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More Clouds on the Horizon? Polar Tourists' Weather Tolerances in the Context of Climate Change

JON MARTIN DENSTADLI* & JENS KR. STEEN JACOBSEN*,**

*Institute of Transport Economics, Oslo, Norway, and **Norwegian School of Hotel Management, University of Stavanger, Stavanger, Norway

ABSTRACT *This article examines high Arctic summer tourists' weather perceptions and tolerances. Given that global warming strikes Arctic regions more forcefully than other parts of the world, an improved understanding of visitors' weather perceptions and responses is imperative for tourism operations in these areas. Evidence from a survey in the Spitsbergen (Svalbard) archipelago shows that visitors are fairly tolerant with respect to present summer season weather conditions, although differences between motivational segments are revealed. Results demonstrate that weather elements such as wind and rather low temperatures have no significant impact on the tourists' overall weather appreciation. Rather, there seems to be a clear dislike of weather elements reducing visibility. Projected climate changes indicate increased precipitation, which is likely to be accompanied by more days and nights with overcast skies. Given tourists' aversion towards weather elements obstructing visual sensations, this may pose some challenges for tourism operators in Spitsbergen (Svalbard) and in other high Arctic destinations.*

KEY WORDS: Arctic tourism, Spitsbergen (Svalbard), climate change, weather perception, weather tolerance, return intention

Introduction

Accentuated by global climate change, tourist weather tolerances have been placed higher on the research agenda. In many destination areas, weather changes challenge tourism operations and call for an enhanced comprehension of visitor perceptions and responses. In several instances, weather aspects are taken into consideration by tourists in their destination choices (Hamilton & Lau, 2006; Lohmann & Kaim, 1999; Scott, Gössling, & de Freitas, 2008). Weather characteristics such as cold, heat, wind, precipitation, waves, clouds, fog, and mist may influence tourists' activities and well-being, both positively and negatively, and may also have bearings on tourism

Correspondence Address: Jon Martin Denstadli, Institute of Transport Economics, Gaustadalléen 21, NO-0349 Oslo, Norway. E-mail: jmd@toi.no

operations (Rauken, Kelman, Jacobsen, & Hovelsrud, 2010; Saarinen & Tervo, 2006; Tervo, 2008; Tervo-Kankare & Saarinen, 2011).

Much previous expert-based research on climate and tourism has emphasised tourists' thermal comfort at their destinations. Subsequently, air temperature has been used as a key indicator to assess the quality of the tourism experience for general activities that take place in most tourism contexts such as sightseeing and shopping (Bigano, Hamilton, & Tol, 2006; Lise & Tol, 2002; Mieczkowski, 1985; Nicholls & Amelung, 2008). Equally, it is known that many tourists deliberately choose places with what is commonly comprehended as unfavourable and mostly cool summer weather, such as areas north of the Arctic Circle in North America and Europe, typically related to various types of sightseeing interests (Jacobsen, 2006; McConnell, 1970) and place attachment (Denstadli, Jacobsen, & Lohmann, 2011). It has even been suggested that what is generally perceived as adverse weather might in some instances be a driver of tourism – that some tourists seek out destinations that are perceived as marginal, where one imagines civilisation encounters nature, where one can brave the elements and experience a sublime attractiveness of nature (Jacobsen, 1994; Jasen, 1997). Thus, the relations between weather and tourism are manifold and complex.

Nevertheless, tourist weather experiences have been shown to influence travel and holiday satisfaction. For instance, undesirable weather was found to be the main single cause of tourist dissatisfaction in Scotland (Smith, 1993). At the same time, the experience of what is normally thought of as adverse weather elements such as rain, mist, and quite low temperatures is highly contextual and varying across tourism environments and cultures (Lohmann & Kaim, 1999; Scott et al., 2008). It is obvious that certain weather conditions, particularly those related to thermal comfort, are of lesser importance to the overall tourism experience for people who travel to high-latitude destinations than is the case of tourists going to, for instance, heliocentric beach destinations. Such reasoning, developed by Smith (1993), distinguishes between weather-sensitive and weather-dependent tourism. Still, relative tourist weather tolerances and their impacts on the overall experiences of destinations remain to a great extent unknown (Scott & Lemieux, 2010, p. 182).

Studies of weather influence on tourists' destination assessments are particularly relevant in high Arctic destinations. Global warming has struck Arctic regions harder than other parts of the world, with average temperature increases twice that observed elsewhere (ACIA, 2005; IPCC, 2007). Climate projections indicate further warming of the Arctic and also an increase in total precipitation and more events of heavy rainfall (Førland et al., 2009; Karlsen, Elvebakk, Høgda, & Johansen, 2006; Karlsen et al., 2009). For tourism enterprises operating in high-latitude areas, this calls for increased knowledge about visitor weather perceptions and responses in order to develop ample and well-timed adaptation strategies.

