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Zahed Ghaderi [a], Mana Khoshkam [a] & Joan C. Henderson [b]
[a] School of Housing, Building and Planning, University Sains Malaysia, Penang, Malaysia
[b] Nanyang Business School, Nanyang Technological University, Singapore, Singapore
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From snow skiing to grass skiing: implications of climate change for the ski industry in Dizin, Iran

Zahed Ghaderi[a]*, Mana Khoshkam[a] and Joan C. Henderson[b]

[a]*School of Housing, Building and Planning, University Sains Malaysia, Penang, Malaysia;*
[b]*Nanyang Business School, Nanyang Technological University, Singapore, Singapore*

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This paper is concerned with climate change and its implications, making particular reference to Dizin in Iran which is one of the country's leading snow ski resorts. The impacts of climate change on ski businesses are examined, alongside the consequences for local communities, their economies, and overall sustainability. In addition, attention is given to responses by affected enterprises and other stakeholders to the problems caused by falls in demand for snow skiing due to decreasing snow cover attributed to global warming. Adaptive strategies focus on marketing and product diversification with attempts to develop other nature-based pursuits throughout the year as an alternative to that of skiing, but there are concerns about the future among those who rely on snow skiers for a livelihood. Findings are derived from original research incorporating 30 interviews with those involved in the ski industry in Dizin, including residents from a nearby village.

Keywords: climate change adaptation; global warming; Iran; ski tourism; stakeholders

Introduction

Many tourism activities are heavily dependent on suitable weather conditions, and climate overall is a key factor in attracting visitors to various types of destination (Hamilton, Maddison, & Tol, 2005), especially snow ski resorts (Becken & Hay, 2007). Such resorts cannot survive without favourable weather and reliable snow coverage for skiing; overly warm summers and snow-deficient winters create challenges for stakeholders and frustrate successful business operations and long-term sustainability. Unusual conditions that result in extreme fluctuations in precipitation can thus be a serious threat for small-scale ski resorts reliant on winter tourism (Scott et al., 2008). Iranian ski resorts are not immune from these circumstances which are evident at a number of resorts located on the high slopes of the Alborz Mountains and one instance is Dizin. Issues of climate change, its consequences, and adaptive strategies are the subject of this paper in which they are discussed with particular reference to the snow skiing industry in Dizin from the perspective of those involved in the industry. Findings are based on original research, incorporating 30 interviews with those involved in the ski industry in Dizin and the surrounding villages.

Literature review

Tourism and climate have a close relationship and climatic conditions often play a key role in enticing visitors (Lise & Tol, 2002), the warmth of the sun partly explaining the

*Corresponding author. Email: zahedghaderi@yahoo.com

traditional popularity of Mediterranean and Caribbean resorts among citizens of more temperate climates in Northern Europe and North America, respectively (Maddison, 2001). Winter sports resorts are dependent on snow falls, in combination with wind and visibility factors which render outdoor sports possible and pleasurable. Alterations to the prevailing climate can thus threaten the health and sustainability of tourism businesses and even local economies. Such a threat is posed at centres reliant on skiing by global warming, a phenomenon which has stimulated controversy and debate about its causes and management.

The topic of tourism and climate has been an interesting researchers for several decades, although research has evolved since the 1960s (Scott, Wall, & McBoyle, 2005). Greater awareness of global warming and its ramifications by the late 1980s is reflected in increased research activity overall and within the context of tourism and recreation (Harrison, Winterbottom, Johnson, Hall, & Higham, 2005; Wall, Harrison, Kinnaird, McBoyle, & Quinlan, 1986). The First Assessment Report of the United Nations Intergovernmental Panel on Climate Change (IPCC, 1990) produced in 1990 neglected tourism and recreation, but a series of articles reviewed the subject (Guoyu, 1996; Smith, 1990; Wall, 1992; Wall & Badke, 1994), tending to adopt a more theoretical perspective. The IPCC's (1996) Second Assessment Report did recognize the significance of climate change on ecosystems and environments which served as settings for leisure and the theme was more prominent in the third report of 2001 (IPCC, 2001). The matter was acquiring urgency for some ski resorts, such as those in North America which were recording receding snow lines and anticipating resultant heavy financial losses, and for the society at large (Lamb, 2002).

