The customer is demanding more specific and higher quality services. The demand for quality, safety, service and responsible, sustainable management of the mountain resources is already of high importance with a growing tendency. Ski destinations can find chances in this development. Transparent environmental management, thorough market research, specific target group addressment, more service and quality paired with communication, media work and marketing are strategies that can be as important as technical snow making is.

5.1.7. Outlook

There are further questions that arise from the results and conclusions of this study. We discussed the limitations of technical adaptation and snow making because the customer in the source markets does not get the feeling of winter and snow if winters become increasingly warm and natural snow in the low lands a rarity. Ski areas adapt and already are or soon will be able to operate a ski area without natural snow. Technology will further improve, so direct climate change impacts will be manageable inside the destination, but what about coping with the indirect effects? The potential effects on customer demand had been examined in the analogue winter 2006/07 when not many knew about the good conditions in the higher ski areas due to technical snow making. How will the customer react if a ski area operates solemnly on technical snow, showing white bands in a brown landscape without a natural snow or winter atmosphere?

The results show the limits of technical adaptation to cope with the indirect effects of climate change and underline that we need to widen our view on vulnerability of ski tourism. There is even greater need for information for the customer, and market potential for alternative activities needs further research.

The existing and growing niche market of sustainability and low impact skiing needs more studies from an economical perspective to quantify opportunities. A closer view on other markets, especially the Southern European and the Eastern European customers, would be of high interest. Certain target groups, such as children and the youth, should be surveyed in more detail too.

In the next chapter we address customer demand more from an economical perspective and test the willingness-to-pay for different attributes of future ski area services.

5.2.Willingness-to-pay for sustainable ski tourism – a choice experiment

5.2.1. Summary

Winter tourism is prone to various aspects of global change. Ski areas may suffer or benefit on different time scales. Vulnerability cannot be defined any more just by the elevation, the percentage of technical snow making and the sheer size of the area. Ski areas as the main economic drivers in ski destinations need to develop new capacities of adaptation and mitigation. In *SkiSustain* the human-environment system of the ski area infrastructure, the natural environment and the customer or market situation are looked at from a holistic perspective and their various interactions within the system.

In the demand side of *SkiSustain*, we focus on the customer preferences and the market situation. The Conjoint Analysis of this chapter develops economic data on the preferences and willingness-to-pay for ski area services that are more environmentally friendly than others. Green marketing effects are tested and thus the potential for adaptation in a behavioral and a mitigative way are assessed. It shows that there is a trend in demand for green ski tourism and a marketing potential for sustainable consumption in ski tourism varying strongly between consumer groups. This creates new possibilities of mitigation and adaptation in a sustainable matter.

5.2.2. Research questions and goals

The intension of this study is to learn about current consumer preferences for ski area services and about future preferences taking global change into account. The main focus is on the skier demand for sustainable consumption as a marketing and management opportunity for ski areas prone to global change. We wonder if mitigation can become a business case leading to less technical or resource intensive and thus more sustainable adaptation. We therefore seek to assess the monetary value of ski area services and to answer the following research questions, being the second part of the overall demand side questions (chapter three):

- What is the willingness-to-pay (WTP) for specific ski area attributes related to sustainable tourism?
- How is WTP affected by additional consumer information and by green marketing?
- How are different socio-economic groups reacting in their demand to information treatments and green marketing?
- What is the customer demand for sustainable ski tourism?

5.2.3. Method

This study uses a discrete choice experiment (DCE) to examine ski tourist preferences for ski area services in ski destinations of the European Alps. We chose the DCE method because of the weaknesses of conventional methods applied for estimating monetary values of goods, such as the contingent valuation methods. Contingent valuation (CV) methods, a direct survey approach to estimating consumer preferences (Mitchell & Carson, 1989), gained increased acceptance among both academics and policy makers as a versatile and powerful methodology for estimating the monetary value of environmental changes (Hanley et al., 2001).

A hypothetical market is described by an appropriately designed questionnaire where the market defines the goods itself. Respondents are then asked to express their maximum willingness-to-pay (WTP) for the hypothetical change in the level of the product. The contingent valuation method is referred to as a "stated preference" method because it asks people to directly state their values, rather than observing values from actual choices, as the "revealed preference" methods do. The fact that CV is based on what people say they would do, as opposed to what people are observed doing, is the weakness of this method. Alternative stated preference formats, such as the choice modeling, were developed to overcome the disadvantages of the CV.

In choice modeling, goods are described by their attributes and levels. By including a price attribute, willingness-to-pay can be indirectly recovered from people's rankings or choices (Hanley et al., 2001). Choice experiments are an example of general choice modeling and possess some advantages relative to CV, one example being that choice modeling generally avoids an explicit elicitation of consumers' WTP, instead relying on choices made among a series of alternatives (Hanley et al., 2001). The choice experiment in this study is combined with a standard questionnaire as described in chapter 5.1.

5.2.3.1. The discrete choice experiment

The demand of customers is modelled using a discrete choice experiment (DCE) from the group of Conjoint Analyses (Louviere et al., 2000). The DCE is part of the family of stated preference methods, in which respondents evaluate a product by its various attributes in a holistic understanding, rather than by singular variables. These methods are referred to as attribute-based methods. In DCE, respondents chose their preferred profile alternative from a set of offered products (choice sets). Chapter 3.8 further outlines the *Conjoint* idea developed for market research and provides definitions of choice experiments.

The data generated by the DCE is analysed within the framework of random utility theory (Greene, 1997). The analysis then produces part worth utilities for

each attribute level, enabling conclusions about the importance of attributes, as well as the preferences for overall scenarios. Random utility models assume that the decision maker has a perfect discrimination capability. A situation of incomplete information and therefore uncertainty in the decision making process must therefore be taken into account. Four kinds of uncertainty are described by Manski (Manski, 1997): instrumental errors, measurement errors and proxy, unobserved individual attributes and unobserved alternative attributes. The utility that individual *i* associates with an alternative *a* is modelled as a random variable and given by:

$U^i_a = V^i_a + \varepsilon^i_{a,}$

where V^i_a is the deterministic part of the utility, and ε^i_a is the stochastic part, capturing the uncertainty. The theory assumes that the respondents chose the alternative with the highest utility. Therefore, the probability that alternative *a* is chosen by individual *i* within the set of choices *C* is:

$P_{ai}(a) = P[U^i_a = \max U^i_b]$ with *b* as an element of *C* (McFadden, 1974).

Random utility models replicate the factors that influence the choice of individuals. The selection of one alternative over another implies that the utility of the chosen alternative is higher than the other. Each alternative has an overall utility, which is represented by a utility function containing a deterministic and a stochastic component:

$U_{ni} = V(Z_i * W_{ni} * Y) + \varepsilon_{ni}$ (McFadden, 1974).

This implies that the overall utility gained by the *i*-th individual is expressed by the sum of the determinant component *V* and the random number *ε*. *V* represents the utility expectation of an individual *i* influenced by the determining attributes. The factor *ε* represents the uncertain components of the individual decisions, as well as the differences between the individual behaviour and the behavior of the representative individual. *V* is a vector that integrates the levels of all determining attributes of an alternative and the exogenous variable *z*, the endogen attributes of alternatives *W* and the unknown vector of parameters *Y*. Because of the stochastic component, the function describes the probability of choosing a single alternative. The regression estimates for each attribute level the part worth utility and therefore their relevance for the decision. The individual chooses that alternative for which the expected utility is the highest of all other alternatives:

Prob {i-chosen} = prob$\{V_j + \varepsilon_j > V_j + \varepsilon j\}$ with V_j being element of C (McFadden, 1974).

Stages of a choice experiment

A choice experiment is characterized by some general stages. A selection of attributes is followed by the assignment of levels. The choice of the experimental design delivers profile combinations of attributes and levels. These profiles are constructed to choice sets to be presented to respondents. The measurement of preferences by choices follows the estimation procedure of WTP (Hanley et al., 2001).

5.2.3.2. Experimental Design

In attribute-based stated preference questions, a good or product, which in our case is a ski area alternative, is decomposed into *A* singularly and precisely specified attributes with each *L* levels and *M* total generic choice outcomes. The combination of the attributes where each is described by two or more levels leads to ski area profiles. Ski area profiles are then combined to sets of two or more ski area options to choose from. In *SkiSustain* we combined two ski area profiles in one choice set, together with a *none of both* option of choosing none of the two ski areas if consumers preferred neither one. A respondent thus had three options to choose from – *ski area A*, *ski area B* or *none of both*.

Development of attributes and levels

The attributes describe the services the ski area has to offer, and levels further distinguish and describe the attributes. The combination of attributes and levels leads to the ski area profiles. The ski area alternatives were characterized by n=8 ski area attributes and a price in terms of the costs of a day ski pass. The ski ticket price was described by four levels or price variations that reflect actual ticket prices in Alpine ski areas today (34€ and 42€), as well as forecasted price increments (see chapter four) to 50€ and 58€.

The eight attributes were snow guarantee, distance to travel to the ski area, alternative offers if there were no snow, expansion plans, environmental management, flexibility in the validity of the ski pass, the percentage of grooming of the slopes and the size of the ski area (table 14). These attributes were chosen according to their importance in describing future ski area scenarios. The scenarios were based on the expert discussions described in chapter three and the experiences and forecasted developments from the supply side research in chapter four.

Snow guarantee and the size are seen as the major factors describing customer satisfaction of ski area performance (see chapter 5.1). The distance to travel is a cost and time factor, two scarce resources. Access proved to be a major factor of vulnerability after the experiences of the winter 06/07 (see chapter four). Alternative offers are important strategies of behavioral adaptation, and expansion of technical adaptation ski areas will increasingly incorporate in the

future. Environmental management, described by the use of energy from renewable resources, is a mitigative component, as well as less grooming. The flexibility of ski passes reflects social engagement for the customers to decide more spontaneously about daily activities. The attributes and their describing levels are presented in table 14.

Table 14 Attribute definitions and levels

Attribute name	Attribute definition	Levels[a]	Levels coded[a]	Variable name[b]
Distance[b]	Time to travel from home to next ski area (hours)	<2, 2-4, 4-8, >8	2, 4,8,10	Hours
Area	Kind of ski area: small and traditional with 20km pistes, big and well known with 100km pistes	20, **100**	27, **28**	Small
Env	Action for the environment: 100% of green energy for the resort (lifts etc.) or 0%	100, **0**	21, **22**	Grpow
Alternat	Alternative offers if no snow: 1. Snow independent downhill activities (up with lift, down e.g. with a scooter; 2. A technical mountain coaster on top of a mountain; 3. A ski dome nearby; 4. Soft sports, e.g. cross country biking trails, high ropes course etc.	downhill, mountain coaster, ski dome, **soft sports**	17,18,19,**20**	Alt1-4
Expan	Expansion of ski area planned/just done: 1. None; 2. Expansion in higher elevations with more lifts and pistes; 3. Expansion on glaciers; 4. Combination of two small areas to being more efficient	none, expan. in higher elevations, expan. of glaciers, **combination of two small areas**	13, 14,15,**16**	Expan1-4
Snow	Snow guarantee in % of a holiday week (days/ six days, 6/6=100%)	100, 80, 65, 50	6, 5,4,3	Snowd
Flex	Flexibility in validity of ski passes: valid only on day purchased or fully transferrable within one year	transferrable, **only on day purchased**	25, **26**	Flexp
Groom	Grooming of runs in % of total (100% of all runs groomed, 50% groomed)	100, **50**	23, **24**	Grooma
Costs	Costs of a day pass in €	34, 42, 50, 58	34,42,50,58	Price

[a] Reference levels for Regression analysis are printed bold (variables of type nominal).
[b] Distance levels are hours to drive to the next ski area. Units are each two hours more or less travel distance.

The fractional factorial design

The combinations of the ski area attributes to profiles were developed following a rigorous statistical design plan (Montgomery, 2001, Sloane & Hardin, 2003). Complete or full factorial designs allow the estimation of the full effects of the attributes by choices made, the main effects and the interactions that include the effects in the combination of different attributes. These designs often generate an impractically large number of combinations. Fractional factorial designs are able to reduce the number of alternatives presented with some loss in estimation power (Hanley et al., 2001, Louviere et al., 2000). These designs are available through specific software.

The program *Gosset* was used to generate the fractional factorial design of the choice experiment (Sloane & Hardin, 2003). The four attributes with two levels and the five attributes with four levels were chosen for the nine individual attributes as described before, depending on whether both linear and quadratic effects were of interest or only linear ones (table 14). We applied an *i*-optimal design minimizing the average prediction variance. The target of ski area alternatives was 64, which is sufficient to estimate all main effects and one-way interactions while still keeping extra design points to reduce the average prediction variance (Louviere et al., 2000, Montgomery, 2001).

Choice set combination

The choice sets consisted of two ski area alternatives plus a *none of both* option. The total sixty-four choice alternatives can be combined to sets randomly or systematically (Louviere et al., 2000). Street et al. propose different design strategies to couple options to sets in a systematic way (Street et al., 2005). We combined the alternatives to sets of two in a systematic way by coupling the first with the second alternative, the second with the third and further, with every eighth coupled again with the first option in order to form eight blocks with each eight choice sets (see table 19). In order to maintain a manageable choice task for the respondent – in terms of the number of choices to do – the sixty-four choice sets were allocated to these eight blocks with each eight choice sets leading to eight different questionnaires.

The resulting sixty-four choice sets in eight blocks were then checked for combinations where one of the two options in a set was dominant, making a comparison of the two options unrealistic – referred to as nested attributes (Louviere et al., 2000). An option is understood as being dominant if, for example, the attributes of 100% snow guarantee and shortest distance to travel are compared with only 50% snow guarantee and the longest distance to travel, assuming that these two factors are among the most important factors when selecting a ski area (see for example Bürki, 2000, Siomkos et al., 2006, Unbehaun et al., 2007). Such an option would not count as dominant, if the other option of the set had a much better environmental performance. Nesting also exists if levels of attributes cannot logically occur together. Checking for such attribute combinations, we identified one dominant choice set, number 45. We then switched option number 45 with number 44 because option 45 was dominant compared with option 46 (cheaper ticket, shorter access, more snow guarantee, same environmental performance). No other nested combinations were found.

The information treatments

According to the aims of this study the experimental design was extended to include a treatment factor that provides some participants with additional information on the ski areas to choose from as another orthogonal factor. The information treatments serve to test the effects of additional information on customer choices. These variations in information provision are applied to explore and to demonstrate opportunities for marketing certain services and products from ski areas.

We chose three different information treatments (table 15):

1. factual information and recommendations from a well-known environmental foundation/NGO (Non Governmental Organisation),
2. factual information and recommendations by other customers who already visited the ski areas,
3. no factual information (=no recommendation) serving as a reference.

Three kinds of treatments were applied – a recommendation of one or both of the two ski area options, disapproval of one or both of the two options and neutral information (see table 15) depending on the attribute combinations. Disapproval of both alternatives was applied to test the willingness to deny going skiing at all and choose the *none* alternative. A third kind with neutral information was applied in the case that neither recommendable nor excluding levels were compared. The respondent noticed that there still is information from that NGO or other consumers, but because of a lack of knowledge of the ski areas available, there was no recommendation or disapproval.

The NGO treatment of an environmental foundation was chosen to test the effects of a potential official certification or logo provided by a trusted third party organization not affiliated with the ski area. This kind of information could serve as a marketing tool for sustainable ski areas. The consumer rating is meant to reflect the growing practice of customer product ratings on the internet where the average of all ratings reflects the reality best. A consumer rating could be a tool to control the performance of ski areas without the need of a third party certificate.

Treatment allocation in the design plan

In the design plan one-third of the potential respondents were supplied with the NGO info, one-third with consumer info, and one third served as the reference or control group. In the design plan, we provided the first eight respondents with the eight different choice set blocks and the NGO information, then the second eight respondents with the eight blocks and the consumer information, then the third eight respondents with the eight blocks and no information as the control group.

After these twenty-four (three times eight) respondents, the design plan started again with the NGO info group. The design of the experimental extension of the basic choice experiment with treatment allocations is presented in table 16.

Table 15 Information treatments one (NGO) and two (consumer)

Treatment 1 (environmental information by NGO)

Disapproval: "A well known environmental foundation recommends choosing neither one of the ski areas A or B. Visiting any of the two ski areas can harm the environment significantly taking into account the sum of all features. Basic requirements of sustainable development are not met within these two ski areas."

Recommendation: "A well-known environmental foundation recommends choosing ski area A (B). Visiting ski area A (B) has the least harmful effects on the environment. In a direct comparison ski area A (B) is more sustainable."

Neutral (neither a recommendation nor disapproval): "A well-known environmental foundation does not recommend or deny a ski area because there is not sufficient information provided to base a decision on."

Treatment 2 (consumer information/rating)

Neutral (neither a recommendation nor disapproval): "There is neither a recommendation nor a denial available provided by guests who visited the ski areas before because there has been no information provided."

Recommendation: "8 out of 10 guests recommend choosing ski area A (B). Visiting ski area A (B) has the least harmful effects on the environment and the best service. In a direct comparison ski area A (B) is more sustainable."

Disapproval: "8 out of 10 guests recommend choosing neither one of the ski areas A or B. Visiting any of the two ski areas can harm the environment significantly taking into account the sum of all features. Basic requirements of sustainable development and service are not met within these two ski areas."

Information treatment allocation to ski area options

The selection of the ski area options that had positive, negative or neutral information was done according to general principles of ski tourism impacts on the environment. In order to determine the levels of attributes which lead to disapprovals of a ski area option, we defined excluding levels, as well as recommendable levels for attributes of recommended ski area options. We based the selection of the recommendable and the excluding levels on the guidelines of the environmental management scheme *Auditing in Ski areas* (pro natura-proski, 2003) and on recommendations and publications of the Board of Environment and Sustainable Snow Sports Development of the German Ski Federation (Luthe, 2007b), as well as on the existing general body of literature on environmental aspects of ski tourism.

Table 16 Extension of experimental design
The allocation of eight questionnaires is done by treatments 1 to 3 in one block of 24 respondents, the 25th respondent starting with treatment 1 again.

	Info treatment 1 (NGO)	Info treatment 2 (consumer rating)	Info treatment 3 (control group)	Info treatment 1 (NGO)
Questionnaire 1 (Question1-Q8)	Respondent 1 (R1)	R 9	R17	R25
Questionnaire 2 (Question9-Q16)	R2	R10	R18	…
Questionnaire 3 (Question117-Q24)	R3	R11	R19	…
Questionnaire 4 (Question25-Q32)	R4	R12	R20	…
Questionnaire 5 (Question33-Q40)	R5	R13	R21	…
Questionnaire 6 (Question41-Q48)	R6	R14	R22	…
Questionnaire 7 (Question49-Q56)	R7	R15	R23	…
Questionnaire 8 (Question57-Q64)	R8	R16	R24	…

Note: Entries indicate the sequence in which respondents were allocated to the 24 block x information-treatment combinations.

Excluding levels of the attribute *alternative offers* were the *mountain coaster* and the *ski dome*, both technical installations that increase resource use. A longer travel distance of more than eight hours that is taken by plane counts for skiing abroad, a practice with immense emissions. Travelling to and from ski destinations accounts for the majority of greenhouse gases (Mountain Riders, 2007). Using conventional energy from non-renewable resources was another excluding factor because buying energy from renewable resources is a simple sign of trying to support the protection of the environment.

Expansion on glaciers is an excluding factor as well, which not only increases resource use but steps on very fragile ecologic terrain in the high Alpine zone. Finally, 100% snow guarantee was excluding too because it can only be given with technical snow making on all slopes, a practice that might not be necessary in that amount (CIPRA, 2006b). With this level we wanted to check the importance of snow guarantee with the stated preferences in the standard questionnaire. Ski areas with excluding criteria were disapproved. Excluding criteria are shown in table 17.

Table 17 Excluding levels of attributes leading to disapproval of ski areas

Attribute	Level
Alternative offers	Mountain coaster on the mountain, Ski dome
Travel distance	More than eight hours by plane
Kind of ski area	-
Green power	0% green energy
Expansion	Expansion on glaciers
Flexibility	-
Grooming	-
Snow guarantee	100% snow guarantee that can only be given by technical snow making.

Recommended were ski areas that offered the attributes presented in table 18 but did not have excluding attributes (table 17). A short travel distance to the ski area of less than two hours implied that the closest ski hill was chosen for skiing even if it might not be the biggest or most snow reliable. Soft mountain sports as alternatives, such as hiking or biking, use fewer resources than technical ones. A small and authentic ski area is meant to support local traditions and less *industrialized* places. A fully flexible ski pass is a service that supports tourists in deciding every day what they want to do without putting economic pressure on buying a multiple day pass that has to be used right away – if the conditions were bad the tourist could come back to the ski area another day.

Less grooming saves on resources and emissions, the goal is to find a minimum percentage of grooming that still meets customer demand. The same applies for technical snow making, leading to less snow guarantee. Both grooming and snow making use resources and produce emissions in a fragile environment, assuming that a thorough use of machine operations is part of sustainable management (Mueller & Weber, 2008). Along with these factors, we also wanted to compare the importance of grooming and snow making with the stated desired services in a ski area from the standard questionnaire.

Table 18 Levels of attributes leading to recommendations of ski areas

Attribute	Level
Alternative offers	Soft mountain sports
Travel distance	Less than two hours
Kind of ski area	Small and authentic
Green power	100% green energy for the lifts and other infrastructure
Expansion	No expansion
Flexibility	Full flexibility and transferability of ski passes
Grooming	Only 50% grooming
Snow guarantee	50% snow guarantee and less that can be achieved without or with little technical snow making.

Table 19 Coupling of the 64 attribute combinations
The combinations (ski area options) are coupled to 64 choice sets and allocated with recommendations, denials and neutral information.

Block number	Choice set number	Combinations of profiles (ski areas)	Recommended profile (ski area)	Disapproval of both profiles (recommending option "none")	Neutral information
1	1	1-2	2		
1	2	2-3	2		
1	3	3-4	4		
1	4	4-5	4		
1	5	5-6	6		
1	6	6-7	6		
1	7	7-8		x	
1	8	8-1		x	
2	9	9-10	9		
2	10	10-11	10		
2	11	11-12		x	
2	12	12-13			x
2	13	13-14			x
2	14	14-15			x
2	15	15-16			x
2	16	16-9	9		
3	17	17-18			x
3	18	18-19			x
3	19	19-20		x	
3	20	20-21		x	
3	21	21-22		x	
3	22	22-23		x	
3	23	23-24		x	
3	24	24-17		x	
4	25	25-26	26		
4	26	26-27	26		
4	27	27-28		x	
4	28	28-29			x
4	29	29-30			x
4	30	30-31		x	
4	31	31-32		x	
4	32	32-25		x	
5	33	33-34		x	
5	34	34-35		x	
5	35	35-36			x
5	36	36-37			x
5	37	37-38			x
5	38	38-39			x
5	39	39-40			x
5	40	40-33			x
6	41	41-42			x
6	42	42-43			x
6	43	43-44	44		
6	44	44-45	44		
6	45	45-46	46		
6	46	46-47	46		
6	47	47-48			x
6	48	48-41			x
7	49	49-50		x	
7	50	50-51		x	
7	51	51-52		x	
7	52	52-53		x	
7	53	53-54			x
7	54	54-55			x
7	55	55-56		x	
7	56	56-49		x	
8	57	57-58			x
8	58	58-59	59		
8	59	59-60	59		
8	60	60-61		x	
8	61	61-62		x	
8	62	62-63			x
8	63	63-64	64		
8	64	64-57	64		

All other attributes were understood as neutral. Ski areas without excluding factors and without recommendable factors were treated with neutral information. The consumer rating used the same procedure of recommending and disapproving as the NGO rating to be able to directly compare which information treatment is more effective.

Table 19 shows the final combinations of each two ski area options to choice sets and their allocation with the kind of information treatments, a positive recommendation, disapproval or neutral information. Due to the combinations of levels in the fractional factorial design plan and the resulting distribution of described excluding factors, all choice sets with disapprovals had excluding factors in both options, thus both options had to be disapproved, and instead the *none of both* option was recommended to be chosen. Table 27 presents the disapproved options in the choice sets with significant differences in treatment effects.

The frequencies of recommendations of ski area alternatives with their information treatments are shown in table 20. 19 ski areas were recommended, 23 were disapproved and 22 had neutral information. The control group – information treatment 3 – did not have any information, indicated as *0* in table 20. Information treatment three was provided for the same number of choice sets as the other treatments, but without any content.

Table 20 Frequency of recommendations, denials or neutral information in the three treatments

	NGO (Infotreatm. 1)	Consumer (Infotreatm.2)	Control (Infotreatm.3)
Recommendation of one option out of two	19	19	0
Denial of both options ("choose none")	23	23	0
Neutral info (no info available)	22	22	0

Pre-testing

The finished experimental setup of the online choice experiment was pre-tested with about 100 respondents to check for technical functionality and for usability. The data was analyzed and checked for unexpected effects, for example, dominance of single attributes (nesting) and for correlations between levels. The respondents were interviewed about their experiences responding to the choice set questions regarding the design, the understanding of the questions and tasks, the formulation of the information treatments and the overall impression of the survey. Some minor changes in the visual setup of the two ski area options were made, as well as some additional descriptions of the attributes provided.

The contents of the information treatments were validated on strategic potential unique selling proposition (USP) aspects gained by the expert discussions in North American ski resorts that already market sustainable management (chapter three). The choice experiment then proved to be ready for application.

5.2.4. Survey procedure

We used an online survey instrument to administer the DCE. The use of the internet allows a more complex and lengthy survey to be presented in a visually attractive and communicative way. The costs and efforts to reach a higher number of customers are lower with an online tool. It also allows for direct and easier data analysis when data are stored in the necessary way (Sloane & Hardin, 2003). There are DCE online software packages offered for sale but with limited customizable functions of design, additional information treatments and data storage.

We thus programmed our own software tool with exactly the design and the functions that were needed to meet the experimental design plan. The combination of a standard questionnaire before and after the choice set part as described in chapter one, the additional information treatments, the complex attribute levels, the wish for a specific layout and the concept of offering the experiment in three languages made the individual programming necessary (in order to communicate with the expected variety of nationalities the survey was offered in three languages English, German and French).

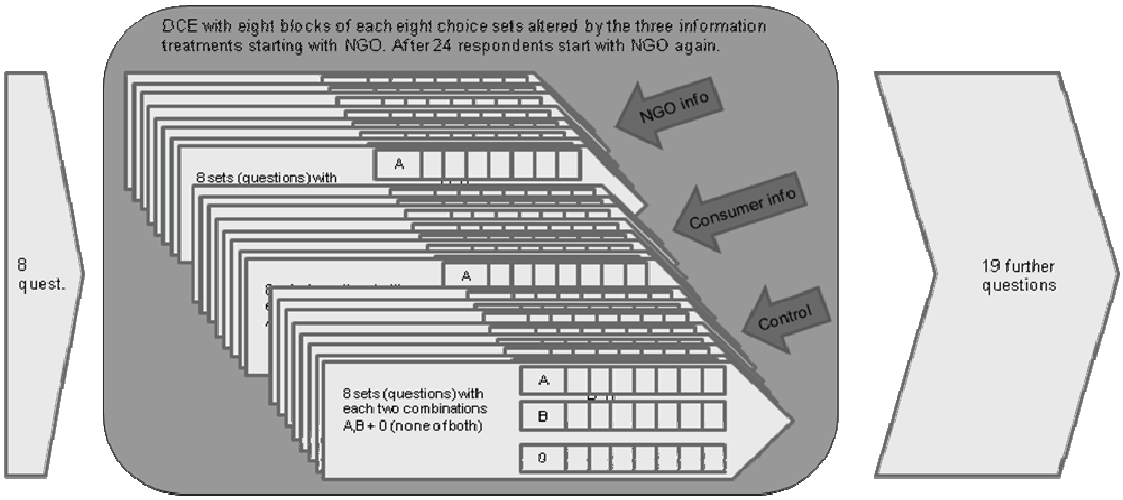

Figure 50 Design of the choice experiment
The figure shows choice set coupling and allocation in eight blocks framed by the standard questionnaire.

Figure 50 shows the design of the online experiment with the first eight questions of the standard questionnaire that each respondent answered, followed by the three different blocks with each eight choice set questions, and

ending with nineteen remaining questions of the total of 35 questions of the demand side survey.

Figure 51 shows a screen shot of one choice set where the two alternatives are presented with each nine levels of attributes. The nine attributes are shown on the left side, each with an info point button to click on for a description of all existing levels. The order of levels describing the attributes was randomly changed with each reload of the same or the following choice set to avoid customers getting used to the same order and to check for the same attributes each time, which decreased this potential disturbing factor (Hu et al., 2006).

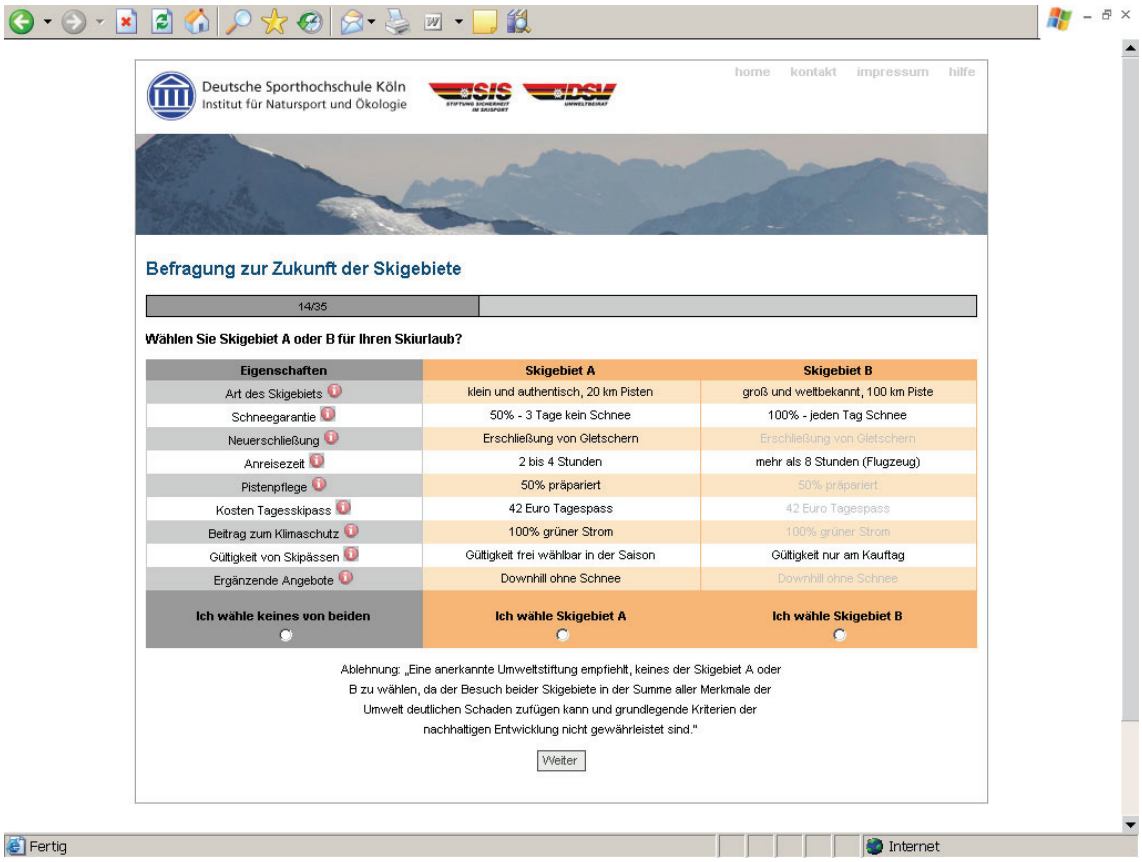

Figure 51 Screen shot of one choice set in German

In addition, only those levels that were different between the two alternatives were highlighted to easier and better understand the differences between the alternatives and to decrease potential negative effects. The design shows a single picture banner that adds visual attraction to the survey, though it does not change with questions and is of a neutral kind to further decrease the risk of disturbing factors (McFadden, 1999). The information treatment was provided as a text centred below the choice set that rather showed a character of understatement. Better visual and more marketing-like information could potentially have shown greater affects on the consumer behavior. We get back to this in the discussion part of this chapter.

5.2.4.1. Sample size

The goal of this study was to generate data representative for the German speaking market, the biggest outbound tourism market in the world and the biggest group of customers in ski areas of the Alpine countries (chapter two). The calculation of the necessary sample size, the reached number and distribution of respondents and the criteria of filtering the data set are described in chapter 5.1. We finally achieved a cleansed set of 2430 respondents.

5.2.4.2. Sample collection

The collection of the sample was done in three main ways:

1. Personal, short interviews in ski areas with collection of email addresses. After the interviews we sent the link of the online experiment www.save-snow.com by email to the collected addresses.
2. Sending out the link of the online experiment by the email newsletters of ski areas to existing subscribers.
3. Publishing the goals of the study and the web address through different public media, such as radio, magazines and television.

By the combination of these three approaches, we sought to best reach the minimum sample size and even extend it, and to use the channels directly to skiers who undoubtedly skied in that particular analogue winter 2006/07. This included skiers of a bigger number of various ski areas and also the general public, who might be more inactive and could not be reached in the ski areas personally nor via ski area newsletters. Details of the sample collection are described in chapter 5.1.3.6).

5.2.5. Hypotheses

The experimental design allows for testing a number of hypotheses regarding the effects of the information treatments on stated preferences for private goods. In the setting of hypotheses and in the data analysis we follow the steps as applied in Schläper et al. (Schläpfer et al., 2008).

We first used Chi-square independence tests to examine whether (H_1) the information treatments affected the questionnaire return rates and whether (H_2) the treatment sub samples are different in terms of socio-economic and other descriptive characteristics.

Second, we compared the effects of the information treatments on the individual choice set responses and tested whether (H_3) the NGO information or the consumer information affected the frequency of response options more in choosing ski area A, ski area B or *none of both* compared with the control group. Hypotheses one through three were tested using statistical data analysis

software SPSS 15.0 (Statistical Package for the Social Sciences). Hypotheses testing were done by Chi-square significance tests with a p-Value of 0.05.

Third, we used multinomial logit models for each of the nine information by population sub samples. The population sub samples are divided and described by socio-economic and demographic criteria as shown in table 23. The multinomial logit model as implemented in Limdep 7 (Greene, 1998) was used to compute willingness-to-pay estimates for the proposed ski area services based on the costs of a day ski pass. We hypothesize that the WTP increases or decreases with information treatments NGO or consumer, relative to the control group, depending on the general importance (matching customer preferences) of the attributes for the customer and on their environmental importance (how well they describe the environmental impacts of a ski area operation). An increase of WTP is expected by high importance and a decrease by low importance of the attributes. We further hypothesize that the information effects different consumer groups (population sub samples) differently.

H_4: The information affects the WTP in general in an increase or a decrease compared to the control group without information.

H_5: The information affects WTP of different attributes differently. The WTP for environmental indicator attributes increases more with NGO information than for other attributes.

H_6: The information affects WTP of different socio-economic sub samples differently.

5.2.6. Results

5.2.6.1. Descriptive statistics

Questionnaire return rates

The response rates varied throughout the different sample collection channels from personal interviews to email newsletters and radio messages. Table 19 shows the questionnaire return rates and the cleaned sample of n=2430. The cleansing filters are described in the footnote of table 21. In total, 55.52% of the respondents were recruited in ski areas, either by direct personal short interviews or by email newsletters from ski areas. 17.61% were members of the German Ski Federation (DSV), 18.68% were generated by public radio and television in Germany and Switzerland, 5.88% were University students or from an NGO, and 2.3% from other sources. Return rates of the sent out emails from personal interviews (29.18%), of the newsletters (4.68%) and of the member magazine (0.28%) are shown in table 21. Return rates for the respondents of the radio station, the television and for those who got the URL to the internet

survey from other sources cannot be expressed because of the unknown total number of people receiving the URL by these channels.

Table 21 Questionnaire return rates

	Total			NGO		Consumer		Control	
Respondents sources	Number	Return rate	% of total	Number	% of total	Number	% of total	Number	% of total
Personal interviews in ski areas A/F: addresses collected	2166								
Respondents	632	29,18%	26,01%	209	8,60%	212	8,72%	211	8,68%
Newsletters from ski areas D/A: recipients	15330								
Respondents	717	4,68%	29,51%	231	9,51%	251	10,33%	235	9,67%
Member magazine German Ski Federation: subscribers	232000								
Respondents	428	0,18%	17,61%	148	6,09%	138	5,68%	142	5,84%
Respondents radio station SWR3 D/CH	454		18,68%	153	6,30%	149	6,13%	152	6,26%
Respondents University/NGO D/CH	143		5,88%	47	1,93%	48	1,98%	48	1,98%
Respondents Others	56		2,30%	20	0,82%	14	0,58%	22	0,91%
Total (N) after filtering	2430		100,00%						

Total N before filtering: 3160.

Filter consisting of: 1. Completion of all 35 questions 2. Unique IP address 3. Time stamp indicating a min. time of 60 seconds for the eight choice sets (responses taking less than one minute were presumingly those who just clicked through to win the lottery of ski passes)

There was no effect of the information treatments on questionnaire return rates in the three treatment samples (χ^2<10>=16.464, p=0.087). The null hypothesis corresponding to H_1 – no effect of information on participation rate – cannot be rejected.

Distribution of responses within the treatment samples

The cleaned sample of 2430 respondents delivered in total 19269 choices, split in the NGO sample (6440 choices), the consumer sample (6507), and the control group (6322). These choices were equally distributed between the NGO info (32.8%), the consumer info (33.7%) and the control group (33.4%) as shown in table 22. The total distribution of choices is equal in the three information treatment samples, the treatments did not affect total response numbers.

Table 22 Frequency of the three response options

Treatment samples	Frequency of responses			Responses
	A	B	"none of both"	N
NGO	2446	2088	1906	6440
Consumer	2362	2037	2108	6507
Control	2528	2187	1607	6322
	7336	6312	5621	19269

Equality of socio-economic sub samples by information treatment

There was no effect of the information treatments on the sub samples in their descriptive socio-economic criteria. We tested age, gender, income, distance

living from the next ski hill, skills in snow sports, frequency of participating in snow sports, types of snow sports and environmental knowledge on glacier skiing, climate change and technical snow making. We first tested on equality in distribution to define the kind of significance tests, being Chi-square and Kruskal-Wallis-H-tests. All three tested samples differentiated by the information treatments 1-3 are equal concerning their descriptive characteristics (differences in grouped median are random). The null hypothesis corresponding to H_2 – no effect of information on the samples in their descriptive socio-economic criteria – cannot be rejected (all independence tests being not significant, see table 23).

Table 23 Statistical comparison of respondents' characteristics
Comparisons are made between all three experimental treatments NGO, consumer and control, with Chi-square and H-independence tests.

Variable	Description	Descriptive statistics	Test statistics
Gender	Binary variable: 0=male, 1=female	(0,471) N=2441	CHI Square Test X²<2>=0,326 p=0,849
Age	Continuous in years	35,93 (median) 37,04 (mean) (12,618) N=2411	Kruskal-Wallis-H-Test X²<2>=0,472 p=0,79
Income	Categories: 1=<1100€, 2=1100-2000€, 3=2100-3000€, 4=3100-4000€, 5=4100-5000€, 6=>5000€	2,88 (1,437) N=2315	Kruskal-Wallis- H-Test X²<2>=0,486 p=0,763
Distance to ski area	Categories: 1=<one hour, 2=1-2 hours, 3=2-4 hours, 4=4-8 hours, 5=>8 hours plane, 6=>8	2,14 (1,3) N=2442	Kruskal-Wallis- H-Test X²<2>=4,287 p=0,117
Skills in snow sports	Categories: 1=professional, 2=very good, 3=good, 4=fair, 5=beginner	2,04 (1,150) N=2443	Kruskal-Wallis- H-Test X²<2>=0,547 p=0,761
Time sum doing snow sports	Categories: 1=<one week, 2=1-2 weeks, 3=2-4 weeks, 4=>4 weeks	2,52 (0,892) N=2444	Kruskal-Wallis- H-Test X²<2>=0,308 p=0,857
Kind of snow sports	Categories: 1=alpine, 2=snowboard, 3=Telemark,4=Cross Country skiing, 5=Skimountaineering, 6=Snowshoeing, 7=winter hiking	(10,523) N=2514	CHI Square Test X²<16>=11,725 p=0,763
Environmental knowledge on glaciers	Categories: 1=knowledge, 2=no knowledge, 3=doesn't know	(0,836) N=2443	CHI Square Test X²<4>=2,697 p=0,610
Environmental knowledge on technical snow making	Categories: 1=knowledge, 2=no knowledge, 3=doesn't know	(0,705) N=2443	CHI Square Test X²<4>=1,928 p=0,749
Environmental knowledge on climate change	Categories: 1=knowledge, 2=no knowledge, 3=doesn't know	(0,43) N=2463	CHI Square Test X²<4>=3,496 p=0,479

The descriptive statistics for each variable are grouped median or mean, standard deviation in braces, sample size N
Test statistics for the null hypotheses that the distributions of responses are the same, with degrees of freedom (two-sided tests)

5.2.6.2. Effects of the NGO and the consumer information on responses

Both the NGO information and the consumer information show significant effects on consumer choices where respondents of the NGO and consumer samples followed the recommendations and chose differently than the control group. We tested the effects of the three information treatments on the frequencies of choices made for all choice sets individually that either had a recommendation or disapproval as presented in table 24.

Table 24 Chi-square significance tests of treatment effects
Tested are treatment effects on choices with recommendations and disapprovals.

Block number	Choice set number	Combinations of profiles (ski areas)	Recommend profile (ski area)	Disapprovalof both profiles (=recommending option "none")	Chi-square cross table test	Significance p	
1	1	1-2	2		χ^2<4>=16,651	0,002	**
1	2	2-3	2		χ^2<4>=17,668	0,001	***
1	3	3-4	4		χ^2<4>=7,911	0,095	ns
1	4	4-5	4		χ^2<4>=5,436	0,245	ns
1	5	5-6	6		χ^2<4>=13,301	0,010	**
1	6	6-7	6		χ^2<4>=7,314	0,120	ns
1	7	7-8		x	χ^2<4>=8,238	0,083	ns
1	8	8-1		x	χ^2<4>=5,684	0,224	ns
2	9	9-10	9		χ^2<4>=4,866	0,301	ns
2	10	10-11	10		χ^2<4>=2,171	0,704	ns
2	11	11-12		x	χ^2<4>=6,635	0,156	ns
2	16	16-9	9		χ^2<4>=2,595	0,628	ns
3	19	19-20		x	χ^2<4>=3,583	0,465	ns
3	20	20-21		x	χ^2<4>=19,071	0,001	***
3	21	21-22		x	χ^2<4>=13,204	0,010	**
3	22	22-23		x	χ^2<4>=2,959	0,565	ns
3	23	23-24		x	χ^2<4>=6,384	0,172	ns
3	24	24-17		x	χ^2<4>=20,916	0,000	***
4	25	25-26	26		χ^2<4>=18,556	0,001	***
4	26	26-27	26		χ^2<4>=12,343	0,015	*
4	27	27-28		x	χ^2<4>=20,622	0,000	***
4	30	30-31		x	χ^2<4>=8,997	0,061	ns
4	31	31-32		x	χ^2<4>=7,915	0,095	ns
4	32	32-25		x	χ^2<4>=3,034	0,552	ns
5	33	33-34		x	χ^2<4>=9,138	0,058	ns
5	34	34-35		x	χ^2<4>=20,003	0,000	***
6	43	43-44	44		χ^2<4>=8,086	0,088	ns
6	44	44-45	44		χ^2<4>=3,861	0,425	ns
6	45	45-46	46		χ^2<4>=11,886	0,018	*
6	46	46-47	46		χ^2<4>=10,138	0,038	*
7	49	49-50		x	χ^2<4>=14,547	0,006	**
7	50	50-51		x	χ^2<4>=12,663	0,013	*
7	51	51-52		x	χ^2<4>=15,598	0,004	**
7	52	52-53		x	χ^2<4>=11,318	0,023	*
7	55	55-56		x	χ^2<4>=18,672	0,001	***
7	56	56-49		x	χ^2<4>=6,946	0,139	ns
8	58	58-59	59		χ^2<4>=2,84	0,585	ns
8	59	59-60	59		χ^2<4>=0,893	0,926	ns
8	60	60-61		x	χ^2<4>=12,690	0,013	**
8	61	61-62		x	χ^2<4>=3,943	0,414	ns
8	63	63-64	64		χ^2<4>=0,126	0,998	ns
8	64	64-57	64		χ^2<4>=0,153	0,997	ns

The choice sets with neutral information were not included in the significance tests because the neutral information did not provide a concrete statement to act – neither a recommendation nor a disapproval – and was thus not of

relevance for answering the hypotheses of this choice experiment. From the 19 choice sets with positive recommendations, seven sets show significant differences in choices between all three treatments (36.84%). From the 23 choice sets with disapprovals eleven or 47.83% show significant differences in choices (table 25).