This article adds to the academic literature by exploring tourists' *in situ* subjective weather perceptions and tolerances in the context of a high Arctic destination. Moreover, the impacts of weather perceptions and tolerances on tourists' return intentions are investigated. The study area is Spitsbergen (Svalbard), a Norwegian mountainous archipelago nearly halfway between the Scandinavian Peninsula and the North Pole. Although visits to Spitsbergen (Svalbard) may be called "special interest tourism",

Figure 1. "Expedition cruises" along the dramatic Arctic coasts are popular. Photo courtesy of Svalbard Reiseliv.

the predominant landscape-oriented sightseeing here (Figure 1) is quite similar to leisure travel that commonly takes place in other parts of Europe (Lohmann & Kaim, 1999).

Literature Review

Many tourists visit high-latitude areas with mainly cool and unpredictable summer season weather, usually in order to see the sights in places where they have not been before (Jacobsen, 1997, 2001; McConnell, 1970) or to call on family and friends (Denstadli et al., 2011). There is, for instance, a long-established tourism interest in areas where one can experience what is perceived as sublime attractiveness of mountains, glaciers, ice fronts, oceans, and other nature aspects that may inspire awe and reverence (Jacobsen, 1994; Nicolson, 1997). Thus, sightseers taking in, for instance, idiosyncratic landscapes, unusual wildlife, or characteristic settlements might be more or less indifferent to what may generally be perceived as undesirable but undramatic weather conditions such as rather low temperatures, occasional precipitation, and moderate winds. Moreover, a number of tourists are fascinated by a cool climate and "foul weather" in its own right, in order to search for "adventure" or feel "heroic" (Bell & Lyall, 2002; Gyimóthy & Mykletun, 2004). In such instances, a cool summer climate might be a pull factor (Dann, 1977) for a destination. Quite a few nature-oriented tourists venturing into remote areas also want to leave behind conventional comforts and experience a primitive lifestyle (Brackenbury, 1993). It has thus been argued that some Arctic areas appear to be increasingly attractive because they do not have elaborate amenities (Jacobsen, 1994). However, although the Arctic is widely imagined as an enclave that has resisted modernity, it is often more modern than many travellers like to think

Figure 2. Colourful houses in Longyearbyen contrast the overcast skies. Photo courtesy of Jens Kr. Steen Jacobsen.

Figure 3. The main street in Longyearbyen. Photo courtesy of Jens Kr. Steen Jacobsen.

(cf. Lopez, 1987) (Figures 2 and 3). For instance, some tourists may choose to visit Longyearbyen in Spitsbergen (Svalbard) partly because of the high standard of restaurants there (Heimtun & Abelsen, 2000).

The image of climate in a destination may be understood as weather anticipation, typically "long-term average weather" (Scott & Jones, 2007). Basically, one has distinguished between three main types of weather impacts on humans: aesthetic, thermal, and physical (de Freitas, 1990; de Freitas, Scott, & McBoyle, 2008). Aesthetic sensations are typically related to cloud cover and visibility. Ocular impressions are particularly vital in tourist sightseeing – to see for oneself and to take photographs. For safety reasons, holiday activities such as trekking and kayaking (Figure 4) also depend on visibility, even if these pastimes do not concentrate only on vision. Thermal sensation is primarily physiological and refers to body–atmosphere energy balance, being dependent not only on solar heat load but additionally on wind, physical activities, and clothing (de Freitas, 1985; de Freitas et al., 2008). Physical sensation refers to precipitation and wind. However, the amount of precipitation in a day has ostensibly only secondary interest compared to ways in which the precipitation falls, frequencies and durations of downpours, and times of occurrence (Besancenot, 1989; Yu, Schwartz, & Walsh, 2009). In addition to temperature chilling, wind has an influence on sea conditions and in the high Arctic it also impacts drift ice. For boating and cruises, wind leading to high sea waves may impact both safety and well-being.

Since the end of the twentieth century, there has been an ocular-centric affinity in tourism research (Gallarza, Gil Saura, & Calderón García, 2002), often related to studies of place images and tourists' visual sensations. Conversely, several expert-based biometeorological approaches have emphasised thermal comfort as a key weather interest of tourists (Mieczkowski, 1985), which has led to rather negative conclusions concerning

Figure 4. Some high Arctic tourists take pleasure in kayaking. Photo courtesy of Svalbard Reiseliv.

tourism possibilities in Northern Europe (Hein, Metzger, & Moreno, 2009; Nicholls & Amelung, 2008). Besancenot's (1989) somewhat wider perspective argues that ideal climates for tourism should provide for not only basic levels of comfort but also for enjoyment and safety. However, as perceptions of "good", "bad", and "acceptable" weather are subjective and context-dependent (Meze-Hausken, 2007, 2008; Smith, 1993), also feelings of comfort, discomfort, pleasure, and safety may be perceived subjectively and differently by various tourists (Førland et al., 2013; Jacobsen, Denstadli, Lohmann, & Førland, 2011). Here, one should also bear in mind that European holiday travel in general is just as much related to sightseeing, various outdoor activities, and visits to friends and relatives as to beach relaxation. For instance, a study of German tourists showed that "landscape" was rated as the most important criteria in destination choices (Lohmann & Kaim, 1999).

