## Vulnerability to global change and sustainable adaptation of ski tourism – an outlook on the study SkiSustain

#### Tobias Luthe, Ralf Roth & Hans Elsasser

#### Abstract

Global change, in particular changes in demographic patterns, in socioeconomic developments and in climate, significantly affects alpine tourism, especially ski tourism. In response, mainly technical means of adaptation in ski areas are being applied. After the analogue winter of 2006/07 the current kind of adaptation proofed to be not sustainable, neither in its effectiveness, nor in its ecological and economical future. 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.

Keywords: vulnerability, global change, adaptive capacity, choice experiment, sustainable ski tourism

## 1 Overview

Alpine economy is highly dependent on tourism. Winter tourism in alpine destinations contributes about 50% to the total tourism sales. In winter tourism, ski areas play a major role in attracting visitors (Lehar 2006). The product "ski area" relies on cold temperatures and snow. Climate change is a major threat to alpine destinations as temperatures will rise and precipitation patterns change (Schneider & Schönbein 2006). Although there are other environmental problems triggered by the skiing industry and other environmental changes affecting this tourism branch (e.g. higher energy costs or demographic changes) climate change is considered the major threat for winter tourism destinations (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. Climate models show that the world average temperature will rise about 2–4°C more until the end of this Century, whereas the mean temperature in the Alps will rise another 2°C within the next 30 years. Precipitation patterns will change with less precipitation in early and mid winter, and more in spring and summer. The total amount of water will not change significantly. Extreme weather events such as storms, floods, draughts or heavy snow fall will become more frequent (Schneider & Schönbein 2006, Seiler 2006, OECD 2007).

Ski areas will no longer be able to offer the services customers had been used to buy. Tourists will face heavy changes in the winter tourism product as the reliability of snow is vanishing, which will affect their satisfaction (Elsasser 2003).

In response to these already experienced and anticipated changes, ski areas need to adapt and develop new strategies taking global change and correlating consumer demand into account. The discussion how ski areas could react led to the development of adaptation and avoidance strategies. Adaptation strategies are mainly those offering alternatives that do not rely on snow and snow making by technical means, the latter being the most widely and intensively discussed and applied adaptation strategy. Avoidance strategies are understood as avoiding an even faster climate change by means of efficiency and of lowering the amount of greenhouse gases being emitted (OECD 2007).

The discussion of adaptation has been focusing on the destination from a supply side. In SkiSustain we also integrate the demand side and investigate the potential to develop alternative services in a changing world by the supply side management in partnership with the customer. Still, the methodology of SkiSustain involves supply side research to match customer demand with supply side perceptions and strategies.

Successful tourism destinations indeed consider tourism satisfaction 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 high performance. Even more, in tourism the customer is partly the producer, as 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 to adapt to actual consumer demand is crucial for the survival of ski areas.

## 2 Problem statement

The relation between the services of ski areas, between customer satisfaction and global change has economic, social and ecological aspects (figure 1). In order to survive, ski areas need to manage this relationship by developing adaptive management and communication strategies.

Mountain resorts depend on landscape and nature as a resource. Infrastructure is built and has to be maintained, landscape is transformed, ecosystems are affected and energy is consumed. Therefore, avoidance strategies and adaptation efforts can only lead to integrative sustainability that offsets the unavoidable impacts on the environment by gains in other areas such as minimising the ecological impacts, saving energy and achieving efficiency in general, generating benefits for the local economy through offering alternative services, and communicating threats and opportunities to customers and stakeholders to begin a partnering process. The last point is a main question of this study: Can threats to ski areas from global change actually become opportunities by better involving the customer in the services generating process and adapting consumer behaviour to changing services? Ski areas most vulnerable to global change are the main focus of this study. What chances do they have to develop their specific sustainability USP (unique selling proposition) by reaching the customer? How do recent experiences after the analogue winter 2006/07 reflect the discussion of "loosers" and "winners" (lower and smaller versus higher and bigger ski areas, OECD 2007) in the future?

#### 2.1 Missing communication between supply side and demand side

Reacting to the challenges explained above, communication with the customer is a key to develop successful strategies from a ski area perspective given the importance of the customer's role in the tourism product. Communication works vice-versa. Both supply side and demand side are receptors and senders (figure 1). Both must be aware of each other's goals, acting and preferences to design meaningful products and services.

Little is known about snow tourists' preferences, especially in the light of global change, and if or how marketing of sustainable tourism and of alternative services could reach the customer. Sustainability as a long-term systematic concept is still fairly unknown to most people, which is a general problem of society (UTOPIA 2007).