Table 25 Ratio of significant treatment effects on choice sets (from the total number of provided recommended and disapproved sets).

	Recommendation	Disapproval
Provided	19	23
Significant	7	11
Ratio	36,84%	47,83%

We further investigate the effectiveness of the NGO and the consumer information and describe the differences in choices made in the 18 choice sets with significant treatment effects. Table 26 lists the differences in agreements to recommendations by information treatment for the seven significant recommended choice sets. The attributes of the ski area options are listed with their describing levels and allow for checking correlations between the strength of a treatment on choices and the underlying levels of the ski area options. The dark grey colored cells indicate attribute levels leading to disapproval of a ski area option, a bright grey colored cell shows attribute levels leading to a recommendation of a ski area option.

The highest agreement to a positive recommendation is option two in choice set one with 25.77% more with the NGO info than in the control group – despite a 50% snow guarantee and a very expensive price for the ski pass of 58€. The distance though is less than two hours to drive, the ski area big and the use of green energy 100%. The second highest agreement to a recommendation is with 23.24% more of the NGO group than the control group ski area two, again of set number two, despite a lower snow guarantee and a much higher price of 58€ to 34€.

The distance, though, is much shorter, the use of green energy 100%, and it is big and offers a mountain coaster on the mountain as option three does. 15.98% follow the NGO info and chose differently than the control group in option six from choice set five. The distance to travel is much shorter in option six, the snow guarantee one day higher and there is no expansion on glaciers, as well as the use of 100% green energy.

Table 26 Comparing effects of information treatments on frequency of chosen ski area options (only in significant choice sets with recommendations)

Choice set	Ski area option	Recom-mended	Difference NGO to control	Difference NGO to consumer	Difference consumer to control	Size	Green energy	Flexibility ski pass	Grooming	Alternative activities	Costs day ticket	Driving distance to ski area	Expansion plans	Snow guarantee days out of six (one week)
1			**-18,13%**	-9,40%	-8,73%									
	1		-7,64%	-9,80%	2,16%	small	0%	not transferrable	100%	Soft mountain sports	58€	> 8 hours	None	6
	2	x	**25,77%**	**19,19%**	6,57%	big	100%	not transferrable	50%	Downhill w/o snow	58€	<2 hours	Higher elevations	3
2			-8,22%	-3,48%	-4,74%									
	2	x	**23,24%**	**16,24%**	7,00%	big	100%	not transferrable	50%	Downhill w/o snow	58€	<2 hours	Higher elevations	3
	3		**-15,02%**	-12,76%	-2,26%	small	0%	not transferrable	50%	Mountain coaster	34€	> 8 hours	None	6
5			-11,59%	2,03%	-13,62%									
	5		-3,91%	-8,48%	4,57%	small	0%	transferrable	100%	Soft mountain sports	58€	> 8 hours	Glaciers	3
	6	x	**15,50%**	6,45%	9,05%	small	100%	not transferrable	100%	Soft mountain sports	58€	<2 hours	Higher elevations	4
25			-12,88%	-0,64%	-12,24%									
	25		-3,10%	-4,29%	1,19%	small	100%	transferrable	50%	Downhill w/o snow	58€	> 8 hours	Higher elevations	5
	26	x	**15,98%**	4,93%	11,05%	big	100%	not transferrable	100%	Soft mountain sports	42€	2-4 hours	None	5
26			-9,19%	1,54%	-10,73%									
	26	x	10,40%	3,69%	6,71%	big	100%	not transferrable	100%	Soft mountain sports	42€	2-4 hours	None	5
	27		-1,21%	-5,23%	4,02%	small	100%	not transferrable	100%	Downhill w/o snow	58€	2-4 hours	Glaciers	6
45			**-19,91%**	-5,17%	-14,74%									
	45		6,41%	1,55%	4,86%	small	0%	not transferrable	50%	Ski dome	58€	4-8 hours	Connecting	4
	46	x	13,50%	3,62%	9,88%	big	100%	transferrable	50%	Soft mountain sports	58€	4-8 hours	Higher elevations	3
46			**-15,24%**	-2,38%	-12,86%									
	46	x	13,33%	3,28%	10,06%	big	100%	transferrable	50%	Soft mountain sports	58€	4-8 hours	Higher elevations	3
	47		1,90%	-0,90%	2,80%	big	0%	not transferrable	50%	Downhill w/o snow	50€	> 8 hours	Higher elevations	3

If we look at the choice sets with significant differences in treatment effects that have disapproval of two options and thus a recommendation to chose the *none* alternative as presented in table 27, we find that a maximum of 28.53% of respondents choose according to the consumer recommendation, which correlates with the distribution of attributes of the ski area options.

The highest agreement of 28.53% to the consumer recommendation more than in the control group was recorded for the *none of both* option of choice set 24. It is followed by the *none* option of set 34 with 27.41% more agreement to the NGO recommendation than in the control group. Here the consumer group shows 6.94% less than the NGO, but still 20.48% more agreement than in the control group.

Table 27 Comparing effects of information treatments on frequency of chosen ski area options (only in significant choice sets with disapprovals)

Choice set	Ski area option	Recom-mended	Difference NGO to control	Difference NGO to consumer	Difference consumer to control	Size	Green energy	Flexibility ski pass	Grooming	Alternative activities	Costs day ticket	Driving distance to ski area	Expansion plans	Snow guarantee days out of six (one week)
20		x	**22,06%**	-0,27%	**22,33%**									
	20		-1,56%	9,01%	-10,57%	big	100%	transferrable	50%	Mountain coaster	34€	> 8 hours	None	3
	21		**-20,50%**	-8,74%	-11,76%	small	0%	not transferrable	100%	Downhill w/o snow	34€	> 8 hours	Higher elevations	5
21		x	7,21%	**-15,58%**	**22,80%**									
	21		-2,17%	5,09%	-7,26%	small	0%	not transferrable	100%	Downhill w/o snow	34€	> 8 hours	Higher elevations	5
	22		-5,04%	10,50%	**-15,54%**	small	0%	not transferrable	100%	Mountain coaster	42€	<2 hours	None	4
24		x	13,33%	**-15,20%**	**28,53%**									
	24		-11,95%	-0,43%	-11,52%	big	0%	transferrable	50%	Ski dome	42€	<2 hours	Higher elevations	3
	17		-1,37%	**15,64%**	**-17,01%**	small	0%	transferrable	50%	Soft mountain sports	34€	> 8 hours	Higher elevations	5
27		x	**22,65%**	-2,65%	**25,30%**									
	27		-10,30%	4,00%	-14,30%	small	100%	not transferrable	100%	Downhill w/o snow	58€	2-4 hours	Glaciers	6
	28		-12,35%	-1,35%	-11,00%	small	100%	not transferrable	50%	Mountain coaster	34€	4-8 hours	Higher elevations	3
34		x	**27,41%**	6,94%	**20,48%**									
	34		**-20,01%**	-10,78%	-9,22%	big	100%	not transferrable	100%	Ski dome	58€	> 8 hours	Glaciers	4
	35		-7,41%	3,85%	-11,25%	big	0%	not transferrable	50%	Soft mountain sports	50€	> 8 hours	None	4
49		x	12,22%	-8,81%	**21,02%**									
	49		-0,94%	-4,81%	3,87%	small	0%	transferrable	100%	Ski dome	50€	4-8 hours	Higher elevations	6
	50		-11,27%	13,62%	**-24,89%**	big	100%	not transferrable	100%	Mountain coaster	34€	<2 hours	Higher elevations	6
50		x	11,22%	-7,69%	**18,91%**									
	50		-6,49%	5,77%	-12,26%	big	100%	not transferrable	100%	Mountain coaster	34€	<2 hours	Higher elevations	6
	51		-4,73%	1,92%	-6,65%	small	0%	not transferrable	50%	Soft mountain sports	50€	<2 hours	Connecting	3
51		x	**22,16%**	0,48%	**21,69%**									
	51		**-20,36%**	-6,43%	-13,93%	small	100%	not transferrable	50%	Ski dome	50€	<2 hours	Connecting	3
	52		-1,80%	5,95%	-7,76%	small	0%	transferrable	100%	Downhill w/o snow	34€	<2 hours	Glaciers	3
52		x	**15,56%**	-5,21%	20,77%									
	52		-9,19%	0,87%	-10,06%	small	0%	transferrable	100%	Downhill w/o snow	34€	<2 hours	Glaciers	3
	53		-6,37%	4,34%	-10,71%	big	0%	transferrable	50%	Ski dome	58€	> 8 hours	Connecting	6
55		x	**16,01%**	-7,03%	**23,04%**									
	55		-14,83%	10,42%	**-25,25%**	big	100%	transferrable	100%	Downhill w/o snow	58€	> 8 hours	None	6
	56		-1,18%	-3,39%	2,21%	small	100%	not transferrable	100%	Soft mountain sports	34€	> 8 hours	None	3
60		x	9,71%	-11,21%	**20,92%**									
	60		-11,79%	10,00%	**-21,79%**	small	0%	not transferrable	100%	Soft mountain sports	34€	<2 hours	Glaciers	6
	61		2,08%	1,21%	0,87%	big	0%	not transferrable	100%	Mountain coaster	34€	> 8 hours	Connecting	3

In all choice sets listed in this table 27, the agreements to the disapproval of both options and thus the recommendations of the *none* options were higher in both treatment sub samples compared to the control group.

In sum, a maximum of 28.53% of the ski tourists follow a consumer rating and choose accordingly, compared to the control group. A maximum of 25.77% follow a NGO recommendation choosing accordingly again in comparison to the control group. We thus conclude that the market share of German ski tourists

adapting their choice behavior to prefer more sustainable ski area services is a maximum of 28.53% if provided with a directed information and a direct recommendation to chose what is more or less sustainable.

5.2.6.3. Effectiveness of the NGO information compared to the consumer information

In all recommended ski area options of the significant choice sets, the NGO recommendation led to more choices and thus agreements to the information compared to the control group and also compared to the consumer information. The maximum effect in agreeing to the NGO recommendation is 25.77% compared to the control group. The maximum effect of the consumer group is 11.05% in option 26, which is still leading to more choices of the recommended areas than in the control group. The differences between the NGO and the consumer info are positive for all recommendations with a maximum of 19.19% in choice set one and an average of 8.2% (table 28).

Table 28 Differences in agreements to the recommended ski area options
Shown are differences in the frequency of choices of ski area options between NGO and consumer groups matching the recommended options (=agreements), only for significant choice sets.

Choice set	Difference NGO to consumer
1	19,19%
2	16,24%
5	6,45%
25	4,93%
26	3,69%
45	3,62%
46	3,28%
Average	8,20%

In the choice sets with disapprovals the consumer information was in nine out of eleven sets more effective than the NGO group, in average 6.02%. The only sets were the NGO info showed higher effects are sets 34 with 6.94% and set 51 with 0.48% (see table 29).

In recommending a *sustainable* ski area the NGO info is more effective. In disapproving *not sustainable* ski areas the consumer information is more effective, both in maximal and average numbers.

Effects differ with the attributes distribution of the ski area options. The highest differences in recommended ski areas of 19.19% are reached in ski area two from choice set one, meaning that 19.19% more of the NGO group chose ski area two than of the consumer group. Ski area option two is recommended and

chosen 19.19% more often despite having only half of the snow guarantee and half of the groomed runs than ski area option one has. The ticket price is the same, but the distance is much shorter. Also, option two has green energy and is bigger. The agreement to the same option (two) compared to option three is a bit lower with 16.24% but still high, although option three is much less expensive with 34€ to 58€ for the day pass and offers 100% snow guarantee. The distance is much bigger, it is smaller in size, has no green energy and offers a mountain coaster on the mountain as an alternative.

Table 29 Differences in agreements to the disapproved ski area options
Shown are differences in the frequency of choices of ski area options between NGO and consumer groups matching the disapproved options (=agreements) and choosing the none of both option, only for significant choice sets.

Choice set	Difference NGO to consumer
20	-0,27%
21	-15,58%
24	-15,20%
27	-2,65%
34	6,94%
49	-8,81%
50	-7,69%
51	0,48%
52	-5,21%
55	-7,03%
60	-11,21%
Average	-6,02%

The highest differences between the NGO and consumer in agreements to disapprovals of 15.58% are reached in choice set 21 option *none of both*, meaning that 15.58% of the NGO group chose *none* less often than the consumer group. Here the consumer information was more effective, as well as in choice set 24 with 15.2% more agreement. These high agreements to the *none* option, despite option 24 that is big, rather cheap and very close or option 22 that offers 80% snow guarantee, is fairly cheap and very close underline the strong effects of the consumer information in disapprovals of ski areas.

In both kinds of treatments, a recommendation and disapproval, it seems that snow guarantee and price are not the main determining factors when additional information is given. The distance to drive, the size and the use of green energy seem to be more important for those reacting strongly to additional information.

5.2.6.4. General effects of the information treatments and on WTP of different attributes

To test and answer the hypotheses H_4 to $H_{6,}$ we first take a look at the results pooled by the socio-economic criteria for general effects of the information treatments on the WTP before we describe effects on the nine single attributes. We then take a closer look on effects in the different socio-economic sub sample groups.

Pooled results

The pooled results by socio-economic sub samples show the differences in the WTP for each of the attributes split by information treatments NGO, consumer info and control group (see table 30). The information affects the WTP in all attributes, and the general profiles of the samples within each information group are similar, but amplified by the consumer info and most by the NGO info (see figure 52). The null hypothesis corresponding to H_4 – no effects of the info treatments on WTP – can be rejected. In the section of the socio-economic sub samples comparison later in this chapter, we will take a closer look at the differences in the NGO info groups.

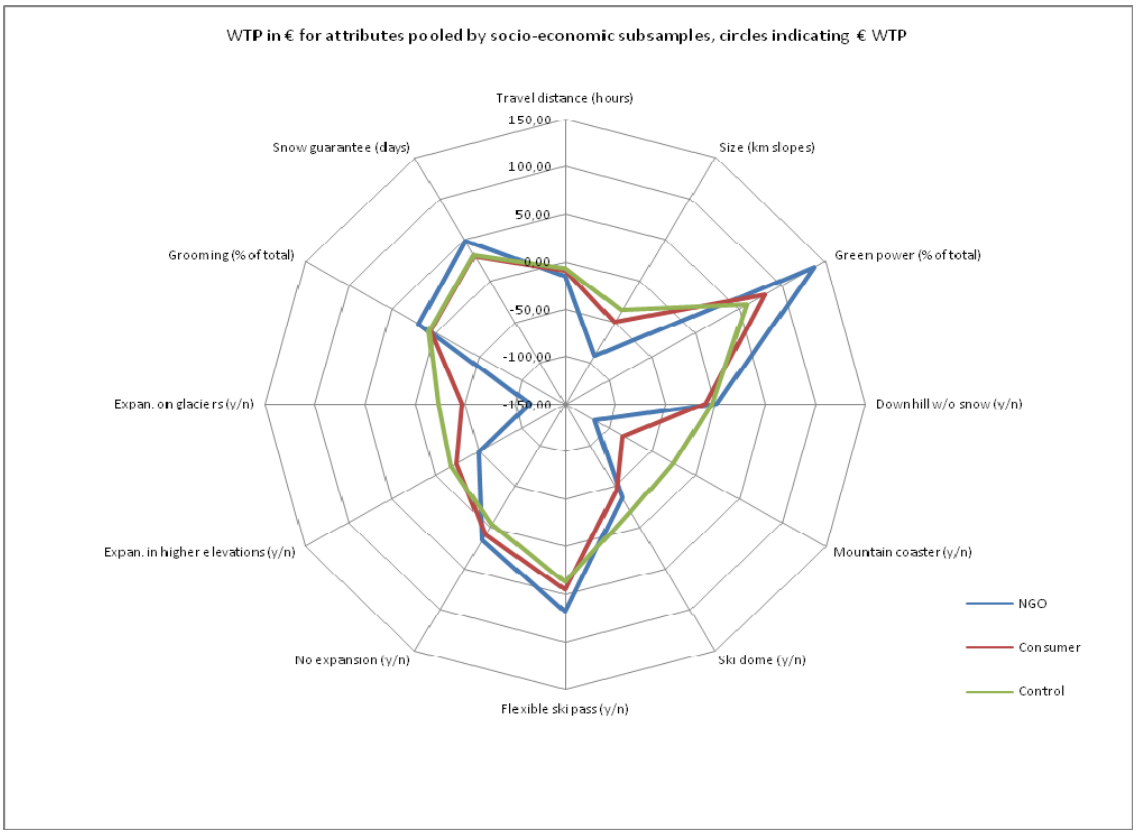

Figure 52 General effects of information treatments on WTP in € per unit for each attribute

Travel distance

One attribute is *travel distance*, the time it takes to travel to the offered ski area. We calculated the WTP for each unit that takes more to travel to the destination. Each unit is a travel time of two hours. In table 30 we express *travel distance* in Euros per single travel hour.

Pooled results show a WTP in the control group being 7€ less for each hour people have to travel further (without info treatment). With NGO info the WTP is only half of it (16€ less). The NGO group puts almost twice as much importance on the travel distance. The consumer info group only shows a slightly higher demand for distance then the control group but less than the NGO group. Coefficients were significant. The WTP in the attribute *travel distance* shows a double in the value people put into less travel time with the NGO info (see table 30).

Size

The attribute *size* of the ski area offered the alternative levels *small size* with a traditional style and 20km runs or *big size* and world known with 100km runs. Computing revealed the WTP for a small resort being 35.57€ less than a big resort. With consumer info it is 50.18€ less, with NGO info even -91.15€. Coefficients were significant. The WTP in the NGO group is almost three times less than in the reference treatment, although options with smaller sizes have been recommended (see table 30).

Green power

The attribute of environmental action was described by the levels zero percent of green energy use for the lifts and buildings or 100% of green energy. In the control group the WTP is 60.01€ for a green energy resort instead of a conventional one. The consumer info increases it to 81.40€; the NGO info doubles it to 137.32€. All coefficients are significant (see table 30).

Alternative activities

Four different alternative kinds of activities were offered in case of no snow or closure of the area due to other reasons. Alternative one was snow independent downhill offers like a slide on rails or a hang glider. Compared to a resort that offers just soft sport alternatives (like Nordic Walking trails, cross country mountain bike etc.) the WTP for the downhill option is 2.67€ less in the control group, 9.72€ less in the consumer group and higher with 1.6€ more in the NGO group. Alternative one was neither recommended positively nor negatively. However, coefficients for treatment one and three were not significant.

Alternative two is a mountain coaster on top of the ski hill, a technical installation like in a leisure park. The control group WTP is 24.48€ lower for a resort offering just a coaster alternative, in comparison to a resort with soft

offers. It is 82.95€ less in the consumer group and 115.88€ less in the NGO group. Coefficients are significant. Alternative two had a negative recommendation in the info groups. There generally is not much demand for technical installations that even decreases with the negative information.

Alternative three consists of a ski dome nearby where the control group was willing to pay 18.82€ less for a day pass compared to a resort with soft sport alternatives. In the consumer group the WTP is 45.44€ less, in the NGO group 35.97€ less. We see that there is no interest in ski domes which even decreases with directed information. All coefficients are significant (see table 30).

Flexibility of ski passes

The attribute *flexibility of ski passes* offered two level alternatives. In total, people were willing to pay 37.36€ more for a day pass that is fully transferable throughout the whole year (also in summer) than for a ticket that is valid only the day purchased (control group). In the consumer group the WTP is 45.31€ higher, in the NGO group even 68.14€ higher. The demand for flexibility of ski passes is generally high and almost doubles with the NGO info. All coefficients are significant (see table 30).

Table 30 WTP for each attribute by information treatment (in € per unit), pooled by the socio-economic sub samples

Pooled by socio-economic subsamples	NGO (€)	Consumer (€)	Control (€)
Travel distance (hours)	-15,64	-8,89	-7,06
Size (km slopes)	-91,15	-50,18	-35,57
Green power (% of total)	137,32	81,40	60,01
Downhill w/o snow (y/n)	**1,60**	-9,72	**-2,67**
Mountain coaster (y/n)	-115,88	-82,95	-24,48
Ski dome (y/n)	-35,97	-45,44	-18,82
Flexible ski pass (y/n)	68,14	45,31	37,36
No expansion (y/n)	15,78	**8,65**	**-4,17**
Expan. in higher elevations (y/n)	-50,08	-25,27	-19,48
Expan. on glaciers (y/n)	-115,05	-48,52	-24,53
Grooming (% of total)	18,13	**4,87**	**6,12**
Snow guarantee (days)	48,13	30,01	31,25

WTP from non significant coefficients are printed bold.

Expansion

The kind of planned or recently finished expansion of a ski resort was tested in this four level attribute. We computed WTP for the reference level *expansion four*, a combination of two small ski areas and thus an expansion to one bigger one.

For a resort that does not expand at all, the WTP is 4.17€ less (control group). Compared with the control group, the consumer group pays 8.65€ more, the

NGO group even pays 15.78% more. The coefficient of the NGO is significant; the other two are not. It seems that the information made people aware of the potential negative outcomes of expansions.

Expansion two, the construction of new lifts and slopes to higher elevations, results in a WTP that is 19.48€ lower than *expansion four* (control group). The consumer info decreases WTP to 25.27€ less, while the NGO info decreases it even further to 50.08€ less. All coefficients are significant.

Expansion three describes the development of new glaciers for skiing. WTP is 24.53€ less for this alternative than for expansion four (control group), 48.52€ less in the consumer group and even 115.05€ less in the NGO group. The NGO info leads to more than four times less WTP than without info. Still, the awareness of the negative impacts of expansions on glaciers already exists even without additional information. All coefficients are significant (see table 31).

Grooming

The *grooming* attribute compared the WTP for a resort that grooms 100% of all pistes everyday with a resort that only grooms the main runs leading back to the valley, approximately 50%. The control group pays 6.12€ more for 100% grooming, the consumer group 4.87€ more (both non-significant) and the NGO group pays 18.13€ more (significant, see table 28).

Snow days

The snow guarantee was tested with the attribute snow days, meaning days of a week with snow guarantee, which is dependent on technical snow making. The WTP for each additional snow day is 31.25€ in the control group and about the same in the consumer group. The NGO group is with 48.13€ willing-to-pay 50% more than the other two groups (see table 28).

The null hypothesis corresponding to H_6 – no differences in effects of the info treatments on WTP of single attributes - can be rejected.

5.2.6.5. Information effects on WTP for different socio-economic sub samples

We examined the differences in WTP by the information effects in the pooled samples and take now a closer look on socio-economic and demographic differences in the sub sample groups. We test hypothesis H_6 by splitting the multinomial logit models in the nine sub samples. Hereby we also take a closer look at the effects on the different levels of the attributes. Because of the higher effectiveness of the NGO information in the recommendations of ski areas, which could more likely serve for marketing, we individually summarize the effects of the NGO information on the socio-economic sub samples.

Travel distance

Sub sample Age

In the younger age class, the WTP is 6.84€ less for each hour travelled farther to the ski area. The travel time is more important for the mid age class who would pay 9.31€ less if they had to travel an hour farther. The age of 50 years plus is rather willing to drive farther with only 4.33€ less (all control group).

Apart from the age class 50 plus, the consumer info does not greatly affect the WTP with outgrowing numbers throughout the calculations. The WTP of the group 50 years plus is unexpected high. We refer to the *Discussion* chapter where we discuss such unexpected effects in choice behaviour.

In the NGO group the younger age class below 31 years shows a WTP that is about 100% lower per hour to travel more. The mid age class (31-50) is decreasing its WTP by even more than 400% € for each hour.

The NGO info is more effective than the consumer info. Most influenced is the mid age class (see table 31).

Sub sample income

The WTP for each hour more to travel is lowest with the highest income class of >4000€ (22.29€ less); it is highest with only 8.99€ less in class 1000-2000€ (control group).

The consumer group does not change much in the WTP, but the NGO info decreases the WTP in all income classes. In class >4000€ the WTP is lowest again with 295.63€ less, followed by the lowest income <1000€ with 92.97€ less per hour more to travel.

Again the NGO info is most effective. The highest income class is most influenced, followed by the lowest income class. They will pay the least and are affected the most (see table 31).

Sub sample frequency of skiing

People who ski more frequently are willing to pay more to travel one hour less to the ski resort than those who ski less often (control group). This relation is stronger in the consumer group Treatment and even more in the NGO group.

The NGO info again has more impact on the WTP than the consumer info, and those who ski less often are more influenced than those who ski more often (see table 31).

Sub sample distance

Those living closest to the next ski hill show the lowest WTP for each hour to travel farther. Those living two to eight hours apart show a positive WTP, and those more than eight hours apart show a WTP in-between (control).

Except for the closest distance, the consumer info decreases the WTP for all distances. The effect on those living more than eight hours apart seems to be too strong. We refer to the *Discussion* chapter for more detailed thoughts about unexpected effects in WTP. Again, the effects of the NGO treatment on the WTP are higher. All sub samples show a decrease in WTP, being strongest with those living two to eight hours apart. Still, WTP is lowest with those who live the closest to the mountains, highest with those who live the farthest apart (see table 31).

Table 31 WTP for travel time to ski area
(by individual characteristics and information treatment in € per hour)

HOURS	NGO (€)	Consumer (€)	Control (€)
Age<31	-12,81	-5,67	-6,84
31-50	-53,90	-10,65	-9,31
>50	-5,28	1224,05	-4,33
Income<100	-46,49	-6,44	-7,17
1000-2000€	-7,23	-11,87	-4,50
2001-4000€	-25,38	-10,41	-8,45
>4000€	-147,82	-6,76	-11,15
Freq <2 wee	-21,93	-18,87	-8,21
>2 weeks	-10,86	-5,09	-5,90
Dist <2h	-19,88	-9,14	-10,01
2-8h	-15,19	-7,50	6,15
>8h	-3,61	-89,92	-2,10

WTP from non significant coefficients are printed bold.
Hours = travel time per units of two hours in the experiment, calculated here per single hour

The comparison of the sub samples from the NGO info within the attribute of *travel distance* (*hours*) shows that those prefer the most to ski in a closer ski area who

- have the highest income,
- are younger,
- come for the day,
- do not ski that often.

All samples would pay less for a ski area that is one hour farther away. The control group shows about the same differences but less amplified as expected.

Size

Sub sample age

People from age class 50 years plus have a much higher WTP for a small resort compared to a big resort than the younger age classes. Again, the WTP of the oldest age class in the consumer group shows too strong effects. With the NGO info it barely changes. Strongest are the effects in age class 31-50. Here the WTP to ski in a small resort is decreasing from 42.18€ less to 309.46€ less. In age class below 31, it decreases from 42.06€ to 78.23€ less. The NGO info is again more effective than the consumer info (see table 32).

Sub sample income

The lowest and the highest income show the least WTP for a small resort of 41.06€ less below 1000€ and 64.1€ less above 4000€. The consumer info shows a decrease in income class 1000-2000€ to 72.44€ less from 26.38€ less. Strongest effects are reached with the NGO info. The WTP of income above 4000€ is 635.58€ less, below 1000€, 257.9€ less and of 2001-4000€, 179.64€ less. Almost no changes show income class 1000-2000€ (see table 32).

Sub sample frequency of skiing

WTP of both sub samples in the control group are not differing much, 37.83€ less for those skiing less than two weeks, 34.43€ less for those skiing more. The consumer info decreases it to 104.51€ less for the first sample, the NGO info to 114.35€ less. Those who ski two weeks and more are willing to pay more for a smaller resort in all groups, the effect being strongest in the NGO treatment with 72.71€ less (see table 32).

Table 32 WTP to ski in a small area
(Shown by individual characteristics and information treatment in € compared to a large area).

Size	NGO (€)	Consumer (€)	Control (€)
Age<31	-78,23	-34,8	-42,06
31-50	-309,46	-62,66	-42,18
>50	-25,81	4231,02	-22,46
Income<1000€	-257,9	-35,98	-41,06
1000-2000€	-27,95	-72,44	-26,38
2001-4000€	-179,46	-60,32	-36,1
>4000€	-635,58	-33,75	-64,1
Freq <2 weeks	-114,35	-104,51	-37,83
>2 weeks	-72,71	-29,61	-34,43
Dist <2h	-109,67	-42,89	-39,38
2-8h	-96,04	-58,92	-37,58
>8h	-54,07	-543,23	**-18,47**

Reference: Big ski area with 100km pistes.

WTP from non significant coefficients are printed bold.

Sub sample distance

Strongest differences are achieved in the NGO sample. Those who live less than two hours from the next ski hill have the lowest WTP for a small resort of 109.67€ less. For two to eight hours distance it is 96.04€ less; for more than eight hours it is 54.07€ less, all samples showing strong decreases in WTP relative to the control group (see table 32).

The comparison of the sub samples from the NGO info within the attribute *size* shows that those who most prefer to ski in a bigger ski area are people who

- have the highest income,
- are younger,
- come for the day,
- do not ski that often.

The low incomes, the older ages, the overnight guests and those skiing often in relation accept a smaller ski area, although they still tend to visit the bigger ones. The control group shows a similar pattern. The youngest and those skiing seldom are affected most after the income by the NGO.

Green power

Sub sample age

The WTP for a resort with 100% green energy is highest with age class <31 years (71.66€). The NGO info shows the strongest effects in age 31-50 whose WTP increases to 449.18€. Age class 50+ again shows too strong effects (see table 33).

Sub sample income

The control group shows a fairly similar WTP in all incomes. In the NGO sample it increases from 55.31€ to 1731.54€ above 4000€, from 55.91€ to 338.25€ below 1000€. The increase in the highest income class is the highest of the samples with a factor of thirty-one (3100%, see table 33).

Sub sample frequency of skiing

Those in the control group who ski less often show a higher WTP of 70.28€ to 49.71€ who ski more often. WTP increases in both info groups but is strongest in the NGO sample to 190.14€ and 96.41€ (see table 33).

Sub sample distance

Those living closest put more value into green power than the others. The more remote people live, the less they are willing to pay for green power. The consumer group does not show strong changes (apart from above eight hours which shows an effect that seems too strong again). In the NGO group all WTP increase, with those living closest are willing to pay the most with 164.94€. The

strongest increase shows the class above eight hours from 38.62€ to 126.2€, which decreases the differences within the NGO sample (see table 33).

Table 33 WTP to ski in a ski resort powered by 100% green energy (by individual characteristics and information treatment in €).

Green power	NGO (€)	Consumer (€)	Control (€)
Age<31	108,6	58,77	71,66
31-50	449,18	**79,39**	59,92
>50	58,78	-14099,53	54,59
Income<1000€	338,25	89,45	55,91
1000-2000€	74,57	100,13	62,15
2001-4000€	190,53	95,24	58,15
>4000€	1731,54	38,96	55,13
Freq <2 weeks	190,14	154,31	70,28
>2 weeks	96,41	54,03	49,71
Dist <2h	164,94	86,63	83,59
2-8h	128,24	58,41	41,08
>8h	126,2	1100,59	38,62

WTP from non significant coefficients are printed bold.
Reference: 0% green power

The comparison of the sub samples from the NGO info within the attribute *green power* shows that those who most prefer to ski in a ski area powered by 100% green energy are people who

- have the highest income,
- are younger,
- come for the day,
- do not ski that often.

Differences of the NGO info compared to the control group are strongest in the income samples, with the day and overnight guests and with those who ski seldom.

Alternative activities

Downhill

Most coefficients in the attribute downhill one are not significant. A greater value of downhill offers that are not snow dependent compared to soft sport alternatives cannot be found (see table 34).

Table 34 WTP to visit a ski area offering downhill alternatives (by individual characteristics and information treatment in € compared to soft alternatives).

Downhill activites w/o snow	NGO (€)	Consumer (€)	Control (€)
Age<31	**4,55**	**0,29**	**2,49**
31-50	**21,22**	**-14,18**	**-4,97**
>50	**-10,04**	**2494,14**	**-8,98**
Income<1000€	**-1,55**	**9,3**	**-11,6**
1000-2000€	**1,27**	-29,07	**8,15**
2001-4000€	37,97	**-7,89**	**-4,24**
>4000€	-546,72	-22,83	**-6,38**
Freq <2 weeks	**-4,96**	**-9,78**	**-6,48**
>2 weeks	**6,19**	-9,93	**0,83**
Dist <2h	**6,35**	**-7,81**	**5,47**
2-8h	**0,94**	**-14,18**	**-4,44**
>8h	**-7,04**	**51,66**	-28,33

WTP from non significant coefficients are printed bold.

Reference: Alt4 (offering soft sport alternatives)

The comparison of the sub samples from the NGO info within the attribute downhill alternatives without snow shows that those who

- have the lowest income,
- are younger,
- come for the day,
- ski more often,

most prefer to visit a ski area offering downhill alternatives if there is no snow. The high income, the older ages, the overnight guests and those skiing less often rather visit a ski area that offers soft sport alternatives instead. The comparison with the control group shows some differences as in the low income bracket, but coefficients here are not significant.

Mountain coaster

Sub sample age

In the control group, WTP is similar around 25€ less for a resort offering technical alternatives compared to soft sport alternatives within all age classes. The NGO group shows strong decreases in all classes as this alternative had a negative recommendation. It is strongest in the mid age class, decreasing from 26.17€ less to 431.68€ less, resulting in a factor of sixteen (1600%, see table 35). Age class 50+ shows too strong effects in the consumer information group again.

Sub sample income

The NGO sample shows strongest effects on the WTP. The class above 4000€ decreases its WTP from 92.42€ less to 1439.72€ less (a factor of fifteen or 1500%). The class below 1000€ decreases from 27.05€ less to 192.88€ less.

The highest and the lowest income classes are again the two classes with the lowest WTP (see table 35).

Sub sample frequency of skiing

For those skiing less than two weeks a year the WTP is lower for this alternative, its effects being strongest in the consumer group with a decrease from 28.98€ less to 166.53€ less for those skiing not more than two weeks. The NGO info is still resulting in a decrease to 148.27€ less with those skiing less than two weeks (see table 35).

Sub sample distance

The information treatments again result in strong decreases of the WTP in a similar range of about factor four, the NGO info being most effective (see table 35).

Table 35 WTP to visit a ski area offering a roller coaster as alternative (by individual characteristics and information treatment in € compared to soft alternatives).

Mountain coaster	NGO (€)	Consumer (€)	Control (€)
Age<31	-70,12	-55,07	-21,86
31-50	-431,68	-83,72	-26,17
>50	-56,73	15582,18	-25,69
Income<1000€	-192,88	-70,45	-27,05
1000-2000€	-63,68	-112,68	**-18,25**
2001-4000€	-184,42	-88,54	**-15,75**
>4000€	-1439,72	-65,38	-92,42
Freq <2 weeks	-148,27	-166,53	-28,98
>2 weeks	-89,59	-51,48	-19,73
Dist <2h	-126,08	-81,32	-30,25
2-8h	-110,9	-72,43	-16,48
>8h	-128,56	-1228,06	**-25,61**

WTP from non significant coefficients are printed bold.
Reference: Alt4 (offering soft sport alternatives)

The comparison of the sub samples from the NGO info within the attribute of *travel distance* shows that those who

- have the highest income,
- are younger,
- stay overnight,
- do not ski that often,

least prefer to visit an area where there is a mountain coaster on mountain in place. Rather, accepted in relation is a mountain coaster alternative by the older clients and those skiing more often. Still no group would pay more for this alternative.

Ski dome

Sub sample age

The mid age class has the lowest WTP affected by the NGO info of 263.42€ less for a ski dome as the alternative for not skiing outside. All WTP in all sub samples are negative, and some are not significant, generally showing little interest in ski dome offers which match the responses of skiers to ski domes in the standard questionnaire described in chapter one (see table 36). Age class 50+ shows too strong effects in the consumer information group again.

Table 36 WTP to visit a ski area offering a ski dome nearby (by individual characteristics and information treatment in € compared to soft alternatives).

Ski dome	NGO (€)	Consumer (€)	Control (€)
Age<31	**-16,08**	**-4,81**	**-12,93**
31-50	-263,42	-66,1	-26,73
>50	**5,65**	12085,62	-29,95
Income<1000€	**-27,35**	**-3,51**	**-24,56**
1000-2000€	**0,31**	-82,48	**11,85**
2001-4000€	-106,45	-57,57	**-20,63**
>4000€	**-599,98**	-46,02	-104,99
Freq <2 weeks	-48,83	-99,68	-27,41
>2 weeks	**-26,7**	-25,48	**-12,47**
Dist <2h	-81,39	-58,72	**-18,83**
2-8h	**3,61**	-30,69	**-11,13**
>8h	**33,56**	**98,04**	-65,54

WTP from non significant coefficients are printed bold.
Reference: Alt4 (offering soft sport alternatives)

The comparison of the sub samples from the NGO info within the attribute *ski dome* alternative shows that those who

- have the highest income,
- are younger,
- come for the day,
- do not ski that often,

least prefer to visit a ski area that offers a *ski dome* alternative if there is no snow.

A ski dome does find a positive WTP with overnight guests and older clients, although these are based on not significant coefficients.

Expansion

No expansion

The sub samples of a resort not expanding in general show an increase in WTP with the consumer and the NGO info from a mostly negative WTP in the control group to mostly positive ones. However, most coefficients are not significant, nor are differences in sub samples (see table 37).

Table 37 WTP to visit a ski area without expansion
(by individual characteristics and information treatment in € compared to combining two small areas to a bigger one).

No expansion	NGO (€)	Consumer (€)	Control (€)
Age<31	28,33	**3,91**	**-7,26**
31-50	**35,62**	18,06	**1,35**
>50	**-3,53**	**1468,63**	**-11,96**
Income<1000€	183,19	**-1,94**	**5,22**
1000-2000€	23,54	**18,52**	-11,27
2001-4000€	**-11,41**	**0,38**	**3,43**
>4000€	**-241,81**	28,6	**-8,67**
Freq <2 weeks	**11,45**	**18,68**	**0,32**
>2 weeks	18,36	**5,04**	**-8,9**
Dist <2h	**19,76**	**8,68**	**-8,03**
2-8h	**10,51**	**7,4**	**4,78**
>8h	**30,79**	**166,11**	-31,49

WTP from non significant coefficients are printed bold.
Reference: Expan4 (combination of two small areas)

The comparison of the sub samples from the NGO info within the attribute of *no expansion* shows that those most prefer to visit a ski area that does not expand who

- have the lowest income,
- are younger,
- stay overnight and
- ski more often.

It is interesting that the negative WTP of the control group (apart from the lowest income which already is positive) turns positive with the NGO info. But some of the coefficients, like the highest income, are not significant.

Higher elevations

Sub sample age

The generally lower WTP for a resort expanding in higher elevations decreases with the NGO info more than with the consumer info and is lowest in age class 31-50 years (see table 38). In the consumer info the effects of the 50 year old plus are too strong again.

Sub sample income

Strongest effects are reached by the NGO info as well as the highest and lowest income classes showing the lowest WTP (see table 38).

Sub sample frequency of skiing

Those skiing less show a lower WTP, which decreases with the NGO info more than with the consumer info (see table 38).

Sub sample distance

Those living closest have the lowest WTP, which decreases most with the NGO info.

The other coefficients are not significant (see table 38).

Table 38 WTP to visit a ski area expanding in higher elevations (by individual characteristics and information treatment in € compared to combining two small areas to a bigger one).

Expansion in higher elevations	NGO (€)	Consumer (€)	Control (€)
Age<31	**-19,32**	-15,78	-23,77
31-50	-185,16	-21,95	**-12,78**
>50	-41,27	9187,04	-26,78
Income<1000€	-183,66	**-19,48**	**-14,22**
1000-2000€	**-10,56**	-82,98	**-11,67**
2001-4000€	-72,31	**-21,77**	-29,43
>4000€	**-576,39**	**20,52**	**-11,94**
Freq <2 weeks	-89,52	-53,79	**-13,85**
>2 weeks	**-21,9**	-14,58	-24,77
Dist <2h	-86,45	-27,19	-35,88
2-8h	**-26,78**	**-13,48**	**5,33**
>8h	**2,71**	-742,48	-47,08

WTP from non significant coefficients are printed bold.

Reference: Expan4 (combination of two small areas)

The comparison of the sub samples from the NGO info within the attribute of *expansion in higher elevations* shows that those least prefer to visit an area expanding in higher elevations who

- have the highest income,
- are older,
- come for the day and
- ski more often.

The positive WTP of the overnight guest in the NGO group is based on non-significance.

Expansion on glaciers

Sub sample age

For a resort expanding on glaciers the NGO sample shows the strongest effects on the mid age group 31-50 years from 28.6€ less (control group) to 362.9€ less, followed by the youngest class with 74.21€ less from 14.52€ less and the oldest from 24.98€ less to 73.82€ less (see table 39). In the consumer info the effects of the 50 year old plus are too strong again.

Sub sample income

Effects are strongest with the NGO info, showing that the class above 4000€ has the lowest WTP of 1242.16€ less, from 2001-4000€ of 192.71€ less, followed by the lowest income with 172.35€ less (see table 39). In the consumer info the effects of the 50 year old plus are too strong again.

Sub sample frequency of skiing

The control sample shows a slightly lower WTP of those skiing less. Both info groups show strong effects with the NGO offering the most effective information. Those skiing less react the most on the info treatments, with differences of up to 600% less WTP relative to the control group (see table 39).

Sub sample distance

Again, the NGO info shows the strongest effects on the WTP with those living the closest to the mountains, the difference factor relative to the control group being close to 500% again (see table 39).

Table 39 WTP to visit a ski area expanding on glaciers (by individual characteristics and information in € compared to combining two small areas to a bigger one).

Glacier expansion	NGO (€)	Consumer (€)	Control (€)
Age<31	-74,21	-35,66	**-14,52**
31-50	-362,9	-58,33	-28,6
>50	-73,82	7313,83	-24,89
Income<1000€	-172,35	-46,46	**-26,09**
1000-2000€	-47,5	-70,28	**-11,23**
2001-4000€	-192,71	-62,53	-28,68
>4000€	-1242,16	**-7,55**	-57,56
Freq <2 weeks	-160,62	-108,86	-26,73
>2 weeks	-79,65	-24,88	-20,33
Dist <2h	-134,32	-59,41	-25,19
2-8h	-84,03	-27,5	-20,08
>8h	-157,86	**-129,02**	**-32,27**

WTP from non significant coefficients are printed bold.
Reference: Expan4 (combination of two small areas)

The comparison of the sub samples from the NGO info within the attribute of *glacier expansion* shows that those least prefer to ski in an area expanding on glaciers who

- have the highest income,
- are younger,
- stay overnight and
- do not ski that often.

The age differences are very low. The effect of the NGO info is very high with those skiing seldom, overnight guests and income.

Snow guarantee

Sub sample age

The mid age group is paying the most for each additional snow day, the oldest age group the least. With the NGO info the strongest effects can be found in the mid age group again, the difference factor being almost 400% relative to the control group. Additional snow days were not recommended from an environmental perspective, but the WTP increases throughout. The oldest age group shows the only decrease from 18.24€ to 15.72€ (see table 40). In the consumer info the effects of the 50 year old plus are too strong again.

Sub sample income

The highest income has the highest WTP, the lowest the second highest. The NGO information impact is strongest in the highest income (about factor 4 relative to the control group) to 443.48€, second in the lowest class to 128.03€.

It seems to be amazing that the lowest income class is willing to pay the second highest amount for additional snow days. In class 1000-2000€ the NGO info is very low in results; the consumer info is a bit stronger (see table 40).

Sub sample frequency of skiing

Here both sub samples show about the same WTP in the control sample. Those skiing less than two weeks react most to additional information with a 200% in the NGO group relative to the control group (see table 40).