Weather is, nevertheless, taken into consideration in many people's destination or route choices. Consequently, one would expect a positive relationship between tourists' weather perceptions and their return intentions, although there may be differences between various traveller segments. For instance, leisure travellers who are regarded as sightseers (tourists) regularly search for novelty, with no immediate intentions to return to places even when they are satisfied, while vacationers typically want relief from daily schedules and commonly become habitués if they are pleased with the destination (Cohen, 1974).

As to specific weather conditions, it has been shown that summer season tourists north of the Arctic Circle display an overall preference for clear skies while a majority do not care about rather cool weather (Jacobsen et al., 2011), indicating that quite high temperatures (thermal comfort) is not much accentuated among these tourists, who pay more attention to visual sensations. Moreover, unfavourable weather conditions might be weighed against other tourist interests in an area, and previous research has shown that weather conditions generally are not crucial in forming tourists' loyalty to a destination area even in Northern Scandinavia (Denstadli et al., 2011). This suggests that links between (perceived adverse) weather and destination satisfaction and/or return intentions may be even weaker in the high Arctic since additional mechanisms may come into play. Nevertheless, a number of tourist activities in high Arctic areas are dependent on particular weather conditions (e.g. experiencing the midnight sun, sightseeing from vessels), and, consequently, one would expect tolerances for particular weather elements to vary across motivational segments.

Research Model

The research model shown in Figure 5 is based on the previous literature review and depicts the relationships that are empirically investigated. The main objectives in this study are to examine how different weather conditions (e.g. rain and air temperature) form tourists' overall weather perceptions and to investigate high Arctic tourists' tolerances towards what is commonly regarded as adverse weather. It is hypothesised that these factors influence tourist return intentions. Finally, and corresponding to previous research, weather tolerance and return intentions are assumed to be context dependent, that is, influenced by the visitor travel motivations.

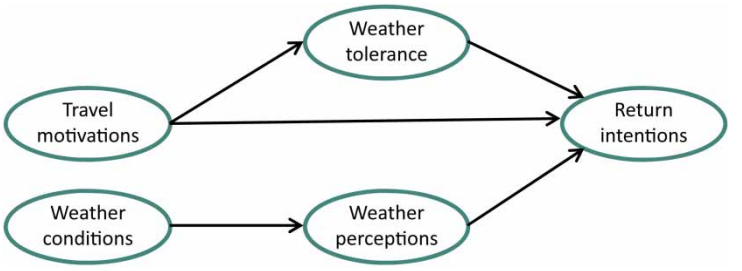

Figure 5. The research model.

Background to Summer Season Tourism and Weather in Arctic Spitsbergen (Svalbard)

Leisure travel to Spitsbergen (Svalbard) (from 74° to 81° North) for the most part takes place during the summer season, with the lion's share of guest nights occurring from June to August. July and the first part of August is by far the most popular time for visits. This is to some degree due to the "midnight sun", which in clear weather is visible in the Longyearbyen area from 20 April to 22 August.

Tourism is vital to the livelihood of several hundred persons in Longyearbyen, the main settlement in the archipelago. At the end of the first decade of the twenty-first century, the total population of Spitsbergen (Svalbard) was approximately 2600, of which some 2000 lived in the "company town" of Longyearbyen, where employment is characteristically based on mining and a university centre. Although the region can be considered as remote there are daily scheduled flights all year from mainland Norway to Longyearbyen. Furthermore, during the summer season the archipelago is called on by numerous offshore cruise ships. Tourism to Spitsbergen (Svalbard) has grown considerably since the early 1990s (Viken, 2001). In 2008, more than 40,000 leisure travellers arrived by air in Spitsbergen (Svalbard), while approximately 30,000 tourists got there by cruise ships. For those travellers who are not passengers on larger cruise ships, typical summer season activities include "expedition cruises" with smaller vessels along the shores of the western part of the archipelago (Figure 1), encompassing visits to mines, guided trekking, and glacier walks (Heimtun & Abelsen, 2000). Visits to friends and relatives are probably more prevalent in Spitsbergen (Svalbard) than in many other societies. As most of the inhabitants live there only temporarily, numerous acquaintances use the opportunity to go to what is commonly perceived as an exotic archipelago. In the Norwegian settlements in Spitsbergen (Svalbard), there is a yearly population turnover of approximately 25% (Statistics Norway, 2012). Several high standard restaurants in Longyearbyen are also attractions to some visitors. The total number of hotel guest nights in Longyearbyen was 89,000 in 2008, while the number of guest nights on board cruise ships in Spitsbergen (Svalbard) is not known (Statistics Norway, 2009, p. 16).

