



Attitudes Towards Climate Change: Attitudes Towards and Observations Regarding Climate Variability and Change: Evidence from Michigan's Downhill Ski Sector

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*This project was funded by the Great Lakes Integrated Sciences + Assessments Center
through a 2011 Great Lakes Climate Assessment Grant.*

Recommended Citation:

Nicholls, S., B. Amelung, 2013. *Attitudes Towards Climate Change: Attitudes Towards and Observations Regarding Climate Variability and Change: Evidence from Michigan's Downhill Ski Sector*. In: *GLISA Project Reports*. D. Brown, D. Bidwell, and L. Briley, eds. Available from the Great Lakes Integrated Sciences and Assessments (GLISA) Center.

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Introduction

The downhill ski sector has received perhaps the greatest amount of interest, due likely to the economic importance and popularity of this activity, and the especially significant implications of warming conditions for its feasibility. The majority of ski-related studies have focused on implications of CVC for snow cover, snow reliability, skiable days, and/or season length; the use of snow-making as a form of adaptation has also been investigated.

Less emphasis appears to have been placed on the human dimensions of this topic, e.g., in terms of alterations to visitor preferences, or public awareness of and concern about projected CVC. There also remains a distinct dearth of material focusing on the implications of CVC for the operations of the individual elements of the ORT industry. Few studies have assessed the ORT industry's awareness and understanding of CVC and its likely implications for their businesses or sites.

In an effort to redress the lack of knowledge regarding the ski sector's awareness and perceptions of climate change, and in order to provide useful and relevant information to members of the ORT sector, this report provides an assessment of the impacts of, vulnerabilities to, and barriers to adaptation to CVC within the ski sector in the Midwest US state of Michigan.

Method

A survey of ski area operators was developed based on a review of the literature and detailed discussion with a series of operators throughout the state. The survey was pilot-tested by this same subset of operators. Invitations to participate in the online survey were shared with the 36 member areas of the Michigan Snowsports Industries Association, whose Executive Director endorsed participation in the study. Nineteen responses were received, representing 18 different ski areas and an effective response rate of 50%.

Characteristics of

Respondents and their Ski Areas

Respondents held a variety of upper level management positions (General Manager, President, Owner, etc.) and had an average of two decades of experience at their current ski area and 26 years of experience in the winter sports industry in general.

Dependence on winter operations as expressed as a percentage of gross revenue ranged from 25% to 100% (average 70%). Gross revenue ranged from less than \$5 million (7 areas) to over \$20 million (3 areas). The number of full-time, year-round employees ranged from none to

500 and averaged 113. Though small, the sample did clearly represent a wide range of area types and sizes.

Respondents' Belief In, Awareness of and Concern about Climate Change

All but one of the 19 respondents believed that the world's climate is changing (this one respondent was excluded from further analysis). Of the remaining 18 respondents, most considered themselves somewhat (39%) or very (44%) aware of the topic of climate change. Concern regarding climate change and its implications for winter operations was more variable – 22% a little concerned, 44% somewhat concerned, and 28% very concerned. Mean awareness and concern scores were 3.4 and 2.9, respectively (out of 5.0). Figure 1 illustrates levels of awareness and concern.

Observed Changes at Ski Area

Respondents were next asked to indicate the number of seasons during which they have observed a series of eleven changes at their ski area in the past ten years. Answer options consisted of never, during 1-3 seasons, 4-6 seasons, 7-9 seasons, and every season.

The most commonly observed change (based on the mean score for each item) was early closing of ski season due to lack of customer demand (observed every season at five areas, though never at six). This finding, in combination with the infrequent observation of early closing due to lack of snow, would seem to lend some credence to the generally recognized though never empirically proven perception among ski area operators that customers are heavily driven by snow conditions in their home area. It is commonly accepted within the industry that once spring arrives in key market areas, and customers' minds turn to summer activities such as boating and golf, it is extremely difficult to attract them to ski regardless of conditions on the slope. The installation of web cams, to provide live video of actual snow conditions, has been one approach to help combat this problem.

Other changes that were observed by the majority of respondents 1-3 or 4-6 times over the past ten seasons were less natural snow; delay in opening day of ski season due to lack of snow; extended mid-season warming trends; more intense severe snow storm events (measured by accumulation of 8" or more in 24-hour period); reduced frequency of conditions necessary to make snow; and, more frequent severe snow storm events. This combination of observations – of both less snow yet also more intense and more frequent severe snow storm events, lends support to a key characteristic of the climate change phenomenon, that of increasing climatic variability.

The remaining four items – early closing of ski season due to lack of snow; increased difficulty of guests reaching your resort due to difficult driving conditions between their

homes and your resort; shift in timing of season (no change in length); mid-season closings due to lack of snow – were observed by the majority of respondents either never or 1-3 times in the past ten seasons.

Additions/Changes to Operations at Ski Area

Next, respondents were asked to indicate whether or not any of 23 measures, additions or changes had been implemented at their area in the past ten years. Three answer options were provided: yes; no; and, not yet operational but in planning or development stage.

In the case of a yes or not yet answer, this follow-up question was asked: “Please indicate the extent to which recent weather variability and/or your concerns about climate change directly influenced your implementation of this measure at your area.” Answer options were as follows: had no influence; was a secondary influence; was one of several factors that had approximately equal influence; was the primary but not the only influence; and, was the only influence.

In the case of a no answer, this follow-up question was asked: “Please indicate why you have not implemented this measure at your area by checking the one most relevant reason from the choices below.” Answer options were: I am not familiar with this measure; I have heard of this measure but need more information about it in order to make an informed decision about its utility; I am familiar with this measure but it is not appropriate or feasible at our area (e.g., due to technical or structural limitations); I am familiar with this measure but it is not financially viable at our area; and, We have not yet implemented this measure but are currently in the process of evaluating its utility for our area.