Table 40 WTP for additional days with snow guarantee (by individual characteristics and information treatment in €)

Snow guarantee	NGO (€)	Consumer (€)	Control (€)
Age<31	44,77	23,69	35,69
31-50	151,44	35,48	37,7
>50	15,72	-1642,98	18,24
Income<1000€	128,03	24,08	39,29
1000-2000€	24,78	36,91	20,21
2001-4000€	76,39	35,48	33,63
>4000€	443,48	24,34	52,65
Freq <2 weeks	61,21	49,79	31,34
>2 weeks	37,97	22,45	31,64
Dist <2h	56,42	27,67	38,44
2-8h	51,33	32,17	24,33
>8h	16,72	237,57	27,44

WTP from non significant coefficients are printed bold.

WTP describing the amount in € to be paied more for each additional unit of snow (= one day/week).

The comparison of the sub samples from the NGO info within the attribute of snow guarantee shows that those demand snow guarantee the most who

- have the highest income,
- are younger,
- come for the day and
- do not ski that often.

The older clients, the overnight guests and those skiing more often put less importance on snow guarantee, although all samples show a positive WTP for more snow guarantee.

Flexibility of ski passes

Sub sample age

The oldest age group is most flexible (from an employment and time perspective) but shows the lowest WTP for flexibility of ski passes. The mid age has the highest WTP of 44.92€ which even increases with the NGO info to 215.49€. The age class below 31 increases its WTP by 150% relative to the control group, while the age class above 50 only slightly increases. With the consumer info we sometimes see a reverse effect compared to the NGO info (see table 41). In the consumer info the effects of the 50 year old plus are too strong again.

Sub sample income

The NGO info is most effective in the highest income class who also show the highest WTP for a flexible ski pass, followed again by the lowest income and the class 2001-4000€ (see table 41).

Table 41 WTP for a fully transferrable ski pass
(by individual characteristics and information treatment in € compared to a non-transferrable one).

Flexibility of ski passes	NGO (€)	Consumer (€)	Control (€)
Age<31	58,66	27,32	36,48
31-50	215,49	57,04	44,92
>50	28,63	-6049,85	24,75
Income<1000€	173,45	18,01	**11,45**
1000-2000€	27,89	68,78	35,84
2001-4000€	103,64	48,77	49,02
>4000€	443,9	49,6	52,78
Freq <2 weeks	97,68	76,21	38,27
>2 weeks	46,13	33,75	36,44
Dist <2h	76,38	42,83	42,53
2-8h	81,88	46,81	32,14
>8h	**5,72**	434,2	44,31

WTP from non significant coefficients are printed bold.
Reference: Non-transferrable ski pass.

Sub sample frequency of skiing

Both sub samples have almost the same WTP, which changes with the most effective NGO info: the strongest effects can be found with those skiing less often (from 38.27€ to 97.68€) (see table 41).

Sub sample distance

The WTP is lowest of those living from two to eight hours apart, but the effects of the NGO info lead to a change from 32.14€ to 81.88€ (see table 41).

The comparison of the sub samples from the NGO info within the attribute of flexible ski pass shows that those most prefer a flexible ski pass who

- have the highest income,
- are younger,
- come for the day and
- do not ski that often.

The overnight guests show a higher WTP in the control group than in the NGO info.

Grooming

Most coefficients in *grooming* are not significant, so most differences are not significant either. In the sub sample frequency of skiing, those who ski less often show a WTP of 11.11€ for 100% grooming, increasing to 40.61€ in the NGO sample.

The opposite was recommended. Ski areas with less energy use for grooming from an environmental perspective should be chosen (see table 42).

Table 42 WTP for 100% grooming of ski runs
(by individual characteristics and information treatment in € compared to 50%).

Grooming all	NGO (€)	Consumer (€)	Control (€)
Age<31	**5,31**	**8,39**	13,7
31-50	**41,7**	**-4,09**	**4,33**
>50	24,1	**-2805,56**	**-5,63**
Income<1000€	**-10,31**	**3,9**	**9,31**
1000-2000€	**-2,05**	**-5,49**	**5,68**
2001-4000€	34,53	**13,19**	**1,76**
>4000€	**382,38**	**-1,15**	**16,37**
Freq <2 weeks	40,61	27,81	11,11
>2 weeks	**2,37**	**-3,85**	**0,37**
Dist <2h	**9,56**	**3,7**	-13,06
2-8h	**20,02**	**5,98**	24,13
>8h	47,11	**207,05**	30,08

WTP from non significant coefficients are printed bold.
Reference: 50% of pistes grommed.

The comparison of the sub samples from the NGO info within the attribute of *grooming* all show that those most prefer to ski in a ski area that offers 100% grooming of all runs who

- have the highest income,
- are older,
- stay overnight and
- do not ski that often.

The control group shows some differences, but most coefficients are not significant so we do not further describe it here. The NGO info attributes of overnight guest, skiing often, and oldest age are significant, though.

The null hypothesis corresponding to H_6 – no differences in effects of the information treatments on WTP of sub samples – can be rejected. The null hypothesis corresponding to H_5 – no differences in effects of the info treatments on WTP of single attributes and no differences, especially in the environmental indicator attributes – can be rejected.

5.2.6.6. Visualization of WTP by sub samples with NGO information

The NGO info has the most amplification of the WTP in the pooled results and in the sub samples. We now take a closer look at the NGO effected WTP split by the same sub samples and visualize the differences.

Figure 53 summarizes the WTP for the levels of the attributes by sub samples with NGO information. The graphs can be interpreted that the WTP and thus the importance of an attribute are higher the more the curves move toward the outside of the circles and lower the closer the curves move toward the center of the circles.

In the attributes *size* and *travel distance*, the interpretation is more difficult. The lower the WTP for each hour to drive, the more important a shorter distance is. The lower the WTP for the size, the more important a bigger ski area is. These differences are based in the way the WTP question was asked in the survey (negative figures show increased WTP).

It is important that we interpret these graphics only by relativity in differences within each attribute. There are no absolute results to be taken from these relative comparisons.

The highest income class shows the strongest differences in the WTP with NGO information in all attributes compared to the other sub samples, and thus is the most affected by the information (figure 53).

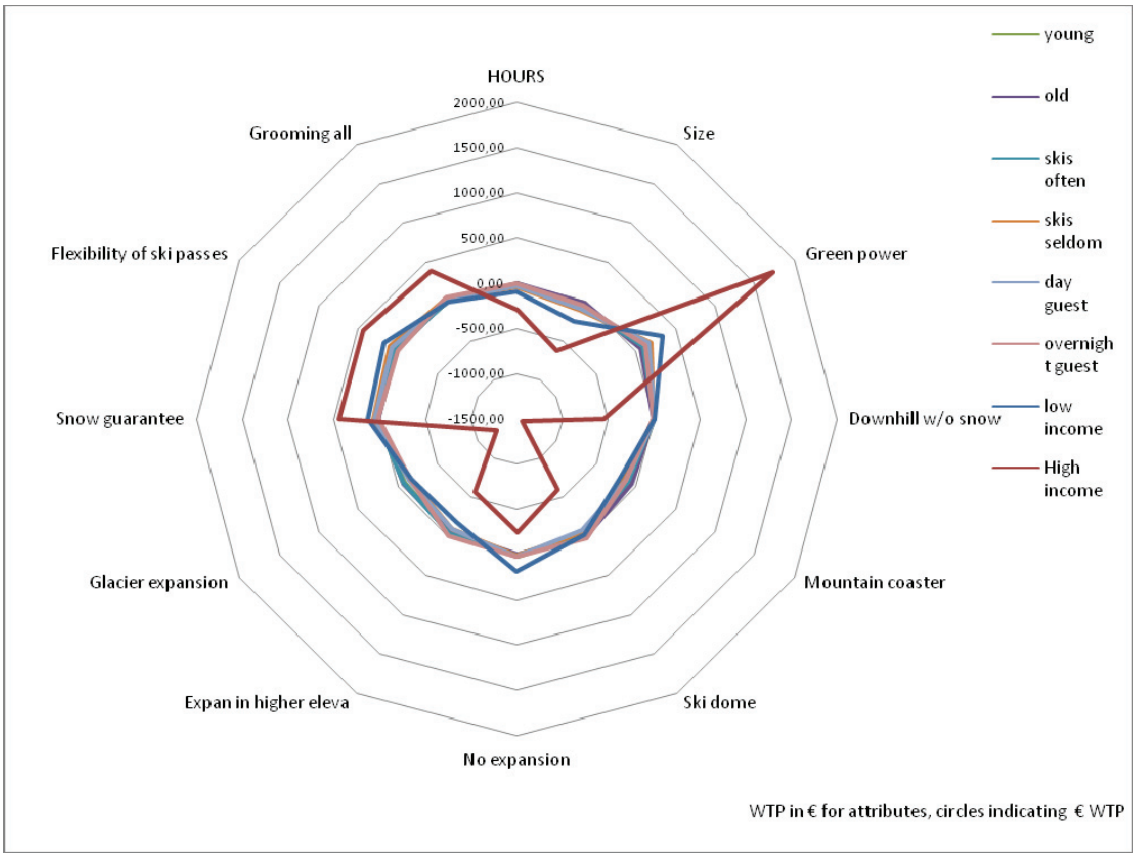

Figure 53 Importance of attributes on the basis of the WTP
(in € per unit for all attributes with NGO info, separated by all sub samples).

The differences are highest in the environmental attributes with a higher importance of *green power*, of *no mountain coasters* and *no glacier expansion* compared to the other sub samples. These three attributes are the most interesting ones in this class, showing how strongly the NGO info affects the highest income class in their valuation of environmental factors compared to the other sub samples. The differences in WTP are so high that in this figure 53 we cannot visualize the differences between the others, which appear to only show little differences in this scale. The differences in the attribute *grooming* are not significant in most sub samples; thus, we take no further look at it for now.

If we eliminate the highest income classes in this comparison, then we can see in figure 54 with a higher resolution that the general shape of all sub samples' WTP is similar, but there are higher differences in the WTP of the lowest income group compared to the others. These differences are similar to the ones of the high income but on a much lower scale.

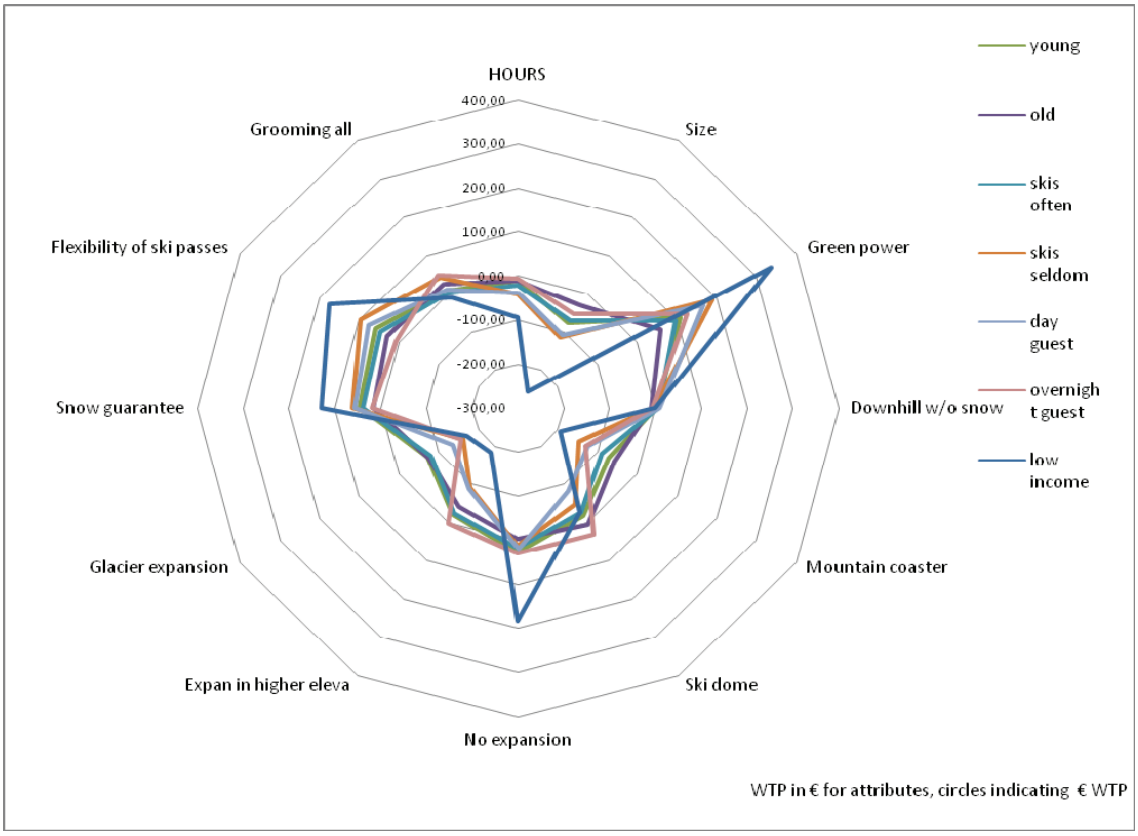

Figure 54 Importance of attributes on the basis of the WTP without highest income (in € per unit for all attributes with NGO info, separated by sub samples with the highest income eliminated).

By now eliminating the lowest income we can take a closer look at the remaining sub samples in a higher resolution (figure 55). Again, the shape of the profiles is very similar also compared to the income sub samples but with lower differences. The environmental attributes show the highest differences, which confirm the general affects of the NGO info we already saw in the pooled results (figure 52). In snow guarantee, distance, alternative downhill choices and the importance of current expansion, all sub samples are more or less equal.

Comparing the sub samples in figure 55 we see that those who ski seldom are most affected by the NGO info showing the highest differences.

If we compare the sub samples within the same sub topic, we see that those who ski seldom are more affected than those skiing often. Environmental attributes are more important for those skiing seldom as is the flexibility. The size and the distance are more important for those who ski more often.

For young skiers green power is more important than for old skiers, as well as flexibility, snow guarantee and size. The older skiers are more interested in *grooming* which confirms their demand shown in chapter 5.1. Young skiers are more affected by the NGO info than the oldest.

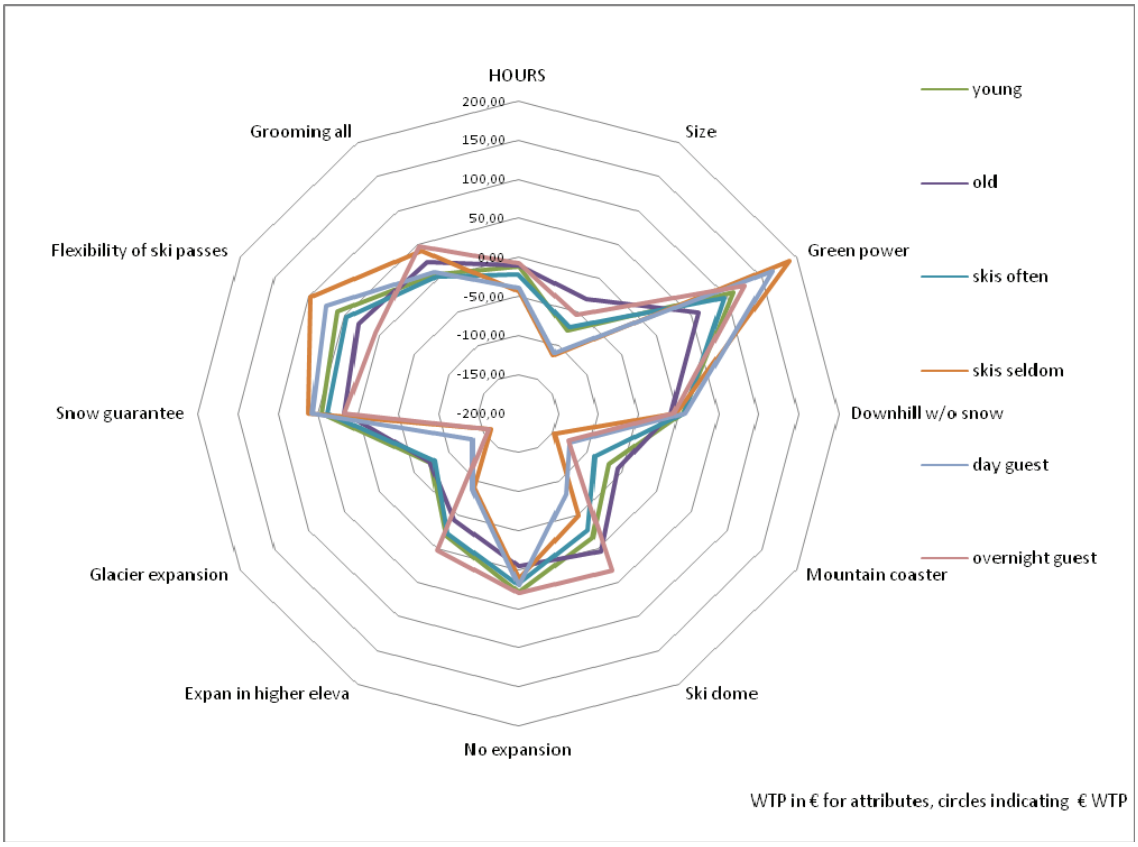

Figure 55 Importance of attributes on the basis of the WTP without lowest income (in € per unit for all attributes with NGO info, separated by sub samples with the highest and lowest income eliminated).

5.2.6.7. Comparison of the length of stay with NGO information

The differences in consumer behavior between the day guest and the overnight guest are most important for a ski destination as we discussed in chapter four. In figure 56 we take a closer look on these two sub samples. Again we can see the strong effects of the NGO information compared to the control group that are especially high in the environmental attributes. The day guest and the overnight guest in the control groups are fairly equal in their general demand profile, but the day guest is relatively more interested in green power, in bigger ski areas, closer distance, in more snow guarantee, in a ski dome and in no expansion.

With the NGO information differences are apparent in the attributes *ski dome* and *no expansion*. The day guest now is much more interested in snow guarantee, a flexible ski pass, size, but there is little difference in the mountain coaster and downhill alternatives, the first one being an environmental indicator attribute.

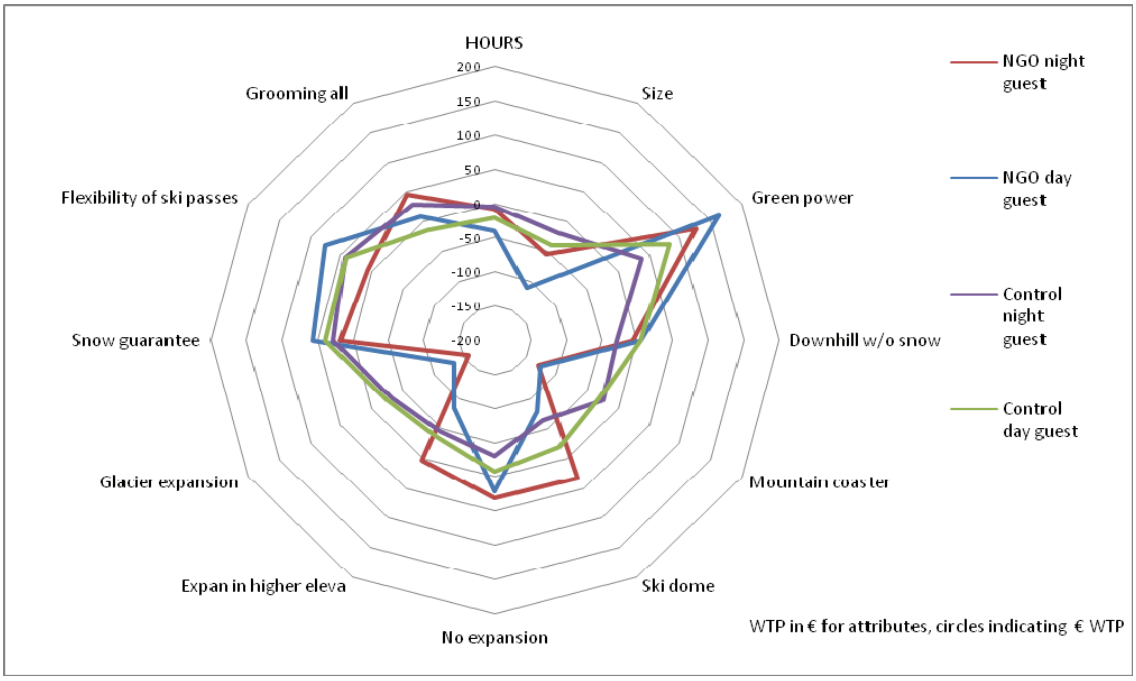

Figure 56 Importance of attributes on the basis of the WTP comparing NGO and control (in € per unit for all attributes, separated by day guests and overnight guests and comparing the NGO group with the control group).

The overnight guest now is more interested in a ski dome, no expansion and expanding to higher elevations, but less interested in glacier expansion, snow guarantee, flexibility of the ski pass and distance.

In general, the day guest is more affected by the NGO info than the overnight guest who rather accepts a smaller ski area, less snow guarantee and a less flexible ski pass. The day guest is more demanding.

The day guest, being divided from an overnight guest in general by his living distance from the ski hill, of course can book a vacation with overnight stays, thus turning into an overnight guest with similar preferences and WTP.

5.2.6.8. Summary of results

We first summarize general results of the choice experiment, then we summarize attribute-based results, and finally we present the essential results of the socio-economic sub samples.

In general, an information treatment affects the choice behavior of skiers significantly. A maximum of 28.53% of the ski tourists follows a consumer rating and choose accordingly. A maximum of 25.77% follows a NGO recommendation, choosing accordingly. We conclude that the market share of German ski tourists adapting their choice behavior to prefer more sustainable ski area services is a maximum of 28.53% if provided with directed information and a direct recommendation of what is more or less sustainable. Disapproval is

more successful if given by the consumer information; a recommendation is more successful if provided by the NGO.

General results of the estimates of WTP

- A NGO or consumer info results in significant changes in WTP with rises of up to a factor of thirty-one (up to 3100%) in some sub samples compared with the control group. In average, most effects are around factor two to six (200-600%).
- Info treatment one, a recommendation of an environmental foundation or NGO, is more effective than info treatment two, a customer or consumer rating. There is an increased (positive or negative) WTP in the NGO sample in all attributes.
- The trend of either a positive or a negative WTP in the control group is amplified between factor two and six with the NGO info in all attributes. The consumer group in most attributes shows a trend like the NGO group, but with only about 50% of the effect. Only in the attribute *ski dome* the effect of the consumer info is higher than that of the NGO info.

Attributes based results

- Strongest effects of the NGO info can be found in the attributes *green power*, *mountain coaster* and *glacier expansion* we refer to as environmental indicator attributes. With the NGO info, the WTP skiing in a resort that offers a mountain coaster as an alternative decreases by factor 4.7. In the sub samples we find an increase of factor fifteen (highest income class) and factor sixteen in the mid age class.
- The WTP to ski in a resort that expands on glaciers decreases by factor 4.6, in the sub sample highest income even by factor 21.
- The attribute of *green power* shows an increased WTP by factor 2.3 with the NGO info in the pooled results. The sub sample highest income shows an increase by factor 31 (3100%).
- A comparable effect of the NGO and consumer info like in green power, mountain coaster and glacier expansion can be found in the attributes *flexibility of ski passes*, *travel distance* (*hours*), *size*, *ski dome*, *expansion in higher elevations* and *snow guarantee*. All the coefficients are significant.
- *No expansion*, *downhill* and *grooming* each show two non-significant estimations in the pooled results.

Relative hierarchical order

An absolute hierarchy in the order of attributes cannot be expressed because of the differences in the units chosen for each level. Also, some WTP are negative and some are positive, depending on the kind of level chosen.

Instead, we can express a relative ranking of attributes between the NGO and the consumer info compared to the control group (see figure 57). The ranking is calculated by the relative differences in the WTP from the pooled results (see table 28).

We examine a change in the order of the environmental indicator attributes of *mountain coaster* and *glacier expansion*. The mountain coaster is increased from sixth position in the control group to first in the consumer group and second in the NGO group. The *glacier expansion* is changed from fifth in the control position to fourth in the consumer position and third in the NGO position. Green power remains first or second in the consumer info. With the NGO info, *travel distance* became less important, as well as the flexibility of the ski pass and, most interestingly, the snow guarantee that decreases from fourth to seventh position in the consumer and NGO groups.

There are little or no changes in *downhill*, *grooming* and *no expansion* (see figure 57).

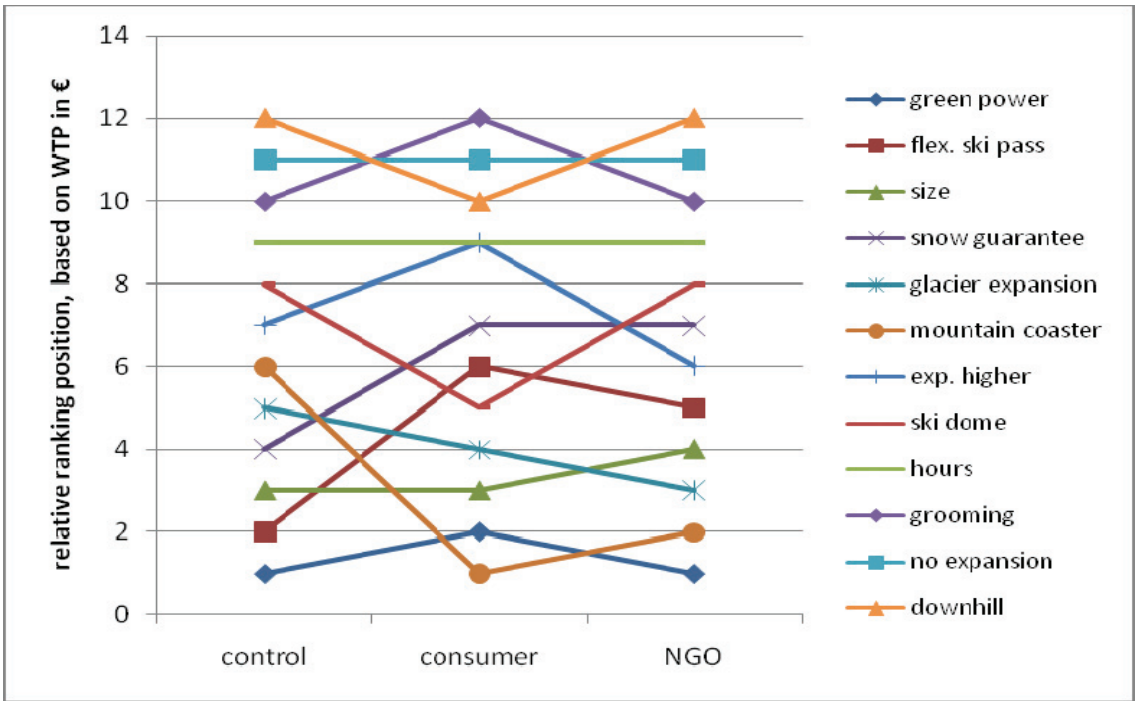

Figure 57 Relative changes in ranking of attributes by NGO and consumer info (compared to the control group).

The main changes in the WTP ranking originate in the increased importance of the environmental indicator attributes *mountain coaster* installation on the mountain and ski area *expansion on glaciers* in both consumer and NGO groups, as well as in a decreased importance of *snow guarantee* and *flexibility in ski passes* in both groups always compared to the control group.

Customers who are more interested in environmental issues are then less interested in *snow guarantee* and *flexibility of ski passes*.

Differences by sub samples

Seeing the sub samples by age, income, distance and frequency of skiing, one can summarize that the preferences of the control group show comparable patterns to the consumer and the NGO groups. With consumer or NGO info the relative differences within the sub samples become much stronger, the NGO info being the most effective information. We thus see an amplification of the WTP in all sub samples, with some in general reacting more than others:

- In general, the youngest and the mid age class are most affected by info treatments, just as the highest income classes, those who ski rather seldom and the day guests are.

With the most effective NGO info, the WTP indicates the following preferences:

- The distance to travel to a ski area is most important for the mid and young age class, for the highest income class, for those who ski seldom and for the day skiers.
- The size of a ski area (preferring a big ski area) matters most to the younger and mid age classes, to the highest and lowest income classes, to those skiing less often and to the day skiers.
- An area with green power is most important to the youngest age class, the highest income class, to those who ski less often and to the day skiers.
- In the attributes of the alternatives only the mountain coaster as a technical installation shows significant differences in all sub samples. The mid and young age classes show the least WTP as it does the highest income class, those who ski seldom and the overnight guests. Technical installations on mountain and ski domes in the vicinity of ski destinations are not favored or accepted.
- In the attributes of *expansions* the most interesting and significant differences can be found in *glacier expansion*. The younger and the mid age group show the lowest WTP as it does the highest income class, those who ski less often and the overnight guests. The overnight guests are more affected here than the day guests.

- *Snow guarantee* is most important for the young and mid age class, the highest and lowest income class and for the day skiers. In skiing frequency, there is an equal importance in the control group. With the NGO info, there is a much higher importance for those skiing less often. Older overnight guests who ski often show the least demand for *snow guarantee*.
- The *flexibility of a ski pass* is most important to the young and mid age class, the highest income, those who ski less often and to the day skiers.
- The *grooming* attribute shows mainly non-significant differences between the sub samples. The older age class, though, most prefers to ski on 100% groomed runs with significant coefficients (appendix C).

If we match some sub sample profiles we find that

- those who are young and those who ski often have very similar interests.
- The day guest who skis seldom

  - wants the biggest ski area,
  - wants to ski in the closest ski area,
  - demands the highest snow guarantee and
  - is most interested into green power.

- The older overnight guest

  - demands the least snow guarantee,
  - does not need to be so flexible and
  - prefers to ski in a smaller ski area.

- Those who ski often, young and old, want to ski on glaciers, even if they get newly developed.
- Those who ski seldom, day guests and overnight guests,

  - do not want to ski on glaciers that are newly developed and
  - are least interested in mountain coasters.

Target groups of special interest

Some sub sample groups are of special interest and are understood as focus groups:

1. Those who react most to the info treatments:

   - The highest income class who skis seldom, who comes for the day or stays overnight is most affected by the information.

2. Those who show most or least demand for snow guarantee and flexibility:

    - The day skiers who ski seldom are the most demanding clients, regardless of income.
    - The overnight guests in a higher age are the least demanding clients.

3. Those becoming relatively more in numbers due to demographic and socio-economic developments:

    - The oldest age class sub sample because of demographic changes; there will be more elderly people in the future.
    - The highest and lowest income classes because of socio-economic changes, leading to an increase in the number of higher and lower income classes in the future.
    - Those who ski less often because of a climate change scenario reaction; about two thirds of the skiers will ski less often or even stop skiing (see chapter one).
    - The day skier client: the demand and behavior of the overnight guest in terms of spontaneity is already changing more toward a day skier (see also chapter three).

Visualization of the sub samples by key differences under NGO influence

The demand profiles of the eight different sub samples as influenced by the NGO info can be visualized focusing on three main aspects:

- the demand for snow guarantee and the flexibility to do alternatives (figures 58-61),
- the responsiveness to green marketing (figures 58-61),
- the future importance of that consumer group relative to today (figures 58-60).

For the visualizations in figures 58-61, three of the four attribute sub samples had to be expressed by selected levels, because these three attributes had more than two levels each. The high income is expressed by the WTP of those with >4000€ income per month, the low income by <1000€ per month. Old skiers are the ones older than 50 years, the young skiers are the group younger than 31 years. Day guests are the ones living less than two hours from the next ski hill, overnight guests are averaged by WTP of those living 2-8h and >8 hours from the next ski area. The frequency of skiing is kept in the original two levels of less than two weeks and more than two weeks per season.

Figure 58 shows the NGO sub samples by their demand for snow guarantee and their flexibility on the x-axis. The demand for snow guarantee is displayed

along with the flexibility of the customer to do alternative activities if there were no snow, based on WTP differences between the control group and the NGO group for the attribute of snow guarantee. The higher the demand for snow guarantee, the lower is the acceptability of doing alternative activities if there were no snow.

Furthermore, figure 58 shows consumers' responsiveness to green marketing on the y-axis. The responsiveness to green marketing is a relative measure of the WTP differences in selected attributes between the control and the NGO group. The attributes of *green power*, *mountain coaster* and *glacier expansion* have been selected as indicators for environmental marketing responsiveness. The higher the value of € WTP, the higher the reactions to marketing. The WTP for the responsiveness to green marketing is calculated as the average of differences between the WTP of the control group and the NGO group, for the three environmental indicator attributes *green power*, *glacier expansion* and *mountain coaster* alternative. Snow demand and responsiveness are based on the same method of calculation for the figures 58-61.

The size of the bubbles in figure 58-60 shows the relative market importance of the sample groups in the future, taking demographic and socio-economic developments into account. Here we base the size on a relative scale with a high importance (and thus a bigger bubble) chosen for the higher incomes (not only from a socio-economic perspective, but also because skiing as such tends to become more expensive), for the elderly (demographic developments) and for the day guests. Even if there will be fewer day guests in the future, the overnight guest already is showing a more spontaneous demand and activity decision behavior that more so corresponds to a day guest profile (see also chapter four). A mid-size is chosen for the lower incomes, the younger and those skiing seldom – all relative to today's growing market shares but of lower importance than the three first named (Lohmann, 2007).

Those skiing often and overnight guests are seen as rather less important in the future, taking their numbers relative to the other shares and their behavior into account. As said before, the booking and selecting behavior of the overnight guests is more tending toward that of day guests.

Figure 58 shows the highest demand with the lowest flexibility and also the highest responsiveness to green marketing by the high income group relative to the other sub samples. This high income group is of future growing importance. Even the lowest income, which also is a growing group of mid importance in the future, shows a very high demand for snow guarantee. The scale in this figure is too small and differences in WTP coefficients are too varied to clearly see the differences in all sub samples in one graphic without eliminating the highest income group in the next graphic (figure 59).

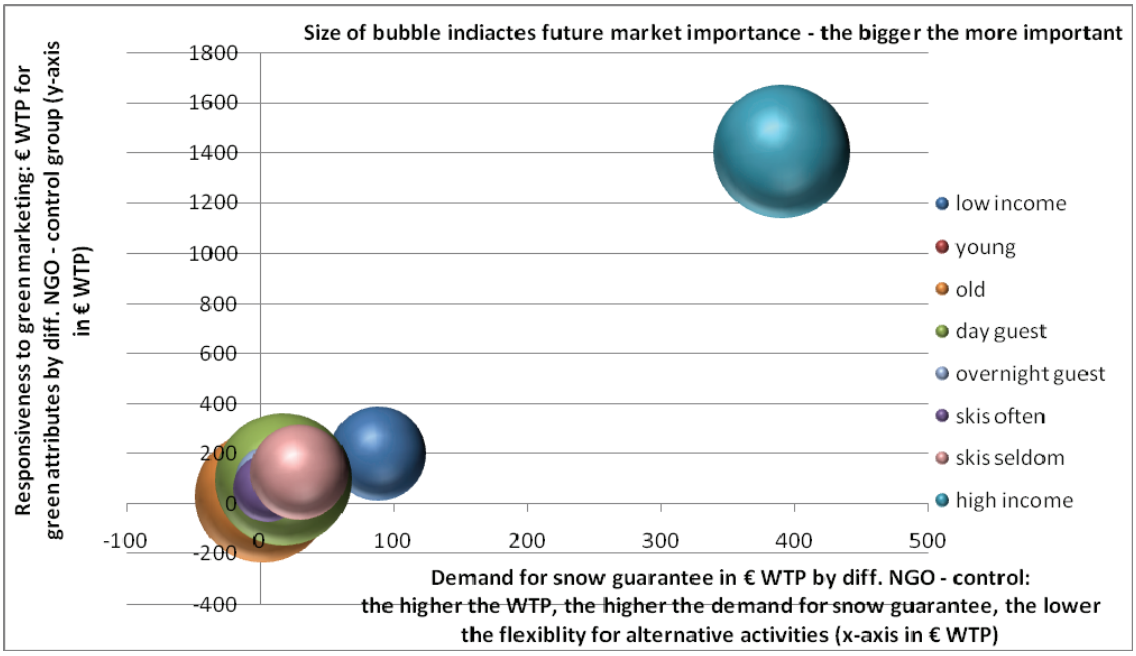

Figure 58 NGO info sub samples comparison by demand for snow guarantee and flexibility (based on € WTP)

In figure 59 we eliminate the highest income and get a better idea of the strong demand and the strong responsiveness to marketing of the lower income. We explain the high demand of the lower income with the potential high part of well educated students in this group.

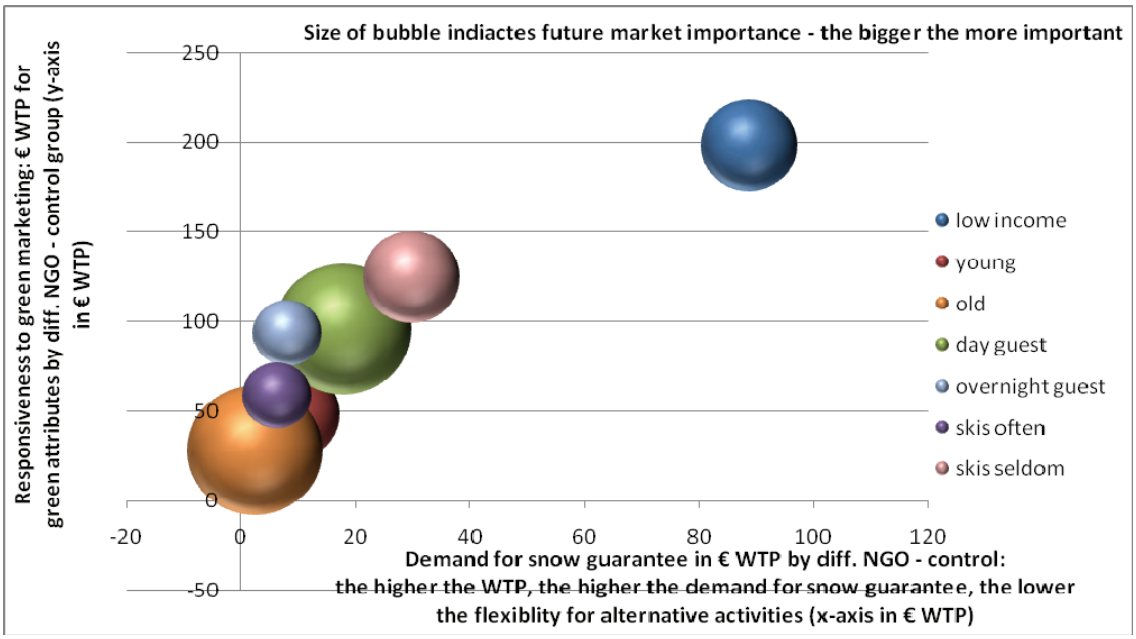

Figure 59 NGO info sub samples comparison without the highest income (by demand for snow guarantee and flexibility, based on € WTP).

If we eliminate the lowest income too, then we can more easily compare the other sub samples as shown in figure 60 with a smaler scale. Those who ski

seldom and day guests are most demanding and less flexible as well as most responsive to green marketing. The day guests are of high future importance, those who ski seldom a bit less important. The overnight guests are reponsive too, but much less demanding than the day guests – although of decreasing importance in the future due to their changing behavior that tends more towards that of day guests. The youngest are of medium importance seeing the devleopment of their numbers (Lohmann, 2007), and are more demanding than the oldest, as well as more responsive. The oldest guests are those least responsive and least demanding, still of growing future importance.

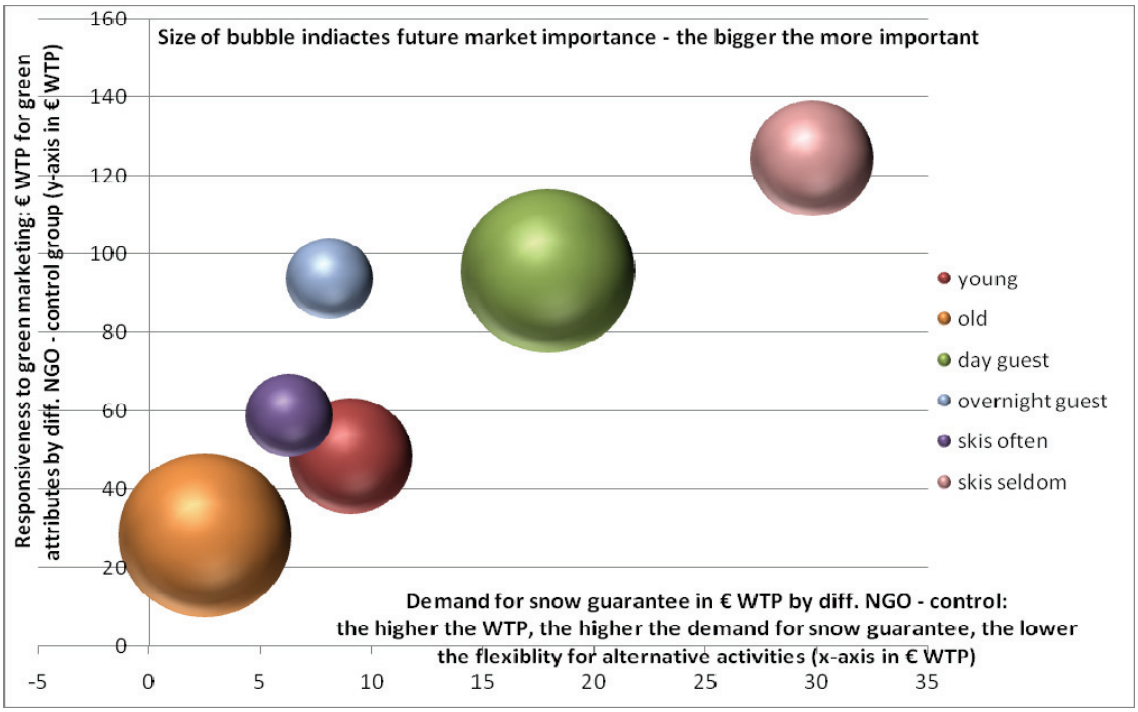

Figure 60 NGO info sub samples comparison without the lowest and the highest income (by demand for snow guarantee and flexibility, based on € WTP).

In the visualization of the sub samples in figures 58-60 we so far showed WTP and information effects for single attributes together with the future importance of that group, indicated by the size of the bubbles. In order to visualize complete consumer profiles in their demand for snow guarantee and their responsiveness for green marketing, we now couple the four attributes of income, age, length of stay (based on the distance to drive to the ski area) and frequency of skiing, as described for figures 58-60, thereby dropping different sizes of the bubbles with future importance of the groups. The coupled attributes show ten consumer profiles based on NGO information and € WTP abbreviated by four letters (figure 61). Each letter stands for one of two levels of the four attributes as explained in table 43.

Table 43 Explanation of abbreviated complete consumer profiles as shown in figure 61

Abbreviation	Income	Age	Time of stay	Frequency of skiing	Responsive-ness to green marketing in € WTP	Snow demand in € WTP
hods	high income	old	day guest	skis seldom	412,65	110,30
hodo	high income	old	day guest	skis often	396,22	104,42
hoos	high income	old	overnight	skis seldom	412,19	107,84
hooo	high income	old	overnight	skis often	395,76	101,96
hyds	high income	young	day guest	skis seldom	417,71	111,94
lods	low income	old	day guest	skis seldom	111,50	34,78
lydo	low income	young	day guest	skis often	100,13	30,53
lyos	low income	young	overnight guest	skis seldom	116,10	33,96
lyoo	low income	young	overnight guest	skis often	99,67	28,07
looo	low income	old	overnight	skis often	94,61	26,43

The consumers with low incomes (lydo, lyoo, lyos, lods, looo) generally have a lower demand for snow guarantee and a higher acceptance of alternative activities with WTP of about 30€ compared to about 100€ (for each additional day of guaranteed snow) of the high incomes. In table 43 the exact € WTP are listed. The responsiveness to green marketing of the low income groups is similar, around 100€ for more environmental performance of the ski area if communicated. The high income groups (hods, hooo, hodo, hoos, hyds) all have a similar WTP for snow guarantee around 100€ and a responsiveness to green marketing expressed in about 400€ for more environmental performance. The coupled consumer profiles of figure 61 clearly indicate the importance of the income for the general preferences of the consumers in terms of WTP. Differences within the low incomes are that the oldest overnight guests who ski often (looo) are the least demanding clients, the old day skiers who ski seldom (lods) are the most demanding and responsive consumers. In the high incomes, the young day skiers who ski seldom (hyds) are the most demanding and most responsive clients, the old overnight guest who ski often (hooo) the least demanding and responsive ones. These comparisons show how important the income is as a describing socio-economic factor for consumer behavior.