Due to the North Atlantic Current, the Spitsbergen (Svalbard) climate is mild compared to similar latitudes in continental Russia and Canada. January temperatures in Longyearbyen are normally between −12°C and −16°C. Figure 6 shows the

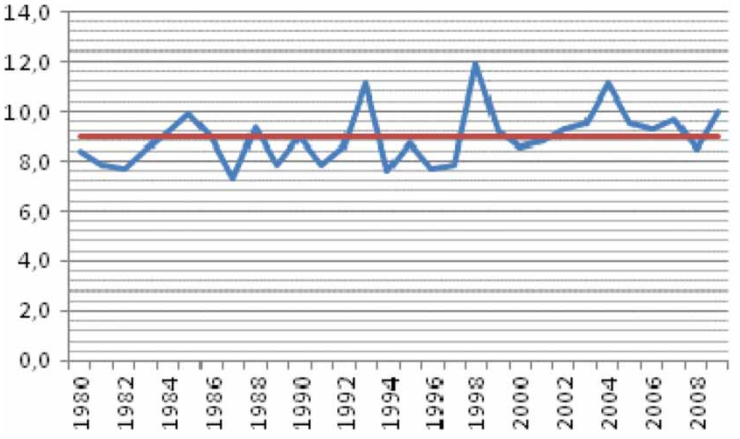

Figure 6. Average daily maximum temperature (in centigrades) in Longyearbyen (Spitsbergen (Svalbard)) in July 1980–2009.

average maximum temperature in Longyearbyen for July in the period 1980–2009 (data taken from eKlima provided by the Norwegian Meteorological Institute). The overall mean temperature for the period was 9.0°C, ranging from 7.3°C to 11.9°C. The interior fjord areas and valleys, sheltered by the mountains, have smaller temperature differences than have the coastal areas, with about 2°C lower summer temperature and 3°C higher winter temperature.

Precipitation in Longyearbyen is frequent but falls in small quantities. With annual precipitation of only 200–300 millimetres, Longyearbyen can be characterised as "Arctic semi-desert". Total precipitation in July ranges between 1 millimetre (1998) and 51 millimetres (1994), with an overall mean for the period 1980–2009 of 16 millimetres (Figure 7).

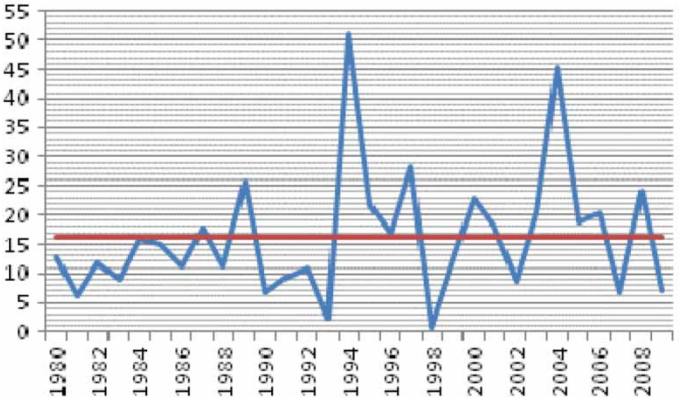

Figure 7. Total precipitation (in millimetres) in Longyearbyen (Spitsbergen (Svalbard)) in July 1980–2009.

Method

Sample

As a majority of the leisure travellers in Spitsbergen (Svalbard) arrive by air, a survey was conducted among departing passengers at Svalbard Airport Longyear on 12 chosen days from 22 June to 10 August 2009. This en route approach was also preferred in order to reach a fairly large number of respondents, to achieve a high response rate, and to obtain tourists' immediate thoughts and perceptions of various weather aspects during their stay in the archipelago. A screening question was first asked in order to identify persons in the target category: non-resident leisure travellers. The potential respondents were then requested to fill in a self-completion questionnaire and return it to the survey staff. The questionnaire was available in Dutch, English, French, German, Italian, Norwegian/Danish, and Swedish, as most of the leisure travellers in Spitsbergen (Svalbard) have a good command of at least one of these languages.

Some 849 passengers were identified as prospective respondents. Of these, 116 persons declined to participate in the survey and 20 questionnaires were later dispensed with for the reason that they were incompletely filled in. This provided an effective sample of 713 respondents, which corresponds to 84% of those who were asked to take part. The basis for survey planning was previous knowledge of traffic structure at the airport. The chosen en route procedure, based on selected flight departures, represents sampling error because the sample may not be a perfect representation of the population (Hurst, 1994; Rideng & Christensen, 2004). However, by distributing data collection over a period of more than a month and varying the days of the week, sampling error is reduced.