The following measures, additions or changes had been implemented or were in the planning/development stage at more than one half of areas:

- Increased snowmaking capacity (i.e., more snow guns);
- Increased frequency of snowmaking;
- Improved snowmaking capacity (i.e., more efficient snow guns);
- Installation of a weather station;
- Addition of new/more winter activities;
- Addition of new/more spring/summer/fall activities;
- Investment in energy conservation measures;
- Expanded use of social media;
- Implementation of new or special winter pricing structures;
- Partnered with surrounding tourism suppliers.

In the case of measures that had for the most part not been implemented, lack of financial viability was the most commonly cited reason for lack of implementation. This was the case for the purchase of weather derivatives; the purchase of site-specific weather forecast information; the addition of a new conference center, spa, indoor or outdoor waterpark, or golf course; investment in alternative sources of energy; and, an increase in advertising budget. These findings are unsurprising – the addition of new facilities represents expensive capital improvements requiring substantial access to financial support as well as the physical land area to accommodate them. The purchase of weather derivatives and of site-specific weather forecast information, as well as investment in alternative sources of energy, are also likely perceived to be less essential expenditures than the maintenance of existing stock and investment in more and/or better snowmaking capabilities.

Inappropriateness or lack of feasibility due to technical or structural limitations was the most commonly cited reason for not installing snow/wind fencing and for not developing runs on higher terrain. Unlike their western US and European counterparts, ski areas in Michigan are clearly constrained in their ability to expand upwards, since most areas were originally built at the upper limits of available topography.

The only item for which lack of familiarity with the measure was the most commonly cited rationale for its non-implementation was the use of snow blankets.

Confidence in Snowmaking

The majority of respondents (63%) were very confident that snowmaking will enable their area to adapt to climate variability or change over the next ten years.

When respondents who indicated that they are very or extremely confident that snowmaking will enable their area to adapt to climate variability or change over the next ten years were asked to explain why they possess such confidence, the most common responses focused on the belief that winter (in terms of sufficiently cold temperatures) would always come (eventually), and on the expectation that snowmaking technologies will continue to improve, allowing snow to be made at increasingly warmer temperatures.

Importance of Climate Change Research

The majority of respondents thought that additional information and research regarding climate change and its potential implications for the winter sports industry would be somewhat (31%) or very (56%) important.

Utility of Climate Change Information

When asked to rate the utility of nine kinds of information regarding climate change and its potential implications for

the winter sports industry, the respondents overwhelmingly rated information regarding projected changes in the occurrence of conditions necessary for snowmaking as the most useful (40% said very useful and 47% extremely useful).

Other very useful kinds of information (items receiving a mean score in excess of 3.75 on the 5-point scale) were: average maximum winter temperatures; timing of natural snowfall; and, average minimum winter temperatures.

When asked the same question with respect to four additional types of research information (relating to consumer perceptions of and reaction to climate change, and to industry adaptation), studies of customers' perceptions of and potential reactions to climate change (e.g., in terms of when, where and how often they might ski) and of projected changes in climatic conditions in major market areas (i.e., where most skiers/riders reside) were rated the most useful.

Summary and Recommendations

- Most (all but one of 19) respondents indicated that they believe the world's climate is changing. However, self-reported levels of awareness of the topic of climate change exceed concern regarding climate change and its implications, with 28% of respondents indicating that they are not at all or only a little concerned.
- Despite the general lack of extreme concern regarding climate change, the majority of respondents indicated that they had increased (78%) and improved (73%) snowmaking capacity and increased the frequency of snowmaking (72%) in the last ten years. However, the majority of respondents indicated that recent weather variability and/or concerns about climate change (RWVCCC) were a secondary influence or one of several factors that had approximately equal influence on the adoption of these measures. RWVCCC were the only influence on the adoption of any of the measures in just one of 46 potential cases. There is a clear disconnect within the sample between the implementation of measures leading to more and better artificial snow production, and the perception or recognition of RWVCCC as a primary cause of this need.

- Diversification, via the addition of new/more winter activities and new/more spring/summer/fall activities, was evident at more than one half of responding properties, though in almost all cases due to factors other than RWVCCC.
- Investment in energy conservation measures was high (75%), though RWVCCC had no influence on this investment in more than one half of instances and was the primary (though not the only influence) for just 15% of respondents.
- Confidence in snowmaking as a means of enabling areas to adapt to climate variability or change over the next ten years was very high, reflecting strong beliefs in both the weather (that winter/sufficiently cold temperatures will always come) and in improvements in snowmaking technology.
- Despite the apparent lack of influence of weather variability/climate change on recent management decisions, 87% of respondents indicated additional information and research regarding climate change and its potential implications for the winter sports industry to be somewhat or very important.
- With regards to supply-side conditions, additional information on projected changes in the occurrence of conditions necessary for snowmaking was rated the most useful. This is clearly the area offering the greatest potential for future research with the greatest opportunity for industry application and benefit.
- With regards to demand-side conditions, studies of customers' perceptions of and potential reactions to climate change, and projected changes in climatic conditions in major market areas, were both rated very-extremely useful. As evidenced in Appendix I, demand-related studies of the implications of weather variability/climate change for the winter tourism are especially rare, and this area appears the most fruitful for future and original research, especially that from the social science perspective.
- Objective cost-benefit analyses of the various climate change adaptation strategies available and case studies of how areas are actively adapting to climate variability and change both offer the opportunity for contribution to increased and improved ski industry awareness and understanding of climate change and appropriate adaptation strategies