There has since been a marked growth in the volume of research devoted to climate change by researchers from assorted disciplines and backgrounds, particularly since 2000, in tandem with its heightened political priority nationally and internationally. The trend is evident with regard to tourism (Becken & Hay, 2007; Scott, 2006; Scott et al., 2008), and the gap in the literature observed by many commentators (Abegg, Koning, Burki, & Elsasser, 1997; Agnew & Viner, 2001; De Freitas, 2003; Perry, 2000; Smith, 1990; Witt & Witt, 1995) is being filled. Tourism is seen to be very vulnerable to the changes brought about by global warming and disasters related to extreme weather such as floods, droughts, and storms (Viner, 2007). There is also an acceptance that the travel and tourism industry contributes to global warming, notably through the release of carbon dioxide and other greenhouse gases. Circumstances are agreed to constitute a crisis for tourism (Scott, Hall, & Gossling, 2012; UNWTO, 2008), with few effective solutions or mitigating measures in sight. The IPCC's (2007) fourth report summarizes principal points in a synthesis volume, which predicts further and greater changes to climate in the twenty-first century.

Unsurprisingly, snow ski tourism has been found to be extremely sensitive to climate change (Steiger, 2011) at sites around the world. Researchers concentrate on industry circumstances in Europe and North America (Elsasser & Burki, 2002; Koenig & Abegg, 1997; McBoyle & Wall, 1987; Richardson, Loomis, Hall, & Higham, 2005; Scott, McBoyle, & Mills, 2003; Scott, McBoyle, & Minogue, 2007), and also cases in Australia (Hennessy et al., 2003; Zeppel & Beaumont, 2011) and Japan (Fukushima, Kureha, Ozaki, Fujimori, & Harasawa, 2002) have been analysed. Temperature and precipitation together determine the amount of snow and snow conditions such as depth and firmness, alongside terrain, are key factors in decisions made by skiers about where to ski (Gilbert & Hudson, 2000; Godfrey, 1999; Moen & Fredman, 2007; Richards, 1996). Skiers also look for reliability (Koenig & Abegg, 1997), and a 100-day rule has been proposed (Witmer, 1986) whereby snow should be at least 30 cm deep and present for a minimum of 100 days in a

season if the ski field with ski lifts is to operate profitably. Forecasts are that the dimunition of snow volumes will worsen with accelerated global warming, representing serious risks to economies and societies.

Responses and adaptations to climate change

One strand in the literature deals with ways of responding to climate change and adaptive strategies open to the many parties involved, from skiers and local communities to government and non-governmental bodies (Burki, Elasser, & Abegg, 2003; Leary, 1999; Smit, Burton, Klein, & Wandel, 2000). They have different motivations and objectives, ranging from a good quality experience to economic success and environmental and social sustainability. Adaptions are diverse and encompass technological applications such as artificial snowmaking and business practices such as product diversification, integrated resort development, and marketing (Burki et al., 2003; Scott & McBoyle, 2007).

The suitability of adaptive strategies depends on the physical features of the location, the degree of exposure to the impacts of climate change, and the resources available at snow ski resorts. Artificial snowmaking is a common technique in North America, the European Alps, Australia, and Japan (Becken & Hay, 2007; Scott & McBoyle, 2007), and has become an integral component of the ski industry in some regions. Tools such as ski slope smoothing, landscaping, glacier protection, and opening up of new skiable terrain have also been widely employed in ski resorts in Europe (Breiling & Charamza, 1999; Koning & Abegg, 1997; Scott & McBoyle, 2007). Expanding ski areas to higher ground was once the most preferred method after snowmaking in Austria, where costs of the latter were shared with the accommodation sector (Wolfsegger, Gossling, & Scott, 2008). However, extension is often criticized by environmentalists because of the possibility of environmental degradation at higher latitudes. Cloud seeding is a form of weather modification technology used in some ski resorts in North America and Australia (Hennessy et al., 2003; Scott & McBoyle, 2007), but it is expensive and less prevalent in Europe (Wolfsegger et al., 2008).

Commercial measures include ski resort and company integration which facilitates access to capital and augments marketing budgets (Scott & McBoyle, 2007). Revenue and product diversification is apparent in North America and Europe, where some snow ski resorts have invested heavily in amenities for non-skiers (Cockerell, 1994; Scott & McBoyle, 2007). Several aim to be a leisure resort for all seasons by supplying appropriate non-ski activities such as golf, mountain biking, and horseback riding. Snow ski resorts are also very active in marketing and promotion with special discounts and free services designed to appeal to visitors. Governments have a part to play through the provision of support and subsidies for ski destinations and more accurate weather forecasting services. Skiers too may adapt by altering their destination and date of travel or switching to other recreational pursuits (Scott & McBoyle, 2007).

Ski tourism in Iran

Mountain skiing has a comparatively long history in Iran, with reports of members of the foreign community starting to ski in the early years of the twentieth century (Allen, 2012). The first ski field of Ab-Ali was established in 1951 (Iran Sport, 2011), and the country now boasts a total of 20 ski resorts. Only a few ski fields can be classed as of international standard, and investment is required to upgrade facilities. Most resorts are found in the Alborz Mountains where the ski season usually lasts from November through to late

Figure 1. Location of Dizin ski resort.