Table 1 provides some pivotal sample characteristics. There is an equal distribution of male and female respondents. A large majority of the respondents have a university or a college degree. This percentage is significantly higher than what is observed among mainland Norway tourists (Denstadli et al., 2011), clearly indicating that high Arctic destinations predominantly attract a high-end market. Visitors from 29 different countries are represented in the sample, and 4 out of 5 were residing outside Norway. Only 12% had been to Spitsbergen (Svalbard) on a previous visit, of which two-thirds were residing abroad.

Measurement

The items employed in the survey were selected partly on the basis of previous research (Jacobsen, 2006; Lohmann & Kaim, 1999), partly on the basis of personal interviews and a test questionnaire in the area one year before the survey. Weather conditions were measured by asking interviewees to specify roughly how often they had encountered the following weather conditions during their visit to Spitsbergen (Svalbard): "clear sky", "cool weather", "windy", "rain/precipitation", "low visibility", "high sea waves", and "frequently changing weather". Responses were given on a five-point Likert-type scale ranging from one ("not at all") to five ("nearly all the time"). The items include elements related to thermal comfort and aesthetic and physical sensations. In addition, respondents were asked to state their overall perception of the weather

Table 1. Selected respondent characteristics (percentages).

Gender	
Female	50
Male	50
Educational level	
Primary school	4
Secondary school	22
University/college	74
Age	
Up to 39 years	27
40–49 years	17
50–59 years	18
60 years or older	28
Country of residence	
Norway	18
Abroad	82
Experience with study area	
First visit	88
Visited before	12
Checked weather before departure	
Yes	64
No	36

during their stay (1 = "very poor", 5 = "very good"). Weather tolerance was measured by the single item "I enjoy a visit to this area whatever the weather is like" (1 = "disagree", 5 = "agree"). Return intention was measured by asking respondents to indicate if they considered revisiting Spitsbergen (Svalbard) during the summer season within the next three years ("yes, definitely", "yes probably", "don't know", and "no"). Finally, the questionnaire included 10 different travel motives considered central to Arctic tourism (Table 4). Respondents were asked to state how important these motives were for their tour in the study area on a five-point Likert-type scale (1 = unimportant, 5 = very important).

In addition to the target variables, the questionnaire comprised inquiries about the respondents' background in relation to travel practice (including if they had been to the study area on a previous visit) and customary demographic variables such as year of birth, gender, and education (cf. Table 1). A test the year before the survey indicated that most passengers were not willing to devote much time to filling in a questionnaire when they waited for the call for their departure. Consequently, the survey instrument had to be kept fairly simple, and for some of the variables in the research model, only single-item measures were included. Obviously, this is a limitation of the model. Also, more in-depth information on, for example, travel motivations could possibly have improved the internal consistency and validity of these constructs (Appendix).

Results

Descriptive Statistics

Weather perceptions. Longyearbyen weather data for the survey period show an average maximum temperature of 9.3°C, which is slightly above the 30-year average (cf. Figure 6). However, large variations are displayed with daily maximum values ranging from 3.5°C to 14.8°C during the period from 22 June to 10 August 2009. Survey results suggest that summer season tourists to Spitsbergen (Svalbard) do not perceive the weather conditions as very harsh. Respondents' general perception of the weather ("How would you generally describe the weather during your visit to Spitsbergen (Svalbard)?") showed an overall average value of 4.2 (1 = "very poor", 5 = "very good"), which indicates that the weather was generally perceived as good.

Table 2 gives respondents' descriptions of different weather elements encountered during their stay in Spitsbergen (Svalbard). Clear skies, which previously have been reported to be a key weather element to Arctic tourists (Jacobsen et al., 2011), was experienced by a majority of visitors. Replies to the item relating to air temperatures show that more than 40% perceived the weather as rather cool most of the time. However, there is also a significant proportion (20%) who felt the temperature as fairly pleasant. Some 28% characterised the weather as frequently changing, while rainfall was perceived as occurring only infrequently, which align with weather statistics for the survey period. Close to 80% reported no or only minor amounts of precipitation, and related to this, fewer than 10% had experienced longer periods with low visibility.

An exploratory factor analysis was performed to determine the underlying dimensionality of weather perceptions among Spitsbergen (Svalbard) visitors. The Maximum Likelihood method with Varimax rotation was employed and factors were extracted on the basis of eigenvalues and inspections of scree plots. Only those items with factor loadings greater than or equal to .40 were retained. The data generated two factors with eigenvalues 2.8 and 1.2, respectively, and 57% variance explained.

Table 2. Visitors' description of weather conditions during their stay in Spitsbergen (Svalbard) (percentages).