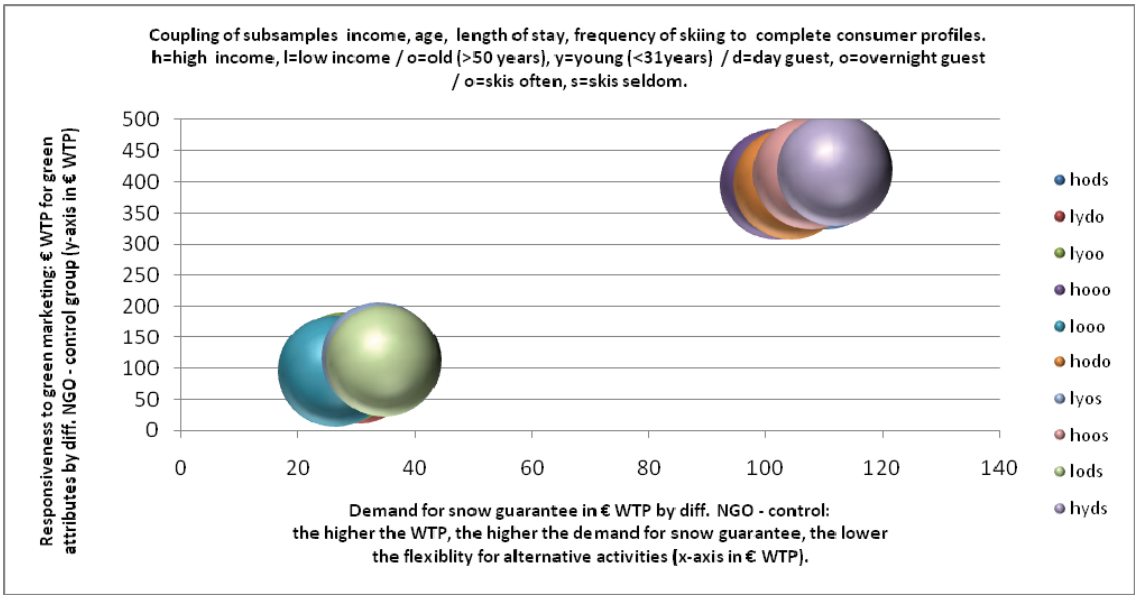

Figure 61 Coupling of sub samples income, age, length of stay, frequency of skiing to complete consumer profiles
(with NGO info, based on € WTP)

Summing up these special interest groups we find that:

- **A ski area that is capable of offering snow guarantee and that wants to market sustainability can target any of the discussed consumers. It surely best addresses the high incomes with the highest WTP and responsiveness for green marketing.**
- **A ski area that is not capable of or willing to offering snow guarantee and that wants to market sustainability best addresses the low incomes, or the high incomes with the lowest demand for snow guarantee such as the old overnight guests who ski often.**

All these results are representing the Germanic speaking market.

5.2.7. Discussion of choice experiment results

5.2.7.1. Differences in NGO-consumer effects

In chapter 5.1 we described the differences in effects of the NGO and the consumer information on choices. From the differences in total numbers of choices made per option in each choice set and differentiated by treatment, we hypothesized that with NGO or consumer information, the attributes *snow* and *price* were not the most important ones affecting consumer choices. Instead, the *distance to travel* (in hours) and the attribute of *green energy* seemed to show higher effects on choices.

The WTP results by single attributes underlined the constantly high importance of *time to travel* and the growing importance of the attributes *green power*, *mountain coaster* and *expansion on glaciers* with information treatment,

especially within the NGO group. *Snow guarantee* decreases in importance by WTP with consumer and NGO information, confirming the observations from the frequency of choices made.

Regarding the effectiveness of the treatments, observations from the frequency of agreements to the different treatments showed that the NGO was more effective in recommendations, the consumer information more effective in disapprovals. WTP calculations confirmed the higher effects of the NGO information throughout the kind of treatments and attributes, with exception to the attribute *alternatives* and the level *ski dome* that showed higher WTP effects than in the NGO group.

5.2.7.2. Significance tests of treatment differences

The Chi-square tests of the differences in treatment effects on choices revealed significant differences between the average of all three treatments NGO, consumer and control in 18 out of 42 choice sets involving recommended or disapproved options, which are about 43%. By testing the differences between only two treatments three times, NGO-control, consumer-control and NGO-consumer, there probably would have been more choice sets with significant differences. However, we intended to calculate as few tests with the same sample as possible and thus decided to stick with the Chi-square tests for the three treatments. In fact, the 18 significant choice sets were those in which the frequency of chosen options was most strongly affected.

5.2.7.3. Effects of the kind of treatments

The kind of information treatment is understood as whether a recommendation was given in a positive or negative way by disapproving both given ski areas and thus recommending choosing the *none* option. The third kind, neutral information, did not provide a recommendation either way, but stated that there was no more knowledge available. With our underlying research structure we could not further calculate effects of the kind of treatments on choices, whether a recommendation or disapproval was more effective to influence consumer behavior.

The reason is that we cannot compare the choice sets with each other because every set of ski area options is different. Each same set was tested with three information treatments NGO, consumer and control, but each either had a recommendation, a denial or neutral information. For a direct comparison, each set had to be tested with both a recommendation and a denial which had not made sense due to the selected attributes and the definition of excluding and recommending levels. Another research plan could be subject of future work in this topic.

5.2.7.4. Attributes selection

The definition and the selection of attributes and their describing levels accounts for a major part of the results of the choice experiment because the attributes define the choice options. The levels of the *price* attribute were chosen to start with prices as they were offered at the time of this study and to extend over the limit of the next big step expected by the ropeways companies of 50 € in some years by normal inflation price increments, reflecting the development in income classes. Levels for alternatives reflected current adaptation practices.

Of course, by looking at the whole system of a mountain experience, such attributes as food and lodging would have been of high interest too. Our focus, though, was on the ropeways companies and we did not want to design the experiment to be even more complex with further attributes. The selection of so-called environmental indicator attributes both from a negative view as excluding levels and from a positive view as recommending levels proved to be right because of the strong effects of consumer behavior and treatments in these attributes.

Interestingly, the attribute of *green power* remains important in all treatment groups, meaning that it was of high importance for the control group too. This effect could be due to the general public awareness and the media coverage on energies from renewable resources as a main problem of society, again underlining the importance of media and the public discussion on the individual.

Green energy, from a strict environmental perspective, is not necessarily as green in its effects as often discussed. Buying green energy does not directly reduce CO_2 emissions but alters the distribution of energies in the European energy mixture. If a company in a country with a low percentage of green energy buys more of it, then it often happens to originate in other countries with a higher ratio of renewable energy production. Because of the European electricity grid, the source market of the energy has to fill the gap in its own supplies with conventional energy mixtures from the buying country. Closing conventional power plants and opening new alternative ones nearer to the consuming market of electricity would have higher greening effects (Assendorpf, 2008). Still, the current practice is a first step, building up demand and a market. Our results show well that it builds capacity and awareness in this so important topic of managing limited resources in a sustainable way. As an environmental indicator attribute, it works well because people are aware of it, and it is somehow understandable and directly related to daily life.

5.2.7.5. Treatment allocation

The definition of excluding attributes leads to a higher number of disapprovals than recommendations, as well as a high number of neutral information. In the kind of treatment allocation to the ski area options, we could possibly affect the strength of results. Less choice sets with neutral information and more sets with positive and negative recommendations in more equal numbers could have optimized the design of the experiment, as well as the provision of denials of single ski area options within the choice sets. However, the fractional factorial design of the options led to the underlying combinations of attributes and levels and did not provide space to recommend or disapprove differently based on our definition of excluding and recommending attributes.

5.2.7.6. Treatment suitability for a marketing purpose

We mentioned before that the contents of the two treatments, NGO and consumer, were rather complex and difficult to understand. Reading the treatment sentences on the sites of the online experiment took time and possibly lowered the effects on consumer behavior, as well as the positioning at the bottom and the visibility with conventional font. The effects of the treatments showed that even a simple sentence, which people have to think about, has such strong effects on consumer choice behavior.

If we applied more marketing, like a message with a well-known and trusted brand logo in combination with brief but clear information, then the effects could have been much higher. This potential of increasing and improving information effects should be kept in mind for any kind of communication of sustainability as a USP.

5.2.7.7. Unexpected effects in choice behaviour

There are some unexpected effects in responses to attributes recommended and choices made. One effect is the extreme values of WTP in the sub sample age above 50 years with the consumer information. Throughout all attributes and levels, these numbers were illogically high and leave the impression that the oldest age class seems to react too strongly to the consumer info. Analysis of the Limdep models revealed that the price attribute of age class over 50 years, only with information treatment of the consumer group, showed an extremely low coefficient (i.e. low price sensitivity) of 0.0001, which was not significant.

WTP calculations for all other attributes for this age class in the consumer group thus led to these unusually high numbers. We are uncertain why the price coefficient is so low purely in this sub sample and only with the consumer information.

Also unexpected is that the attribute snow guarantee was not recommended from an environmental perspective because it implies technical snow making - but the WTP is higher with both info groups. We presume that despite the *info* button in the web-based choice sets, customers do not necessarily imply that snow guarantee today and in the future is achieved by technical devices. From an environmental perspective results also show that skiers prefer such attributes which do not directly affect their skiing. The *green* demand is thus high, but only as high as the main activity of skiing is not substantially being influenced or limited.

In the random utility model it is assumed that individuals base their choices on the attributes and levels of the alternatives. Overall utility is decomposed into systematic and random components. There are, however, other factors affecting consumer behavior. A wide body of literature discusses factors like survey locations, task complexity, the response mode, time pressure and others (Louviere, 2001). Meanwhile, there are more factors being discussed.

McFadden (1999) provided a synthesis of these factors categorizing them into four classes: context effects, reference point effects, availability effects and superstition effects. Hu found out that response variability is much affected by a measure of fatigue of the respondent in completing the choice task (Hu et al., 2006). Swait discusses context dependence and aggregation in choice analysis (Swait et al., 2002).

In the case of our choice experiment the unexpected choice effects could be partly explained by these context and reference point effects. It will rather not be an effect of fatigue because the choice set questions were positioned in the first third of the survey, although there were eight choices to be made. For motivation purposes, the survey was combined with a lottery to win ski passes. Complexity could count for some unexpected effects though. The nine attributes to choose from are a rather complex set up of the choice sets. This complexity and also some fatigue could lead to certain *pick-any* behavior (Louviere, 2001). In addition, the info treatment was complex and long to read. A more marketing oriented logo, for example, could have helped to design the choice tasks less complex.

There seems to be a general effect of reacting to treatments which might capture more attention than others (Hu et al., 2006). Our treatments were not very captivating and also did not differ from each other, so we can expect that this effect was not of relevance in this case. We see that there are other effects that have to be taken into account when interpreting the results and unexpected effects of the random utility models. Constantly exaggerated WTP of the oldest age class in the consumer info could be explained by such context effects. In this choice experiment however, we tried to minimize such potential effects.

One could question if survey participants who live less than two hours from the mountains and count as day skiers had problems in selecting between ski area options with travel distances of up to eight hours. We do not think that this is difficult to imagine for these respondents because people travel all over the world for various reasons. For someone who lives close to the mountains, it can still be an option to travel far for many reasons. Thus a general separation of the WTP results for day and overnight visitors does not appear to be necessary.

5.2.7.8. Pricing concepts and willingness-to-pay in ski area marketing

In measuring the WTP for goods or services there are two distinct concepts to discuss, the *maximum price* and the *reservation price* concept. The choice behavior differs depending on which of these concepts the consumer applies internally (Breidert, 2005).

The maximum price of a product is the sum of the perceived reference price of a reference product and the differentiation value with the product of interest. In the example of *SkiSustain*, a day skier starting in the morning from his home would possibly pay as much as 100€ for a perfect powder day in a ski area, referred to as the use value or the utility gained from a product. If a ski area sold its tickets for 100€, it is likely that no one would buy it because they might assume that a competing ski area offers the day ticket for only 50€, although the skier might have to accept a bit less powder snow.

The utility of a product helps a marketer only in rare occasions; instead, the exchange value and the economic value are better measures. This value is determined by the alternatives the consumer has available. The skier might pay as much as 70€, for example, for the ski area with more powder snow. The economic value depends on the circumstances under which it is offered.

The reservation price for a product describes a price for which the consumer is indifferent to consume the product or not at all. Imagine a ski area where tourists spend a week to go skiing. Consider the overnight guest who is willing to pay the most, for example, 80€ for a day pass. If the ski pass costs 80€, there would only be this skier buying the ticket for his reservation price, a price in which the skier is indifferent to buying the pass or not. The difference between the reservation price and the sales price is referred to as the consumer surplus.

The price a person is willing to pay depends on the perceived economic value and on the utility of the good. These two values determine whether the price a person is willing to pay is the maximum price or the reservation price, and is again dependent on the circumstances under which the product is offered. The overnight guest in a ski destination either has no alternative to go skiing somewhere else or makes a bigger effort to get to another ski area. The choice

then is either to ski that day or to drive much further. The day skier who starts at home might have alternatives right away from home of which ski area to go to with similar efforts. If a person believes there is no alternative offering, he pays the reservation price, for example, the overnight guest. If a person perceives an alternative, then he pays the maximum price.

When a consumer switches from purchasing to not purchasing a product, it mostly cannot be determined what price concept lay behind. In this case the more general term willingness-to-pay is applied. It is defined as *the highest price an individual is willing to accept to pay for a good or a service* (Breidert, 2005).

It is common practice in marketing research and practice to use the WTP and not differentiate between the two price concepts (Breidert, 2005). However, the possible differences between the maximum and the reservation price could be of further interest for understanding choice behavior differences of day skiers and overnight guests. The differentiation between these two groups proved to be of exceptional importance in ski tourism (see chapter four).

5.3.Discussion of customer demand results of both study parts

In this chapter we merge the results of both parts of the customer demand research, the standard questionnaire and the choice experiment, and discuss the interactions of both results. We also refer to relevant supply side results.

5.3.1. The market for sustainable ski tourism

A main question of *SkiSustain* and its customer survey part was if sustainability in the management and communication of ski areas and thus mitigation is marketable and if there is a demand for it. The results of the choice experiment confirm and even emphasize the conclusions of the results of the standard questionnaire. Sustainability is a potential market USP with a growing tendency. The maximum frequency in deciding, according to an information treatment, is up to 28%. It was estimated to be around 16% by the customers in the standard questionnaire. 28% is a high share, considering the basic and rather complex information treatment we provided in this study into account. The information consisted of a simple sentence that gave a recommendation or disapproval of one or both of the two ski areas to be chosen from. The percentage of consumers responding to a green marketing that really is marketing with all its tools of pictures, emotions and trusted certifications would presumably be much higher than in this study.

Still, in the overall market, the majority of skiers demand classic alpine skiing in a big ski area with snow guarantee. This is the case even in the Germanic speaking market our results are representative for. We also understand the

experiences of the supply side (the managements of ski areas) who confirm findings with their estimation of the Germanic market potential (25-30%, see chapter four) but believe that the Southern and Eastern European markets show much less demand for sustainability. It then depends on the socio-graphic distribution of customers in a destination to determine how big the sustainability market locally really can be at this point. Of course, we do not know how fast or if at all the Southern and Eastern markets will increase their demand for sustainability.

But inside the market of the Germanic speaking clientele there is a high buying power indicated by effects of the NGO info in the WTP with rises up to 3100% in certain sub samples with an average increase in pooled WTP of 200% to 600%. The economic effects of a NGO treatment underline the market potential. With the standard questionnaire we showed that 80% of the guests would pay between an additional one and eight Euros for the ski pass if this money were invested into transparent local environmental and social improvements. Ski area managers did not expect that customers would be willing to pay more for environmental performance inside the ski area, but possibly for additional corporate social engagement (chapter four). The indicators of sustainability in a customer understanding are those that do not affect the skiing itself - skiers want to ski, especially day skiers. This snow demand of day skiers has to be taken into account when selling sustainable ski tourism with less snow guarantee.

Recent studies estimate the market of the so called *LOHAS* in Germany to about five million households with higher incomes and thus an estimated buying power with a minimum of 200 billion Euros with a strong growing tendency (Schulz, 2008). The customer potentially attracted by *green* ski areas does have a high financial income and could thus be a real chance to ski areas going green. A general market of sustainable consumption with a share of 20-30% in Germany, mostly of people with higher incomes (Schulz, 2008), confirms our results in the demand for sustainable ski tourism and underlines the findings of this choice experiment.

Positive effects of selling *green* ski area services can be measured with the attributes of *green power*, *mountain coaster* and *glacier expansion*. The link to being *green* in a common understanding is very direct and obvious. We found the high demand and preference for green energy also in the results of the standard questionnaire. Green energy is the most accepted sustainability indicator along with mobility and public transport.

Grooming is not that important in WTP, and effects of info treatments are low or not significant in the sub samples. Less grooming without further explication and information is a more indirect indicator for being *green* that, in addition, affects

the personal way of skiing much more than green energy, which the customer has no disadvantages in. Results of our standard questionnaire show that groomed runs are a major factor in skiers' demand, so the acceptance to waive or renounce grooming is naturally low.

5.3.2. Sustainability in a more open understanding attracts the majority

Apart from that group buying more sustainability in favor of classic skiing attributes, there is a general majority demanding quality and pure skiing in the outdoors, which also can be seen as a way of sustainability. Technical installations on the mountain, like mountain coasters or artificial ski environments (like ski domes) are not accepted or demanded by the majority. We found the same results in the standard questionnaire that underline these findings. Instead, soft mountain sports activities are sought for. The request for information on the environment and on nature, the demand for quality and service, as well as the awareness for environmental questions, reflect the importance of sustainability from an ecological as well as from a social perspective.

Because of socio-economic developments, the potential for directed marketing of sustainability will increase in the future. There will be a greater amount of people who are most affinitive to green marketing, such as of the highest and the lowest income classes (Statistisches Bundesamt Deutschland, 2008). There will be more who ski less often, about two-thirds to three-quarters.

The total number of day skiers will decrease the most. Spontaneity is highly dependent on the weather and snow conditions, and media will play a larger role to communicate transparently the on-mountain conditions to reach those being most spontaneous and flexible in their decision to ski.

5.3.3. Demand for snow guarantee and acceptance of alternatives

Snow guarantee remains the most important factor in customer demand, but there are other factors nearly as important. If the kind of snow is icy and the quality of the ski runs is bad, then the sheer existence of snow is not enough. In general, those living further away from the ski hill and those who ski less often show more allowances for less snow guarantee. This implies that spontaneous day guests are less likely to accept alternatives if they want to ski. From the guests staying overnight, 80% would stay in the destination two to four days within one week, even if there is no snow to ski on. Of course this response is hypothetical because guests have a contract with the accommodation and would have to pay for that period even if they left earlier just because of a lack of snow. But it does indicate the general acceptance of doing alternative activities in the ski destination if they could not ski. It reflects the flexibility and also growing spontaneity of overnight guests in the future.

Those customers who demand more environmental performance accept less snow guarantee. If a ski area targets the environmental conscious skier more, it could provide less snow guarantee, but it does not necessarily have to. We found that technical snow making is accepted, but the customer is sensitive to the kind and the amount of it. Snow making thus is a necessity, but there also is a limit that does not need and should not be exceeded if a *green* market is targeted.

Alternatives to skiing have to be focused on the well-being of the environment. Technical installations of any kind in summer on the mountain, as well as ski domes, are not accepted. Instead, soft mountain sport alternatives are demanded. *Expansion*, even if the area gets bigger, is not accepted. Big ski areas are preferred in general, but only if they exist and not if they expand and then need to build new lifts and runs.

5.3.4. Differences of demand and consumer profiles

There are strong differences in the demand concerning the attributes tested and depending on the type of customers, and ski area managers admit their lack of knowledge about demand of certain groups of customers (chapter four).

The size of a ski area is important – the bigger the better for most of the people. The size might automatically be related to more skiing opportunities. Those who ski more than two weeks a year, those who travel far and the older age classes will more likely visit smaller ski resorts too. Distance and time to travel to the next ski area is an essential factor too. About 60% of skiers live less than two hours from the next ski hill and count as spontaneous day skiers. For this group, each hour more to drive is less valuable than for those travelling far anyway. Those who ski less often, those with the highest income and the mid age class show the highest value in less travel time.

Flexibility in service offers is a major factor of customer satisfaction. Given the high willingness to stay in a resort up to 60% of the time when no skiing is possible, a flexible ski pass is needed in which paid days can be taken during the next vacation. Not surprisingly, those who live the closest, the day skiers, then those skiing less often, as well as the highest income class, indicate the greatest importance for a fully transferable ski pass. Overnight guests and especially the older ones are more flexible in their activities. This can be positive in terms of reacting to lack of snow and positive for the ski destination because the guest remains in the hotel.

From a ski area perspective, this development is rather negative if the overnight guest does not buy a week ski pass at the beginning but decides spontaneously every day what the activity of the day is. The trend toward flexibility was demonstrated by Abegg in 1996. Overnight guests are more likely to do other

activities, whereas day guests only come in good snow conditions, finding early confirmation in Harrer (1996). Ski areas with good access will face higher numbers of spontaneous day visitors in the future. Given the discussion on the maximum and the reservation price concept, overnight guests might show a generally higher WTP than day skiers. The results of the choice experiment confirm this. In general, each tourist declared as a day guest in this study – due to the short living distance to the next ski hill – could of course become an overnight guest throughout the season, showing a similar demand.

For those who put more emphasis on environmental factors, the flexibility of the ski pass is becoming less important if the ski area instead demonstrates a higher environmental performance. About 28% of skiers are willing to move their main ski vacation into springtime. This is a chance for ski areas who have the problem of securing an opening in early season and who have the risk of losing the Christmas clientele.

5.3.5. The uncertainty of developments

There is, of course, a great uncertainty in many developments. New target groups from emerging markets, such as Eastern Europe, could outweigh the probable loss of clients from the established traditional markets. The clientele in some ski areas could then possibly change its character with new languages, new cultures and other preferences. Thorough market assessment and research will be necessary to refine strategic approaches. The role of the media plays an important role in creating and feeding public hypes. We discussed the media up and downs despite the real problem of development in other examples, such as the *Waldsterben.* The media hype on climate change and ski tourism played an important role in the analogue winter 2006/07. We do not know for sure if that would be the case in coming winters like the one we experienced. The role of general information though is clear. With additional information the customer behaves differently.

Product life cycles of trends have to be seen too. Any new fashion or trend undergoes a product life cycle with strong rising periods, a settling period and a more or less stable stadium (Freyer, 2006). This may also be true in the case of sustainable consumption and in the demand for sustainable tourism. We expect a long-term growing market of sustainability and resource efficiency. Natural resources are limited while the population keeps growing, so the topic of sustainability is a topic and a mega trend of the future (Blanke et al., 2008, Utopia, 2007). However, if climate change does not occur as foreseen (IPCC, 2007, OECD, 2007), then sustainable tourism could possibly suffer from decreasing customer awareness and demand for sustainable consumption.

5.4.Conclusions

The conclusions of the demand side survey include the first part – the standard questionnaire – and the second part – the choice experiment – and are structured by the complete initial set of demand side questions posed in chapter three. There are many aspects in global change and in individual decision behavior that cannot be foreseen and that are uncertain. The uncertainty of predictions has to be taken into account when coming to any conclusions.

What are preferences of ski tourists for services and products in ski areas today? How important is snow guarantee even if achieved by technical snow making as the main kind of applied technical adaptation?

Snow remains the most important factor in customer demand, and 90% accept technical snow making. The quality of the snow, of the runs and the thorough management of snow with technical production only where and when necessary are almost as important. The majority, the mass of people demands big ski areas, classic Alpine skiing and snow guarantee. The intactness of the natural environment and the mountain scenery as such meet the demand. Information and a high service quality with friendly staff are important, as well as free and easy transportation inside the destination. Lift lines and crowded runs are disliked which correlates with the need for safety and general communication.

Ski areas with easy access could face crowds of day guests on a good day. The customer though does avoid lift lines and safety on crowded runs is a real issue of satisfaction, a potential problem.

Technical installations and expansions in ski areas do not meet customer demand. The opposite, being more quality of the natural environment and activities that are sustainable to the personal health and the environment, are demanded instead – as long as the original reason why skiers visit the mountains in winter, the skiing, is not affected as such.

Snow guarantee is important, but not the only important factor. Investing not only in technical snow making but more in other services and environmental quality is a way to go if communication is right.

The acceptance of less snow guarantee increases with higher environmental performance in the ski area and with related information or marketing – those customers who demand more environmental performance accept less snow guarantee. Snow and the possibility of skiing remain the core market and the main interest in ski tourism. Technical snow making is not the only strategy but remains an integral part of integrated adaptation. Snow making has its limits where people in the source markets, especially young people, lose their snowy minds – technical adaptation cannot help here. It has its limits where no natural winter environment is visible and where the quality of the skiing is affected

negatively. Successful sustainable adaptation thus will have to be a mixture of mitigative, behavioral and technical means.

What are the consumers' acceptances to adapt their demand to changing services and for alternatives to skiing?

Despite the general demand for snow guarantee, overnight guests would to 95% accept a lack of snow and stay while doing other activities instead. The willingness for alternatives is also high with about 85% of the families – as long as the kids can play in some snow. Almost a third of the overnight guests would be willing to move their main vacation period from the early winter months to the spring, if natural snow were then more reliable. Alternative activities are of soft and healthy kind, both for the own body as well as for the environment. Artificial environments such as indoor skiing or mountain coasters are not accepted, instead hiking, wellness, sun bathing, free guided information tours of the mountain and interpretive centres. The acceptances of the overnight guests as described here are very different from those of the day guests. The day guests demand snow guarantee and best Alpine skiing conditions, which is the reason why they come to the mountains.

There will be fewer day visitors in the future, and those who remain will be pickier to snow conditions – dependency on day visitors requires more snow guarantee, bigger ski areas, better access.

What are the ski tourists' awareness and perceptions of climate change impacts and of general environmental aspects in ski tourism considering the experiences after the unusually warm winter of 06/07, and which indicators describe this environmental awareness best?

Environmental awareness of ski tourists representing the German speaking countries is dependent on media influence and on spending time in nature, and it differs between topics. Skiers who spend more time on the snow for example have a higher awareness to the potential negative outcomes of technical snow on the environment. The highest awareness can be found in the outcomes of climate change on skiing – because climate change has been in the media in that winter more than any other ski tourism related topic, it indicates the influence of media on skiers' awareness. The unusual warm winter of the held interviews had most probably amplifying effects on customer awareness.

The general awareness of the importance of environmental performance in ski tourism is 80%, who expect the ski area to treat the environment with care. 16% of ski tourists are believed by the interviewed customers to choose ski destinations according to environmental criteria. These criteria are described best by environmental indicators such as the use of green energy, alternative

mobility, forest and wildlife protection and transparency and information about ski tourisms' environmental performance.

What is the willingness-to-pay (WTP) for specific ski area attributes related to sustainable tourism, and how is WTP affected by additional consumer information and by green marketing?

Green marketing can achieve a significantly higher WTP for environmental quality and develop a niche USP that will not attract the majority and the masses but a certain clientele in a very strong way. Certain target groups show a higher WTP of up to 3100% in reacting to recommendations of a non-governmental organization (NGO) information, with average effects of 200-600%. Environmental indicator attributes like the use of *green energy*, no *expansion on glaciers* and no *technical installations* on the mountains show the highest WTP.

Green investments pay off, in the short and in the long term, direct and indirect.

Because of the much higher WTP with additional information, the economical potential might even be high enough to operate a smaller ski area with fewer of these higher paying customers than usually needed. On the other hand, a *negative* marketing of competitors who do not act environmentally friendly is possible and affective too, and ski areas not managing accordingly could become a negative target by internet-based customer ratings. The NGO information is about 50% more effective than the consumer rating based information.

The customer seeks involvement and partnership, information and transparency – he will reward it with a higher WTP on the day pass and with more acceptance of less snow guarantee, opening up potential for sustainable adaptation.

How are different socio-economic groups reacting in their demand to information treatments and green marketing?

Differences in the WTP and in the reactions to marketing are very strong depending on the kind of customer. The target groups that will most likely become more important in the future because of demographic and socio-economic changes are those who can be reached most effectively by an info treatment (highest and lowest income) or are the least demanding who accept smaller ski areas, longer distances and less snow guarantee (the older age groups). WTP estimations of day tourists or those living less than two hours from the next ski hill indicate that this more spontaneous group can be reached by info treatments too, as it is with those who ski less often, a target group that also will increase in climate change forecasts. The day guest, in general, is more demanding and particular; the overnight guest is rather willing to be more

flexible in his demand and in alternative activities to do. In general, the ski tourist is getting more demanding and more spontaneous in his decisions, even the overnight guest. Overnight guests are more likely to do other activities and willing to pay more, whereas day guests only come in good snow conditions and are rather willing to pay less. Ski areas with good access might face higher numbers of spontaneous day visitors in the future that even could lead to crowds and problems of congestion, both in traffic and at the lifts and on the ski runs.

What is the customer demand for sustainable ski tourism?

About one-quarter of the Germanic speaking skiers market is the potential in the year 2007 to buy and pay more for sustainability in ski areas in favor of classic factors, such as snow guarantee. A maximum of 28.53% follow a consumer rating, a maximum of 25.77% a NGO recommendation, both in recommendations of sustainable ski tourism. We thus conclude that the market share in the Germanic speaking countries is about a good one-quarter.

The general market potential in Germany of those demanding sustainable consumption is estimated as five million people with a buying power of minimal 200 billion Euros in 2007. This kind of customer is willing to pay much more for a service or a product that is more sustainable. For a ski area going *green* this is a very high potential.

Green resorts are marketable, especially with those *green* attributes not affecting the skiing itself like the use of energy from renewable resources. The economic potential and impact of marketing *green* resorts within about a fourth of the Germanic speaking market is high and surely can be increased by more specific communication and marketing. The marketing effects on certain consumer groups and their decision making behavior could possibly be used to develop specific other USPs in more detail. The USP, the content and the communication, have to be very specific and clear, though. The guest who comes for the day is spontaneously choosing the ski area with good snow conditions.

In order to sell *sustainability* for spontaneous day skiers, sustainable ski areas have to have snow.

The market of sustainable consumption and sustainable tourism is a trend today and expected to grow even more in the future (CIPRA, 2007a). One-fourth of the Germanic speaking countries are not a niche anymore, but a trend. There is an uncertain development in the markets of new clientele, e.g. from Eastern Europe, and an uncertainty of the general socio-economic and climatic development. The individual distribution of customers from different source

markets in the destination has to be taken into account, leading to different market potentials in the sustainability topic.

Environmental sustainability is a key factor for success in tourism. The most successful countries in tourism also boast the highest environmental performance as the 2008 Travel & Tourism report reveals (Blanke et al., 2008).

Developing a USP of sustainability is an opportunity for smaller and lower ski areas that suffer most from climate change, deriving threats from global change into opportunities of mitigation as a new business model. Such ski areas could offer less snow guarantee and soft sport alternatives, if they have a high percentage of overnight guests. Sustainable management thus makes sense as a market and business model, as a risk preventing technique and as a long term management principle to improve and sustain ski tourism.

Mitigation is a new business model for smaller and most suffering ski areas and a complementary performance facet for bigger and higher ski areas no one can leave behind.

5.4.1. Recommendations

Developing the niche market of sustainable consumption is one opportunity for smaller ski areas as their USP, and for bigger ski areas that need a higher number of visitors as a mandatory aspect to increase efficiency and to avoid negative publicity and manage risks. In order to successfully develop and market sustainability, the improvement of the feel-able, see-able natural environment must cooperate with more quality of the experience of mountain sports, especially skiing.

Alternatives to skiing should be dedicated to the well-being of the customer and the environment – technical installations, artificial experiences and massive expansions are contra-productive.

Some loss of skiing possibilities is accepted, but only to some degree, again depending on the target group. The customer is flexible to a certain degree and with right communication adaption in the demand is possible – in the kind of services demanded and in the time when overnight guests book their vacations. Hereby ski destinations should clearly distinguish between day skiers and overnight stays – the day visitor wants to ski; the overnight guest more likely buys a ski pass on a good day and does something else on a bad day. The added value of the night guest will then move toward the destination and off the ski area, even in winter.

The changing behavior of the overnight guest could lead to more advantages for the destination and less for the ski area. The ski area has to become part of the added value from overnight stays and decrease the day guest dependency.

The contents of sustainability must be developed and communicated well to the customer. The understanding of sustainability as not only ecologic but also the social and economic aspects needs still to be developed. Transparency, trustworthiness and proactive communication will take more efforts though to develop the contents and the quality in terms of sustainable development and to market these. Examples to build up trust and transparency are webcams and customer rating portals.

Customer demand differs a lot in between target groups – constant customer demand research and more service orientation are key success factors.

Thorough market research to address the right kind of customer well, internal quality checks and in-house trainings are important. The ski area and the destination must partner with the customer and offer more communication, media work, more service and more quality. Mitigative adaptation that currently is not facing much interest from tourism stakeholders indeed becomes a viable business model with the market potential of sustainable tourism. The potential in sustainability marketing to adapt consumer behavior to changing ski area services could pay for mitigation in the short term. Mitigation then could feedback in the long term to sustain the ecological and social system of ski tourism.

Not engaging in sustainability may well become a risk for ski areas, even if they do not target the market of sustainable ski tourism, which is an opportunity.

5.5.Outlook

The results of the customer side survey of *SkiSustain* developed demand profiles based on the WTP for ski area attributes representative of the Germanic speaking market of ski tourists. These demand profiles are an outlook on an adaption in demand if some kind of *green* marketing is applied. The data set of our choice experiment has been analyzed by the socio-economic and demographic sub samples of age, income, living distance from the mountains and skiing frequency.

The data allows for further in-depth analysis of choice behavior by other responses provided in the standard questionnaire of the demand side survey. This further analysis is not part of this study and can be subject to future research. The different effects of the concepts of maximum and reservation price in the WTP of day skiers and overnight guests might open up other chances and should be addressed in further research too. Also, a closer look on the willingness-to-pay in the growing markets of Eastern Europe, and on the demand for sustainable consumption in both the Eastern European and the Southern European countries would be of further interest too. The role of the media should be thoroughly observed.

6. Vulnerability management framework and outlook

Chapter six – describing the fourth and last methodological step of this study – integrates the conclusions from the supply side and the demand side research by responding to the integrative strategic part of the overall research questions (chapter three) throughout this chapter. The working steps of this chapter are shown in figure 62.

We first discuss the common view of vulnerability and come to a wider understanding, presenting and discussing the extended vulnerability factors of future relevance. Hereby we discuss elements of exposure, sensitivity and adaptive as well as mitigative capacity.

From here we draw a picture of feasible and real opportunities for sustainable adaptation – based on the market demand for sustainable tourism from the demand side research – resulting in a set of applicable strategic recommendations for a sustainable ski area within a framework of maximized adaptive capacity.

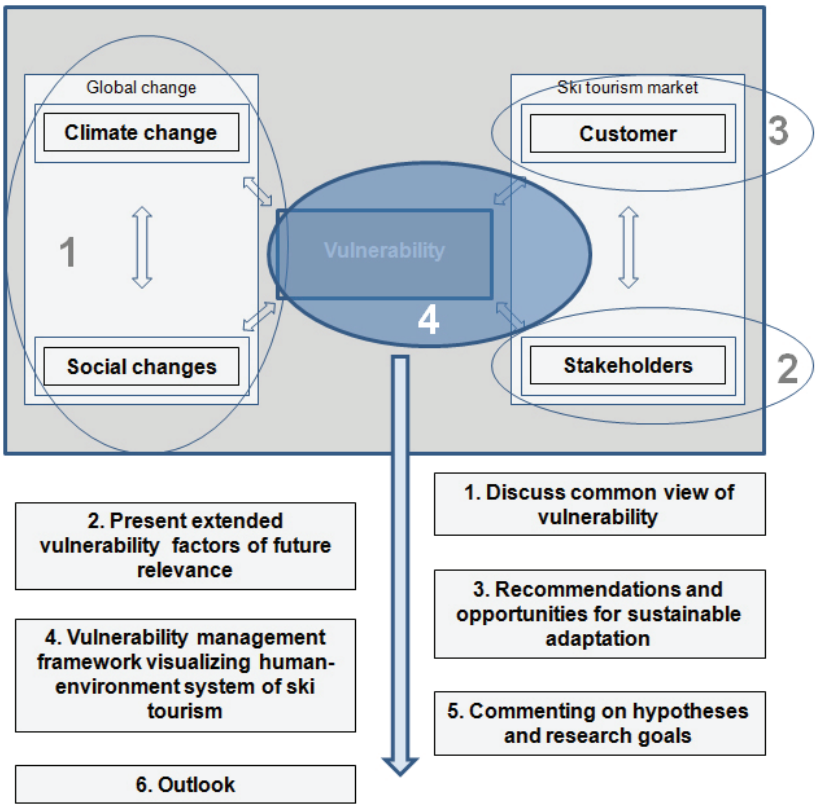

Figure 62 Working steps of chapter six
Chapter six is the fourth and last methodological step of SkiSustain and structured in the six parts as indicated in this figure.

We complete our interpretations with a graphical visualization of the coupled human-environment system of global change and ski tourism vulnerability and describe some main feedback processes.

The conclusion and the closing remarks at the end of this chapter address the set research goals of *SkiSustain* and conclude on the general hypotheses of this study, ending with a short outlook.

6.1.A vulnerability framework template

Turner (Turner et al., 2003a) provides a general framework of vulnerability analysis that ideally considers the totality of the system. Turner states that this ideal, of course, is unrealistic because of real world data, uncertainty and other constraints, such as complexity and connection and multiple spatiotemporal scales. Turner provides a template suitable for *reduced-form* analysis, yet inclusive of the larger systematic character of the problem (figure 63).

In ski tourism we discussed our approach to focus on the ski area and the ropeways company and still kept the destination in mind. The reduced form of a ski tourism framework thus should focus on the ropeways company. Tuners framework is not explanatory *but provides the broad class of components and linkages that comprise a coupled system's vulnerability to hazards* (Turner et al. 2003a). The elements shown are interactive and scale dependent, linking place to region to world. The hazards for the system arise from influences outside and inside the system. The human-environment conditions of the system determine the sensitivity to exposures. The social and environmental or biophysical mechanisms influence each other and feed back into the system. Adaptive responses determine the ability to cope with both the social and biophysical subsystem.

We seek to address elements of the general framework of Turner to the specific example of ski tourism vulnerability to global change and present a modified visualization of the framework at the end of this chapter.

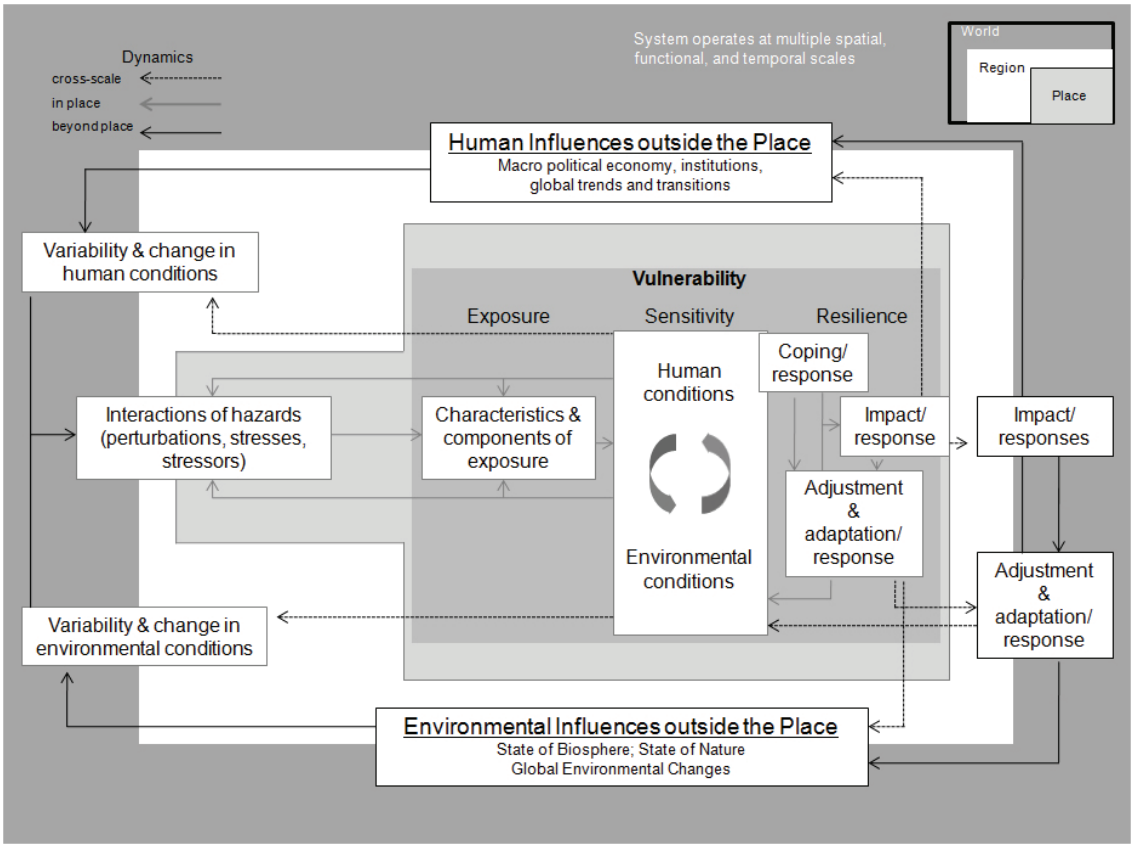

Figure 63 Vulnerability framework (Turner et al., 2003a)

6.2.Extended vulnerability of ski tourism

Vulnerability can be described as a function of three overlapping objectives: exposure, sensitivity and adaptive capacity or resilience (Turner et al., 2003a).

Vulnerability of ski tourism to global change is the likelihood that the coupled human-environment system, ski tourism, may experience harm from exposure to stresses associated with changes in the natural and social environment. The expression human-environment system refers to the interrelations between humans and environment, being part of a holistic system (Turner et al., 2003b). Hazards for the system arise from influences outside and inside the system and place. The human-environment conditions determine its sensitivity to any set of exposures. The social and environmental mechanisms influence and inform each other. Responses in one system can influence the resilience and the ability to cope with the other. In the *Glossary* chapter we provide further definitions of exposure, sensitivity and adaptive elements. Mitigative aspects are understood as taking advantage of opportunities and thus being part of adaptive elements.

Global change is more than climate change. Demographic developments, socio-economic and socio-graphic changes, need to be taken into account more when assessing the vulnerability of ski tourism. The discussion with the ski area

managements and their fresh experiences after the winter 2006/07 revealed the complexity and the various feedback loops between global change factors, customer demand and impacts in the ski areas.

In the following, we describe the common view on vulnerability of ski tourism to climate change and name reasons why these factors are not reflecting the complexity of global change. We then discuss our extended view on vulnerability as resulting from this study. We hereby keep the focus on the ski area – with the ropeways company as the core and economic motor of ski destinations – by maintaining the look at the feedback loops in-between other destination tourism stakeholders.

6.2.1. The common view

The future of winter sports is being discussed with the focus on climate change and technical snow making adaptation. The warming of the climate is observed and expected to be higher in the Alps than in the world average. The natural snow line is rising, leaving lower ski areas with less natural snow reliability. Snow making is being discussed as the adaptation technique in focus, and those smaller ski resorts that cannot afford the investments in technical adaptation will lose even more. Higher ski areas with more natural snow guarantee would be on the winning side, especially when being big enough to afford the necessary investments.

The elevation and size of a ski area, technical snow making capacity and the necessity of operating a minimum of 100 days per winter are the main factors in the current discussion of adaptation to climate change (OECD, 2007). In the discussion of the supply side experiences of the winter 2006/07, we saw that the size, elevation and snow making capacity indeed were the main steering factors of exposure, sensitivity and adaptive capacity. Limits of technical snow making and more sensitivity factors have been experienced and question the common discussion of losers and winners defined by the named factors.

6.2.1.1. Elevation

Elevation is the main exposure factor to escape from global warming. The higher the elevation, the colder the mean temperature is, which corresponds with natural snow reliability and with snow making capacity. Still, local differences of cold air influences, warm thermal wind systems (Foehn) and inversion with cooler temperatures in the valleys may lead to completely different local conditions. Elevation is a very important factor in vulnerability but has to be seen in a more diverse and locally differentiated way – there are more site-specific influences steering the reliability of natural snow and the potential to produce technical snow.