March, except in Dizin and Tabriz where skiing is possible until mid-May, or has been in the past (Starling, 1987). Dizin ski resort, shown on the map in Figure 1, has the largest field in Iran and is one of the biggest in the Middle East with a plethora of trails. It is also marketed as a centre for snowboarding. Domestic skiers and those from overseas are attracted to Dizin (Iran Ski Federation, 2012), many of the former from the capital of Tehran which is about 90-min drive away. The primary access roads from Tehran and Karaj are, however, frequently blocked in winter, sometimes by avalanches, as are secondary roads leading to skiing villages which are narrow and dangerous.

There is some optimism about the future of ski tourism in Iran (Tavallai, 2007), and skiing is growing in popularity among Iranians. Although there are rules about gender segregation on the ski lifts and slopes (Burke & Elliott, 2008), these are commonly flouted and restrictions are being broken down (BBC, 2000). Nevertheless, political and social circumstances impose limitations on all forms of tourism in Iran (Alipour & Heydari, 2005). The industry also cannot escape the hazards attendant on climate change which are being felt in the well-known resorts on the higher slopes of the Alborz Mountains. Global warming is manifest in an attenuated cold season and extremes of temperature, spanning over -20 to $+50$°C. Current temperature data imply an existing climatic regime deleterious to snowfall and snow cover (Amiri & Eslamian, 2010; Iran Meteorological Organization, 2012). Concerns about inadequate snow levels and continuous droughts, believed to be linked to climate change, have called into question the viability of an economy founded on ski tourism. These worries and the search for solutions are revealed in the interviews conducted at the sites which are now considered.

Methodology

The qualitative research methodology involved semi-structured interviews in which a set of pre-determined questions were asked, aligned with predominant themes in the climate change and tourism literature (Scott et al., 2005). A total of 30 people agreed to participate, of which six were female. These were judged to be stakeholders and identified using the snowball method, whereby personal links were used to find suitably knowledgeable individuals. The sample size was determined according to the criterion of saturation defined by Patten (2007), and respondents are listed in Table 1.

Table 1. Study participants.

Type of business	No. of respondents	Titles
Dizin ski resort	5	Three managers and two professional staff
Ski instructors	5	Professional ski instructors
Accommodation	4	General managers
Ski retailers	4	Business managers
Restaurants	3	Managers
Environmental NGOs	2	One manager and one member
Government organizations	2	Officers in charge
Ski clubs	2	Members
Development company	1	Manager
Tour operator and travel agent	2	Managers

Interviews were conducted at Dizin and Velayat Rood, a nearby village in which the population relies heavily on tourism, between May and August 2012. They were conducted in Persian (Farsi) by a team of three trained postgraduate researchers and lasted from 20 min to 1 h. Most were recorded on tape, although manual notes were made of six interviews at the request of the interviewees. The material was translated into English and subjected to qualitative thematic analysis, which is a means of uncovering, describing, and reporting the content of data and emergent patterns (Attride-Stirling, 2001). The results are outlined below and feature direct quotations to support points made. The difficulties in securing interviews should be acknowledged and some respondents were reluctant or unable to provide detailed answers, yet sufficient information was provided for the purposes of the exercise.

Results

A range of themes were extracted, and the findings have been organized into sub-sections dealing with climatic conditions, changes in demand, adaptation, and socio-economic impacts.

Changing climatic conditions

There was agreement in the interviews that the duration of the ski season in Dizin had been shortened due to changes in the climate. The opening of enterprises was delayed and revenues thereby reduced. This outcome and ensuing anxieties were reflected in the comment of a respondent that "climate change affected our business and our profitability has dramatically been decreased, our future is at stake". One respondent recalled the winter of 2006–2007 as the warmest on record, with "minimum business". The ski season was reckoned to have shrunk to 80–100 days, compared with 120–160 days in previous decades, and a professional skier spoke of the extent to which the situation had deteriorated in 30 years. Another ski instructor stated "those years that we almost had snow all the year, and up to five to six months were suitable for skiing and other winter sports activities". A tour operator concurred that "the climate has changed within these two past decades and our ski customers reduced".

Shrinking and shifting demand

The majority of respondents agreed that Dizin had lost snow skiers due to climate change as well as due to the rise of new ski resorts in Iran and neighbouring countries.

One commented on how "other emerging ski resorts which have more sufficient snow attracting our customers, they are no longer satisfied with the current condition in Dizin". Most interviewees felt that Dizin was struggling to compete with up-and-coming ski resorts in the Middle East and beyond which offered better snow and amenities and sometimes lower prices. One interviewee asserted:

> I am a tour operator, I have different ski packages to Turkey, Armenia, Ukraine and even Lebanon … the packages are cheaper than Dizin, the snow has better quality and the facilities they use are more superior … so, they become a serious rival for Dizin.