	Not at all (1)	(2)	Now and then (3)	(4)	Nearly all the time (5)	Total
Clear sky	2	6	38	26	28	100
Rather cool	7	13	38	22	20	100
Windy	7	20	40	21	12	100
Frequently changing weather	17	24	31	16	12	100
Rain/precipitation	43	36	19	2	0	100
Low visibility (mist, low clouds, etc.)	20	37	36	6	1	100
High sea waves	49	24	22	4	1	100

Table 3. Intentions to return to Spitsbergen (Svalbard) by visitor segments (percentages).

	Total	First-timers	Repeaters
No	23	25	4
Do not know	50	50	46
Yes, probably	17	18	15
Yes, definitely	10	7	35
Total	100	100	100

The analysis provided a two-factor solution describing tourists' experiences of (1) "Visibility" (includes weather elements essential for observing landscapes: "clear sky", "rain", "low visibility", and "frequently changing weather") and (2) "Comfort" (comprising weather conditions that impact tourists' comfort when being outdoors and on board vessels, includes the items "rather cool", "windy", and "high sea waves").

Weather tolerance and return intentions. Replies to the weather tolerance statement ("I enjoy a visit to this area whatever the weather is like") show an overall average value of 3.8 (1 = "disagree", 5 = "agree"), suggesting that Spitsbergen (Svalbard) tourists are fairly tolerant with respect to weather conditions. Significant differences between first-time and repeat visitors are revealed (means of 3.7 and 4.3, respectively; $F_{1,681} = 15.477$, $p < .001$); thus, repeat visitors are less sensitive with respect to weather conditions.

Table 3 shows return intentions to Spitsbergen (Svalbard) during the summer season within the next three years. A minority of 23% of the respondents give a negative answer, half are uncertain, while 27% report that they are likely to come back to Spitsbergen (Svalbard) in the near future. However, only 10% present an unambiguously positive reply. Considering travel distance and costs, the figures are fairly positive. Repeat visitors state higher return intentions than do first-time visitors: half of those who have previously been to Spitsbergen (Svalbard) plan to come back within the next three years, compared to 25% of first-timers.

Travel motives. Table 4 gives descriptive statistics for travel motives. "Seeing special landscapes" stands out as the single most important motive to visit Spitsbergen (Svalbard), followed by sightseeing activities more generally, and travelling around. Thus, experiencing what is commonly perceived as dramatic Arctic landscapes, such as snow-capped mountains by the sea, glaciers, and icebergs, is a key motivation for going to the archipelago. The least important reasons for going to Spitsbergen (Svalbard) are visiting friends/relatives, dining out, and exploring villages. Some differences between first-time and repeat visitors are revealed. First-timers emphasise outdoor experiences related to seeing the "midnight sun" and experiencing snow and ice stronger than do repeat visitors (Figure 8). In contrast, visiting people in the area and experiencing local life in the sense of dining out are relatively stronger motivational factors among repeaters.

Table 4. Travel motives for domestic and international tourists to Spitsbergen (Svalbard), mean scores (1 = unimportant, 5 = very important).

	Total	Repeat visitors	First-time visitors
Seeing special landscapes	4.7	4.6	4.7
Sightseeing from ship	4.1	3.9	4.1
Travelling around, being on the move	4.0	3.9	4.1
Hiking/outdoor recreation	3.8	3.6	3.8
Seeing the midnight sun*	3.8	3.4	3.8
Experiencing snow and ice**	3.6	3.1	3.7
Finding peace and quiet	3.4	3.5	3.4
Exploring villages	2.7	2.5	2.7
Dining out*	2.5	2.8	2.5
Visiting people in the area**	2.2	2.7	2.2

$^{**}p < .01$, $^{*}p < .05$

Figure 8. First-timers in Spitsbergen (Svalbard) emphasise experiencing snow and ice stronger than do repeat visitors. Photo courtesy of Svalbard Reiseliv.

An exploratory factor analysis provides three underlying motivations for visiting Spitsbergen (Svalbard): (1) "Exploring local life" describes tourists' wish for seeing and experiencing local community. The factor is constituted by the items "exploring villages", "dining out", and "visiting people in the area"; (2) "Arctic serenity" depicts interests in getting in close contact with natural elements. This includes the items "seeing special landscapes", "hiking/outdoor recreation", "seeing the midnight

sun", "experiencing snow and ice", and "finding peace and quiet"; and (3) "Focus on sightseeing from vessel" comprises one single item; "sightseeing from ship".

Multivariate Analyses

Structural equation modelling (SEM) was employed for investigating the relationships outlined in Figure 5. SEM combines confirmatory factor analysis and regression analysis into simultaneous estimation of the relationship between observed and latent variables and the relationship between latent variables. Thus, using SEM one is able to estimate how well a conceptual model that contains observed indicators and hypothetical constructs fits the data (Yoon & Uysal, 2005).