Even if there was a demand for information on sustainability performance of ski areas, ski tourists as a focus group do not have trustful sources of such information as not much exists (Luthe 2007). The few approaches either lack transparency, completeness or independent control. Existing benchmarking regimes do not serve customers' needs in terms of providing scientific information responding to their questions and which are independently controlled but still understood by the majority of snow tourists (Luthe 2007). As none of these approaches are complete by presenting the majority of existing ski areas, benchmarking by topics of Corporate Social Responsibility (CSR) is not applicable for the majority of consumers.

On supply side, only a few ski destinations, such as Aspen Snowmass or Whistler Blackcomb, just started to actively communicate their CSR performance (Luthe 2007). For the uninformed customer these efforts are still difficult to place within the complicate topic of CSR, global change, and ski tourism. The vast majority of ski areas remain silent about the threats and opportunities deriving from global change and their efforts and responsibility to tackle these challenges in partnership with the customer. There is a lack of sustainable managed ski resorts giving examples of good practice in also in terms of communication and reporting.

Summarising the current relation between customers on the demand side and ski destination managements on the supply side facing global change, communication is lacking. Communication from the supply side is important to:

- 1. learn about customer preferences;
- 2. react to global change and to design the services accordingly (adaptation); and
- develop CSR performance and possibly market it to turn threats into opportunities.



Figure 1: Coupled human-environment system of ski tourism.

## 2.2 Destination uncertainty governance

The coupled human-environment systems between supply and demand sides in ski destinations represent our key interest. Because of the complexity and the uncertainty of many variables within global change the risk for the long-term success of mountain tourism destinations 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 governance model implemented in the destination (Beritelli et al. 2007). Beritelli et al. discuss the contribution of corporate governance theories to the explanation of destination governance structures and evolution. They propose 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.

In SkiSustain we address this issue and research perceptions and strategies in ski destinations with different regulatory frames and models of governance. However, SkiSustain focuses on the relation between global change, customer demand, and supply side strategies.

#### 2.3 Studies on customer demand in ski destinations

Some research has been devoted to customer demand in ski destinations, but no newer study focuses on customer demand for sustainable management of ski destinations. Zeier (1993) surveyed customer demand in Switzerland. In 1996, Hohermuth & 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. König (1998) surveyed perceptions and demand of ski tourists in Australia in the context of climate change. Bürki (2000) did a survey in two Swiss cantons with a sample size of n = 948 on skiers demand in a changing climate. A recent survey (n = 538) by Unbehaun (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 find out about customer demand (Siomkos et al 2006). In the project STRATEGE, Manova did an unpublished survey on the effect of media coverage about climate change on customer demand (Manova 2007).

So far there has been no customer survey being representative for a market of a bigger country (such as the German ski tourism market) testing the demand for sustainability in ski tourism and combining this with a Conjoint Analysis (Louviere et al. 2000) to derive economic data on the potential market of sustainable ski tourism.

#### 2.4 Studies on supply side strategies of ski destinations

From a supply side, a number of qualitative and quantitative studies surveyed perceptions and strategies of ski destinations focusing on a single region or country. Apart from SkiSustain, no study researched strategies and perceptions in the main Alpine countries France, Austria, Switzerland, and Italy with the same methodology in the same time. Examples for supply side surveys are Abegg (1996), König (1998), and Bürki (2000). More recent quantitative surveys have been done with the cableways in Switzerland by Abegg et al. (2007) and with the German cableways (Roth et al. 2008) adopted from Abegg.

#### 3 Research goals

Within a framework of integrative sustainability, specific indicators are needed that enable ski areas to describe, define and develop their own identity in terms of sustainability performance as a unique selling proposition (USP). For a destination that enjoys a competitive advantage in a specific segment, its product differences must be clearly visible and communicated in one or more attributes that are key buying criteria.

To define these services and strategies a framework is needed that can help to continuously monitor global changes and customer demand, and flexibly seize services to meet customer satisfaction, the needs of local residents, and environmental goals. A strategic framework should both serve as a management tool for ski areas and as a decision support tool for tourists.

The complexity of the various relations and influences makes a theoretical model necessary that helps to define, to measure and improve ski areas' sustainability performance (i) in comparison to a best-in-class standard and (ii) in responding to customer demand, possibly even shaping it. This model can then be taken to further define a strategic framework.