6.2.1.2. Snow making capacity

If temperatures are cold enough then missing snow can be produced by technical means. Technical snow is an inherent part of adaptation and meanwhile, widely accepted by customers (see chapter five). A ski area without snow making will have a much harder time to survive in the future than others. With progress in technology developments, the air temperature will not be the limiting factor anymore. Snow today can be produced in plus temperatures, even on a warm summer day. The factors of limitations will rather be the supply of water, the costs of energy and local, regulative restrictions.

Customers accept snow making even from an environmental perspective (chapter five). The client instead is sensitive to the necessary amount of snow making, the snow management and the quality of the ski runs. The demand reflects more expectations for quality in the future rather than 100% coverage of the whole ski area. From the supply side and an economic perspective, there is a most effective percentage of snow making in a cost/use ratio that is lower than 100% of the slopes surface. This ratio is dependent on costs for snow making and the demand and acceptance of skiers, thus it will differ with the kind of clientele. A rough idea for an ideal cost/use ratio of 50-60% was given by a ropeways company manager (chapter four).

The direct effects of climate change on snow can be managed technically. The indirect, social outcomes require different approaches. If the customers in the gray and dark towns are not aware of the good technical snow conditions on the mountain, or white snow bands in a brown mountain environment prevent customers from getting into a winter mood, than technical snow alone does not help. Snow making is necessary and a “must” for today’s and for future ski areas, but the limits already have been shown in the season of 2006/07.

6.2.1.3. The size of a ski area

Size matters. Bigger ski areas meet the major customer demand more than smaller ones. The size represents more variety and offers. Size also means a bigger company that more likely generates enough cash flow to invest in snow making, water reservoirs and modern chair lifts. On the other hand, the bigger the ski area, the more customers it needs for profitable operations. Bigger ski areas need to address all kinds of clients. There is less room and flexibility to concentrate on a smaller, but potentially more profitable niche market. Size could also be attained by smaller ski areas forming strategic partnerships by keeping and even tuning their individual USP and style.

6.2.1.4. The 100-day-rule of operating days

The so-called 100-day-rule as described in the OECD report (2007) is accepted as a working tool for a necessary time to operate the ski area in the winter

season to generate sufficient sales. The results from *SkiSustain* more so lead us to a period-dependent number of operating days. The necessary sales cannot only be generated by a total sum of days but also on the time when these days are reached. Christmas, the first half of February, March and the Easter periods are the days with the highest visitor frequency, counting for about ten weeks or seventy operating days. If these periods have snow and ski areas can operate, then most money is earned. We would thus rather focus on a time-dependent operating-day-rule that does not necessarily mean that 100 days have to be reached – it is a matter of when.

6.2.2. Vulnerability factors of future relevance

What vulnerability factors are of future relevance?

The common vulnerability aspects proved their relevance throughout the observed winter 06/07. However, it became clear that vulnerability of ski tourism is not solely created by the direct outcomes of climate change that can be addressed by technical means and that are steered by elevation and size. We therefore have to extend our view on vulnerability, taking more factors into account, including other kinds of adaptation.

The extended vulnerability factors are categorized in exposure, external and internal sensitivity elements, and adaptive elements addressing the sensitivity. An order by importance does not seem suitable - what is important today may be less important tomorrow, and the differences between each ski area are too high to set up a general hierarchy. In the end, vulnerability is made up by the sum and the interplay of all the factors; thus, a holistic picture needs to be drawn.

In general, the discussions proved that a main problem of the ski areas is uncertainty in the kind, strength and speed of global change impacts. Strategic approaches thus need to be based on multiplicity, flexibility, variety, individuality, and all those on shorter timelines being backed-up by constant research. The system of local governance needs to be adopted accordingly to be able to manage the uncertainty and the complexity of vulnerability.

6.2.2.1. Exposure elements

In this section we describe the exposure elements of ski tourism to global change derived from chapters four and five. An overview is given in table 44.

Table 44 Exposure elements of ski tourism vulnerability to global change

Exposure elements	
Components	▪ Ski tourism, comprised of - Ski destination stakeholders in general - Ski area/ropeways company in focus - Ski tourist as an individual - The market system of skiers
Exposure to climate change	▪ Elevation ▪ Climate change development ▪ Local differences in climate change ▪ Extreme weather events ▪ Topography changes
Exposure to demographic, socio-economic and socio-graphic change	▪ The general dependency of the ski tourism on volume of skiers ▪ Demographic situation with a growing number of elderly and fewer younger people ▪ Socio-economic welfare ▪ Socio-graphic situation with new market developments and market stagnations ▪ Competing trends and fashions of activities ▪ Demand development and reflections on society

Components

The components of exposure in ski tourism are the tourism stakeholders within the ski destination, the ski tourist as an individual and the demand side market of ski tourists as a social system (see table 44). The ropeways company as the main stakeholder of a ski area (here commonly referred to as "ski area") and the ski tourist as an individual are within the focus of exposure in this study without neglecting the interconnections within the system. All exposure elements are dependent on each other and cannot be seen separately. Effects are of direct and indirect kind.

Exposure to climate change

Elevation

We described the elevation earlier as a classic exposure factor (section 6.1.1), but it cannot be understood as the higher a ski area, the less vulnerable to global change. Higher resorts that might receive more visitors when lower resorts shut down could reach their limit of carrying capacity. If the demand reaches peaks of traffic, accommodation uses or crowed ski runs, it could turn into a problem of closing people out. Skiers avoid lift lines. They prefer safety on the slopes with fewer people. If higher areas become too crowded, this might affect demand negatively. In summer, the higher areas are less attractive compared to the mid, high and lower ones which are greener and gentler in their terrain. The thawing of permafrost can result in rockslides and terrain

moves in the high alpine, becoming a problem of safety and also an issue of changing topography. Whole runs could become more concave with changed pitches that require repositioning of runs and lifts. A short-term win of higher areas could thus result in long-term losses.

Climate change development

The complexity and uncertainty in climate change leaves space for expected and unexpected developments. The models and forecasts could be interrupted and changed, so the general scale of climate change is to some degree insecure.

Local differences in climate change

As discussed earlier (chapter 4.4.3), the local outcomes of climate change can be different from the general trend. Each ski area has a unique topography with changing effects on the local climate. Cold air valleys, inversions, and Foehn are some examples. Thus a general trend could still mean the local opposite.

Extreme weather events

Extreme weather events are expected to increase in the future, such as storms, floods, extreme snowstorms, droughts and others. These unforeseeable events can hit some ski areas more than others and are additional risks.

Topography changes

The higher temperatures lead to melting glaciers, thawing permafrost and resulting changes in high mountain topography that could alter the pitch of slopes and require changes in the slopes profiles and the repositioning of lifts.

Exposure to demographic, socio-economic and socio-graphic change

The general dependency of ski tourism on volume of skiers

The ski tourism industry is an industry of volume. Prices are calculated for a minimal volume of skiers; current infrastructure is optimized for high volumes as well. The total existing number of ski tourists is a limiting factor for the total number of ski areas.

Demographic situation with a growing number of elderly and fewer younger people

The demographic development is changing the market and the kind of customer ski areas interact with. More elderly have different needs and expectations, while fewer younger skiers result in a total decrease in skier numbers.

Socio-economic welfare

The individual economic situation of skiers, as well as the general economic situation, can influence their capabilities to spend money on skiing thus affecting ski tourism directly in a positive or negative way.

Socio-graphic situation with new market developments and market stagnations

New markets of skiers are arising in Eastern and Southern Europe. Traditional source markets stagnate or even decrease, such as the Central European market.

Competing trends and fashions of activities

Other trends and fashions of activities produce new competition from *hip* and *trendy* sports. Skiing, like other sports, undergoes life cycles. Currently, skiing seems to be in a stagnation phase with other activities or topics taking over. Ski areas need to adjust their services and infrastructure, as well as to react in communication.

Demand development and reflections on society

The general demand for ski tourism reflects on society the traditions that are incorporated, such as teaching children to ski and signing them up in ski clubs and ski courses, or the traditional ski holiday with the family over Christmas.

6.2.2.2. Sensitivity elements

We classify the extended sensitivity factors in the categories' external and internal elements (see table 45). External ones are those with the direct influencing or steering force not being the ski area:

- The natural environment and the site-uniqueness
- The general structure, the regulatory system and local traditions
- The market and its influence on society

Internal factors are directly related to the activities and the management inside the ski area that has the power of steering actively:

- Management and inner structure

External factors

The natural environment and the geography

Climatic development in source markets

When there is no snow where people live, then they are not aware of the beauty of winter and snow anymore, decreasing the demand for skiing. Rain and gray towns and low lands in winter might push tourists to the warm south as an alternative, which is seen as the main competition for ski areas in winter (chapter four).

Climatic development in competing and sea tourism destinations

In summers like 2003 and 2007, where heat waves and fires chase tourists away from the Mediterranean or other sea tourism destinations, the mountains

as an alternative might become more attractive again, opening up chances for summer tourism in ski destinations.

Table 45 Extended sensitivity elements of ski area vulnerability to global change

Sensitivity elements	
External	
Natural environment/ site-uniqueness	▪ Climatic development in source markets ▪ Climatic development in competing and sea ▪ tourism destinations ▪ Change of mountain topography ▪ Access and proximity of competitors ▪ Development space ▪ Landscape beauty ▪ Water availability
General structure/ regulatory system/ traditions	▪ Size ▪ Summer tradition ▪ Regulatory system (water, investments, developments) ▪ Model of local governance ▪ Ratio cold to warm to hot beds ▪ Age of ropeways ▪ Costs of energy ▪ Snow making capacity and technology
Market and influence on society	▪ Day guest ratio ▪ New market developments ▪ Socio-graphic market share ▪ Demand development and reflections on society ▪ Sea tourism development ▪ Ski area competition ▪ Costs of transportation ▪ Media influence ▪ Customer preferences and societal influences ▪ Safety feeling
Internal	
Management and inner structure	▪ Day guest ratio ▪ Diversity factor summer/winter Diversity factor operations, e.g. summer events, Gastronomy ▪ Stakeholder communication and partnering ▪ In-house communication

Change of mountain topography

Warming lets glaciers melt and permafrost thaw; changing topography and safety issues will follow. This might affect the highest ski areas more than the lower ones.

Access and proximity of competitors

Easy and short access is one magnet for day tourists. Customers prefer closer ski areas and are willing to pay more for skiing in a closer ski area (chapter five). With rising costs of transportation and more flexibility and spontaneity, the areas closer to the source markets may profit more. Still, the peaks and crowds in the closer areas might be a chance for the more remote ones offering more tranquility and atmosphere. The proximity of other ski areas as competitors is of importance too when the guest has to decide where to go.

Development space

The example of Val d'Isere, Zermatt or Verbier showed the importance of space to develop a higher number of warm hotel beds to increase the percentage of overnight guests. If there is no space because of a narrow valley and safety reasons or environmental regulations, then the limit is reached.

Landscape beauty

It is simple – those with a Matterhorn, a Mont Blanc or an Eiger do not need much else to attract visitors the whole year round, especially in summer. Summer tourism profits a lot from famous mountain scenery, and those without it need to be much more creative and active.

Water availability

Water is a limiting factor for snow making. In rather dry places, like St. Moritz or the Dolomites, which have the elevation but not the natural precipitation, water availability is a sensitivity aspect of increasing importance.

The general structure, the regulatory system and local traditions

Size

Size is important, we discussed this factor earlier (section 6.1.1), but small does not necessarily mean negative. The trend to condensation will lead to fewer ski areas with the remaining ones being bigger. Smaller ski areas might have chances to develop niche markets with special focus groups. They could operate with fewer visitors and open only on the best days. Smaller ski areas might be able to operate on a much lower volume of services and costs but still benefit from the day skier on good days.

Summer tradition

Destinations like Gstaad or Kitzbühel have a long traditional summer use from mountain agriculture. There is and always has been a lively cultural landscape with infrastructure, trails and gastronomy on the mountain that is attractive for summer tourism. The opposite would be a French ski station that is "dead" in summer – developing summer tourism here needs much more effort.

Regulatory system (water, investments, developments)

Regulations are a main barrier for ski areas, especially for building water reservoirs for snow making. Local or regional political and regulative differences may affect ski areas in different ways.

Model of local governance

The management of uncertainty relates to the model of local governance as discussed in chapter two. This topic is vast and needs further research. We discussed some positive aspects of the model Dolomiti Super Ski and some negative aspects of the French system of ownership (chapter four). A *Model Europe* is demanded by ski areas.

Ratio cold to warm to hot beds

Hot beds are housing for locals living and working in the destination. They make the place alive also in off-season time. Warm beds are hotels or apartments that are necessary for overnight guests. Cold beds are secondary homes – often empty but still a valuable source of income for the town. The ratio of the three is one steering factor of the dependency on day guests and the atmosphere of the place in summer and winter.

Age of ropeways

Ropeways have a lifetime of about 20 to 30 years before they need to be renewed. The older the lifts in one area are, the more they need replacement and investment. Such investments are crucial. The customer demands modern high speed chair lifts (see chapter five). The more investments are needed for lifts, the less money is available for snow making or even summer tourism investments. This creates a higher dependency on a sufficient annual cash flow.

Costs of energy

Costs for energy are locally different but already a major cost factor. With energy prices expected to further rise in the future this is a major factor of sensitivity. Efficiency efforts and means of mitigation should become more important to respond to the higher costs of energy and thus of operations.

Snow making capacity and technology

The current capacity of snow making and the kind of technology, its efficiency and its management are all sensitivity factors. The more efficient and effective the system, the less sensitive a ski area is. As mentioned in the beginning of chapter six, neither 100% nor a too low percentage of snow making seem to be perfect from a cost/use ratio, but rather around 50-60% (see chapter four), depending on the individual situation.

The market and its influence on customer demand

Day guest ratio

The dependency on day guests proved to be a major factor of sensitivity. The day guest is very spontaneous and stays at home if weather or snow are unstable or not as expected. Overnight guests instead book in advance and come and stay even when there is less or no snow, as long as the alternatives are there. The overnight guest is crucial for the destination but also important for the ski area when he buys a week ticket and even books in advance. His behavior becomes more flexible and spontaneous with decisions and ticket sales which reflects society and the market in general. More differences in the demand and behavior are discussed in chapter five of this study. Day guest ratios correlate with access and warm beds.

New market developments

Eastern Europe is an example for new markets that most likely will become more important in the future. Ski destinations with good access to these countries already profit from this new clientele. Of course, there are uncertainties of how this higher percentage for most Alpine resorts' unusual customer group might influence the market and existing customers. Still, it can be an opportunity.

Socio-graphic market share

The socio-graphic market share differs between destinations. The Eastern European share is high in the Austrian Zillertal compared to Verbier, where there are many British. If a ski area wanted to develop a USP of sustainability today, then it would need a higher Germanic speaking customer share.

Demand development and reflections on society

Demographic and socio-economic developments will result in a decreasing number of skiers in the future from traditional markets. There are many alternative activities today that compete with skiing. The more frequent warm and dry winters like 2006/07 become, the fewer people will ski in the future. This of course is an uncertain development.

Sea tourism development

Cheap all-inclusive offers in Mediterranean or tropic countries are already seen as the major competitors for ski areas in winter. It will depend on security, climate and costs as to whether sea tourism will become an even more alluring competitor.

Ski area competition

Of course, the direct competition between ski areas is a factor of sensibility too. In general, ski areas understand each other more as partners in flourishing the

existing market of ski tourists and as direct competitors only on a secondary level.

Costs of transportation

Rising costs of transportation will affect the travel behavior – for day skiers as well as for flight tourists. The actual increments in gas and gasoline are expected to keep its high levels and even increase further. Costs of transportation relate to close access to ski areas. It is probable that ski areas closer to source markets or towns will have a better position compared to those where consumers need to travel further.

Media influence

The media influence proved to be a main problem in the winter 2006/07, purposely reporting bad conditions which affected mostly day tourists. Ski destinations will have to become more proactive in media work and communication.

Customer preferences and societal influences

The general preferences of customers in terms of trends, fashions, public discussions and the influences of society on the individual preferences are affecting the market too.

Safety feeling

In the years after terrorism hit the USA and other Western democracies in a never experienced scale (after September 11, 2001), the feeling of safety became much more important. Depending on the future developments, security and safety could become a constant in customer demand avoiding the mass gatherings of people being more prone to the insecurity of terrorism.

Internal factors

Management and inner structure

Day guest ratio

It is not only a matter of a general sociological trend that even overnight guests are becoming more spontaneous like day skiers are. It is also a matter of strategy that determines what percentage of day guests is needed and targeted.

Diversity factor summer/winter

The dependency on winter needs to be decreased and the current ratio in sales from about 90:10 or 80:20 changed to a more even ratio, for example, in Gstaad with 60:40. The added value of Alpine skiing cannot be reached in the ski area in summer though.

Diversity factor operations, e.g. summer events, gastronomy

The added value of the tourists' spending on the ski ticket is fairly low. Gastronomy and hotels have a much higher added value from tourists' spending (chapter two). Gastronomy benefited from the winter 06/07 when people bought less ski tickets, but instead spent more money in the restaurants. Investments in gastronomy increase added value and decreased vulnerability. Events are a means of attracting many and specific people whole year round.

Stakeholder communication and partnering

A better communication of goals and strategies between tourism stakeholders inside the ski destination leads to the definition of common USP. Partnering between the ski area and the destination is needed to level the seasons better and decrease summer dependency of the ski area on the destination, as well as winter dependency of the destination on the ski area. The whole system should work more as a unit, analogue to a *Model Europe*.

In-house communication

The importance of partnering and communication is apparent inside the ski area and inside the ropeways company as well. In-house training and involvement of employees support the quality and the efficiency of the system as a whole.

6.3.Addressing exposure and sensitivity: adaptive and mitigative elements

Elements of adaptation or resilience as shown in table 46 describe the ability of ski tourism to adjust to global change, to moderate potential damages, to take advantage of opportunities, to cope with the consequences and to increase overall adaptive capacity. Again, we narrow our focus on the ski area with the ropeways company as the central point, but still keep the bigger system of the destination in mind.

6.2.2.3. Technical strategies

Snow making capacity

Snow making capacity remains the major factor to decrease vulnerability to direct climate change impacts. Customer demand and financial issues might match in a lower percentage than 100% that keeps the best cost to use ratio. It is, of course, different in every ski area.

Snow (making) management

The kind of snow making – its use only when and where necessary – and the, from a customer perspective, understandable management of snow machines (e.g., in terms of operating days and times), as well as the snow quality, are aspects of efficiency, regulations and customer satisfaction. The management of natural and technical snow can influence the amount needed and the quality

and the lastingness of it. Snow farming and mechanical grooming techniques are examples.

Table 46 Adaptive elements of ski area vulnerability to global change

Adaptive elements	
Technical	▪ Snow making capacity ▪ Snow (making) management ▪ Landscaping and optimization of the area ▪ Connective expansion ▪ Renewing of lifts and ground-free transportation
Behavioral	▪ Service, quality management and controlling ▪ Partnering inside the destination and within outside aggregations ▪ Destination communication and common goals, personal contacts ▪ Diversity of investments, operations, guests, seasons and activities ▪ Sharing risks and costs ▪ Staff training and service quality ▪ Target group adressment ▪ General fostering of the winter sports market ▪ Media work ▪ Market research and marketing ▪ USP development ▪ External support, subsidies
Mitigative	▪ Environmental management system (EMS) ▪ Operations efficiency ▪ Lowering negative impacts ▪ Information and capacity building ▪ Sustainable consumption

Landscaping and optimization of the area

Landscaping and optimization mostly mean to level the slopes so less snow is needed to operate the ski area. Ski areas in lower elevations with grassy slopes naturally need less snow, for example, a solid cover of 20 cm, compared to slopes in the rocky high Alpine which might need one meter of snow to cover the stones. It also implies the avoidance of southern exposures.

Connective expansion

Expansion in higher elevations and on glaciers tries to access cooler average temperatures, and thus opens new terrain that is less affected by warming temperatures. These two kinds of expansion are first limited by terrain and regulations in the Alps; second, they do not meet customer demand as we have shown in chapter five. We thus focus on the third kind of expansion, which is to grow bigger in size and possibly connect with neighboring ski areas. Reasons are to be more efficient and successful in operations. Big size is a key performance factor for ski areas (see chapters four and five).

Renewing of lifts and ground-free transportation

High service quality requires low waiting times in the lifts, which again makes modern high-speed lifts necessary. Ground-free transportation is becoming more important in the lower parts of ski areas which makes access to the high Alpine without snow possible.

6.3.1.1. Behavioral strategies

Service, quality management and controlling

The customer is becoming more demanding. Quality and service are expected to an increasing level. The customer wants to be understood as a partner. Ski areas with poor service will suffer from customers not coming again. Internet-based, negative rating services proved to affect demand significantly (see chapter 5.2). High service quality throughout the service chain of the "mountain experience" (figure eight) can address the sensitivity elements of customer preferences, safety feeling, day guest ratio, overnight guest booking behavior, demand development, competition of sea tourism and other ski areas and also media coverage. The guest himself can meanwhile actively participate in online voting platforms and create some kind of indirect media influence.

Partnering inside the destination and within outside aggregations

Ski areas and the destinations often have opposing goals and targeted customers. With bundled forces, joint strategies and shared USP, the sum is more than its ingredients. Better communication inside the social construct of tourism stakeholders will improve its adaptive capacity. Marketing or procurement aggregations with other ski areas or destinations can help, for example, developing specific USP.

Destination communication and common goals, personal contacts

Partnering inside the destination is important, and active communication between the partners is an aspect that needs improvement. Ski areas and the tourism of the destination should work in the same direction. Important service tools like CRM bonus cards did not work in some places due to the lack of destination partnering and communication – a clear sensitivity factor. Misunderstanding between decision makers of different partners can, of course, increase difficulties.

Diversity of investments, operations, guests, seasons and activities

Investments can be dedicated to various goals. Ski areas investing only in winter and little in summer, which still occurs in some French stations, miss the early chance to strengthen other strategic areas. Summer tourism, four season and snow-independent activities, as well as other operations, like gastronomy are important fields of diversification. Increasing the revenue and the added value of the service chain should be a main goal of ski areas. Gastronomy and

lodging are the two services in the supply chain that generate the highest added value. Diversity in the kind of guests is of key importance, not only in the socio-economic groups but also in the length of stay, namely day and overnight guests. The ratio of warm to cold beds has to be increased to offer the necessary infrastructure for a higher percentage of overnight guests.

Sharing risks and costs

In chapter two we discussed the percentages in added value generated by the various stakeholder sectors, such as the ropeways, gastronomy and lodging. The ropeways company is carrying the major costs for investments into ski tourism and adaptation to climate change, also the biggest risks in the impacts of changes. Still, it benefits less than other sectors from the customers who mainly come because of the services provided by the ropeways company. Sharing risks, costs and benefits more evenly would help to better partner inside the destination and to increase adaptive capacity of the ropeways companies.

Staff training and service quality

The customer demands service and information. Both rank among the most important factors for a customer in a ski area (see chapter five). If staff is not well informed and cannot provide sufficient information in important topics, such as snow making or climate change, then the customer leaves with a mediocre impression. Ski areas had to admit that in-house training is a field that requires more attention.

Target group addressment

In the demand side of this study we draw a picture of customers with specific customer profiles and their individual demand, as well as the individual effectiveness of directed marketing. If addressed accordingly, a ski destination can design services with the best fit to the individual needs, thus targeting specific groups more effectively. A destination that, for example, has a small and low ski area, should focus more on the older overnight guest who skis seldom and design special packages for him. Dependency on day guests should not be too high because the overnight guest generates more added value. Thus, thorough target group addressment and accordingly designed services and infrastructure can influence vulnerability.

General fostering of the winter sports market

The winter 06/07 has shown that the source market easily gets affected by just one bad season. People tend to forget about snow, especially day guests and those skiing seldom anyway. Even the biggest and most well-known ski areas had losses on day guests. Those working well with the source market and

spreading the word can decrease vulnerability in a bad year. Snow in towns and ski domes are just two examples of this.

Media work

Media work relates to the general fostering of the winter sports market and helps to reach the spontaneous customer when there is no feeling of winter in the towns. It also can help to provide more information and in general achieve more involvement and understanding of the customer.

Market research and marketing

Market research enables ski areas to decrease uncertainty of market development and to strategically design services according to the demand. Directed marketing can significantly increase customer demand and willingness-to-pay as proved in the example of green marketing (see chapter five).

USP development

The uniqueness of a ski area shapes its profile, shapes strategies and is the premise for marketing and target group addressment. It helps the customer to distinguish between competitors.

External support

External support from outside the destination and from outside the system of ski tourism is an important part of behavioral adaptation. Financial subsidies help to overcome weak seasons and to invest in the future, if provided by official politics for the strengthening of local economic development and employment. Legislative support from politics sets the frame for diversifications in operations and activities.

6.3.1.2. Mitigative strategies

Mitigation, so far, has not been in the focus of ski area managements. Its importance is seen as moderate (Wolfsegger et al., 2008). Even more, Bürki (2000) reported that stakeholders neither felt pressure nor desire to mitigate, and a leading role of ski tourism in climate protection could not be expected.

With increasing costs of energy, stricter regulations and the attainment of natural limits, mitigation becomes a more viable alternative of adaptation, especially for those ski areas in lower elevations suffering most, which in a recent study named mitigative aspects as one of their main strategic approaches of the future (Roth et al., 2008). Even more, mitigation and thus higher environmental performance can lead to new business opportunities in the market of sustainable consumption. Although the total numbers of consumers favoring more sustainable services and alternatives for snow

guarantee by technical means are about one-fourth of the German speaking market today, the buying power, due to the higher incomes of this group and its expected numerical increase, serves as a potential niche for smaller ski areas. They could operate with fewer clients who pay more for a service that requires fewer investments and allows for more cost efficient operations.

The negative feedback effects of technical adaptation on climate and the environment in general can be lowered by mitigative actions (Mueller & Weber, 2008). This also decreases the probability of environmental risks harming the company and ski tourism as a whole. Mitigation in an extended understanding (see the *Glossary* chapter and chapter two) can be the core of a sustainable way of adaptation. Inclusion of the socio-economic aspects of global change should be thought of too. Mitigation to the loss of skiing traditions and young kids not learning to ski anymore could mean investigating how this development can be stopped. Suggestions include offering special packages for kids and families, supporting ski clubs, subsidizing lifts close to source markets and bringing snow into towns.

Mitigative strategies thus are becoming more important and provide some direct and indirect advantages:

- **Increased operations efficiency and cost savings**
- **Environmental risk prevention**
- **Meeting better environmental regulations**
- **Improved partnering with the customer**
- **Fostering general environmental awareness and capacity building in consumer behavior**
- **Offering new business opportunities in sustainable consumption**
- **…thus securing the long term future of ski tourism by lowering its negative environmental impacts and feed-back loops on the system of global change.**

However, the ropeways company and the ski area itself are directly only responsible for about less than five percent of greenhouse gas emissions, taking an average week vacation in account. The major parts are about 70% for travel to and from the destination, as well as lodging with about 25% (Mountain Riders, 2007). Mitigation, to be more effective than costs savings, risk management and marketing, has to be a joint strategy of the whole destination and, of course, is dependent on the political frame and other human influences outside the place as visualized in figure 64. For a more complete list on mitigation elements see Mueller & Weber, 2008.

Lowering the climate relevant emissions

The original and main definition of mitigation is to avoid climate change (*Glossary* chapter). Ski tourism has to reduce its emissions of CO_2, CH_4 and

other greenhouse gases in order to lower its negative impacts on climate and its part on human acceleration of climate change.

Environmental management system

An implemented and well working environmental management system (EMS) is the premise to manage the environment efficiently and safely. Better reviewing and meeting environmental regulations, as well as risk precaution and management, are benefits of an EMS. In addition, data and environmental performance are the premise for a worthwhile green marketing (see chapter five).

Operations efficiency

With rising costs of energy and water, as well as other procurements, garbage disposure and recycling, an efficient management with resources becomes a major tool to save on costs. Snow making, lifts and snow management or grooming are major fields of application in ski areas. Labor use and involvement of the personnel are social aspects of operations efficiency. Lodging and hotels, local living, gastronomy and mobility are other major services that require more efficiency in operations. Mobility to and from the destination, as well as inside it, is the main producer of green house gases and other emissions in ski tourism, by far (Mountain Riders, 2007). Again, partnering and communication with all stakeholders and tourists are necessary to address these issues.

Lowering general negative impacts

No to forget are *classic* ecological effects of ski area operations, such as impacts on plant and animal species from constructions, earth movements, soil compressions, noise and light pollution, habitat changes, among others. The decrease of direct and indirect negative impacts on the local ecology, as well as on the general air quality and the climate by emissions of any kind, are part of mitigative strategies.

Information and capacity building

Pro-active communication in the field of environmental management with the media, stakeholders and customers, builds capacity to prevent misunderstandings or negative press. It is a premise for involving the customer better in the services generating process to adapt his behavior and choices to what the supply side is able to offer from an aspect of sustainable development. More information and involvement proved to be a major aspect of customer satisfaction. Capacity building should both be an internal and an external process seen from the perspective of a ropeways company. Capacity building involves the look on the future customer and opens up possibilities for kids and families to access snow sports easier.

Sustainable consumption

The market of sustainable consumption exists and is strong, still being of minor importance but with a growing tendency. Mitigation from an environmental aspect lowers the negative effects ski tourism has on the environment. The actual share of the ropeways company and of the ski area on the climate relevant emissions are comparably low (Mountain Riders, 2007). Only working with the destination, stakeholders' major improvements and effects can be achieved. Mitigation also takes advantage of opportunities, such as the growing demand for sustainable consumption. Environmental aspects of mitigation are a premise for sustainable tourism; socio-economic facets need to be included too. In this understanding of mitigation as an opportunity for targeting a new market of sustainable tourism, it can become more interesting to invest into this win-win opportunity of mitigative adaptation.

6.4.Recommendations and strategic approaches

The listed exposure and sensitivity factors can be addressed by the discussed adaptive elements. These strategies should be proved and applied individually by the ropeways companies. In addition, we further outline some strategic approaches and recommendations of high relevance. We find that our recommendations match with the ten destination success factors of Kämpf and Weber (2005), discussed in chapter two.

What strategies are adjacent to manage and increase adaptive capacity in a sustainable matter?

6.4.1. Change is chance

Understanding the system of ski tourism vulnerability, with its interactions between exposure, sensitivity and adaptive capacity, clarifies the threats and the opportunities existing and to be developed. Experiences of the analogue winter 2006/07 have shown what threats need to be expected and taken into account in the future. The common division of losers and winners is not wrong, but too narrowly focused.

Interactions within a framework of vulnerability are much more complex and diverse and could alter the current division of high and low ski areas as winners and losers where the system affects and is affected by each unit. No matter who might be a winner, he will lose in the long term if the system of ski tourism is weakened.

The possible and potential impacts of global change already are affecting the coupled human-environment system of ski tourism. Negative outcomes have mostly hit the lower and smaller ski areas so far, those being the most threatened stakeholders in winter tourism. However, the bigger and higher areas experienced first signs of threats from extended exposure and sensitivity

and have to act accordingly. Their exposure to climate change is much lower due to higher elevations, also to other factors due to the bigger size and more investment power.

6.4.1.1. Losers to winners?

The lower and smaller ski areas as the classic *losers* are most exposed and sensitive to global change. They have the highest pressure to adapt and the highest need to diversify and develop other core competencies than snow.

These areas have a number of opportunities arising from changes. They can have better chances to strengthen summer tourism. They are greener in summer and less rocky and rough than the higher ones. It, of course, depends also on developments in competing summer destinations, for example, the weather extremes with droughts and bush fires experienced in the Mediterranean in the summer 2007. Such events in the sea and classic summer destinations could foster interest in the Alpine destinations. Lower ski areas suffer less risk from permafrost thawing with rock fall or slope pitch changes than the higher ones. Smaller ski areas are more flexible and can react more spontaneous to new markets or trends. They have the chance to target specific customer groups better because they are more flexible and could operate with a lower volume of visitors. Fewer investments in snow making and offering only a minimum of snow guarantee could save tremendously on costs.

More sustainable ski tourism that uses much less technical adaptation and even re-builds some services could be the mega-trend for the future especially for smaller and lower ski areas. The willingness-to-pay of the *sustainable* ski tourist is much higher and could outweigh the lower market share and fewer numbers of skiers.

A market share of about one-fourth of the German skiers is, carefully calculated, about one million people. The average WTP is two to six times higher, in special focus groups up to thirty one times higher. Carefully calculated, ski areas aiming at this market might be able to operate with about a half or a third of the current volume of skiers by saving on operations costs and by increasing the day pass price. This hypothetical outlook requires further study into the individual ski area system and according business models.

The smaller and lower ski areas could start later in the season when natural snow might be more reliable and shrink to a more healthy size that has lower costs of operations and could work with fewer visitors. They could only open on certain days or periods when natural snow is sufficient, attracting more day skiers which, of course, depends on their accessibility. Targeting an off-piste clientele, some could even stop grooming and just offer wild terrain. Examples

like this exist and work quite well, such as Silver Mountain in Colorado or La Grave in France.

Partnering with other ski areas and investors will be of key importance to try to grow bigger in size and investment power. Higher and bigger ski areas might want to invest in smaller and lower areas which are closer to the source markets to foster the general interest in snow and mountain sports.

Smaller and lower ski areas need to find their niches and specialize on certain activities, topics or clientele where snow is not in the only focus any more. Sustainable tourism is such a niche with a high paying market which develops change and threats into business chances, by mitigating the impacts and by being much more efficient in operations.

Diversification in snow-independent activities of any kind, as well as in summer tourism, more specific target group adressment and lowering costs of operations are seen as other important strategies and chances. Ski areas in destinations with a tradition of summer use and mountain agriculture will have better chances to diversify more into summer tourism. Famous mountain scenery would work as a main USP too. There are market niches and chances for ski areas that are smaller and that are not able or not expected to cover the whole range of service offers for all kinds of customers. They could operate with a lower volume of visitors if services are matched accordingly.

Target groups of key interest are the sustainable tourist, families and the elderly, the hip and young crowd, the extreme sports clientele, the lowest and the highest incomes, a more spontaneous day tourist if access is right and snow conditions are good, and the overnight guest if lodging and gastronomy, as well as alternative offers, are right. There are more such specific customer groups to be targeted, for example, tourists from emerging markets from Eastern Europe and Asia.

However, exposure of smaller and lower ski areas to risks of global change impact is highest and a shrinking number of the total will be unavoidable.

6.4.1.2. Winners to losers?

On the other hand, the higher and bigger ski areas as the classic *winners* might suffer from extended exposure and sensitivity in the long term. The high Alpine might have a lower visitor potential in summer because of its harsh and rocky environment if there are no famous high mountains, for example, like the Matterhorn. Thawing permafrost could increase risks of rock falls, mud slides and change the topography of slopes and lift lines.

These areas need the high volume of skiers and have to target all kinds of customers, they cannot be as specialized for certain customer groups like the smaller could be. Shrinking numbers of the total market of skiers can become a major problem for those needing high volumes of visitors. Shrinking numbers of ski areas on the other hand could lead to increased demand, which in some ski areas could exceed the carrying capacity, as the example of Zermatt shows (chapter four). The long-term success of winning ski areas is related to the strength of the whole system of ski tourism.

Higher and bigger ski areas need to attract the mass of customers. They have to do it all, and snow competence is the USP promising most success.

Still, higher and bigger ski areas have the lowest exposure and sensitivity with the highest adaptive capacity and a lower overall vulnerability. They are on the winning side but should not neglect the risks and threats which certainly exist and which could grow to serious problems. Snow competence will be the main focus and USP of these ski areas. Very winter dependent ski stations in France with almost no summer structure and diversity have a higher sensitivity to changes than more diversified ones.

Mandatory for all ski areas and of equal importance are more active media work, outreach and communication, better customer involvement, high quality and service, partnering and diversification as well as basic environmental management.

The uncertainty and complexity of developments is a main problem for ski tourism. In general, the concentration process of ski areas will progress and become even stronger. A shrinking number of ski areas in a classic sense are foreseen. The developments of new markets in and from other countries are uncertain too and could open up new chances for Alpine ski tourism. Budget skiing and cheap offers could fill the low season periods in ski areas better but are no general goal as seen by ski area managements (see chapter four) because quality and service are expected by all customer groups (see chapter five).

6.4.2. Blending adaptive elements

Some exposure elements, such as the socio-graphic situation or the demographic situation, cannot be tackled by size or elevation. Only a blended combination of the listed adaptive elements, including technical, behavioral and mitigative elements, can be successful in the long term. The focus needs to be moved towards behavioral and mitigative strategies as the limits of technical adaptation become obvious. Still, without technical adaptation ski areas in the common understanding will have trouble to survive.

6.4.3. Adapting demand to changing services

In the past and in the current the main discussion, how to react to ongoing and expected changes has been centered around investing to maintain a common service product of Alpine lift accessed skiing on groomed terrain. A focus of this study is in assessing the potential to meet the demand with changing services that are not being completely maintained as they used to be. Exposure and sensitivity will lead to more pressure on conventional downhill skiing services. Maintaining them will require more resource input because of technical adaptation that in a long term might not be adequate and even feeds back into increasing environmental problems. Taken the changes as given, applying technical adaptation only where necessary (an independent expertise and label should qualify for that) and as little as possible, instead fostering behavioral action and involving the guest more into demanding a changing service, is an opportunity of mitigation and sustainable consumption.

Fostering tourism demand for changing services would lead to a demand side behavioral adaptation.

6.4.4. General recommendations to maximize adaptive capacity

Following the discussion of vulnerability, we summarize some general recommendations addressing tourism stakeholders, especially the managements of ropeways companies. The goal of these recommendations is to maximize overall adaptive capacity. For certain specific consumer target groups, different recommendations may apply as shown in chapter five and below. The individual situations in the ski areas differ and each stakeholder with practical and local experiences and insights will take from it what could be of use and of feasibility.

6.4.4.1. Check, evaluate and apply adaptive elements

The listed adaptive elements should be checked and evaluated for feasibility and relevance in the individual situation by the decision maker and manager to apply those elements, which locally make sense.

6.4.4.2. Be competent in snow and in risk management

Snow is and remains the unique three-dimensional resource of ski tourism. Snow competence is a key performance aspect of those ski areas that want to and are capable of keeping the core business of skiing. Technical snow making is an integral part of adaptation. The percentage of covered slope surface does not necessarily have to be 100%. Form a cost to use ratio a lower percentage should be sufficient, dependent on the individual ski area. The management of the snow and the manner of snow making are important; the guest is sensitive

here. Icy conditions should be avoided as well as constantly running snow machines, despite good, natural snow when skiers are on the mountain.

There is less acceptance of the necessity of snow making in this case. Informing customers about the local practice of snow making would help to increase this acceptance. The main runs should be groomed perfectly, and more slopes and terrain should be left open and ungroomed for off-piste skiing, which meets customer demand. Signs, markings and clearly visible closures of icy or rocky slope patches, and of avalanche danger, should provide for a well-informed, content customer. Fun parks with music are mandatory for the younger clientele.

6.4.4.3. Diversify in activities

Diversification should be achieved in many fields. It decreases dependence on Alpine skiing and increases adaptive capacity. Activities that are snow independent, such as mountain biking or ropes courses can be offered in four seasons. Other snow related activities than skiing, such as snow kiting, dog sledding or snow shoeing diversify in winter. None of them will reach the added value of Alpine skiing though. Events can attract bigger numbers of people in topics meeting the targeted groups, for example in music, culture or sports.

6.4.4.4. Diversify in seasons

A general prospering of the summer season increases the revenue in summer and decreases dependency in winter. Advertising to overnight guests for moving the main ski holiday to late spring when there is more natural snow probability can lead to fewer risks at the Christmas season by strengthening the springtime where applicable.

6.4.4.5. Diversify in investments and operations

Investing in gastronomy and lodging increase the added value and the share of the service chain, thus diversifying in operations and investments.

6.4.4.6. Diversify in guest segments

More diverse guests from different markets, especially from the emerging ones, should be targeted more directly. The WTP of certain guest segments differs strongly (chapter five) and thus delivers various opportunities for ski tourism stakeholders.

6.4.4.7. Decrease dependency on day guests

The dependency on day guests must be reduced. Ski destinations should maximize warm beds and infrastructure to increase the percentage of overnight

guests. Ropeways companies though need the day guest in addition to generate volume, calling for a healthy ratio of day skiers to overnight visitors.

6.4.4.8. Be more flexible

More flexibility in ski pass validity supports the overnight guest in his decision to buy multiple day passes in advance despite of his more spontaneous booking behavior.

6.4.4.9. Offer alternatives and complements

Alternative or complementary offers to classic Alpine skiing should be of *soft* kind, such as hiking, biking, paragliding, aided climbing (*Via Ferrata*), wellness and sun bathing, among others. Technical installations on the mountain do not meet customer demand. Courses and trainings in mountain specific or related topics, such as photography, wildlife, glacier retreats, global change and others are good alternatives.

6.4.4.10. Provide more service quality

The guest is demanding high quality and compares other service offers. Specific demand is met, for example, with free guiding services on the mountain to inform people about the ski area and related topics. The customer must be understood as a partner in designing his experience. Other examples are a system of e-commerce where especially day tourists could buy their ski passes online from home without having to wait in the morning queue, a customer quality rating system and transparent and reliable weather and snow conditions as well as for road traffic online. Constant market research is needed though to listen to customer demand and to design offers more specifically to certain target groups.

6.4.4.11. Develop a unique selling proposition (USP) in summer and in winter

The shaping of the individual profile by defining strategies, contents, target groups and marketing channels are premises to develop a USP both in winter and summer. This USP serves to compete with other ski areas and other destinations. Communication between all stakeholders is a key to USP development. An example for a USP in four seasons is Zermatt with its Matterhorn mountain that is found in the logos and the communication material of Zermatt tourism.

6.4.4.12. Communicate more

We already stressed the importance of communication throughout this study. Despite of that it is brought up here again for a complete list of recommendations. Involving customers, partnering with other stakeholders and

active media work and marketing require more communication, both externally and internally, inside the ropeways company, in the ski area and inside the destination.

6.4.4.13. Seek partnerships

Various kinds and levels of partnerships are possible and necessary. Partnering with the customer, with other stakeholders in the destination, with investors, other ski areas and destinations, other industry sectors and market aggregations are such kinds and levels. Ski areas should invest more resources in partnering. Understanding the diversity of stakeholders and the small share in total ski tourism, for example, on emissions a ski area is responsible for, the necessity to involve all stakeholders and be open for partnerships is obvious.

6.4.4.14. Develop the future customers

Stakeholders should invest more into school programs and families, both inside the ski destination and in the source markets. Every future customer is important and a worthwhile investment as a future multiplicator and ambassador. Flourishing the source markets of future ski customers implies the need to bring snow events into towns and outreach more with schools and ski clubs. Bigger ski areas and agglomerations can support and invest in smaller ski areas and ski hills or lifts closer to the source markets. Events are a kind of trend setting.

6.4.4.15. Target specific customer groups

Customer demand profiles reveal some special interest groups that could be targeted by ski areas more specifically because they differ quite strongly in their demand and also in their responsiveness to marketing (see chapter five), to match the USP with the customer group, making more efficient and effective business possible. Smaller ski areas could find their niche customers here, for example the *sustainable* tourist with a high WTP and the acceptance of less snow guarantee; bigger ski areas could design better service packages for their clients. These are the highest incomes, the lowest incomes, the elderly, the young crowd, families, the day guest, the overnight guest and the very sportive *extreme* guests. More separations are possible by further customer research.

6.4.4.16. Think systematically

All actions and strategies should be based on the assessment of the interrelated system as discussed throughout this work to incorporate economic, social and ecological dimensions and find balanced strategies that work not only in a short term but in a mid and long term (see figure 64). The principle of sustainable development requires more systematic and long term thinking than currently applied.

6.4.5. Sustainable ski tourism

Is sustainable tourism a feasible and real opportunity for ski areas?