Figure 9 shows results of testing the structural model (statistical tests of the measurement models and overall model are provided in the Appendix). In addition to the relationships outlined in the research model (Figure 5), "repeat visitor" was included as a control variable since the results above show that tourists who have visited the study area previously have a greater probability of returning within the next few years.

A main objective of this study is to examine how different weather conditions (e.g. overcast sky, rain, and air temperature) form tourists' overall weather perceptions. Results show a negative and significant relationship between "visibility" and weather perceptions, that is, those who regularly encountered weather conditions that reduced visibility (e.g. rain and frequently changing weather) perceived the weather as rather poor (Figure 9). On the other hand, experiencing weather conditions that reduce one's thermal comfort (wind and low temperatures) have no negative impact on tourists' overall weather perceptions. Moreover, results show no significant relationship between overall weather perceptions and return intentions, suggesting that present

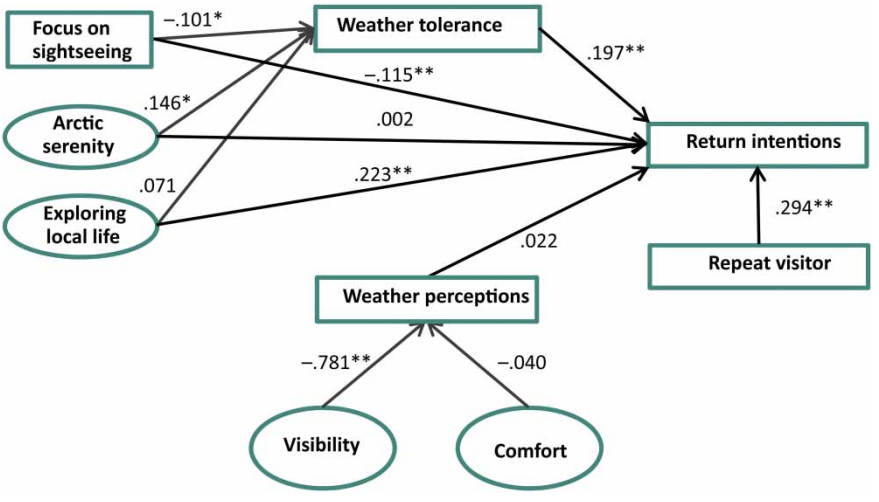

Figure 9. Results of testing the research model.
*$p < .05$.
**$p < .01$.

weather conditions are not of vital importance in forming tourists' loyalty to high Arctic destinations. On the other hand, a positive and significant relationship between weather tolerance and return intention is revealed, that is, the more weather tolerant a tourist is, the more likely (s)he is to revisit the archipelago in the course of the next three years.

Results support previous research indicating that weather tolerance is influenced by context: tourists who visit Spitsbergen (Svalbard) predominantly for sightseeing interests are more attentive to weather conditions than are other visitors. Moreover, those travellers who seek serenity display high weather tolerance in the sense that they will enjoy a visit to the area whatever the weather is like. Travel motivations also have a direct impact on return intentions. In line with previous research, there is a negative relationship between the importance of sightseeing and return intentions (cf. Cohen, 1974). Moreover, the positive relationship between "exploring local life" and "return intentions" indicates that vacationers (in contrast to sightseer tourists; see Cohen, 1974) are more likely to return to the archipelago in the near future. Finally, results confirm the bivariate relationship reported above regarding repeat visitors' greater propensity to return to Spitsbergen (Svalbard) within the next few years.

Discussion and Conclusions

Climate projections for Norway's Arctic indicate higher air temperatures (Hanssen-Bauer et al., 2009; Karlsen et al., 2006, 2009). Average Arctic air temperature has been increasing at almost twice the rate of the rest of the world since the beginning of the twentieth century, and global climate model simulations project a substantial future warming of the Arctic (ACIA, 2005; IPCC, 2007). Also, an increase in total precipitation and more events of heavy rainfall are expected, and possibly more frequent occurrences of high wind speeds (ACIA, 2005; Førland et al., 2009; Hanssen-Bauer et al., 2009).

Although results here suggest that summer season visitors to Spitsbergen (Svalbard) are fairly tolerant with respect to present weather conditions – the great majority state that they will enjoy a visit to Spitsbergen (Svalbard) whatever the weather is like – projected climate change may nevertheless represent challenges for future summer season tourism to Spitsbergen (Svalbard) and other high Arctic destinations. First, precipitation increase is likely to be accompanied by more days and nights with overcast skies and/or low clouds. Considering tourists' dislike of reduced visibility, this would negatively impact future visitors (cf. Figure 9). Although overall present weather perceptions are of little importance for return intentions, this might change with more frequent rain and fewer days and nights with clear skies in the future. However, one should bear in mind that the fairly good weather conditions in Spitsbergen (Svalbard) during the survey period may have influenced the relationship between tourists' weather perceptions and return intentions. Second, precipitation increase and a likely reduction in visibility may negatively impact opportunities for landscape sightseeing, a principal reason for visiting. As documented above, tourists emphasising sightseeing are more attentive to weather conditions than are other Spitsbergen (Svalbard) visitors.