Summarising the needs for further insight into the human-environment system of ski tourism and global change there are a number of research goals the study SkiSustain seeks to address:

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- Get an overview on the interrelated human-environment system of ski tourism and global change from a holistic perspective going beyond the current focus on climate change (see figure 1).
- Extend the focus on climate change impacts on the natural environment to a holistic understanding for the relations and feedback loops in the coupled humanenvironment system of ski tourism and global change.
- Assess supply side experiences and strategies of vulnerability to global change. Focus on ropeways companies in ski areas as the traditional, the main driving and the most suffering stakeholders in ski destinations. Access the topic from an international scope to widen and broaden the national focus in an international and very mobile tourism market.
- Extract sensitivity and adaptive elements to develop future ski area services scenarios focusing on behavioural adaption and mitigation.
- Investigate 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.
- Discuss a differentiation in sensitivity of ski areas and possibilities of sustainable adaptive and mitigative capacity.
- Build up a vulnerability management framework for ski areas.
- 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.

# 4 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 part being followed by a strategic integrative part.

## 4.1 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 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 to be 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 chances in global change?
- Would ski areas believe and invest in sustainable ski tourism?

## 4.2 Demand side questions

All demand side question shall address and represent the German market of ski tourists.

- What is the ski tourist's awareness and perception of climate change impacts and of environmental aspects in ski tourism taken the experienced unusually warm winter of 2006/07 into account?
- What is the perception of ski tourists on correlations between their behaviour as skiers and the management of ski areas from a perspective of sustainable development and feedback effects?
- 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?
- How do skiers accept less snow guarantee and thus alternatives to skiing? What is the consumer's acceptance to adapt demand to changing services?
- What is the demand for mitigative adaptation and sustainable ski tourism, which indicators meet customer expectations?
- What is the effect of additional information and of directed environmental marketing on customer choice behaviour expressed in Euros willingness-to-pay?
- What is the willingness-to-pay for specific ski area attributes and how does it get affected by green marketing?
- How are different socioeconomic groups reacting in their demand to information treatment and green marketing?
- What topics should be marketed in what way to target the market of sustainable consumption?

## 4.3 Integrative questions

In the integrative part we join stakeholder and consumer results to come to 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 real opportunity for ski areas?
- What are other opportunities or aspects of key interest that need further research?

# 5 Methods

We address the raised questions by designing a research process that is divided into four methodological steps (see figure 2):

## Step 1: Overview on 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 guide lines for the semi-structured interviews of step two.

## Step 2: Experiences and strategies of tourism stakeholders

In step two we assess experiences and strategies by interviewing the managements of ropeways companies as 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 each of about one hour.

Ski areas are selected to represent a mean of ski areas in the Alps and of a current understanding of vulnerability. We select ski areas in France, Italy, Switzerland and Austria. The total number of interviews is 20. 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 a number of 36 ski areas in four Alpine countries.

#### Step 3: Consumer demand for sustainable ski tourism

Form the hypothesised causal model of vulnerability 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 of this study.



Figure 2 Methodological research frame of SkiSustain

Together with the scenarios we test effects of green marketing and add information treatments. The contents of these treatments and their kind are developed in expert discussions in ski resorts with experiences of marketing sustainability. Some ski resorts in North America are internationally leading the track in terms of actively communicating global change and sustainability issues. 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.

We then use the validated indicators and scenarios of future ski areas to research 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 choice set part with eight questions plus a set of 27 quantitative general questions addressing a variety of topics matching the risen research questions.

#### Part 1: Quantitative questionnaire

The quantitative questionnaire consists of 27 questions that investigate customer preferences for different kinds of ski area services. We aim on a representative sample of German ski tourists in terms of age, gender, skills, origin and income. We generated 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. Newsletters of the ski areas Mayrhofen (Austria) with 7,330 recipients and Oberstdorf (Germany) with each about 8,000 recipients were another main source of generating participants of 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 TV station. An email newsletter to about 12,000 ski instructors was sent from the German Ski Federation, and an article was placed in the member magazine of the Ski Federation with a printed number of about 220,000 magazines. 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.

By the radio and TV station as well as by the member magazine generated customers had to actively type in the link of the web survey which was a very easy one to spell and to remember (www.Save-Snow.com). All other respondents generated in the interviews and by the newsletters could click on the link that was provided in the email they received about ten days after doing the interviews or by the newsletter. Extensive pre-testing of the online survey was done with about 100 customers before starting the actual survey later on. Feedback was generated and some of the visual choice set design and some explanations were changed according to the experiences of the tests. 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.

#### Part 2: Choice experiment

The demand of customers is modelled 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 many 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 a good or a 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 some participants with additional information on the ski areas to choose from. We chose three different information treatments:

- recommendations from a well known environmental foundation/NGO
- recommendations by other customers who already visited the ski areas
- a third option of no treatment serving as a reference.