Mitigation as the premise for sustainable tourism proved to be a potent market niche where, especially smaller and lower ski areas with more exposure and more sensitivity, could find their USP. The bigger ski areas understand mitigation and environmental sustainability as a complementary USP which is sub-lined by the momentum market share of about one-fourth of the Germanic speaking countries. This existing market that is of growing importance could, for now, possibly not fulfill the necessary volume of skiers needed by big ski areas. Because of this compromise to offer services that attract the majority of people, the level of sustainability performance could not be reached in a bigger ski area of what a smaller, specialized area could offer today. Sustainable tourism as such today is thus a market and a USP for smaller ski areas who can operate with lower volumes of skiers. However, a general trend of sustainable tourism is seen that could lead to an even higher demand in the near future (CIPRA, 2007a). We have to be aware that one-fourth of the market is not a niche anymore.

Sustainable tourism requires an adaption from a consumer's behavioral point of view and a generally better partnering process between the supply side and the demand side of ski tourism. Lower and higher ski areas of smaller size alike could move in this direction, but the pressure for lower ski areas, of course, is much higher due to fewer alternatives the higher areas have. The perceptions and acceptances of the ski area managements showed that the majority is willing to invest into a USP of sustainability, more so as a complementary one in the bigger ski areas.

Results of this study indicate that it is mandatory for any ski area to perform a certain environmental standard, if only to meet environmental regulations, and the principles of sustainable tourism must be incorporated by any ski area. Sustainability as a USP can work in bigger destinations too though, depending on the scale to be targeted and reached. Aspen Snowmass in Colorado is such a working example. Sustainable tourism is a viable market niche for those with the highest pressure to act and those who want to lead the track. For all others it is a must to incorporate the related principles (see further below).

In general, the definition of a sustainable ski area is unclear and still open to some degree (see the *Glossary* chapter). Further research and practical experiences have to define the degree of sustainability, and especially what the role of technical snow making and snow guarantee can be.

6.4.6. Recommendations for establishing sustainable ski tourism

Sustainable ski tourism is not primarily to be understood as a tool of marketing and sales but to sustain the long term success of ski tourism.

The definition of sustainable ski tourism as understood in this study (see the *Glossary* chapter) leaves space for developments. Sustainable (ski) tourism is not a set statues but a dynamic process of balancing different objectives and needs where solutions are highly individual. Still, certain guidelines have to be met and goals achieved. These goals have to be implemented in the management process (TIES, 1990). Sustainable management requires a well working and healthy economic growth. At the same time, ecological and social aspects have to be met. A business that is economically viable, but lacking ecologically and socially, cannot be sustainable now and over time (The Natural Step, 2003, Weizsäcker & Lovins, 1996).

Sustainable ski tourism thus is a dynamic process of balancing different needs and aspects to come to individual solutions that meet certain guidelines and goals we outlined in the *Glossary* chapter. There are different stages of sustainability that will be reached throughout this dynamic process. We thus can only give some general recommendations based on customer demand, ski area experiences and common practice of sustainable tourism, shown in table 47. Transparent and trustful communication of the set goals, the process and the progress to stakeholders and customers are an intrinsic part of a path toward sustainable ski tourism.

Sustainable adaptation to global change implies an adjustment on all *screws* of the system as discussed earlier. Rather than solemnly focusing on keeping the services, like 100% snow guarantee despite the necessary resource intensiveness, the adaption from a customer perspective demanding a changing service that requires less technical adaptation and is less cost intensive is another *screw* more attention should be put into.

In general, we understand sustainable ski tourism as the leading principle of all ski areas, but distinguish two kinds of strategic goals and approaches:

1. **For long term success a management according to principles of sustainable development is mandatory for any business.**
2. **To develop sustainable tourism as a USP further steps have to be undertaken.**

The recommendations for establishing sustainable ski tourism are thus to be understood as general guiding principles for any kind of ski area (see table 47).

Table 47 Recommended guide lines for sustainable ski tourism from a ski area perspective

Guide lines for sustainable ski tourism from a ski area perspective
Understand sustainable ski tourism as a principle for sustaining long term success
Find a healthy economic growth
Be transparent and trustworthy
Develop and incorporate contents
Include the social facet
Communicate well and build capacity
Implement an environmental management system (EMS)
Minimize technical adaptation and optimize its usage
Mitigate (more operations efficiency, less emissions, etc.)
Offer soft alternative activities
Develop and engage in local governance
Find strategic partnerships
Meet the “sustainable” guest
Step beyond and develop sustainability as a unique selling proposition (USP)

6.4.6.1. Find a healthy economic growth

Growing not for the sake of growing but to maintain a healthy business – these words capture the economical dimension of a sustainable business in one sentence (Patagonia, 1999). Without being economically successful no business or organization can sustain itself. Economic success though is not the only or main goal of a sustainable business, but an intrinsic part of it (The Natural Step, 2003, Weizsäcker & Lovins, 1996). Mitigative aspects and less technical adaptation allow for more efficiency in operations and cost savings in technical equipment, energy and water use, as well as in construction. 80% of the customers are willing to pay more for the day ticket if used to improve the local socio-ecologic performance. The share of 28% of the German ski tourists shows a higher willingness-to-pay for sustainable ski tourism in average of 200-600% and in some target groups up to 3100% (see chapter 5.2). These figures are the base for an economic success of sustainable ski tourism.

6.4.6.2. Be transparent and trustworthy

Customers need trust in what a business promises, especially in a topic that is difficult to understand and to control such as sustainability. Ski area managements believe that in summer the tourist can build his own opinion on the environmental performance of ski areas because the landscape is more visible without snow. Even in summer though many aspects of sustainable development are not visible, which makes it unlikely for the general customer to understand and judge about the sustainability performance of ski areas from environmental, social and economic perspectives. Transparent information is one key element to involve the customer and gain acceptance and willingness-

to-pay, but trustworthiness is reached by independent third party certifications and customer rating systems. We showed the possible effects of negative customer ratings on the choice of ski areas in chapter 5.2. Certifications are trusted if they are third party and if they are well-known, for example, the WWF, the DSV (German Ski Federation), Greenpeace or ISO. What contents they show seem to be of secondary importance for the customer. A certification and information system that is made for ski tourism is a premise for gaining customer trust (see chapter 5.1).

6.4.6.3. Develop and incorporate contents

The expression *sustainability* is overused and often comes down to an empty slogan. The development of clear and practical contents is important to gain trust and to make it concrete. Examples for contents are taken from ecological, social and economical sustainability. Some, like mobility, green energy, the use of bio fuels, forest sanctuaries and protecting wildlife habitats meet the expectations of customers more than other, less well-known indicators and are thus also better to market (see chapter 5.1). Political engagement to improve public access by train and bus to the ski area, local procurement of supplies, food, labor and staff training are as important but also less obvious to the customer. Sustainability should not come down to empty marketing slogans but really improve and sustain the long term business success, as well as its main resources, an intact natural environment and customer satisfaction.

6.4.6.4. Include the social facet

In addition to healthy economical growth and environmental performance, the social aspects of involving customers, stakeholders and local inhabitants add a social perspective to sustainable tourism. Fair labor conditions for the ropeways company staff and in-house training, the politics of the local destination governance, in terms of affordable living and hot beds in the destination for local inhabitants are examples. Because the ski tourism industry is living from natural resources and from bringing masses of people in fragile landscapes, it has a responsibility to educate customers on sustainable development and raise awareness for the interrelations of tourism and global change. Education builds capacity and involves the customer, becoming a necessary partner to achieve the goal of more sustainability.

6.4.6.5. Communicate well and build capacity

Participation and social involvement is a component of sustainable development. Communication of contents, common goals, processes and progress are important to activate and involve stakeholders, customers, investors, staff and the media for transparency and trustworthiness. It includes information about the current weather and snow conditions, as well as about impacts on the environment, labor training and social services, environmental

risks and mitigation. Trying to establish a USP in sustainable tourism requires the customer to adapt his demand and, for example, be willing to accept less snow guarantee because of possibly less technical snow making capacity in a sustainable ski area.

It is a general matter of adapting behavior in the choices he makes, such as using public transport or choosing a hotel that is more eco efficient. The necessary infrastructure needs to be in place, but the customer also needs to know about it and be aware on it. Here transparent and trustworthy information are keys for success – the *green* market potential of about one-fourth of the German market can only be accessed by directed marketing. Capacity building is meant to increase knowledge, awareness and also a market place. A benchmarking and decision support tool for consumers that includes a customer rating system for feedback on performances of ski areas could be part of it.

6.4.6.6. Implement an environmental management system (EMS)

An EMS is the premise for implementing environmental aspects into the management of an organization. The structured collection of data, the monitoring of impacts, the setting of standards, guidelines and goals, together with their implication and monitoring, are contents of an EMS. It serves as the starting point for environmental sustainability, it augments sales opportunities, customer satisfaction and improves risk management.

6.4.6.7. Minimize and optimize technical adaptation

Adaptation to global change should be based on a minimum of technical elements that, by its resource use, can feed back negatively into increasing environmental problems. Less technical adaptation leads to cost savings on energy, water and construction, finances that can be used to develop alternatives and to diversify. Still, for some reasons – like safety issues, modernization of lifts, slopes optimization and for a minimum percentage of snow making – technical adaptation will remain an integral part of adaptation in ski tourism. Technology is one facet of achieving sustainability to maintain a certain standard of life, in this case of remaining able to ski. A mixture of technical and behavioral elements, with the focus on the latter, is pointing in a more sustainable direction.

6.4.6.8. Mitigate

Avoid consequences of the negative impacts from ski tourism on the natural environment. The use of natural resources, such as the landscape, mountain space and snow, as well as water consumption, the need for energy, burning fuels and emitting greenhouse gases, can negatively contribute to further acceleration of climate change and to local environmental degradation. The thorough use of resources, operations efficiency, minimizing risks from

operations on the environment (such as leaking oil from machines), the fostering and use of renewable energies, of public and alternative mobility and capacity building are aspects of mitigation.

The ropeways companies themselves, together with the whole ski area, only emit about 3% of the greenhouse gas CO_2 when assessing an average one-week ski vacation. The emissions share of the lodging and housing sector, with about 25%, is much higher, even more mobility and transport to, inside and from the ski area with about 70% (Mountain Riders, 2007). Successful mitigation in ski tourism thus demands partnering of tourism stakeholders to also address the main emitters of lodging and mobility.

6.4.6.9. Offer soft alternative activities

If the focus and practice of adaptation moved more toward behavioral and mitigative strategies, then technical snow guarantee could not be offered anymore. Alternative activities and diverse other and complementary services need to be provided. More technical installations, such as roller coasters on the mountain, a ski dome nearby and others, do not meet customer demand. Instead, soft mountain sports that are healthy for the body and the environment, and that offer a natural mountain experience, as well as information, courses and guiding are sought for by the majority of customers.

6.4.6.10. Develop and engage in local governance

Local and regional political engagement should be part of the guidelines for sustainable ski tourism. We learned about the importance of the local system of governance, such as for diversification and for common strategies and USP. Partnering with all stakeholders to develop and implement a system of local governance increases the capacity for sustainable development.

6.4.6.11. Find strategic partnerships

The path towards sustainability is complex and multi-layered. Strategic partnerships help to develop contents, manage the tasks and work packages, as well as to control, monitor and evaluate the process. Marketing aggregations specified on sustainability help to communicate and reach the customer.

6.4.6.12. Meet the sustainable guest

Knowing the guest structure and their preferences is the premise for establishing and operating a sustainable ski business. In this study, the market potential shown is reflecting the German speaking market. The higher the socio-graphic share of German customers in a ski area, the higher the chance that these skiers will pay for it. From a demographic perspective, the younger and mid age customers are most willing to pay for sustainability. From socio-economic aspects, those with a higher income who do not ski often are the best

target group. More separation could be done and will make sense because the willingness-to-pay differs much between certain consumer groups (see chapter 5.2).

6.4.7. Withdrawal from ski tourism

Any kind of adaptation strategies implies that the goal to maintain ski tourism and secure skiing is as the core of it. Closing down ski areas and finding complete alternatives to tourism would be another way to react to global change. In ski area based mountain tourism, so far no other activity than Alpine downhill skiing can generate a similar sales volume and revenue. Events may be the most proximate activity for the destination if the ski area were closed. Tourism is the main industry in many regions of the Alps (see chapter two) and world wide of growing importance. Many rural regions, where Alpine tourism is important, have a rather weak economic structure and diversity. The potential for alternative industries in the Alpine regions that can outweigh ski tourism has to be seen as very low (Abegg, 1996, Elsasser, 1995). Maintaining ski tourism thus should be the goal in general to foster sustainable development in the Alpine regions. Shrinkage of the current number and the closure of ski areas is part of this process.

6.5.The vulnerability management framework

What are the feedback processes in the coupled human-environment system of ski tourism and global change?

We developed a reduced form of a ski tourism framework that focuses on the ropeways company but maintains its position in a multifaceted, coupled system. The in figure 64 presented framework is adapted from Turner (2003) and provides the broad class of components and linkages of the coupled ski tourism system's vulnerability to global change. The elements shown are interactive and scale dependent, linking place, to region, to world. The hazards for the system arise from social and from environmental influences outside and inside the system, which influence each other and render into the system. The interactions and feedback loops are in place, beyond place and cross-scale.

Social and climate change interact and together form the hazard of global change. The ski tourism market is exposed to these changes, the main dependencies being between the ropeways company and the ski tourist. The model of local governance affects the exposure of the ski destination and relates to sensitivity elements we identified earlier in this chapter. The human-environment conditions of the system determine its sensitivity to any set of exposures. The responses and their outcomes determine the resilience of the system and feed back into sensitivity and outside of the place influences, no

matter if responses are tourist or ski area reactions, of keeping or maintaining demand or services.

The interplay of tourist reactions in adapting demand and of ski areas mitigating creates a market of sustainable tourism that feeds back into sensitivity, as well as into the strength of the original hazards. Furthermore, the tourist demand that is not changed puts pressure on more technical adaptation. The ratio of blended kinds of adaptation feeds back again into the human and environmental influences outside the location. These influences, such as the media and the general state of global environmental change, e.g., water scarcity, link the relation between supply side and demand side of the ski tourism market.

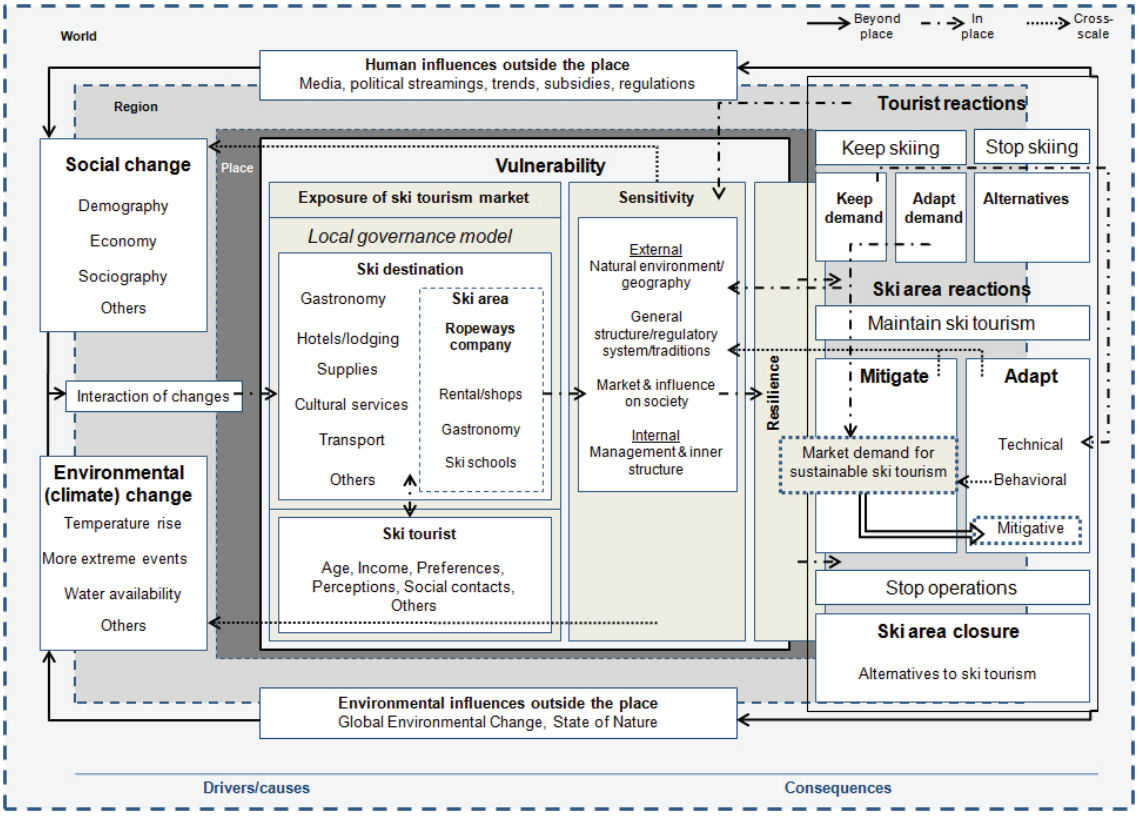

Figure 64 SkiSustain vulnerability management framework of ski tourism (adapted from Turner et al. 2003)

The framework illustrates the complexity and the various sources and potential effects of uncertainty in the vulnerability analysis of the coupled human-environment system of ski tourism and global change. Its systemic qualities are capable of left-right and right-left application, meaning causes-consequences or consequences-hazards. However, the diversity and uncertainty of places may reveal many differences in individual vulnerability analysis. This framework can thus be applied for different places – ski destinations – in different scales to define individual vulnerability.

6.6.Overall conclusions and outlook

Ski tourism is of high economic and social importance for many mountain regions, and especially for the European Alps with their dense population and their high economic dependency on tourism and winter tourism, as summarized in chapter two of this study. The coupled human-environment system of ski tourism is threatened by climate change, warming temperatures and a lack of snow, potentially leading to fewer visits of ski tourists and lower sales for ski areas in winter.

The literature review of chapter two revealed a focus of vulnerability in ski tourism on climate change impacts and a resulting discussion of losing ski areas – those low in elevation and small in size – and of winning ski areas, those in high elevation and big in size. It showed that the main applied and discussed adaptation to the problems is of technical kind, mainly technical snow making and expanding in higher elevations. Due to the ongoing discussion and based on recent publications in the scientific body of ski tourism and climate change, we hypothesized in chapter three that climate change is not the only and the main threat for ski tourism, that the current focus on technical adaptation is not sustainable and that the threats and problems of global change can also lead to opportunities of alternative, more sustainable strategic approaches.

In *SkiSustain* an integrative methodological approach was chosen to extend and differentiate the understanding of vulnerability of ski tourism from climate change to more diverse impacts of global change and to develop and test opportunities for sustainable adaptation. Referring to the goals as set up in chapter three this study first *obtained* an overview on the interrelated human-environment system of ski tourism and global change. It *extended* the focus on climate change impacts on the natural environment to a holistic understanding for the relations and feedback loops in the coupled human-environment system of ski tourism and global change. After an analogue winter season 2006/07 this study *assessed* tourism stakeholders' perceptions, experiences and strategies in ski areas of four Alpine countries in qualitative personal interviews, as described in chapter four.

It then *extracted* exposure and sensitivity elements and constructed future ski area scenarios, thereby focusing on behavioral adaptation and mitigation. These scenarios with a changed *status quo* were tested with customer demand based on economic willingness-to-pay data in a representative study for the world's biggest outbound tourism market, Germany (chapter five). Information treatments were applied to test the potential for marketing of sustainable ski tourism. The integrative chapter six *discussed* a differentiation in exposure and sensitivity of ski areas and possibilities of sustainable adaptive and mitigative

capacity, *built up on this* a vulnerability management framework for ski areas, and *defines* now, in the outlook section of this chapter, further fields and questions of more in-depth research. Addressing our research goals, this integrative methodological approach made testing of the hypotheses from chapter three possible, leading to the following overall results of *SkiSustain*:

- Climate change with its direct impacts is not the only threat to the current system of ski tourism. Other facets of global change, such as the sum of socio-economic and demographic developments, as well as indirect impacts of climate change, are currently underestimated in their potential outcomes on ski tourism and could become an even greater threat in the future.
- We therefore need to extend and differentiate our understanding of vulnerability. The *winner* and *loser* discussion of ski areas needs individual re-assessment.
- The current kind of adaptation is not sustainable. Technical adaptation is limited in its capabilities to cope with global change, especially with the indirect impacts of climate change and a diminishing customer demand. New ways of adaptation are needed that put more focus on behavioral means and on mitigation.
- There are opportunities resulting from changes. The growing market of sustainable consumption is a prospect for ski areas to develop mitigation as a business opportunity.
- Regarding the holistic system and the uncertainty of developments in global change and ski tourism, there are other main steering factors of adaptive capacity, such as the model of local governance, which need further research.

The empirical data of *SkiSustain* was collected in the unusually warm winter of 2006/07, an analogy for future winters regarding the expected and forecasted climatic developments (Beniston, 2007a). Perceptions of stakeholders from ski areas as well as demand of ski tourists surely reflect the real time experiences of direct and indirect climate change impacts of that particular winter. The perceived strength of socio-economic, socio-graphic and demographic impacts would most probably have been lower after a *normal* winter – in terms of average temperatures and depth and duration of snow cover – which has to be taken into account in the interpretation of the results.

The contribution of this study *SkiSustain* to the scientific discussion and to the body of literature in climate change impacts on ski tourism is an extended holistic view on this coupled human-environment system and its vulnerability to global change, differentiating the current division into *losers* and *winners* from climate change. The broader understanding of exposure and sensitivity elements and the demonstrated limitations of technical adaptation open up a

new perspective on opportunities from global change, such as the market of sustainable ski tourism.

This is the first study modelling demand of ski customers for sustainable ski tourism, expressed in economic willingness-to-pay data, by testing information treatments and the effects of *green* marketing and being representative for an important outbound tourism market, in our case the German customer. The demand side results indicate the importance of this market trend that could lead to win-win situations from an economic, a social and an ecological perspective. Mitigation and more behavioral adaptation become a business case that could get the ski tourism industry as the driving force for more sustainability in winter- and mountain tourism. The fact that the analyzed data reflect the impacts of future climatic developments (Beniston, 2007a) provided the opportunity to experience market reactions that else would have had to be extrapolated, and increased the quality and the relevance of these results in the discussion of ski tourism vulnerability and strategies of adaptation – if climate change happens as expected (IPCC, 2007, OECD, 2007).

At the end we have to question, what sustainability in ski tourism really is, and stress the individual local and regional assessment of ski tourism according to the vulnerability management framework in figure 64. With *SkiSustain* we provide a framework for an ongoing discussion on vulnerability and sustainability in ski tourism, and maintaining ski tourism in a sustainable kind and size should include the possible withdrawal from ski tourism as a strategic approach, too. The international scope of this study revealed further sensitivity elements, such as different management and governance approaches, as well as adaptive elements requiring further research as described in the following outlook paragraph.

6.6.1.1. Outlook on other aspects of key interest that need further research

The experiences of the analogue winter 2006/07 showed the limits of the current way of adaptation and the need to find other and more sustainable strategies. Water availability and energy costs are the main direct limiting factors of snow making as the most applied kind of technical adaptation. Regional and local assessments of water usage and of downstream effects from upstream water management should be subject of further research, as well as the further improvement of efficiency in snow making technology. Opposing the trend of nearing 100% coverage of the slopes with snow making, more efforts should be put into defining an individual, effective cost/benefit ratio of technical snow making coverage, in terms of costs for the installation and the production of snow, of the customer expectations and his willingness-to-pay. The range of consumer demand and of acceptances is high as we showed in chapter five. In addition, the demand of the youngest customer group below

twenty years of age showed completely different patterns than the age classes above (chapter five). This demand should be analyzed more to better address this important consumer group in the future. Customer reactions on technically produced white snow bands in a brown landscape should be assessed by further research too.

Behavioral adaptation and mitigation with a *real* focus on sustainable tourism are a trend that may well work especially for those with higher exposure and sensitivity to global change. The current market share in sustainable ski tourism of one-fourth of the Germanic speaking countries is not a niche anymore, but a trend, and communication and information are necessary to develop this market. A transparent, independent and trustful communication tool for customers and for the media that as well serves as a market place for the industry and as a mean of quality control in sustainable management does not exist yet. Such a tool needed further research in a certification system meeting the needs of ski tourism. This prospect of communication and certification includes the need for more research and practical experiences in the definition and the performance rating of sustainability in ski tourism.

The uncertainty of the diverse and complex impacts of global change ask for more joint efforts from all ski tourism stakeholders, as well as from customers, to find and apply more sustainable means of adaptation. Maintaining a sustainable size and kind of ski tourism requires the shrinkage and concentration in numbers of ski areas to a healthy size. Hereby the market developments and the evolving demand in emerging regions, such as Eastern Europe, Russia and China need to be taken into account more. In an interconnected system, change impacts will affect the higher and bigger ski areas alike. The complexity and uncertainty in developments require new models of local governance that increase adaptive capacity and the sustainability of ski tourism. Here more research, practical examples and experiences are needed to find business models where mitigation and explicit sustainable ski tourism meet the right size and kind of a ropeways company business, referred to as a *Model Europe*. The premise for successful strategic approaches in sustainable adaptation to global change is the partnering of destination stakeholders to define common goals and bundle forces, as well as to increase the share of revenue from tourists' spending for the ropeways company. To develop a *Model Europe* of individual local destination governance should be a main goal in ski tourism development to adapt to global change in the European Alps. Not to forget in this discussion, alternative diversifying activities and industries to Alpine ski tourism that help mountain regions to become less dependent on snow and on tourism in general need further assessment too.

Glossary

There are some expressions and terms that are often used in global change research and in ski tourism. We refer to the following definitions and explanations to understand and use within this study and relate to the definitions in Roth (Roth et al., 2003).

Adaptation

Adaptation is the adjustment in natural or *human systems* to a new or changing environment. Adaptation to *climate change* refers to adjustments in natural or human systems in response to actual or expected climatic *stimuli* or their effects, which moderates harm or exploits beneficial opportunities. Various types of adaptation can be distinguished, including anticipatory and reactive adaptation, private and public adaptation, and autonomous and planned adaptation (IPCC, 2001b).

Adaption

We understand and use *adaption* as the social adjustment of customer demand and of traditions to changing services, as defined in the online dictionary: *"Sociology. A slow, usually unconscious modification of individual and social activity in adjustment to cultural surroundings."* (http://www.dictionary.com)

Adaptive capacity

The ability of a system to adjust to *climate change* (including *climate variability* and extremes) to moderate potential damages, to take advantage of opportunities, or to cope with the consequences (IPCC, 2001b). Analogue to the adjustment to climate change, adaptive capacity can also mean adjusting to global change.

Alpine/mountain tourism

Alpine tourism is tourism in a mountain environment, specifically in the Alps, that is related to activities in the mountains.

Avoidance

See *mitigation*.

Climate

Climate, in a narrow sense, is usually defined as the "average weather" or, more rigorously, as the statistical description in terms of the mean and variability of relevant quantities over a period of time, ranging from months to thousands or millions of years. The classical period is 30 years, as defined by the World Meteorological Organization (WMO). These relevant quantities are

most often surface variables, such as temperature, precipitation and wind. Climate, in a wider sense, is the state, including a statistical description of the *climate system (IPCC, 2001b)*.

Climate change

Climate change refers to a statistically significant variation in either the mean state of the *climate* or in its variability, persisting for an extended period (typically decades or longer). Climate change may be due to natural internal processes or *external forcings*, or to persistent *anthropogenic* changes in the composition of the *atmosphere* or in *land use*. Note that the *United Nations Framework Convention on Climate Change* (UNFCCC), in its Article 1, defines "climate change" as: "a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods." The UNFCCC thus makes a distinction between "climate change" attributable to human activities altering the atmospheric composition and "climate variability" attributable to natural causes (IPCC, 2001b).

(Climate) Impact assessment

The practice of identifying and evaluating the detrimental and beneficial consequences of *climate change* on natural and *human systems (IPCC, 2001b)*.

(Climate) Impacts

Consequences of *climate change* on natural and *human systems*. Depending on the consideration of *adaptation*, one can distinguish between potential impacts and residual impacts. Potential impacts: All impacts that may occur given a projected change in *climate*, without considering adaptation. Residual impacts: The impact of climate change that would occur after adaptation (IPCC, 2001b).

Climate variability

Climate variability refers to variations in the mean state and other statistics (such as standard deviations, the occurrence of extremes, etc.) of the *climate* on all *temporal and spatial scales* beyond that of individual weather events. Variability may be due to natural internal processes within the *climate system* (internal variability), or to variations in natural or *anthropogenic external forcing* (external variability) (IPCC, 2001b).

Cold – warm – hot beds

Cold beds describe homes that are privately owned by people not living in a destination who only use their homes for an insignificant time per year – cold

beds are secondary homes being unused most of the year. Warm beds are apartments or hotels that can be rented throughout the year. Hot beds are homes where people live throughout the year. The high percentage of cold beds in ski destinations is a common problem in the Alps because many ski areas are missing warm beds to increase the number of overnight guests (see chapter four).

Destination governance

Governance is the whole system of rights, processes and controls established internally and externally over the management of a business entity with the objective of protecting the interest of all stakeholders (CEPS, 1995). The concept of governance applied to tourist destinations consists of setting and developing rules and mechanisms for a policy, as well as business strategies, by involving all the institutions and individuals. In destination governance there are two extreme cases of models relevant for this study: the corporate-based versus the community-based approach (Beritelli et al., 2007). The community-based model is the traditionally grown model of many destinations in the Alps often leading to costly, retarded or non-existing strategies. The corporate-based model is centrally managed and often shows more distinct, focused and differential strategies (Beritelli et al., 2007). The remainder is the model of North American ski resorts.

Ecotourism

The International Ecotourism Society (TIES) defines ecotourism as "responsible travel to natural areas that conserves the environment and improves the well-being of local people" (TIES, 1990). Ecotourism is about connecting conservation, communities, and sustainable travel. This means that those who implement and participate in responsible tourism activities should follow the following ecotourism principles:

- minimize impact,
- build environmental and cultural awareness and respect,
- provide positive experiences for both visitors and hosts,
- provide direct financial benefits for conservation,
- provide financial benefits and empowerment for local people,
- raise sensitivity to host countries' political, environmental and social climate.

Environmental Management System (EMS)

An EMS is defined in the latest draft revision to ISO 14001 (ISO & DIS, 2003) as:

"Part of an organisation's management system used to develop and implement its environmental policy and manage its interaction(s) with the environment".

An EMS can increase sales opportunities, customer satisfaction and improve risk management. Central to an EMS is the environmental policy. The environmental policy is a declaration of the organization's overall aims and principles with respect to the environment, as defined by its senior management. It must include a commitment to the continual improvement of environmental performance and to compliance with environmental legal and other requirements. The policy must also be publicly available.

A key element of an EMS is the process of identifying and evaluating the organization's impacts on the environment (environmental impacts may be positive or negative, beneficial or adverse), and its activities, products and services that cause them. Further steps include an environmental review to determine the impacts and the assessment of their significance, identifying operational control measures and developing an environmental program that assigns people tasks.

An EMS relies on good communication for it to be effective. Internal communication needs to ensure that staff is kept up to date with how progress is being made against environmental objectives and targets, and that they are able to influence the development of the EMS and environmental improvement programs. External communication helps to ensure that stakeholders, as well as customers, are kept informed of the organization's progress and can be engaged in the improvement process. Procedures must be documented and thoroughly monitored.

EMS that have been applied in ski tourism are ISO 14001, EMAS (Eco-Management and Audit Scheme) of the European Commission, The Natural Step and Auditing (pro natura-proski, 2003).

Foehn

Foehn, spelled Föhn in German, describes a physical system of warm dry winds that fall down a mountain. Föhn in the central Alps usually occurs either from the South or the North, with heavy precipitation and cooling temperatures on the luv side of the range and warming temperatures with dry air at the lee side of the mountain range.

Greenhouse gas

Greenhouse gases are those gaseous constituents of the *atmosphere*, both natural and *anthropogenic*, which absorb and emit radiation at specific wavelengths within the spectrum of *infrared radiation* emitted by the Earth's surface, the atmosphere and clouds. This property causes the *greenhouse*

effect. Water vapor (H_2O), *carbon dioxide* (CO_2), *nitrous oxide* (N_2O), *methane* (CH_4) and *ozone* (O_3) are the primary greenhouse gases in the Earth's atmosphere. Moreover there are a number of entirely human-made greenhouse gases in the atmosphere, such as the *halocarbons* and other chlorine- and bromine-containing substances, dealt with under the *Montreal Protocol*. Besides CO_2, N_2O and CH_4, the *Kyoto Protocol* deals with the greenhouse gases *sulfur hexafluoride* (SF_6), *hydrofluorocarbons* (HFCs), and *perfluorocarbons* (PFCs) (IPCC, 2001b).

Human-environment system

The term "coupled human-environment system" describes the fact that humans and the environment are not separable entities, but part of an integrated whole system (Polsky et al., 2003).

Market potential for mitigation

The portion of the economic potential for greenhouse gas emissions reductions or energy-efficiency improvements that could be achieved under forecast market conditions, assuming no new policies and measures (IPCC, 2001b). In a broader sense we could also understand the market potential as customer demand for *mitigating* services, such as a sustainable ski area.

Mitigation

An *anthropogenic* intervention to reduce the *sources* or enhance the *sinks* of *greenhouse gases (IPCC, 2001b)*. This definition is climate change based. We extend the understanding of mitigation in ski tourism to avoid any kind of negative impacts on the environment, not only on climate, but also, for example, oil from grooming machines leaking into the ground. A social facet also can be added, relating to the problem of people forgetting about skiing and snow. Ski tourism stakeholders can avoid this by communicating more and supporting specific offers and target groups. Mitigation has the same meaning as avoidance.

Mitigative capacity

The social, political and economic structures and conditions that are required for effective *mitigation (IPCC, 2001b)*.

Resilience

Resilience is described as the ability to recover quickly from illness, change, or misfortune. In vulnerability assessment, resilience has the same meaning as adaptive capacity (Turner et al., 2003a).

Ropeways

Ropeways companies are the main employer, provider of lift infrastructure and generator of visitor flow and sales in ski areas. Thus, they are also the main body being affected by climate change because of their sheer dependency on snow. The ropeways companies are within the focus of our research – we are assessing their vulnerability of global change and surveying ways for increasing their sustainable adaptive capacity. Nevertheless, as described below, we use the term “ski area” throughout to include the services the customer cannot separate and understands as a whole when visiting a ski area (Michel, 2001).

Skiing as used within this study

With the term skiing we understand Alpine lift accessed skiing and related snow gliding sports on single or double boards, such as snowboarding, Telemark, cross country skiing, Nordic skiing, ski touring or mono ski that are typical activities in ski areas. In this study we also include general snow sports that are part of the variety in ski areas.

Ski area

We understand a ski area as the sum and interplay of infrastructure and services mainly provided for the activities of alpine skiing, snowboarding and other non-motorized snow related sports that require lift serviced access to downhill terrain. This involves the main infrastructure of ropeways and uphill transportation, as well as construction and preparation of slopes or ski runs, rescue service, signalization and management of natural hazards, such as avalanches or crevasses, information and maps, ski schools, rental shops and on-mountain gastronomy with hygienic services and others. It involves the land owners who provide their land for the ski area. The ropeways companies are the major employer and provider of services in a ski area. Ski areas in a European understanding of the Alps have mostly grown from single lifts and are community-based governed (Beritelli et al., 2007). The profiles of different stakeholders in ski areas, though, are becoming more unclear. Ropeways companies are trying to offer services with a higher added value, such as mountain gastronomy. The path has opened up to move more toward the model of a corporate-based ski resort (Beritelli et al., 2007).

Ski area as used within this study

If we discuss the vulnerability and the adaptive capacity of ski tourism, the whole system of a destination with all services necessary for tourism must be looked at. However, the ropeways company in a ski area is the main stakeholder in terms of maintaining a tourist infrastructure measured by volume. For the main activity in a ski area, alpine skiing, the ropeways company is the provider and motor of tourism. It is also the motor in ski destination in terms of

generating visitor volume, at least in the winter season. The ropeways company is also the stakeholder most vulnerable and prone to climate change, and thus stands in the focus of our research as the main actor and link in ski tourism on the supply side. We still use the expression *ski area* to include on-mountain services, such as ski schools, rental and repair, and gastronomy, knowing that the guest understands a ski area as a unit of lifts and other components (Michel, 2001). Ropeways companies are increasingly seeking to offer other services in ski areas, such as mountain gastronomy; thus, the boarders and the profiles of ski areas and ropeways companies are becoming less sharp. We also keep in mind that the ski area cannot be seen separately from the destination and its related services, especially not in respect to four season tourism. We intend to include feed-back loops and relations within and between the destination and the ski area.

Ski destination

We find the expression *ski destination* in scientific articles as well as in tourism practice (Klenosky et al., 1993). According to the definitions of a tourist destination, we understand a ski destination as a tourist destination, with the main activity and offered infrastructure from an economical or historical point of view being skiing and related snow sports. We understand the difference in a ski area as the inclusion of the whole local system, such as other non-ski area related services and industries as described above. The difference in a ski resort is that a ski resort has been built for the purpose of developing ski tourism with the necessary infrastructure. A ski destination has grown either from or out of an existing ski area, or nearby or within an existing ski resort by adding other non-ski related services and industries.

Ski resort

The term *ski resort* is more common in North American ski tourism as it describes a venture that is planned and built for the purpose of establishing ski tourism in a place. Ski resorts usually are owned by a company or an investor group and governed in a corporate-based approach (Beritelli et al., 2007). In this model, which we refer to as the *North American model*, the described services of a ski area, along with lodgement and gastronomy, are offered by the same company or group. Ropeways and other services, such as gastronomy or ski schools, are not separated.

Ski tourism

Tourism based on Alpine lift accessed skiing and related snow gliding sports on single or double boards, such as snowboarding, Telemark, cross country skiing, ski touring or mono ski.

Snow farming

Snow farming describes a process of keeping snow over time (Fauve *et al.*, 2002). Technically made snow can be kept in a depot to be used when and where needed; natural snow can be covered with foils and cloth to be kept through the summer. The covering of glaciers is one example of snow farming.

Snow sports

Snow dependent activities, such as skiing and related forms, plus snow shoeing, winter hiking, tobaggoning, dog sledding, snow kiting, snow tubing, snow biking and others.

Sport marketing

"Sport marketing consists of all activities designed to meet the needs and wants of sport consumers through exchange processes. Sport marketing has developed two major thrusts: the marketing of sport products and services directly to consumers of sport, and marketing of other consumer and industrial products or services through the use of sport promotion." (Mullin et al., 1993).

Sport tourism

Tourism based on sport activities (Dettling, 2005). Sport is understood as any kind of active movement that is done on self-purpose (Dreyer & Krüger, 1995).

Stakeholders

Person or entity holding grants, concessions, or any other type of *value* that would be affected by a particular action or policy (IPCC, 2001b). In this study we understand stakeholders as persons or functional elements that are part of the supply side of ski tourism, such as the ropeways company, the gastronomy and lodging sector, destination tourism and others.

Sustainability

Sustainable development implies "meeting the needs of the present without compromising the ability of future generations to meet their own needs" (World Commission on Environment and Development, 1987). Sustainable development thereby involves the three dimensions: social, environmental and economical issues. In our understanding, a fourth dimension of technological development and a fifth of participation is part of sustainable development, where the ecological dimension forms the fundament for any economic and social action. Technology makes a balance of the three dimensions in modern life possible, and participation initializes any application.

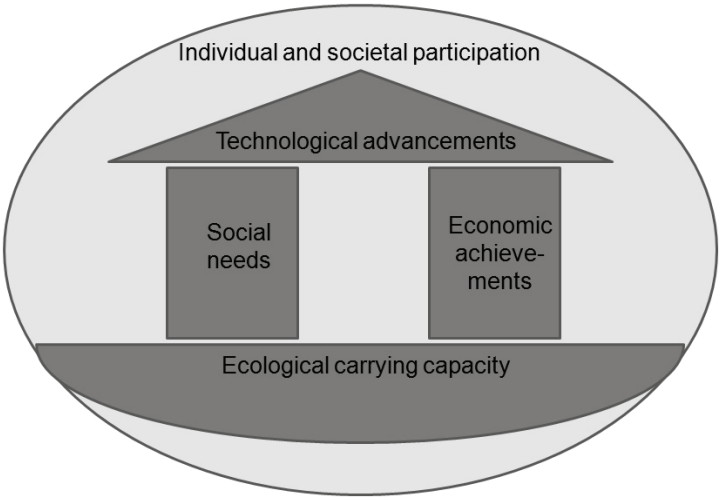

Figure 65 Five dimensions of sustainable development (Luthe, 2007b)

Sustainable and responsible tourism

Sustainable tourism is, "Tourism that meets the needs of present tourists and host regions while protecting and enhancing opportunities for the future" (World Watch Institute, 2005).

"Sustainable tourism development requires the informed participation of all relevant stakeholders, as well as strong political leadership to ensure wide participation and consensus building. Achieving sustainable tourism ... requires constant monitoring of impacts, introducing the necessary preventive and/or corrective measures whenever necessary. Sustainable tourism should ... ensure a meaningful experience to the tourists, raising their awareness about sustainability issues and promoting sustainable tourism practices amongst them" (WTO, 2004).

Responsible tourism:

- minimizes negative economic, environmental and social impacts
- generates greater economic benefits for local people and enhances the well being of host communities
- improves working conditions and access to the industry
- involves local people in decisions that affect their lives and life opportunities
- makes positive contributions to the conservation of natural and cultural heritage embracing diversity
- provides more enjoyable experiences for tourists through more meaningful connections with local people, and a greater understanding of local cultural, social and environmental issues
- provides access for physically challenged people

- is culturally sensitive, encourages respect between tourists and hosts, and builds local pride and confidence (TIES, 2002)

Sustainable ski tourism as used within this study

In this study we use the term *sustainable tourism* as it is defined by the World Watch Institute, and address it to the practice of ski tourism while involving skiing and related activities. With sustainable ski tourism we express a dynamic process of balancing economic, ecologic and social aspects that

- continuously monitors and reacts to changes in the natural and social environment;
- researches, fosters and implements most sustainable ways of adaptation and mitigation to react on global change and help to avoid further negative changes;
- minimizes negative outputs on the local environment;
- involves the customer in the process of sustainable adaptation and mitigation and communicates challenges and responsible behavior actively to the customer,
- seeks a healthy economic growth to maintain local and regional employment opportunities and welfare; and
- maintains an infrastructure for people to access the mountain environment in a safe way for a mentally and physically healthy life style of experiencing nature and participating in sports.

Hereby we evaluate the negative outcomes on the natural environment, as well as the positive socio-economical aspects of skiing on health, well-being and economic development.

Tourism

The World Tourism Organization (WTO) defines tourism as *"involving activities from persons (tourists) travelling to and staying in places outside their usual environment for not more than one consecutive year for leisure, business and other purposes not related to the exercise of an activity remunerated from within the place visited" (WTO, 1993).*

Tourism marketing-management

Modern understanding of marketing involves the strategic alignment of business activities on the market and on market developments. Marketing begins with surveying the market (customer demand) and designing products to meet the demand in accordance with business goals and production possibilities. The modern marketing-management only starts the development and production of a product if research has proved the market potential (Freyer, 2006).

Tourist destination

The internationally accepted expression *tourist destination* describes geographical, landscape-oriented, socio-cultural and organizational units with their attractions tourists are interested in. From an economical point of view, there is a bundle of services offered by different actors in a destination. To call a destination a tourist destination, a minimum of touristic infrastructure has to be in place (Freyer, 2006). Other authors understand a tourist destination as a destination which local and regional economy, to a greater part, relies on tourism (Beritelli et al., 2007). A tourist destination has to offer all necessary and related tourist infrastructure that are needed for longer stays, such as lodgement, gastronomy, leisure facilities, health care, mobility services, shopping facilities and others.

Uncertainty

An expression of the degree to which a value (e.g., the future state of the *climate system*) is unknown. Uncertainty can result from lack of information or from disagreement about what is known or even knowable. It may have many types of sources, from quantifiable errors in the data to ambiguously defined concepts or terminology, or uncertain *projections* of human behavior. Uncertainty can therefore be represented by quantitative measures (e.g., a range of values calculated by various models) or by qualitative statements (e.g., reflecting the judgment of a team of experts) (IPCC, 2001b).