Based on earlier publications on tourism and weather, one may argue that a projected temperature increase can bring about novel opportunities and stimulate tourism to high Arctic destinations. However, the present study indicates that weather elements related

to thermal comfort (e.g. higher air temperature) have little impact on overall tourist weather appreciation in Spitsbergen (Svalbard). Again, this relationship may to some degree have been influenced by fairly nice weather when the survey was carried out. Our findings are nevertheless in contrast to the quite strong accentuation of tourist thermal comfort in several expert-based studies (Hein et al., 2009; Mieczkowski, 1985; Nicholls & Amelung, 2008). Most tourists in Spitsbergen (Svalbard) (and likely in destinations with similar weather conditions) seem well prepared to stand up to possible cool weather discomfort challenges. Additionally, previous studies have shown that only a minority of Spitsbergen (Svalbard) tourists would be concerned about rather cool weather on a possible future summer season visit to this northerly archipelago (Jacobsen et al., 2011).

Taken together, these results nuance the effects of weather for tourists along comfort and aesthetic lines. The present study shows that air temperature is not a crucial weather element for tourist satisfaction in the high Arctic. Rather, there is a noteworthy aversion towards weather elements obstructing visual sensation, lending support to the accentuation of visibility in tourism research (Gallarza et al., 2002). As pointed out, this finding is particularly important given the prevalence of commercial sightseeing operations in Spitsbergen (Svalbard) (and possibly also in other high Arctic destinations). In consequence – and contrary to the viewpoints of many tourism managers in Northern Scandinavia (Brouder & Lundmark, 2011; Rauken et al., 2010) – the present study indicates that tourism operations in the high Arctic may face some challenges in the years to come.

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Appendix. Structural Equation Modelling

Measurement Models

Confirmatory factor analyses (CFA) of the two measurement models (Weather perceptions and Travel motives) were run. Standardised loading estimates from the CFA should be .50 or higher (Hair, Blank, Babin, Anderson, & Tatham, 2006). Results showed that all items for the "Visibility" and "Comfort" constructs had loadings above this threshold, and were statistically significant. Measures of internal consistency (Cronbach's alpha) for the scales displayed values of .69 and .64, respectively. Reliability values between .60 and .70 are deemed acceptable, while values of .70 and higher suggest good reliability (Hair et al., 2006). For travel motives, all items displayed significant loadings, but four of the items comprising "Arctic serenity" and one item for the "Exploring local life" scale had standardised loadings below the .50 limit. Cronbach's alpha for the two scales were .58 and .59, respectively, which is slightly below the lower limit of .60. Another measure for assessing internal consistency is item-to-total correlations (i.e. the correlation of the item to the summated scale score). Hair et al. (2006) suggest that correlations exceeding .50 are deemed acceptable. The "exploring local life" items showed high item-to-total correlations (.70–.79), whereas items comprising "Arctic serenity" were in the range .51–.69. Taken together, the two travel motives constructs do not meet all statistical thresholds for acceptable construct validity, which poses some limitations on the overall model. However, the constructs do possess face validity by comprising vital elements of vacationing and tourists' general interests in experiencing attractive landscapes, respectively.

Model Fit

Table A1 provides fit indices for the structural model in Figure 9. The 'relative chi square' (χ^2/df) provides a basic overall goodness-of-fit measure with values less than 2 indicating adequate fit (Ullman, 2007). The model provides a value marginally above this. Supplementary indices measuring the incremental fit of the model compared to a model that corresponds to completely unrelated variables are the Comparative Fit Index (CFI), Incremental Fit Index (IFI), and Tucker–Lewis Index (TLI). Table 4 shows that the test values are in the range .87–.90. Ullman (2007) refers to values

greater than .95 as indicative of good fitting models, while Chi and Qu (2008) denote .90 as the recommended lower level. The structural model satisfies the latter requirement for two measures (CFI and IFI). A final measure to assess model fit is the root mean square error of approximation (RMSEA), which estimates the lack of fit in a model compared to a perfect (saturated) model. Hu and Bentler (1999) indicate values of .06 or less as representing a good fitting model. The model employed here is below this limit.

Table A1. Fit indices for the SEM model.

χ^2/df ratio	2.302
CFI	.897
IFI	.899
TLI	.871
RMSEA	.049

Fit indices are in the lower part of the acceptable range, whereas the RMSEA indicate fairly good fitting models. Taken together, results indicate that the overall model fits are adequate.