The information treatments serve to test the effects of directed marketing on customer choices.

#### 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 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, to 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. Vulnerability to global change and sustainable adaptation of ski tourism

# 6 First outlook on results: customer demand sample description

At the time of presentation of this paper we received the first results of the customer survey Save-Snow. In the following, we provide an outlook on the demand side results, describe the sample of Save-Snow and discuss its quality.

#### 6.1 Respondents and distribution

3,160 participants filled out the online questionnaire Save-Snow. To filter the valid response data, we defined the data as "valid" if:

- 1. All 35 questions had been completed.
- 2. The IP address is unique and only counted once.
- 3. The time stamp must indicate that the time taken to answer the eight choice set questions was 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 most likely that those just clicked through to take part in the lottery.

Filtering according to these criteria resulted in 2,430 valid questionnaires for further analysis.

#### 6.2 Age and gender

The mean age of all participants of this study was 37 years (34 years for women, 38 years for men). The age distribution is shown in figure 3.



#### 6.3 Origin and distribution of responses

The distribution of the responses from the interviews and newsletters is as shown in figure 4. With 55.5%, most of the responses were generated in direct contact with

tourists in ski areas. The second largest group (26.9%) contained responses from the general population derived from radio, TV and the general internet. The third group (17.6%) consists of members and ski instructors affiliated with the German Ski Federation.



Figure 4: Origin and distribution of responses.

#### 6.4 Activities in winter sports

68% of the sampled persons are alpine skiers and 14% snowboarders. The remaining participants fulfil activities like ski touring, cross country skiing, winter hiking, Telemark, snowshoeing and tobaggoning (figure 5).



Figure 5: Activities of sample participants.

## 7 Discussion: sample quality and representativeness

Up to date only little data on customer demand in ski tourism in the Alps is available. Even less data is available on the mean of skiers and their total number. Estimations of the German Ski Federation (DSV) indicate a number of 4–6 million skiers in Germany (DSV 2006). Data of the Allensbach institute indicate a total of 8.71 million people in Germany (from a sample of N = 2,831) who skied in their life or who are active skiers (Allensbach 2007). Representativeness depends on the sheer size of the sample, not on the size relative to the population. We calculated a minimal

sample size of n = 1,842 to represent the 8.71 million skiers in Germany (Cochran 1977). With n = 2,430 we trespassed this size and minimised the acceptable margin of error for mean to 0.026.

Comparisons with other samples to judge the sample quality are possible too. 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 2007). In her study, 75% were alpine skiers and 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 shows the mean age of skiers in a Swiss region in the age class 31–50 years, with 59% males and 41% females (Bürki 2000). 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 2006). Taking the sheer sample size of Save-Snow and the comparisons of the age and gender distribution with other studies indicates that it is representative for the total mean of skiers from Germany (Bortz & Döring 2006).

The four selected ski areas four short interviews reflect an average of ski areas fairly well. Oberstdorf as a rather small and low area, Stuben as small but high area, Mayrhofen as a mid size and mid elevation area, St. Anton as a high and large and finally, Les Arcs as a high and large one with glacier access.

Taking these figures and comparisons into account this sample 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).

#### 8 Summary and outlook

Global change affects ski destinations in multiple ways. Climate change is the main threat because of the direct dependency of ski areas on snow and weather. Demographic developments and socio-economic changes will result in differences in customer demand. The traditional market of ski tourists will shrink, more people of the upper age classes and less young tourists will visit the Alps. Income will divide customers more and more into a well paying and into a budgetary class. Changes and developments are perceived differently by ski areas managements as their strategic responses are. The main adaptation strategy so far is the production of technical snow. Ski areas in lower elevations and of smaller size can often not keep up with the general development of investments in snow making equipment, plus are scheduled to suffer from too high temperatures to offer a snow guarantee. While they count as losers, the higher resorts are understood as the winners. Little is known so far about the demand of customers and how this demand evolves with global change. The diversity of customers might open up new potential market niches and USP (unique selling proposition) for all ski destinations, but especially for the "losers". Managing and marketing a "green" resort not offering 100% snow guarantee but alternative activities and a profound engagement in climate protection could attract a growing number of customers and thus outweigh potential losses from less snow guarantee.

Results of Save-Snow including the Conjoint Analysis as well as the outcomes of the supply side qualitative research will lead to a framework for ski tourism to sustainable adapt to global change. The results will be published in 2008.

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