Vulnerability

Vulnerability can be described as a function of three overlapping objectives: exposure, sensitivity and adaptive capacity or resilience. Vulnerability to global change is the likelihood that a specified human-environment system may experience harm from exposure to stresses associated with changes in the natural and social environment. The expression *human-environment system* refers to the interrelations between humans and environment being part of a holistic system. Hazards for the system arise from influences outside and inside the system and place. The human-environment conditions determine its sensitivity to any set of exposures. The social and environmental mechanisms influence and give feed back to each other. Responses in one system can influence the resilience and the ability to cope with the other (Turner et al., 2003).

Exposure elements: the nature and the degree to which a system is exposed to significant global change variations.

Sensitivity elements: the degree to which a system is affected, either adversely or beneficially, by global change-related stimuli.

Adaptive elements: the ability of a system to adjust to global change to moderate potential damages, to take advantage of opportunities, or to cope with the consequences.

The IPCC (2001b) defines vulnerability as the following: “The degree to which a system is susceptible to, or unable to cope with, adverse effects of *climate change*, including *climate variability* and extremes. Vulnerability is a function of the character, magnitude, and rate of climate variation to which a system is exposed, its *sensitivity*, and its *adaptive capacity*.

Vulnerability management framework for ski areas

Analogue to climate risk-management, a vulnerability management-framework for global change impacts delivers ways of mitigating global change and of adapting to the consequences of global change (IPCC, 2007). Mitigation especially needs to be seen in its possibilities and potential effects of ski areas on mitigating to global developments. Still, a framework should support and serve as a tool for ski area managements on how to tackle the challenges in a sustainable way and, on a second level, it should deliver a system and data to enable benchmarking and comparing for customers demanding sustainable consumption. However, such a framework can only be a reduced form of the whole system of vulnerability. The framework should implement the broad classes of components and linkages that comprise a coupled system’s vulnerability to hazards (Turner et al., 2003a).

Willingness-to-pay (WTP)

The customers in a market each have a maximum amount of money they are willing to pay for each of the products. Each of these prices is called willingness-to-pay (WTP). WTP refers to the maximum amount of money a person is willing to pay for a product. Underlying this are two pricing concepts: reservation price and maximum price. WTP and pricing concepts are further discussed in chapter five.

Winter tourism

Tourism, including ski tourism, but also other snow sports and activities that are not snow dependent, but can be or usually are done in winter time, such as hiking, wellness, sunbathing, cultural events, dining and others alike.

References

ABEGG, KÖNIG, BÜRKI & ELSASSER (1998) Climate impact assessment in tourism. *Applied Geography and Development,* 51**,** 81-93.

ABEGG, B. (1996) Klimaänderung und Tourismus - Klimafolgenforschung am Beispiel des Wintertourismus in den Schweizer Alpen. *Schlussbericht NFP 31.* Zürich.

ABEGG, B. & ELSASSER, H. (2007) Wintertourismus im Klimastress. IN EGGER R & HERDIN T (Eds.) *Tourismus Herausforderung Zukunft.* Wien, LIT.

ABEGG, B., SPRENGEL, D. & HOFFMANN, V. (2007) Klimawandel als Strategietreiber. Eine Befragung der Schweizer Seilbahnen. Bern.

ADGER, N. W., BROOKS, N. & AL., E. (2004) New indicators of vulnerability and adaptive capacity. *Technical Report* Tyndall Centre for Climate Research.

ALLENSBACH (2007) Allensbacher Markt- und Werbeträgeranalyse 2007. Allensbach, Institut für Demoskopie Allensbach.

ALPENKONVENTION (2008) http://www.alpenkonvention.org.

ARD & ZDF (2007) Deutschland ist online., ARD, ZDF.

ASSENDORRF, D. (2008) Illusion Ökostrom. *DIE ZEIT.* Hamburg.

ATTESLANDER, P. (2006) *Methoden der empirischen Sozialforschung,* Berlin, Erich Schmidt Verlag.

BARTLETT, J. E., KOTRLIK, J. W. & HIGGINS, C. C. (2001) Organizational Research: Determining Sample Size in Survey Research. *Information Technology, Learning and Performance Journal,* 19.

BEHRINGER, J., BÜRKI, R. & FUHRER, J. (2000) Participatory integrated assessment of adaptation to climate change in Alpine tourism and mountain agriculture. *Integrated Assessment,* 1.

BENISTON, M. (2007a) Entering into the "greenhouse century": recent record temperatures in Switzerland are comparable to the upper temperature quantiles in a greenhouse climate. *Geophysical Research Letters,* 34.

BENISTON, M. (2007b) Linking extreme climate events and economic impacts: Examples from the Swiss Alps. *Energy Policy,* 35**,** 5384-5392.

BERITELLI, BIEGER & LAESSER (2007) Destination Governance - Using Corporate Governance Theories as a Foundation for Effective Destination Management. *Journal of Travel Research,* XX**,** 1-12.

BIEGER, T., LAESSER, C. & RIKLIN, T. (2006) Thesenpapier: Neue Preismodelle für mehr Unternehmens- und Kundenwert in der Bergbahn-Industrie. *Institut für Öffentliche Dienstleistungen und Tourismus.* St. Gallen.

BLANKE, J., FELTON, J. & ET AL (2008) The Travel & Toruism Competitiveness Report 2008. Balancing Economic Development and Environmental Sustainability". Geneva, World Economic Forum.

BOGNER, A. (2005) *Das Experteninterview,* Wiesbaden, Verlag für Sozialwissenschaften.

BORTZ, J. & DÖRING, N. (2006) *Forschungsmethoden und Evaluation für Human- und Sozialwissenschaftler,* Berlin.

BREIDERT, C. (2005) Estimation of Willingness-to-Pay. Theory, Measurement and Application. *Abteilung für Informationswirtschaft.* Wien, Wirtschaftsuniversität.

BREILING, M., CHARAMZA, P. & SKAGE, O. (1997) Klimasensibilität österreichischer Bezirke mit besonderer Berücksichtigung des Wintertourismus. IN 97:1, I. F. L. A. R. (Ed.) Alnarp, Sweden.

BREUER, C. & PAWLOWSKI, T. (2007) Hedonische Preismessung im Wintersport - ein ökonometrisches Modell. *5. Deutscher Sportökonomie-Kongress Qualitätsmanagement im Sport.* Köln.

BROSIUS, H. B. & KOSCHEL, F. (2001) *Methoden der empirischen Kommunikationsforschung. Eine Einführung,* Wiesbaden, Westdeutscher Verlag.

BÜRKI, R. (2000) Klimaänderung und Anpassungsprozesse im Wintertourismus. *Publikation der Ostschweizerischen Geographischen Gesellschaft***,** 206.

BUNDESINSTITUT FÜR BEVÖLKERUNGSFORSCHUNG (2008) Bevölkerung. Daten, Fakten, Trends zum demographischen Wandel in Deutschland.

BUSCH, T. & HOFFMANN, V. (2006) Sustainable Related Uncertainities and Real Options. *Proceedings IFSAM VIIIth World Congress.*

CARTER, T. R., PARRY, M. L., HARASAWA, H. & NISHIOKA, S. (1994) IPCC Technical Guidelines for Assessing Climate Change Impacts and Adaptations. London.

CEPS (1995) Corporate Governance. IN 12, W. P. N. (Ed.) Brussels, Centre of European Policy studies.

CIPRA (2006a) Alpmedia News. CIPRA.

CIPRA (2006b) Wintertourismus im Wandel. Skifahren in Ewigkeit, Amen? Alpenkonferenz: Konkrete Maßnahmen für das Klima., CIPRA.

CIPRA (2007a) Nachhaltiger Tourismus hat Zukunft. Ab in die Alpen! Ökologisches Kontinuum. Die Natur kennt keine Grenzen. CIPRA.

CIPRA (2007b) *Wir Alpen! Menschen Gestalten Zukunft. 3. Alpenreport*, Haupt Verlag.

CLARK, W. C. & DICKSON, N. M. (2003) Sustainability Science: The Emerging Research Program. *Proceedings of the National Academy of Sciences,* 100.

COCHRAN, W. G. (1977) *Sampling Techniques (3rd edit.).* New York, John Wiley & Sons.

DETTLING, S. (2005) *Sporttourismus in den Alpen. Die Erschließung des Alpenraums als sporttouristisches Phänomen. Sozialhistorische und ökoloische Begründungen,* Marburg, Tectum Verlag.

DEUTSCHER TOURISMUSVERBAND E.V. (2004) Tourismus in Deutschland. Zahlen, Daten, Fakten.

DIEKMANN, A. (2003) *Empirische Sozialforschung,* Reinbek bei Hamburg.

DREYER, A. & KRÜGER, A. (1995) *Sporttourismus - Management und Marketing-Handbuch* München, Oldenburg.

DSV (2006) *DSV Ski-Atlas 2007*, Sport + Freizeit Verlag der Motorpresse Stuttgart.

ELSASSER, H. (1995) Nicht-touristische Entwicklungsmöglichkeiten des ländlichen Raumes: Beispiele aus den Alpen. IN MOLL, P. (Ed.) *Umweltschonender Tourismus - eine Entwicklungsperspektive für den ländlichen Raum.* Bonn, Material zur angewandten Geographie.

ELSASSER, H. (2005) Climate change in the Alpine Space - Consequences for People and Environment. Bayrisches Staatsministerium für Umwelt, G.u.V.B.V., Bau- und Wohnungswesen (Hg.): Climate change and tourism.

ELSASSER, H. & BÜRKI, R. (2002) Climate change as a threat to tourism in the Alps. *Climate Research,* 20**,** 253-257.

ELSASSER, H. & BÜRKI, R. (2003) Auswirkungen von Umweltveränderungen auf den Tourismus – dargestellt am Beispiel der Klimaänderung im Alpenraum. IN BECKER/HOPFINGER/STEINECKE (Ed.) *Geographie der Freizeit und des Tourismus – Bilanz und Ausblick.* München-Wien, Oldenbourg Verlag.

ELSASSER, H. & MESSERLI, P. (2001) The Vulnerability of the Snow Industry in the Swiss Alps. *Mountain Research and Development,* 21**,** 335–339.

ENIT (2007) Italian State Tourist Board. 2007 Corporate Annual Report.

FAUVE, M., RHYNER, H. U. & SCHNEEBELI, M. (2002) *Preparation and maintenance of pistes. Handbook for practitioners*, Davos, Swiss Federal Institute for Snow and Avalanche Research.

FREYER, W. (2006) *Tourismus. Einführung in die Fremdenverkehrsökonomie.*, Oldenbourg Verlag.

FUCHS, M. (2004) Strategy development in tourism destinations: a DEA approach. *Poznan University Economics Review.*

GIDDENS, A. (1997) *Die Konstitution der Gesellschaft,* Frankfurt a.M & New York.

GREENE, W. (1997) *Econometric Analysis,* Prentice Hall, Englewood Clifss, NJ.

GREENE, W. (1998) Limdep Version 7.0. User's manual. Econometric Software Inc., . New York, Plainview.

HÄDER, M. (2006) *Empirische Sozialforschung. Eine Einführung,* Wiesbaden.

HANLEY, N., MOURATO, S. & WRIGHT, R. E. (2001) Choice Modelling Approaches: A Superior Alternative for Environmental Valuation? *Journal of Economic Surveys 15 (3),* 3**,** 435-462.

HOFFMANN & TRAUTMANN (2006) The Role of Industry and Uncertainity in Regulatory Pressure and Environment Strategy. *Academy of Management Best Conference.*

HOHERMUTH, S. & MEIER, H. P. (1996) Lokale Chancen für Nachhaltigkeit - Wintertourismus aus der Sicht der Bevölkerung. *Cultur prospectiv.* Zürich.

HU, W., ADAMOWICZ, W. L. & VEMAN, M. M. (2006) Labelling context and reference point effects in models of food attribute demand. *American Agricultural Economics Association,* 88**,** 1034-1049.

HUTTNER, S. (2008) Klima Global - Handeln Lokal. Zum sozialen Konstrukt der Klimaänderung in skitouristischen Gemeinden des bayerischen

Alpenraums. Diplomarbeit im *Seminar für sozialwissenschaftliche Geographie.* München, Ludwigs-Maximilian-Universität.

IPCC (2001a) IPCC Third Assessment Report (TAR). *IPCC***,** 995.

IPCC (2001b) IPCC Third Assessment Report (TAR). Annex B Glossary of Terms.

IPCC (2007) Climate Change 2007: Impacts, Adaptation and Vulnerability. IN II, I. W. G. (Ed.) *Fourth Assessment Report of the IPCC.*

ISO & DIS (2003) Environmental Management Systems – specification and guidance for use. IN INTERNATIONAL ORGANIZATION FOR STANDARDIZATION, G. (Ed.).

JAIS, R. (2001) Verletzungen im alpinen Skisport unter Berücksichtigung der Entwicklung in der Skitechnologie. Zweite Erhebung 2001. *Faculty of Medicine.*, Technical University Munich.

KÄMPF, R. & WEBER, K. (2005) Erfolgsfaktoren im alpinen Tourismus. Basel, seco.

KEMP, R. & MARTENS, P. (2007) Sustainable development: how to manage something that is subjective and can never be achieved? *Sustainability: Science, Practice, & Policy.*

KLENOSKY, D. B., GENGLER, C. E. & MULVEY, M. S. (1993) Understanding the factors influencing ski destination choice: a means-end analytic approach. *Journal of Leisure Research,* 25.

LAMNEK, S. (2005) *Qualitative Sozialforschung,* Weinheim & Basel, Beitz Verlag.

LANCASTER, K. J. (1966) A New Approach to Consumer Theory *Journal of Political Economy,* 74,1**,** 132-157.

LOHMANN, M. (2007) Demographischer Wandel und Konsumentenverhalten im Tourismus - wie die Veränderung der Altersstruktur die zukünftige touristische Nachfrage beeinflusst. IN EGGER R & HERDIN T (Eds.) *Tourismus Herausforderung Zukunft.* Wien, LIT.

LOPEZ-MORENO, J. I., BENISTON, M. & GARCIA-RUIZ, J. M. (2007) Environmental change and water management in the Pyrenees: Facts and future perspectives for Mediterranean mountains. *Global and Planetary Change***,** 13.

LOUVIERE, J. (2001) What if consumer experiments impact variances as well as means? Response variability as a behavioral phenomenon. *Journal of Consumer Research,* 28.

LOUVIERE, J. J., HENSHER, D. A. & SWAIT, J. D. (2000) *Stated choice methods. Analysis and Application.*

LUTHE, T. (2007a) Nachhaltigkeitskommunikation von Skigebieten: Informationsmöglichkeiten für Schneesportler. *FdSnow. Fachzeitschrift des Skisports.,* 31.

LUTHE, T. (2007b) *Schneesport und Bildung für eine nachhaltige Entwicklung. Filme, Fachinformationen und Praxistipps zur vernetzenden Kommunikation eines zukunftsfähigen Schneesports in Schule und Verein* Deutscher Skiverband und Stiftung Sicherheit im Skisport, Planegg, DSV-Umweltreihe Band 9.

MANFREDA, K. L., BATAGELJ, Z. & VEHOVAR, V. (2002) Design of Web Survey Questionnaires: Three Basic Experiments. *Journal o Computer-Mediated Communication,* 7.

MANOVA (2007) STRATEGE. Universität für Bodenkultur Wien.

MANSKI, C. F. (1997) Monotone Treatment Response. *Econometrica,* 65.

MAYRING, P. (2000) Qualitative Inhaltsanalyse. Forum Qualitative Social Research.

MAYRING, P. (2002) *Einführung in die qualitative Sozialforschung. Eine Anleitung zum qualitativem Denken*, Weinheim & Basel: Beitz Verlag.

MAYRING, P. (2003) *Qualitative Inhaltsanalyse. Grundlagen und Techniken,* Weinheim, Basel, Beltz.

MCFADDEN, D. (1974) *Conditional logit analysis of qualitative choice behavior. Frontiers in Econometrics,* New York, Academia Press.

MCFADDEN, D. (1999) Rationality for Economists. *Journal of Risk and Uncertainty,* 19**,** 73-105.

MCI (2006) *TourismManagerAustria. Wissen für die Praxis*.

MICHEL, J. (2001) *Erlebnis Berg. Qualitätsanforderungen an Luftseilbahnen und ihre Dienstleistungen.*, FIF Universität Bern.

MITCHELL, R. & CARSON, R. (1989) *Using Surveys to Value Public Goods: The Contingent Valuation Method,* Baltimore, John Hopkins Press.

MONTGOMERY, D. C. (2001) *Design and Analysis of Experiments*, Arizona State University.

MOßIG, I. (1996) Stichproben, Stichprobenauswahlverfahren und Berechnung des minimalen Stichprobenumfangs. *Justus-Liebig-Universität Gießen.*

MOUNTAIN RIDERS (2007) Diagnostic environnemental de l'activité tourisitque de la commune de Saint Martin de belleville en terme d'emissions de gaz à effet de serre: répartition de propositions d'actions.

MÜLLER, H., LANDES, A. & SCHEURER, R. (2001) Tourismus und Umweltverhalten. Befragung zum Reiseverhalten 2000. IN BERN, F. U. (Ed.).

MÜLLER, H. & WEBER, F. (2008) 2030: Der Schweizer Tourismus im Klimawandel. FIF, Universität Bern, MySwitzerland.com.

MÜLLER, H., WEBER, F., THALMANN, E. & ET AL. (2007) Tourismus. *In: Klimaänderung und die Schweiz 2050. Erwartete Auswirkungen auf Umwelt, Gesellschaft und Wirtschaft.* Bern.

MULLIN, B. J., HARDY, S. & SUTTON, W. A. (1993) *Sport Marketing*.

OECD (2007) *Climate Change in the European Alps: Adapting Winter Tourism and Natural Hazards Management.*, Organisation for Economic Co-operation and Development OECD.

PACHAURI, R. (2008) Climate change and sustainability science. *Sustainability Science,* 3.

PATAGONIA (1999) *Notes from the field,* San Francisco, Chronicle Books.

PATTERSON, BASTIANONI & SIMPSON (2006) Tourism and Climate Change: Two-Way Street, or Vicious/Virtuous Circle? *Journal of Sustainable Tourism,* 14**,** 339-348.

PETERS, C. & ROTH, R. (2006) Sportgeographie - Entwurf einer Systematik von Sport und Raum. *Schriftenreihe Band 20.* Köln, Institut für Natursport und Ökologie, Deutsche Sporthochschule Köln.

POLSKY, C., SCHRÖTER, D., PATT, A., GAFFIN, S., MARTELLO, M. L., NEFF, R., PULSIPHER, A. & SELIN, H. (2003) Assessing Vulnerabilities to the Effects of Global Change: An Eight-Step Approach. *Research and Assessment Systems for Sustainability.* Belfin Center for Science & International Affairs, Harvard University.

PRO NATURA-PROSKI (2003) *Auditing in Skigebieten. Ein Tool zur ökologischen Aufwertung von Skigebieten,* Vaduz, Stiftung pro natura - pro ski.

RITTNER, V. (1991) Der Stellenwert des Sports in der modernen Gesellschaft. Zur Diskussion der Frage der Aufnahme des Sports in die Landesverfassung Nordrhein-Westfalens. Köln.

ROLLAND, V. (2006) Attractivité des stations de sports d'hiver: reconquete des clienteles et competitive internationale. *Rapport au Premier Ministre Dominique de Villepin.* Député de Savoie.

RÖSCH, H.-E. (1978) *Einführung in die Sportwissenschaft,* Darmstadt., Wissenschaftliche Buchgesellschaft.

RÖSCH, H.-E. (1986) Sport und Geographie. Zur Begründung einer Sportgeographie. *Düsseldorfer Sportwissenschaftliche Studien,* Heft 1.

ROTH, R., PAZUCHA, K., KRÄMER, A. & LUTHE, T. (2008) Globaler Wandel und die strategische Ausrichtung der Deutschen Berg- und Seilbahnen., Deutsche Sporthochschule Köln, Institut für Natursport und Ökologie.

ROTH, R., TÜRK, S. & KLOS, G. (2003) Fachbegriffe aus Natursport und Ökologie. *Schriftenreihe.* Köln, Institut für Natursport und Ökologie, Deutsche Sporthochschule Köln.

RÖTHIG, P. & PROHL, R. (2003) *Sportwissenschaftliches Lexikon,* Schorndorf, Hofmann.

RYAN, C. (1995) *Researching Tourist Satisfaction,* London & New York.

SCHLÄPFER, F., SCHMITT, M. & ROSCHEWITZ, A. (2008) Competitive politics, simplified heuristics, and preferences for public goods. *Ecological Economics*.

SCHNABEL, U. (2008) Die Konjunktur der Ängste. *DIE ZEIT Nr. 26, 19.Juni 2008.*

SCHNEIDER, C. & SCHÖNBEIN, J. (2006) Klimatologische Analyse der Schneesicherheit und Beschneibarkeit von Wintersportgebieten in deutschen Mittelgebirgen. *Schriftenreihe der Deutschen Sporthochschule Köln, Institut für Natursport und Ökologie,* 19.

SCHRÖDER, A., WIDMANN, T. & WIDMANN-BRITTNER, A. (2007) Oldies-nothing but Goldies? Die Auswirkungen des demographischen Wandels auf die Reisebranche. IN EGGER R & HERDIN T (Eds.) *Tourismus Herausforderung Zukunft.* Wien, LIT.

SCHULZ, W. F. (2008) Megatrend Nachhaltigkeit. IN NACHHALTIGKEIT", B.-B. P. M. D. (Ed.), Universität Hohenheim.

SCOTT, D., MCBOYLE, G. & MINOGUE, A. (2006) Climate change and the sustainability of ski-based tourism in Eastern North America: a reassessment. *Journal of Sustainable Tourism,* 14.

SEILBAHNEN ÖSTERREICH (2005) Marketing Forum Seilbahnen Österreich.

SEILBAHNEN SCHWEIZ (2008) www.seilbahnen.org.

SEILER, W. (2006) Der Klimawandel im Alpenraum. Trends, Auswirkungen und Herausforderungen. *Vortrag im Rahmen der 31. Sitzung des Ständigen Ausschusses der Alpenkonferenz.* Galtür, Austria.

SFEZ, L. & CAUQUELIN, A. (2005) Analyse des attitudes face à l'adaptation au changement climatique. Les cas de deux stations de moyenne montagne dans les Alpes de Haute Provence. *Enquête menée par le credap et le credatic.*

SIOMKOS, G., VASILIADIS, C. & LATHIRAS, P. (2006) Measuring customer preferences in the winter sports market: The case of Greece. *Journal of Targeting, Measurement and Analysis for Marketing,* 14**,** 129-140.

SLOANE, N. & HARDIN, R. (2003) Operating manual for Gosset: A general purpose program for constructing experimentla desings. *Second edition.*

SNTF (2007) Recueil d'Indicateurs et analyses 2007.

STATISTISCHES BUNDESAMT DEUTSCHLAND (2008) Verdienste und Arbeitskosten für das Jahr 2007.

STREET, D. J., BURGESS, L. & LOUVIERE, J. J. (2005) Quick and easy choice sets: Constructing optimal and nearly optimal stated choice experiments. *International Journal of Research in Marketing,* 22**,** 459-470.

SWAIT, J., ADAMOWICZ, W. L., HANEMANN, M., DIEDERICH, A., KROSNICK, J., LAYTON, D., PROVENCHER, W., SCHKADE, D. & TOURANGEAU, R. (2002) Context Dependence and Aggregation in Disaggregate Choice Analysis. *Marketing Letters,* 13:3.

SWART, R. J., RASKIN, P. & ROBINSON, J. (2004) The problem for the future: sustainability science and scenario analysis. *Global Environmental Change Part A,* 14.

TEICH, M., LARDELLI, C., BEBI, P., GALLATI, D., KYTZIA, S., POHL, M., PÜTZ, M. & RIXEN, C. (2007) Klimawandel und Wintertourismus: Ökonomische und ökologische Auswirkungen technischer Beschneiung. WSL Birmensdorf.

THE NATURAL STEP (2003) *Ants, Galileo & Gandhi. Designing the Future of Business through Nature, Genius and Compassion*, Greenleaf Publishing.

TIES (1990) TIES Description and Ecotourism Principles. *The International Ecotourism Society.*

TIES (2002) Cape Town Declaration on Responsible Tourism in Destinations. IN SOCIETY, T. I. E. (Ed.).

TOURISME FRANCE (2006) www.tourisme.fr.

TOURISMUS-VERBAND, S. (2007) Schweizer Tourismus in Zahlen. Ausgabe 2007.

TURNER, B. L., KASPERSON, R. E., MATSON, P. E., MCCARTHY, J. J., CORELL, R. W., CHRISTENSEN, L., ECKLEY, N., KASPERSON, J. X., LUERS, A., MARTELLO, M. L., POLSKY, C., PULSIPHER, A. & SCHILLER, A. (2003a) A framework for vulnerability analysis in sustainability science. IN HANSON, S. (Ed.) Worcester, Clark University, Stockholm Environmental Institute.

TURNER, B. L., MATSON, P. A., MCCARTHY, J. J., CORELL, R. W., CHRISTENSEN, L., ECKLEY, N., HEVELSRUD-BRODA, G. K., KASPERSON, R. E., LUERS, A., MARTELLO, M. L., MATHIESEN, S., NAYLOR, R., POLSKY, C., PULSIPHER, A., SCHILLER, A., SELIN, H. & TYLER, N. (2003b) Illustrating the coupled human-environment system for vulnerability analysis: Three case studies. IN HANSON, S. (Ed.) Worcester, Clark University.

UNBEHAUN, W., PRÖBSTL, U. & HAIDER, W. (2007) Trends in Wintersport Tourism - Challenges for the future proceedings of leisure future. *Leisure Future.* St. Gallen.

VIELHABER, A., MUELLER, H., KÖSTERKE, A. & ENDER, W. (2005) Fernreisen 2005. Delphi-Studie in Deutschland, Österreich und der Schweiz. IN ENTWICKLUNG, S. F. T. U. (Ed.), Studienkreis für Tourismus und Entwicklung e.V.

VINER, D. & AGNEW, M. (1999) Climate Change and its impacts on tourism. IN KINGDOM, R. F. W. U. (Ed.).

VON DER LIPPE, T. & KLADROBA, A. (2002) Repräsentativität von Stichproben. *Marketing,* 24**,** 227-238.

WALL, G. (1985) Climate Change and its impact on Ontario - Tourism and Recreation. *Phase 1.* Report submitted to Environment Canada, Ontario.

WBCSD (2007) The World Business Council on Sustainable Development. http://www.wbcsd.org. Accessed on 04.05.2008.

WEIZSÄCKER, E. U. & LOVINS, A. (1996) *Faktor Vier. Doppelter Wohlstand - halbierter Naturbverbrauch. Der neue Bericht an den Club of Rome.*, Droemer Knaur Verlag.

WELZER, H. & LEGGEWIE, C. (2008) Alles wird anders, aber wie? Ein Plädoyer für die Anpassung unter unbekannten Bedingungen. *DIE ZEIT.*

WITMER, U. (1986) Erfassung, Bearbeitung und Kartierung von Schneedaten in der Schweiz. *Geographica Bernensia,* G25.

WKO (2005) Tourismus in Zahlen. Wirtschaftskammer Österreich.

WOLFSEGGER, C., GOSSLING, S. & SCOTT, D. (2008) Climate change risk appraisal in the Austrian ski industry. *Tourism Review International*.

WORLD COMMISSION ON ENVIRONMENT AND DEVELOPMENT (1987) Our Common Future.

WORLD WATCH INSTITUTE (2005) Typology of Tourism. *Vital Signs*.

WRIGHT, K. B. (2005) Researching Internet-Based Populations: Advantages and Disadvantages of Online Survey Research, Online Questionnaire Authoring Software Packages, and Web Survey Services. *Journal of Computer-Mediated Communication,* 10.

WTO (1993) Empfehlungen zur Tourismusstatistik. IN ORGANIZATION, W. T. (Ed.).

WTO (2004) WTO Tourism Highlights. World Tourism Organization.

WWF ITALIA (2006) Alpi, turismo e ambiente: alla ricerca di un equilibrio. IN REPORT, W. (Ed.).

UTOPIA (2007) Strategic consumption. Online portal and community for sustainable development and sustainable consumption. http://www.utopia.de. Accessed 04.03.2008.

ZEMP, M., HAEBERLI, W., HOELZLE, M. & PAUL, F. (2006) Alpine glaciers to disappear within decades? *Geophysical Research Letters,* 33.

Appendix A Supply side questionnaire

***SkiSustain* – guiding questions for semi-structured guide-lined interviews with managements of ski areas**

Duration: about 60 minutes
Interviewer: Tobias Luthe

I. Description of facts about the ski area

1. Name of ski area:
2. Name of interview partner:
3. Visitors (average last ten years) summer: 3a.Winter:
4. Result in sales of season 2006/07: 4a.Loss or gain in %:
5. Snow making capacity % of total piste surface:
6. Day visitors % of total winter: 6a.Overnight stays %:
7. Sales destination summer: 7a.Winter:
8. Operating days average winter: 8a.Summer:
9. Access (car, train, plane):
10. Ownership/Management structure:
11. Price day ticket:
12. What is the percentage of sales generated by the cable ways/the ski area compared to the destination in summer? 12a. Winter:

II. Experiences of global change after the analogue winter 06/07

1. How good or how bad was the last winter in terms of the weather, snow, sales and guest numbers, compared to the year before and compared to a ten years average?
2. What is the limit in terms of operating days? How much are needed to survive?
3. How many years like 2006/07 are survivable?

III. Estimation of general vulnerability

USP

1. What is your USP (unique selling proposition), in winter and in summer?
2. What is the public image of this destination?
3. Target groups
4. Who are your main target groups and how do you address them?
5. How do you achieve customer satisfaction?
6. Performance key factors
7. What is the role of environmental quality for the success of your business?
8. How do you describe performance in mountain destination tourism?
9. What are key success factors for your business?
10. What indicates the efficiency of your destination?

Vulnerability

11. What are threats to your destination?
12. Are climate change/demographic change/ethnic backgrounds threats? Which one most, and why?
13. On a scale from 1 to 10 with 10 being the most vulnerable, where do you see the vulnerability of your destination?

IV. Sensitivity elements

1. What are weak points/ sensitivity elements of this destination (elevation, size and capacity, mobility and access, energy, water availability, space for development in the valley/on mountain, environmental regulations, competition, diversity factor, communication, missing data, others…)?

V. Adaptive capacity

Resort structure

1. How is this ski area managed? Who owns the land, who owns the ropeways? What kind of governance system is applied here?

Destination communication

2. How do you partner inside the destination with other stakeholders? Do you partner and work on similar goals?

Internal resort communication

3. How is your internal communication process in terms of continuing formation designed?
4. Are your employees well informed about global change and CSR performance, and down to which hierarchical level?

Environmental management system (EMS)

5. Does this ski area have an EMS? If not, would you implement one?
6. Do you publish an environmental report? If not, could you imagine doing so?
7. What would be your goals with an EMS?

Benchmarking

8. Are you benchmarking your destination to others?
9. Who are your main competitors?
10. What indicators would you benchmark in favour of others?

Partnering destination

11. Do you partner with other destinations/ski areas? If not, do you intent to do so?

VI. Strategies and action to cope with global change impacts

Education

1. How important do you see education about risks of the customer? Would he then take more risk himself?

Marketing

2. Do you operate e-CRM or e-Commerce systems? Is there a responsible person or even a team dedicated to e-CRM?
3. Would you establish a customer credit account system where the customer collects credits to buy from a set of activities, e. g. lift tickets, visits to public pools etc.? This of course would mean to partner within the destination and even more within a set of neighbouring destinations/a valley. It would involve the chance to collect superior data on the customer.

Adaptation

4. Because of changing winters, would you strive to move and market the main ski season from Christmas more towards Easter?
5. Do you see a flexible ticket system in the ski area, where a day ticket is valid throughout the season or even independent from the person? Would that attract customers, even if there was less snow predictability? Could you then raise the ticket prices instead and still profit?
6. What is your target focus on summer and four season tourism in the future (diversity %)?
7. What are your adaptation strategies?

Investments

8. What are you planned investments and in what fields? Summer?

Mitigation

9. Would you donate a percentage of sales to social/environmental organizations/activists? How much per sold day ticket?
10. What are your mitigation strategies (transport, energy, education…)?
11. What is the relation in your efforts between adaptation and mitigation (costs, acceptance)?

Chances

12. Do you see chances from global change impacts?
13. What are potential chances derived from changes (innovation, summer, wellness…)?
14. Is sustainable ski tourism a market and a business opportunity in your opinion?

Sustainable ski tourism

15. How do you understand the expression sustainable development?
16. What, in your opinion, is sustainable tourism?
17. Could you imagine that ski tourism is sustainable?
18. Is sustainability a source of customer satisfaction?
19. Is sustainability a USP? Do you see a chance for your destination to sell/market sustainability performance?
20. What is ecotourism in your understanding?
21. Would ecotourism fit to ski tourism?
22. What is the demand for sustainability performance (% of your customers)?
23. Would you participate in a "Club of sustainable ski areas" and thus leading the track? This could involve joint marketing etc.

VII. Outlook on the future of the ski area and of ski tourism in general

Future of station

1. Where do you see your destination in the future – 3-5 years, 5-10 years, till the end of this century (image, main target groups, USP, services, niche…)?
2. How will the topic of global change, customer demand and destination performance evolve in the future?

Costs

3. What is the day ticket price now, what will it be in five years, what in ten years?

Services demanded

4. What are your next steps? What will you change after your experiences of the last winter?
5. Where do you see the need for action?
6. What external services or support would you demand for?

Appendix B Demand side questionnaire

SkiSustain - questions of the internet based demand side standard questionnaire "Save-Snow" and the choice experiment part:

1/35
How did you hear about this study?

2/35
How long do you travel from your home to the next ski area (mid mountain ranges do also count)?
Less than 1 hour
1 to 2 hours
2 to 4 hours
4 to 8 hours
More than 8 hours – I travel by plane to the mountains
More than 8 hours – I am not flying, I am travelling by car/bus/train/boat

3/35
Do you go skiing/ sbowboarding in ski resorts outside the Alps, for example in North America?
Yes I do. Please specify the countries.
No, I have never travelled that far to go skiing or boarding
Yes, I am planning to do so in the future.

4/35
What are reasons that you are travelling so far to go skiing/boarding – or why WOULD you possibly travel that far? (multiple answers possible)
I like to meet new people and cultures
Others, please specify
Better snow
More snow
The ski runs are less crowded
No lift lines
Staff is more friendly
The service is better
Prices are cheaper
I have never been to ski resorts outside the Alps and I will not do it in the future neither.

5/35
What percentage of skiers and boarders base their destination choice also on environmental criteria (e.g. distance to travel, environmental certification, green energy for lifts etc.)?
Please write down a number: In the last winter 2006/2007 …% of skiers/boarders selected their ski resort taking environmental aspects into account.

6/35
Do you think that ski resort expansion on glaciers can have negative effects on society in general?
Yes, glaciers melt faster if equipped with lifts and infrastructure. The storage function of drinking water in dry summers gets disrupted.
No, there is no negative relation between snow sports on glaciers and society in general.

I am not sure.

7/35
Do you think that technical snow (machine made snow) can have negative impacts on the environment?
Yes
No
I am not sure

8/35
Does climate change effect snow sports?
Yes – in the future we will expect milder and drier winter seasons. Good snow conditions for Skiing/Snowboarding will be less predictable and less likely to happen.
No, every season is totally different, that is normal.
I am not sure.

9-16/35 (choice experiment questions)
Do you choose ski resort #1# or #2# for your winter vacation?
Imagine you were **planning your next ski or snowboard vacation**. You are staying for one week from Saturday through Saturday and you got **six full days at the resort**. There are two choices to be made where to go – you can choose from two alternative ski areas A and B. Both differ in nine attributes. You may choose ski area A or B taking into account the differences or similarities in the nine attributes. You will be asked **eight times to chose between two ski areas**.
Please choose the ski area where you would really spend your holidays in winter. If you would not select any of the two choices, you can also state “No thanks, I would not visit any of the offered ones.”
The attributes of ski area B (the one on the right side) are written in grey colour to indicate those features both ski areas do not differ from each other. Thus please pay special attention to the attributes in black font.
For more information and an explanation of the attributes please click on the info buttons on the left sides in the grey field.
Sometimes there is additional information and recommendations provided at the bottom of the page to help you choosing between ski areas A and B. You may use this information as a kind of decision support.

17/35
Do you visit the mountains in summer? If yes, what activities do you like to do there (multiple answers possible)?
Hiking
Mountainbiking
Mountainike Downhill
Rock climbing
Golf playing
Others, please specify
Water sports
Visiting concerts/events
Dining
Nordic Walking
Enjoy the landscape
Sun bathing
In summer I do not visit the mountains

18/35

Because of climate change ski passes will become more expensive in the future, winters will become milder and there will be less snow most of the season. How will you react (single answer)?

I will go skiing/boarding less often than I am used too.
I will stop skiing or boarding.
Instead of going to the mountains in winter I will visit the mountains in summer more often.
I will ski or board as much as in the past – if necessary I will fly to where the snow is, even to another continent.
I will ski or board as much as in the past - if necessary I will go to the next ski dome to ski or board indoors.

19/35

What factors are most important to you when skiing or boarding in a ski resort? Please click the three most important ones.

Others, please specify
Carving runs
Party music at the lift stations
Powder snow
Sunshine
No lift lines
Freeride terrain
Quality of the groomed runs
Amount of snow
Great mountain scenery

20/35

Imagine you spent one week of winter vacation, and on some days of that week there is no skiing or boarding possible – due to lack of snow. What would you like to do alternatively (click the most important three answers)?

Visit an interpretive centre on the mountain top
Use free internet to do some work, surf the web or email
Sun bathe on the mountain
Nordic Blading/Inline Skating
Nordic Walking
Hiking
Sledding or tubing (e.g. on rails, without snow)
Mountain biking on single trails
Mountain bike Downhill Park
Enjoy a romantic night dinner with candle light up in a gondola
Play golf
High speed mountain coaster up on the mountain
Visit concerts or other cultural events
Try out a high ropes course
Visit a wellness center/spa
Participate in free courses on e.g. avalanche rescue, outdoor photography, or on wildlife and plants
Helicopter skiing/boarding
Ski/board in the closest ski dome (indoor)
Party and nightlife
None of the above

21/35
How many days within your six days vacation (one week in total) would you stay at the resort doing something alternative due to lack of snow before you left back home?

No day (0 out of 6)
1 out of 6 days
2 out of 6 days
3 out of 6 days
4 out of 6 days

22/35
Which of the certificates for an environmentally friendly ski are below would you trust (multiple choices possible)?
ISO (International Organization for Standardization)
A code of conduct of the ski area association
Certificate of the University of Zurich
Certificate of the German Sport University Cologne
Certificate of the German Ski Federation
Auditing in ski areas
The Natural Step
Greenpeace
WWF (World Wide Fund for Nature)
None of these
I don't know any of these.

23/35
Is it of any importance to you if ski areas donate a part of their earnings to environmental organizations and invest it into conservation of the environment?
Yes
No
I am not sure

24/35
Would you be willing to spend an extra sum in addition to the ski pass for climate protection and conservation of the environment?
Yes, more than 8 €
…
No, I would not be willing to pay more.

25/35
When did you book your main winter vacation in the past?
Christmas
Mid/end of January
February (Carnival)
March
April (Easter)

26/35
When will you book your main winter vacation in the future if snow will become less predictable due to climate change?
Christmas (very poor snow guarantee in the future)
Mid/end of January (poor snow guarantee in the future)
Carnival/ in February (higher snow guarantee in the future)
March (high snow guarantee in the future)

Easter/April (very high snow guarantee in the future)

27/35
What services in a ski resort are most important to you (please click on the three most important answers)?

Other, please specify
Friendly greeting lift staff
Free guided groups to learn to know the ski area
Information about action on climate change and environmental preservation in the ski area
Information about plants and animals living in the alpine environment and how they cope with winter
A guide who can explain the surrounding mountains
Free parking at the lifts
A free shuttle bus so there is no car needed between your apartment and the ski hill
Party music at the lift stations

28/35
To call a ski resort environmentally friendly, what actions should it take in your opinion (multiple answers possible)?
Usage of renewable energy (e.g. wind, solar,…)for lifts
Less grooming of runs
Less technical snow making
No technical snow making
Less machine operations in general (motor scooters for transportation, helicopters, grooming machines etc.)
Environmental education and training for the staff of the ski area
Forest sanctuaries
Environmental information for visitors
Wild life protection zones
No expansion on glaciers
No use of glaciers for skiing/boarding at all
No expansion with new lifts and new runs
Usage of bio diesel for all grooming machines
Offering free shuttle busses to the ski hill to stop car traffic in the valley

29/35
For how many days would you wait (waive but stay) for skiing or boarding in the main ski area due to lack of snow, if instead your kids had enough snow in the fun park and in the learning area?
I don’t have kids
1 out of 6 days
2 out of 6 days
3 out of 6 days
4 out of 6 days
No, I would not wait any day, I expect 100% snow guarantee (I would then leave)

30/35
How many days a season do you ski or snowboard?
Less than one week
1 to 2 weeks
3 to 4 weeks
More than 4 weeks

31/35
What kind of snow sports do you do most often?
Other, please specify
Winter hiking
Snow shoeing
Ski touring/ski mountaineering
Nordic skiing - skating
Nordic skiing – diagonal/classic
Telemark
Snowboard
Alpine ski
Sledding
Tubing

32/35
How would you describe your skills/your level in snow sports?
I am an expert skier/boarder and I also go off-piste in any terrain
I am a very good skier/boarder and I go on any run including moguls/bumps
I am a good skier/boarder and I also go on black runs. I am still practicing moguls/bums though.
I ski/board ok, I am still practicing on black (most difficult) runs.
I just started skiing/boading.
Nothing of these options describes my level.

33/35
What is your age?
Years

34/35
What is your gender?
Female
Male

35/35
What is your monthly income (after taxes)?
below 1000€
1100 to 1900€
…
More than 5000 €

Appendix C Limdep models of the choice experiment

Sub sample frequency of skiing

info all UP TO 2 WEEKS, n=10545

	Coeff.	Std.Err.	t-ratio	P-value
HOURS	-0,16355	0,004617	-35,4267	2,89E-15
SMALL	-0,42114	0,030046	-14,0166	2,89E-15
GRPOW	0,694691	0,033768	20,5727	2,89E-15
ALT1	-0,04107	0,036685	-1,11947	0,262941
ALT2	-0,52159	0,048791	-10,6904	2,89E-15
ALT3	-0,29468	0,06879	-4,28377	1,84E-05
FLEXP	0,355989	0,033616	10,5899	2,89E-15
PRICE	-0,0059	0,001172	-5,03519	4,77E-07
EXPAN1	0,045408	0,03718	1,2213	0,221971
EXPAN2	-0,23927	0,055219	-4,33308	1,47E-05
EXPAN3	-0,45169	0,052225	-8,64882	2,89E-15
GROOMA	0,126125	0,033375	3,77903	0,000157
SNOWD	0,250297	0,010209	24,5167	2,89E-15

info all > 2 WEEKS, n=8935

	Coeff.	Std.Err.	t-ratio	P-value
HOURS	-0,13568	0,00486	-27,9215	2,89E-15
SMALL	-0,41564	0,031959	-13,0055	2,89E-15
GRPOW	0,63018	0,036183	17,4163	2,89E-15
ALT1	-0,0297	0,039115	-0,75938	0,447626
ALT2	-0,50257	0,05185	-9,69284	2,89E-15
ALT3	-0,22144	0,071564	-3,09435	0,001972
FLEXP	0,383561	0,035807	10,7121	2,89E-15
PRICE	-0,01031	0,001297	-7,9468	2,89E-15
EXPAN1	0,032809	0,039686	0,826693	0,408411
EXPAN2	-0,19573	0,057653	-3,39499	0,000686
EXPAN3	-0,36323	0,056878	-6,38613	1,70E-10
GROOMA	-0,00901	0,035934	-0,25082	0,801953
SNOWD	0,295997	0,011049	26,7907	2,89E-15

info 1 UP TO 2 WEEKS, n=10545

	Coeff.	Std.Err.	t-ratio	P-value
HOURS	-0,17522	0,008053	-21,7586	2,89E-15
SMALL	-0,45684	0,051942	-8,79517	2,89E-15
GRPOW	0,75962	0,058492	12,9868	2,89E-15
ALT1	-0,01983	0,063281	-0,31335	0,754013
ALT2	-0,59234	0,085612	-6,91886	4,55E-12
ALT3	-0,19507	0,118998	-1,63926	0,101159
FLEXP	0,390224	0,058265	6,69741	2,12E-11
PRICE	-0,004	0,002023	-1,97487	0,048283
EXPAN1	0,045725	0,064089	0,713454	0,475565
EXPAN2	-0,35763	0,096412	-3,70943	0,000208
EXPAN3	-0,64168	0,090919	-7,05768	1,69E-12
GROOMA	0,162234	0,057465	2,82319	0,004755
SNOWD	0,244522	0,017701	13,8143	2,89E-15

info 1 > 2 WEEKS, n=8935

	Coeff.	Std.Err.	t-ratio	P-value
HOURS	-0,1541	0,008771	-17,5691	2,89E-15
SMALL	-0,51585	0,057246	-9,01111	2,89E-15
GRPOW	0,68399	0,065743	10,404	2,89E-15
ALT1	0,043929	0,070201	0,625764	0,53147
ALT2	-0,63555	0,092405	-6,87785	6,08E-12
ALT3	-0,18939	0,126744	-1,49426	0,135108
FLEXP	0,327251	0,063915	5,1201	3,05E-07
PRICE	-0,00709	0,00232	-3,05794	0,002229
EXPAN1	0,13026	0,071095	1,83218	0,066924
EXPAN2	-0,15533	0,100572	-1,54448	0,122473
EXPAN3	-0,56504	0,101368	-5,57422	2,49E-08
GROOMA	0,016792	0,063365	0,264999	0,79101
SNOWD	0,269352	0,019628	13,7232	2,89E-15

info 2 UP TO 2 WEEKS, n=10545

	Coeff.	Std.Err.	t-ratio	P-value
HOURS	-0,16721	0,008167	-20,4729	2,89E-15
SMALL	-0,46306	0,052987	-8,73909	2,89E-15
GRPOW	0,683706	0,059726	11,4475	2,89E-15
ALT1	-0,04334	0,064161	-0,6755	0,49936
ALT2	-0,73786	0,087375	-8,44468	2,89E-15
ALT3	-0,44167	0,121485	-3,63563	0,000277
FLEXP	0,337659	0,058916	5,73118	9,97E-09
PRICE	-0,00443	0,002067	-2,14408	0,032026
EXPAN1	0,082756	0,065203	1,2692	0,204368
EXPAN2	-0,23835	0,094786	-2,51458	0,011918
EXPAN3	-0,48234	0,091859	-5,2509	1,51E-07
GROOMA	0,123235	0,058125	2,12016	0,033992
SNOWD	0,22062	0,017785	12,4049	2,89E-15

info 2 > 2 WEEKS, n=8935

	Coeff.	Std.Err.	t-ratio	P-value
HOURS	-0,13352	0,008353	-15,985	2,89E-15
SMALL	-0,38881	0,05484	-7,09	1,34E-12
GRPOW	0,709379	0,061848	11,4698	2,89E-15
ALT1	-0,13036	0,066617	-1,95688	0,050362
ALT2	-0,67593	0,089894	-7,51919	5,51E-14
ALT3	-0,33462	0,124428	-2,68921	0,007162
FLEXP	0,443151	0,061271	7,23266	4,74E-13
PRICE	-0,01313	0,002208	-5,94583	2,75E-09
EXPAN1	0,066117	0,067813	0,974993	0,329564
EXPAN2	-0,19141	0,099327	-1,92707	0,053971
EXPAN3	-0,32663	0,096995	-3,3675	0,000759
GROOMA	-0,05056	0,061377	-0,82376	0,410078
SNOWD	0,294797	0,018924	15,5776	2,89E-15

info 3 UP TO 2 WEEKS, n=10545

	Coeff.	Std.Err.	t-ratio	P-value
HOURS	-0,15172	0,007895	-19,2169	2,89E-15
SMALL	-0,34974	0,051649	-6,77148	1,27E-11
GRPOW	0,649716	0,057642	11,2716	2,89E-15
ALT1	-0,05992	0,063588	-0,94232	0,346028
ALT2	-0,26796	0,081804	-3,27559	0,001054
ALT3	-0,25339	0,118051	-2,14641	0,03184
FLEXP	0,35378	0,057965	6,1033	1,04E-09
PRICE	-0,00924	0,002017	-4,58246	4,60E-06
EXPAN1	0,002961	0,06441	0,045978	0,963328
EXPAN2	-0,12807	0,097056	-1,31951	0,187
EXPAN3	-0,24715	0,089373	-2,76533	0,005687
GROOMA	0,102681	0,05837	1,75915	0,078551
SNOWD	0,289691	0,017704	16,3628	2,89E-15

info 3 > 2 WEEKS, n=8935

	Coeff.	Std.Err.	t-ratio	P-value
HOURS	-0,1218	0,00826	-14,7465	2,89E-15
SMALL	-0,35533	0,054664	-6,50032	8,01E-11
GRPOW	0,513137	0,061348	8,36431	2,89E-15
ALT1	0,008529	0,067269	0,126783	0,899112
ALT2	-0,20367	0,088426	-2,30328	0,021263
ALT3	-0,12871	0,122104	-1,05414	0,29182
FLEXP	0,37612	0,061557	6,1101	9,96E-10
PRICE	-0,01032	0,002241	-4,60626	4,10E-06
EXPAN1	-0,09184	0,06807	-1,3492	0,177274
EXPAN2	-0,25568	0,100913	-2,53368	0,011287
EXPAN3	-0,20985	0,098718	-2,12579	0,033521
GROOMA	0,00383	0,062665	0,061126	0,951259
SNOWD	0,326571	0,019106	17,0926	2,89E-15

Sub sample income

sample all Income < 1000 Euro, n=3074

	Coeff.	Std.Err.	t-ratio	P-value
HOURS	-0,15988	0,00854	-18,721	2,89E-15
SMALL	-0,44871	0,055582	-8,07295	2,89E-15
GRPOW	0,755374	0,063298	11,9337	2,89E-15
ALT1	0,003308	0,068202	0,048496	0,961321
ALT2	-0,49417	0,090486	-5,46132	4,73E-08
ALT3	-0,11159	0,121194	-0,92075	0,35718
FLEXP	0,23456	0,061928	3,78765	0,000152
PRICE	-0,00833	0,002172	-3,83515	0,000125
EXPAN1	0,13937	0,068529	2,03375	0,041977
EXPAN2	-0,22654	0,101518	-2,23149	0,025649
EXPAN3	-0,38316	0,100578	-3,80955	0,000139
GROOMA	0,05313	0,062402	0,85142	0,394536
SNOWD	0,311556	0,019173	16,2495	2,89E-15

sample all Income 1000-2000 Euro, n=4518

	Coeff.	Std.Err.	t-ratio	P-value
HOURS	-0,14954	0,006966	-21,4663	2,89E-15
SMALL	-0,39671	0,045549	-8,70953	2,89E-15
GRPOW	0,804907	0,051586	15,6033	2,89E-15
ALT1	-0,02405	0,055621	-0,43245	0,665417
ALT2	-0,55804	0,073396	-7,60312	2,89E-14
ALT3	-0,0977	0,105294	-0,92789	0,353467
FLEXP	0,426287	0,051087	8,3443	2,89E-15
PRICE	-0,01053	0,001846	-5,70118	1,19E-08
EXPAN1	0,062684	0,057257	1,09478	0,273612
EXPAN2	-0,27457	0,082949	-3,31007	0,000933
EXPAN3	-0,39002	0,078184	-4,98854	6,08E-07
GROOMA	0,010008	0,050951	0,196425	0,844277
SNOWD	0,269476	0,015668	17,1989	2,89E-15

sample all Income 2000-4000, n= 8097

	Coeff.	Std.Err.	t-ratio	P-value
HOURS	-0,15284	0,00519	-29,446	2,89E-15
SMALL	-0,44241	0,034044	-12,9951	2,89E-15
GRPOW	0,602399	0,038231	15,7567	2,89E-15
ALT1	0,010905	0,041371	0,263582	0,792102
ALT2	-0,44609	0,055437	-8,04684	2,89E-15
ALT3	-0,31567	0,07699	-4,10015	4,13E-05
FLEXP	0,368934	0,03787	9,74205	2,89E-15
PRICE	-0,0065	0,001336	-4,86158	1,16E-06
EXPAN1	-0,00348	0,04169	-0,08341	0,933522
EXPAN2	-0,22168	0,062797	-3,53006	0,000415
EXPAN3	-0,43919	0,059732	-7,35264	1,94E-13
GROOMA	0,074656	0,037749	1,97768	0,047965
SNOWD	0,264526	0,011584	22,8352	2,89E-15

sample all Income > 4000, n=2813

	Coeff.	Std.Err.	t-ratio	P-value
HOURS	-0,14406	0,008696	-16,5662	2,89E-15
SMALL	-0,36922	0,056593	-6,52414	6,84E-11
GRPOW	0,526089	0,063694	8,25963	2,89E-15
ALT1	-0,16776	0,070685	-2,37328	0,017631
ALT2	-0,67081	0,092217	-7,27422	3,48E-13
ALT3	-0,50832	0,129654	-3,92061	8,83E-05
FLEXP	0,391261	0,064614	6,05539	1,40E-09
PRICE	-0,00613	0,002293	-2,67142	0,007553
EXPAN1	0,057136	0,071322	0,801095	0,423077
EXPAN2	-0,0327	0,098704	-0,33124	0,74046
EXPAN3	-0,34015	0,103386	-3,2901	0,001002
GROOMA	0,082761	0,064446	1,2842	0,199072
SNOWD	0,271162	0,019515	13,8952	2,89E-15

info 1 Income < 1000 Euro, n=3074

	Coeff.	Std.Err.	t-ratio	P-value
HOURS	-0,197	0,015596	-12,6318	2,89E-15
SMALL	-0,5465	0,098779	-5,53252	3,16E-08
GRPOW	0,716753	0,113575	6,31084	2,78E-10
ALT1	-0,00329	0,121736	-0,02705	0,978416
ALT2	-0,40872	0,159633	-2,56036	0,010457
ALT3	-0,05796	0,209677	-0,27643	0,782221
FLEXP	0,367545	0,109493	3,35678	0,000789
PRICE	-0,00212	0,003871	-0,54744	0,584077
EXPAN1	0,388182	0,120621	3,21821	0,00129
EXPAN2	-0,38918	0,176478	-2,20525	0,027437
EXPAN3	-0,36521	0,170179	-2,14601	0,031872
GROOMA	-0,02185	0,109246	-0,20004	0,841452
SNOWD	0,271295	0,033755	8,03713	2,89E-15

info 1 Income 1000-2000 Euro, n=4518

	Coeff.	Std.Err.	t-ratio	P-value
HOURS	-0,17794	0,012886	-13,8083	2,89E-15
SMALL	-0,34417	0,082495	-4,17209	3,02E-05
GRPOW	0,91806	0,096366	9,52681	2,89E-15
ALT1	0,015665	0,101437	0,154434	0,877267
ALT2	-0,78398	0,133071	-5,89146	3,83E-09
ALT3	0,003871	0,192606	0,020098	0,983965
FLEXP	0,343392	0,092912	3,69588	0,000219
PRICE	-0,01231	0,00339	-3,63174	0,000282
EXPAN1	0,289829	0,105378	2,75037	0,005953
EXPAN2	-0,13001	0,14854	-0,87527	0,381427
EXPAN3	-0,58488	0,144874	-4,03716	5,41E-05
GROOMA	-0,02527	0,092388	-0,27351	0,784462
SNOWD	0,305079	0,028833	10,5811	2,89E-15

info 1 Income 2000-4000, n= 8097

	Coeff.	Std.Err.	t-ratio	P-value
HOURS	-0,16334	0,009084	-17,9818	2,89E-15
SMALL	-0,57747	0,059412	-9,71969	2,89E-15
GRPOW	0,613071	0,066643	9,19935	2,89E-15
ALT1	0,122178	0,071539	1,70785	0,087664
ALT2	-0,59342	0,098145	-6,04633	1,48E-09
ALT3	-0,34254	0,132658	-2,58213	0,009819
FLEXP	0,333492	0,065156	5,11833	3,08E-07
PRICE	-0,00322	0,002301	-1,39859	0,161936
EXPAN1	-0,03672	0,071662	-0,51244	0,608342
EXPAN2	-0,23267	0,108906	-2,13645	0,032643
EXPAN3	-0,62009	0,104743	-5,92008	3,22E-09
GROOMA	0,1111	0,064706	1,71699	0,085981
SNOWD	0,24581	0,019921	12,339	2,89E-15

Info 1 Income > 4000, n=2813

	Coeff.	Std.Err.	t-ratio	P-value
HOURS	-0,13741	0,015476	-8,87919	2,89E-15
SMALL	-0,29543	0,101635	-2,90672	0,003652
GRPOW	0,804848	0,113801	7,07241	1,52E-12
ALT1	-0,25412	0,125226	-2,02932	0,042426
ALT2	-0,66921	0,165351	-4,04719	5,18E-05
ALT3	-0,27888	0,246897	-1,12954	0,258671
FLEXP	0,20633	0,119731	1,72328	0,084838
PRICE	-0,00046	0,00417	-0,11146	0,91125
EXPAN1	-0,1124	0,131153	-0,85699	0,391452
EXPAN2	-0,26791	0,179833	-1,4898	0,136277
EXPAN3	-0,57737	0,177994	-3,24379	0,00118
GROOMA	0,177738	0,115843	1,5343	0,124957
SNOWD	0,206135	0,035481	5,80977	6,26E-09

info 2 Income < 1000 Euro, n=3074

	Coeff.	Std.Err.	t-ratio	P-value
HOURS	-0,14497	0,014901	-9,72883	2,89E-15
SMALL	-0,40483	0,097807	-4,13905	3,49E-05
GRPOW	1,00656	0,112188	8,97213	2,89E-15
ALT1	0,104654	0,118623	0,882245	0,377644
ALT2	-0,79275	0,15974	-4,96275	6,95E-07
ALT3	-0,03949	0,218112	-0,18107	0,856316
FLEXP	0,202605	0,108595	1,86569	0,062084
PRICE	-0,01125	0,003905	-2,88166	0,003956
EXPAN1	-0,02184	0,121711	-0,17941	0,857612
EXPAN2	-0,21924	0,176183	-1,24436	0,213365
EXPAN3	-0,52274	0,175887	-2,97204	0,002958
GROOMA	0,043841	0,108393	0,404461	0,685874
SNOWD	0,270994	0,033899	7,99424	2,89E-15

info 2 Income 1000-2000 Euro, n=4518

	Coeff.	Std.Err.	t-ratio	P-value
HOURS	-0,15296	0,012295	-12,4405	2,89E-15
SMALL	-0,46669	0,07988	-5,84241	5,15E-09
GRPOW	0,645068	0,089136	7,23692	4,59E-13
ALT1	-0,18729	0,095556	-1,96	0,049996
ALT2	-0,72593	0,131692	-5,51233	3,54E-08
ALT3	-0,53137	0,193453	-2,74679	0,006018
FLEXP	0,443106	0,089872	4,93043	8,20E-07
PRICE	-0,00644	0,00321	-2,00687	0,044764
EXPAN1	0,119315	0,098379	1,21281	0,225204
EXPAN2	-0,53461	0,146106	-3,65909	0,000253
EXPAN3	-0,45278	0,132317	-3,42197	0,000622
GROOMA	-0,03538	0,087742	-0,40322	0,686785
SNOWD	0,237764	0,027067	8,78439	2,89E-15

info 2 Income 2000-4000, n= 8097

	Coeff.	Std.Err.	t-ratio	P-value
HOURS	-0,153	0,008986	-17,0268	2,89E-15
SMALL	-0,44357	0,05854	-7,57723	3,53E-14
GRPOW	0,700307	0,065605	10,6746	2,89E-15
ALT1	-0,05804	0,070722	-0,82062	0,411862
ALT2	-0,65102	0,098483	-6,61046	3,83E-11
ALT3	-0,42332	0,13436	-3,15061	0,001629
FLEXP	0,358611	0,065055	5,51245	3,54E-08
PRICE	-0,00735	0,002264	-3,24822	0,001161
EXPAN1	0,002773	0,071508	0,038784	0,969063
EXPAN2	-0,16004	0,108431	-1,47599	0,139946
EXPAN3	-0,45976	0,1032	-4,45503	8,39E-06
GROOMA	0,096965	0,064969	1,49249	0,135571
SNOWD	0,260913	0,019874	13,1286	2,89E-15

info 2 Income > 4000, n=2813

	Coeff.	Std.Err.	t-ratio	P-value
HOURS	-0,15395	0,015147	-10,1638	2,89E-15
SMALL	-0,38471	0,097204	-3,95776	7,57E-05
GRPOW	0,444045	0,112733	3,93892	8,18E-05
ALT1	-0,26017	0,126482	-2,05695	0,039691
ALT2	-0,74522	0,154759	-4,81534	1,47E-06
ALT3	-0,52456	0,209259	-2,50676	0,012184
FLEXP	0,565279	0,109713	5,15235	2,57E-07
PRICE	-0,0114	0,004009	-2,84341	0,004463
EXPAN1	0,325955	0,123883	2,63115	0,00851
EXPAN2	0,233855	0,158734	1,47325	0,140683
EXPAN3	-0,08608	0,186109	-0,46251	0,643719
GROOMA	-0,01306	0,110967	-0,1177	0,906303
SNOWD	0,277368	0,033149	8,36738	2,89E-15

info 3 Income < 1000 Euro, n=3074

	Coeff.	Std.Err.	t-ratio	P-value
HOURS	-0,14671	0,014654	-10,012	2,89E-15
SMALL	-0,42037	0,095852	-4,38555	1,16E-05
GRPOW	0,572405	0,107481	5,32566	1,01E-07
ALT1	-0,11877	0,118228	-1,00456	0,31511
ALT2	-0,2769	0,1578	-1,75477	0,079298
ALT3	-0,25145	0,209099	-1,20253	0,229159
FLEXP	0,11725	0,107351	1,09221	0,274741
PRICE	-0,01024	0,003641	-2,81188	0,004925
EXPAN1	0,063676	0,117779	0,540642	0,588755
EXPAN2	-0,14556	0,182656	-0,79693	0,425492
EXPAN3	-0,26714	0,183722	-1,45403	0,145938
GROOMA	0,095271	0,110155	0,864886	0,387101
SNOWD	0,402247	0,033532	11,9958	2,89E-15

info 3 Income 1000-2000 Euro, n=4518

	Coeff.	Std.Err.	t-ratio	P-value
HOURS	-0,12673	0,011607	-10,9187	2,89E-15
SMALL	-0,37211	0,076814	-4,84428	1,27E-06
GRPOW	0,876502	0,085663	10,232	2,89E-15
ALT1	0,114952	0,094633	1,21471	0,224476
ALT2	-0,25735	0,122182	-2,10629	0,03518
ALT3	0,167141	0,171975	0,971889	0,331106
FLEXP	0,505431	0,085449	5,91498	3,32E-09
PRICE	-0,0141	0,003113	-4,53098	5,87E-06
EXPAN1	-0,15895	0,096917	-1,64004	0,100997
EXPAN2	-0,1646	0,142884	-1,15199	0,249327
EXPAN3	-0,1584	0,133364	-1,18771	0,234949
GROOMA	0,080108	0,087137	0,919334	0,357921
SNOWD	0,285015	0,026503	10,7539	2,89E-15

info 3 Income 2000-4000, n= 8097

	Coeff.	Std.Err.	t-ratio	P-value
HOURS	-0,14591	0,009036	-16,1475	2,89E-15
SMALL	-0,31191	0,059497	-5,24241	1,58E-07
GRPOW	0,502485	0,067084	7,49034	6,86E-14
ALT1	-0,03661	0,073369	-0,499	0,617776
ALT2	-0,13608	0,092915	-1,46457	0,14304
ALT3	-0,17829	0,134494	-1,32562	0,184967
FLEXP	0,423598	0,067213	6,30236	2,93E-10
PRICE	-0,00864	0,002411	-3,58346	0,000339
EXPAN1	0,029634	0,074138	0,39972	0,689363
EXPAN2	-0,25425	0,110069	-2,30994	0,020891
EXPAN3	-0,24779	0,103412	-2,39611	0,01657
GROOMA	0,015184	0,06721	0,225914	0,821268
SNOWD	0,290549	0,020649	14,0711	2,89E-15

info 3 Income > 4000, n=2813

	Coeff.	Std.Err.	t-ratio	P-value
HOURS	-0,14561	0,015172	-9,59736	2,89E-15
SMALL	-0,41818	0,098564	-4,24276	2,21E-05
GRPOW	0,360146	0,109121	3,30042	0,000965
ALT1	-0,04167	0,120845	-0,3448	0,730247
ALT2	-0,60373	0,16452	-3,66961	0,000243
ALT3	-0,68589	0,232317	-2,95238	0,003153
FLEXP	0,344821	0,111828	3,0835	0,002046
PRICE	-0,00653	0,003883	-1,68236	0,092499
EXPAN1	-0,05663	0,120719	-0,46913	0,63898
EXPAN2	-0,07802	0,183716	-0,4247	0,671054
EXPAN3	-0,37602	0,179886	-2,09034	0,036587
GROOMA	0,106964	0,112037	0,954726	0,339716
SNOWD	0,343945	0,034378	10,0047	2,89E-15

Sub sample age

info all age < 31, n=6872

	Coeff.	Std.Err.	t-ratio	P-value
HOURS	-0,15394	0,005683	-27,0892	2,89E-15
SMALL	-0,47582	0,036928	-12,885	2,89E-15
GRPOW	0,739252	0,041825	17,6748	2,89E-15
ALT1	0,016297	0,04524	0,360248	0,718662
ALT2	-0,4773	0,060968	-7,82868	4,88E-15
ALT3	-0,10672	0,082214	-1,29803	0,194276
FLEXP	0,380461	0,041332	9,20502	2,89E-15
PRICE	-0,01003	0,00147	-6,82641	8,71E-12
EXPAN1	0,054899	0,045919	1,19556	0,23187
EXPAN2	-0,19242	0,068521	-2,80814	0,004983
EXPAN3	-0,39939	0,065494	-6,09808	1,07E-09
GROOMA	0,103722	0,041717	2,48631	0,012908
SNOWD	0,323096	0,012787	25,2675	2,89E-15

info all age 31-50, n=9112

	Coeff.	Std.Err.	t-ratio	P-value
HOURS	-0,16106	0,004916	-32,7629	2,89E-15
SMALL	-0,43434	0,032081	-13,539	2,89E-15
GRPOW	0,603031	0,036103	16,7029	2,89E-15
ALT1	-0,0347	0,039167	-0,88604	0,375594
ALT2	-0,50382	0,051623	-9,75948	2,89E-15
ALT3	-0,36418	0,073834	-4,93248	8,12E-07
FLEXP	0,376607	0,036094	10,4342	2,89E-15
PRICE	-0,00583	0,001281	-4,54902	5,39E-06
EXPAN1	0,06611	0,039832	1,65971	0,096974
EXPAN2	-0,19012	0,057836	-3,28717	0,001012
EXPAN3	-0,41047	0,056259	-7,2961	2,96E-13
GROOMA	0,020137	0,035763	0,563063	0,573392
SNOWD	0,272115	0,01096	24,8279	2,89E-15

info all age > 50, n=3326

	Coeff.	Std.Err.	t-ratio	P-value
HOURS	-0,12014	0,008045	-14,9338	2,89E-15
SMALL	-0,26746	0,053274	-5,02044	5,16E-07
GRPOW	0,711697	0,059926	11,8762	2,89E-15
ALT1	-0,12465	0,064874	-1,92138	0,054683
ALT2	-0,6078	0,085575	-7,10253	1,23E-12
ALT3	-0,3549	0,122215	-2,9039	0,003685
FLEXP	0,325476	0,058803	5,535	3,11E-08
PRICE	-0,00803	0,00208	-3,86174	0,000113
EXPAN1	-0,07939	0,065179	-1,21802	0,223217
EXPAN2	-0,40974	0,098271	-4,16953	3,05E-05
EXPAN3	-0,50628	0,092234	-5,4891	4,04E-08
GROOMA	0,119743	0,058387	2,05083	0,040283
SNOWD	0,16385	0,018035	9,0852	2,89E-15

info 1 age < 31, n=6872

	Coeff.	Std.Err.	t-ratio	P-value
HOURS	-0,18386	0,01032	-17,8162	2,89E-15
SMALL	-0,56142	0,065648	-8,55189	2,89E-15
GRPOW	0,779378	0,075775	10,2854	2,89E-15
ALT1	0,032685	0,081185	0,402604	0,68724
ALT2	-0,50322	0,10855	-4,63583	3,56E-06
ALT3	-0,11544	0,1438	-0,80276	0,422115
FLEXP	0,420975	0,073469	5,72997	1,00E-08
PRICE	-0,00718	0,002581	-2,78112	0,005417
EXPAN1	0,203335	0,08153	2,49398	0,012632
EXPAN2	-0,13869	0,119048	-1,16497	0,244032
EXPAN3	-0,53257	0,114641	-4,64549	3,39E-06
GROOMA	0,038085	0,073799	0,51606	0,605813
SNOWD	0,321295	0,022444	14,3156	2,89E-15

info 1 age 31-50, n=9112

	Coeff.	Std.Err.	t-ratio	P-value
HOURS	-0,17305	0,008763	-19,7489	2,89E-15
SMALL	-0,49676	0,056868	-8,73544	2,89E-15
GRPOW	0,721056	0,064116	11,2462	2,89E-15
ALT1	0,03406	0,068864	0,494598	0,620884
ALT2	-0,69296	0,092103	-7,52379	5,33E-14
ALT3	-0,42286	0,133563	-3,16598	0,001546
FLEXP	0,345927	0,063842	5,41852	6,01E-08
PRICE	-0,00161	0,002283	-0,7031	0,481996
EXPAN1	0,057177	0,070411	0,812056	0,416759
EXPAN2	-0,29724	0,102118	-2,91073	0,003606
EXPAN3	-0,58256	0,099798	-5,83735	5,30E-09
GROOMA	0,066942	0,062547	1,07027	0,284496
SNOWD	0,243104	0,019388	12,5392	2,89E-15

info 1 age > 50, n=3326

	Coeff.	Std.Err.	t-ratio	P-value
HOURS	-0,11656	0,013533	-8,6129	2,89E-15
SMALL	-0,28477	0,090037	-3,16279	0,001563
GRPOW	0,648575	0,10084	6,43176	1,26E-10
ALT1	-0,11084	0,109494	-1,01228	0,311402
ALT2	-0,62598	0,146914	-4,26088	2,04E-05
ALT3	0,062398	0,197374	0,316142	0,751895
FLEXP	0,31594	0,100077	3,15695	0,001594
PRICE	-0,01103	0,003505	-3,14834	0,001642
EXPAN1	-0,0389	0,109966	-0,35376	0,723519
EXPAN2	-0,45544	0,166763	-2,73107	0,006313
EXPAN3	-0,81455	0,159721	-5,09984	3,40E-07
GROOMA	0,265955	0,09857	2,69814	0,006973
SNOWD	0,173461	0,030777	5,6361	1,74E-08

info 2 age < 31, n=6872

	Coeff.	Std.Err.	t-ratio	P-value
HOURS	-0,15084	0,009719	-15,5198	2,89E-15
SMALL	-0,46275	0,06358	-7,27821	3,38E-13
GRPOW	0,781508	0,071858	10,8757	2,89E-15
ALT1	0,00392	0,076212	0,051429	0,958984
ALT2	-0,73226	0,106448	-6,87904	6,03E-12
ALT3	-0,06401	0,144156	-0,444	0,657041
FLEXP	0,36325	0,071077	5,11063	3,21E-07
PRICE	-0,0133	0,002559	-5,19698	2,03E-07
EXPAN1	0,052059	0,079183	0,657448	0,510893
EXPAN2	-0,20982	0,117326	-1,78836	0,073718
EXPAN3	-0,47425	0,110266	-4,301	1,70E-05
GROOMA	0,111573	0,070839	1,57502	0,115253
SNOWD	0,314994	0,022032	14,2974	2,89E-15

info 2 age 31-50, n=9112

	Coeff.	Std.Err.	t-ratio	P-value
HOURS	-0,15975	0,008646	-18,4756	2,89E-15
SMALL	-0,47017	0,056439	-8,33055	2,89E-15
GRPOW	0,595675	0,063485	9,38288	2,89E-15
ALT1	-0,10639	0,068834	-1,54553	0,122219
ALT2	-0,62816	0,091243	-6,88447	5,80E-12
ALT3	-0,49595	0,129536	-3,82863	0,000129
FLEXP	0,427982	0,063453	6,74484	1,53E-11
PRICE	-0,0075	0,002218	-3,38236	0,000719
EXPAN1	0,135508	0,069679	1,94474	0,051806
EXPAN2	-0,16473	0,099877	-1,64933	0,09908
EXPAN3	-0,43766	0,100152	-4,36995	1,24E-05
GROOMA	-0,03067	0,062431	-0,49121	0,623279
SNOWD	0,266251	0,019107	13,9347	2,89E-15

info 2 age > 50, n=3326

	Coeff.	Std.Err.	t-ratio	P-value
HOURS	-0,14237	0,014496	-9,8211	2,89E-15
SMALL	-0,24605	0,092993	-2,64591	0,008147
GRPOW	0,819941	0,106723	7,68286	1,55E-14
ALT1	-0,14504	0,113901	-1,27342	0,202869
ALT2	-0,90616	0,155456	-5,82907	5,57E-09
ALT3	-0,70283	0,2175	-3,23139	0,001232
FLEXP	0,351822	0,100919	3,48619	0,00049
PRICE	5,82E-05	0,003654	0,015916	0,987301
EXPAN1	-0,08541	0,112374	-0,76002	0,447242
EXPAN2	-0,53426	0,173168	-3,08523	0,002034
EXPAN3	-0,42533	0,160479	-2,65035	0,008041
GROOMA	0,163154	0,101588	1,60603	0,108268
SNOWD	0,095545	0,031138	3,06842	0,002152

info 3 < 31, n=6872

	Coeff.	Std.Err.	t-ratio	P-value
HOURS	-0,13145	0,009727	-13,5138	2,89E-15
SMALL	-0,40405	0,063815	-6,3316	2,43E-10
GRPOW	0,688358	0,070963	9,70029	2,89E-15
ALT1	0,023956	0,079086	0,302914	0,761955
ALT2	-0,21	0,103985	-2,01955	0,04343
ALT3	-0,12421	0,141378	-0,87857	0,379636
FLEXP	0,350443	0,071312	4,9142	8,91E-07
PRICE	-0,00961	0,002535	-3,78995	0,000151
EXPAN1	-0,06974	0,079111	-0,88152	0,378038
EXPAN2	-0,22833	0,121375	-1,88122	0,059942
EXPAN3	-0,13948	0,117553	-1,18653	0,235414
GROOMA	0,131603	0,073642	1,78706	0,073928
SNOWD	0,342854	0,02233	15,3543	2,89E-15

info 3 age 31-50, n=9112

	Coeff.	Std.Err.	t-ratio	P-value
HOURS	-0,15264	0,008264	-18,4698	2,89E-15
SMALL	-0,34579	0,054027	-6,40027	1,55E-10
GRPOW	0,491196	0,060675	8,09555	2,89E-15
ALT1	-0,04076	0,066485	-0,61308	0,539821
ALT2	-0,21457	0,086325	-2,48555	0,012935
ALT3	-0,21618	0,122817	-1,76021	0,078372
FLEXP	0,368249	0,060959	6,04093	1,53E-09
PRICE	-0,0082	0,002181	-3,75828	0,000171
EXPAN1	0,011091	0,06751	0,164292	0,869501
EXPAN2	-0,1048	0,10004	-1,04755	0,294846
EXPAN3	-0,23443	0,093907	-2,49638	0,012547
GROOMA	0,035514	0,061372	0,578674	0,562809
SNOWD	0,309059	0,01865	16,5712	2,89E-15

info 3 age > 50, n=3326

	Coeff.	Std.Err.	t-ratio	P-value
HOURS	-0,11121	0,014356	-7,74697	9,33E-15
SMALL	-0,28874	0,09645	-2,99369	0,002756
GRPOW	0,70176	0,106692	6,57742	4,79E-11
ALT1	-0,11538	0,116738	-0,98836	0,322979
ALT2	-0,3303	0,148369	-2,22619	0,026002
ALT3	-0,38503	0,231251	-1,66497	0,095919
FLEXP	0,318153	0,10767	2,9549	0,003128
PRICE	-0,01285	0,003738	-3,43874	0,000584
EXPAN1	-0,15378	0,119792	-1,28375	0,199229
EXPAN2	-0,34422	0,180407	-1,90802	0,056389
EXPAN3	-0,32	0,163364	-1,95879	0,050137
GROOMA	-0,07241	0,106919	-0,67728	0,498231
SNOWD	0,234507	0,032771	7,15596	8,31E-13

Sub sample living distance

info all <2 h, n=12157

	Coeff.	Std.Err.	t-ratio	P-value
HOURS	-0,16497	0,004307	-38,3025	2,89E-15
SMALL	-0,38997	0,028015	-13,9197	2,89E-15
GRPOW	0,716314	0,031649	22,6332	2,89E-15
ALT1	-0,00624	0,034048	-0,1834	0,854485
ALT2	-0,50787	0,045844	-11,0782	2,89E-15
ALT3	-0,34637	0,065056	-5,32409	1,01E-07
FLEXP	0,351122	0,031285	11,2235	2,89E-15
PRICE	-0,00724	0,001099	-6,58493	4,55E-11
EXPAN1	0,035682	0,034548	1,03284	0,301681
EXPAN2	-0,29242	0,051346	-5,6951	1,23E-08
EXPAN3	-0,44879	0,049229	-9,11646	2,89E-15
GROOMA	-0,00181	0,031142	-0,05796	0,95378
SNOWD	0,265957	0,009515	27,9514	2,89E-15

info all 2-8 h, n=6201

	Coeff.	Std.Err.	t-ratio	P-value
HOURS	-0,13786	0,005851	-23,5621	2,89E-15
SMALL	-0,49632	0,038348	-12,9427	2,89E-15
GRPOW	0,567596	0,0432	13,1387	2,89E-15
ALT1	-0,05857	0,047363	-1,23671	0,216195
ALT2	-0,47387	0,061759	-7,67286	1,69E-14
ALT3	-0,12151	0,084004	-1,4465	0,148038
FLEXP	0,411774	0,043087	9,55692	2,89E-15
PRICE	-0,00889	0,001555	-5,7161	1,09E-08
EXPAN1	0,062245	0,048015	1,29636	0,194851
EXPAN2	-0,07367	0,068883	-1,06956	0,284818
EXPAN3	-0,30851	0,067237	-4,58841	4,47E-06
GROOMA	0,145116	0,043215	3,35799	0,000785
SNOWD	0,286049	0,013237	21,6097	2,89E-15

info all >8 h, n=1122

	Coeff.	Std.Err.	t-ratio	P-value
HOURS	-0,08161	0,013438	-6,07339	1,25E-09
SMALL	-0,34977	0,089544	-3,90611	9,38E-05
GRPOW	0,755026	0,099083	7,62015	2,53E-14
ALT1	-0,1577	0,108867	-1,44851	0,147475
ALT2	-0,77248	0,138701	-5,56938	2,56E-08
ALT3	-0,14114	0,20258	-0,69673	0,48597
FLEXP	0,332821	0,101188	3,28915	0,001005
PRICE	-0,00841	0,003618	-2,32472	0,020087
EXPAN1	-0,01981	0,110566	-0,17913	0,857838
EXPAN2	-0,38506	0,170784	-2,25465	0,024155
EXPAN3	-0,65688	0,15602	-4,21024	2,55E-05
GROOMA	0,358268	0,100507	3,56462	0,000364
SNOWD	0,227988	0,031864	7,15504	8,36E-13

info 1 <2 h, n=12157

	Coeff.	Std.Err.	t-ratio	P-value
HOURS	-0,17657	0,007635	-23,1257	2,89E-15
SMALL	-0,48712	0,049376	-9,86549	2,89E-15
GRPOW	0,73265	0,055935	13,0982	2,89E-15
ALT1	0,028205	0,059621	0,47307	0,636163
ALT2	-0,56004	0,080779	-6,93302	4,12E-12
ALT3	-0,36151	0,114538	-3,15622	0,001598
FLEXP	0,33926	0,05464	6,20895	5,33E-10
PRICE	-0,00444	0,001926	-2,30625	0,021097
EXPAN1	0,087768	0,060153	1,45908	0,144543
EXPAN2	-0,38402	0,091793	-4,18357	2,87E-05
EXPAN3	-0,59661	0,085136	-7,00777	2,42E-12
GROOMA	0,042456	0,054058	0,785374	0,432235
SNOWD	0,250621	0,016627	15,0728	2,89E-15

info 1 2-8 h, n=6201

	Coeff.	Std.Err.	t-ratio	P-value
HOURS	-0,16457	0,010658	-15,4418	2,89E-15
SMALL	-0,5205	0,06877	-7,56861	3,77E-14
GRPOW	0,695004	0,078348	8,87076	2,89E-15
ALT1	0,005079	0,085953	0,059091	0,952879
ALT2	-0,60103	0,112465	-5,34412	9,09E-08
ALT3	0,019583	0,149592	0,130909	0,895848
FLEXP	0,443751	0,078499	5,65297	1,58E-08
PRICE	-0,00542	0,002815	-1,92505	0,054224
EXPAN1	0,056947	0,087682	0,649467	0,516036
EXPAN2	-0,14516	0,117674	-1,23353	0,217376
EXPAN3	-0,45542	0,125735	-3,6221	0,000292
GROOMA	0,108482	0,078174	1,38771	0,165225
SNOWD	0,278163	0,023776	11,6995	2,89E-15

info 1 >8 h, n=1122

	Coeff.	Std.Err.	t-ratio	P-value
HOURS	-0,05987	0,022262	-2,68913	0,007164
SMALL	-0,44853	0,146889	-3,05355	0,002262
GRPOW	1,04695	0,169693	6,16968	6,84E-10
ALT1	-0,05837	0,177049	-0,32969	0,741633
ALT2	-1,14948	0,226834	-5,0675	4,03E-07
ALT3	0,278417	0,32559	0,855115	0,392488
FLEXP	0,047476	0,166379	0,285348	0,775377
PRICE	-0,0083	0,005802	-1,42979	0,152778
EXPAN1	0,255436	0,179503	1,42301	0,154732
EXPAN2	0,022514	0,280084	0,080382	0,935933
EXPAN3	-1,30963	0,265881	-4,92562	8,41E-07
GROOMA	0,390837	0,162301	2,4081	0,016036
SNOWD	0,138685	0,05355	2,58984	0,009602

info 2 <2 h, n=12157

	Coeff.	Std.Err.	t-ratio	P-value
HOURS	-0,16234	0,007408	-21,9136	2,89E-15
SMALL	-0,38104	0,048105	-7,92108	2,89E-15
GRPOW	0,769745	0,054475	14,1301	2,89E-15
ALT1	-0,06936	0,058133	-1,19317	0,232803
ALT2	-0,72257	0,079469	-9,09249	2,89E-15
ALT3	-0,52176	0,114187	-4,5693	4,89E-06
FLEXP	0,380568	0,053864	7,06539	1,60E-12
PRICE	-0,00889	0,001887	-4,70797	2,50E-06
EXPAN1	0,077127	0,059239	1,30197	0,192926
EXPAN2	-0,24157	0,087096	-2,77361	0,005544
EXPAN3	-0,52782	0,084511	-6,2456	4,22E-10
GROOMA	0,03288	0,053036	0,619954	0,535288
SNOWD	0,245828	0,016337	15,0475	2,89E-15

info 2 2-8 h, n=6201

	Coeff.	Std.Err.	t-ratio	P-value
HOURS	-0,13153	0,010126	-12,9898	2,89E-15
SMALL	-0,51716	0,066415	-7,78675	6,88E-15
GRPOW	0,512717	0,074231	6,90702	4,95E-12
ALT1	-0,1245	0,081219	-1,53284	0,125315
ALT2	-0,63578	0,108419	-5,86412	4,52E-09
ALT3	-0,26939	0,14617	-1,84301	0,065328
FLEXP	0,410864	0,073934	5,55716	2,74E-08
PRICE	-0,00878	0,00268	-3,27517	0,001056
EXPAN1	0,064959	0,082321	0,789098	0,430055
EXPAN2	-0,11836	0,118855	-0,99586	0,319321
EXPAN3	-0,24142	0,116335	-2,07521	0,037967
GROOMA	0,052472	0,07445	0,704798	0,480936
SNOWD	0,282338	0,022733	12,4199	2,89E-15

info 2 >8 h, n=1122

	Coeff.	Std.Err.	t-ratio	P-value
HOURS	-0,15651	0,029038	-5,39002	7,04E-08
SMALL	-0,47279	0,187743	-2,51828	0,011793
GRPOW	0,957875	0,211637	4,52603	6,01E-06
ALT1	0,044961	0,224841	0,199966	0,841507
ALT2	-1,06882	0,306242	-3,49013	0,000483
ALT3	0,085325	0,385029	0,221605	0,824621
FLEXP	0,377897	0,199333	1,8958	0,057986
PRICE	-0,00087	0,007351	-0,1184	0,905754
EXPAN1	0,144568	0,229441	0,630089	0,528637
EXPAN2	-0,6462	0,336526	-1,92021	0,054831
EXPAN3	-0,11229	0,313838	-0,35779	0,720497
GROOMA	0,180199	0,204554	0,880934	0,378354
SNOWD	0,206763	0,063177	3,27275	0,001065

info 3 <2 h, n=12157

	Coeff.	Std.Err.	t-ratio	P-value
HOURS	-0,15766	0,007447	-21,1715	2,89E-15
SMALL	-0,31012	0,048591	-6,38217	1,75E-10
GRPOW	0,658326	0,054535	12,0716	2,89E-15
ALT1	0,043094	0,0598	0,720639	0,471132
ALT2	-0,23826	0,078968	-3,01721	0,002551
ALT3	-0,14829	0,11077	-1,33873	0,180659
FLEXP	0,334964	0,054538	6,14186	8,16E-10
PRICE	-0,00788	0,001914	-4,11537	3,87E-05
EXPAN1	-0,06328	0,060653	-1,04323	0,296841
EXPAN2	-0,28259	0,089244	-3,16653	0,001543
EXPAN3	-0,19838	0,08746	-2,26821	0,023316
GROOMA	-0,10286	0,055435	-1,85557	0,063515
SNOWD	0,302706	0,016655	18,1751	2,89E-15

info 3 2-8 h, n=6201

	Coeff.	Std.Err.	t-ratio	P-value
HOURS	-0,12101	0,009842	-12,2954	2,89E-15
SMALL	-0,46276	0,065106	-7,10775	1,18E-12
GRPOW	0,505845	0,072935	6,93559	4,05E-12
ALT1	-0,05463	0,080377	-0,67963	0,496742
ALT2	-0,2029	0,102167	-1,98595	0,047039
ALT3	-0,13702	0,142561	-0,96117	0,336468
FLEXP	0,395721	0,072768	5,43811	5,38E-08
PRICE	-0,01231	0,002627	-4,68787	2,76E-06
EXPAN1	0,05881	0,080959	0,726416	0,467584
EXPAN2	0,065619	0,12358	0,53098	0,595433
EXPAN3	-0,24731	0,110269	-2,24276	0,024912
GROOMA	0,297071	0,073567	4,03812	5,39E-05
SNOWD	0,299619	0,022687	13,2064	2,89E-15

info 3 >8 h, n=1122

	Coeff.	Std.Err.	t-ratio	P-value
HOURS	-0,0519	0,022353	-2,32182	0,020243
SMALL	-0,22825	0,152643	-1,49531	0,134833
GRPOW	0,477405	0,161209	2,96141	0,003062
ALT1	-0,35023	0,188725	-1,85578	0,063485
ALT2	-0,31655	0,229429	-1,37971	0,167676
ALT3	-0,81016	0,378851	-2,13845	0,03248
FLEXP	0,547735	0,17724	3,09035	0,001999
PRICE	-0,01236	0,006454	-1,9151	0,055479
EXPAN1	-0,38929	0,188048	-2,07015	0,038438
EXPAN2	-0,58196	0,298344	-1,95062	0,051102
EXPAN3	-0,39888	0,27064	-1,47382	0,140529
GROOMA	0,371784	0,176712	2,1039	0,035388
SNOWD	0,339224	0,055147	6,15131	7,68E-10

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