A respondent from the accommodation sector explained how foreigners were now "rarely seen" on Dizin's slopes; those who did still travel to Iran for skiing were said to originate mainly from Armenia, Germany, Russia, and Ukraine. Study participants estimated that the site received between 30,000 and 60,000 visitors during the peak season, $<7\%$ of which were foreigners. Local businesses and those whose employment depended on the ski industry directly or indirectly had to cope with falling revenues which were often insufficient to meet maintenance and operating costs, indicating that enterprises were increasingly uneconomic. One interviewee asserted that "our income does not support the business so we try to make ends meet during the shoulder seasons". However, although skiing had been curtailed by the shortened season, interest in different tourist activities had been boosted. There were more tourists who engaged in mass picnics, hiking, trekking, and other nature-based pursuits during summer. According to one respondent, "in the past, Dizin was famous only for its ski piste and a favourite place for winter tourism, but now we are facing new demands coming for summer tourism activities".

Product diversification and marketing as adaptive strategies

Various strategies had been employed to adapt to climate change and combat the accompanying threats, but product diversification and promotion were the most prevalent, albeit constrained by funding. One respondent claimed: "we try to focus on other tourist activities in the absence of reliable snow for skiing, but again we have restrictions in budget". Another said: "we tried to develop new products such as some snow-related activities which do not need enormous amounts of snow". Examples were snowman festivals and snowboarding competitions, while innovations unrelated to snow included MICE events, kite flying, and mountain climbing. Marketing efforts had been intensified and businesses had arranged special promotions to draw visitors, with the aim of helping them cover their costs. Grass skiing had been highlighted and the Grass Skiing Junior World Championship was held at Dizin in 2012, a representative of the National Ski Federation describing the intention to "introduce the potential of Dizin's grass skiing to the world and simultaneously encourage Iranians to come for grass skiing". Conventional skiing was not neglected, and Iranian tour operators and travel agents continued to sell Dizin and other ski resorts. Groups received discounts of between 10% and 30% if they booked for the low season. Nevertheless, there were doubts about whether revenue generated from non-skiers could make up for the contraction in the size and spending of the very lucrative ski market.

Socio-economic and environmental impacts

The majority of respondents spoke about the negative consequences of climate change on business, but a few denied such effects. Interviewees generally agreed about the crucial role of snow skiing tourism as a source of income and employment in the Dizin area.

An accommodation supplier said that "ski tourists are high spenders and have made a significant contribution to the local economy", adding that "each novice skier needs to rent ski equipment, pay for training, transportation, accommodation and meals". The outcomes of climate change such as a "shorter skiing season" and "falling demand and revenues" were therefore of critical importance to communities and economies. Most of those interviewed concurred that there were fewer ski tourists and a small-scale restaurateur spoke of losing "half of our top-spending customers that were coming for snow skiing, although we still have enough visitors, but they just come for picnics and they will bring their meals and drinks with them".

Opinions partly depended upon the nature and extent of involvement in the snow ski tourism industry. A snow ski instructor professed that "we are the most affected group. Accommodation and catering service providers can still operate from other markets, but it is too difficult for us to shift to other activities". Another described how the 200 officially registered snow ski and ski board instructors, 30 of whom were women, were "suffering from less demand and reduction in income". Several respondents anticipated reduced investment in the ski industry and a move by developers and businesses to other sectors such as construction, which was likely to be more profitable. Reference was made to delayed and abandoned projects involving new ski clubs, hotels, villas and chalets, and restaurants. Interviewees conveyed a sense of anxiety about the future which appeared uncertain for residents and enterprises.

Respondents from NGOs and the Environment Department communicated their fears about the unwelcome effects of climate change on the environment and wildlife. They claimed that summer visitors and accompanying supporting developments had damaged sensitive environments and ecosystems, already seeing other types of disturbance due to climate change. A ranger in a protected area observed how "due to fluctuations in precipitation, wildlife come down from their refuge towards the main road and will be hunted by illegal hunters". An NGO representative warned that the search for a replacement for the skiing industry was leading to undesirable and unsustainable economic activity. He cited the example of the second homes which had been built in the region, saying that "we can see more people shifted to mass construction industry, because snow ski tourism is no longer viable for them and this will jeopardize sustainable development".

Nevertheless, some were more positive and thought that climate change had created chances for them to devise new products and earn more profits. A manager from the development company declared that "we are now working to develop grass skiing and many people during summer come here for that purpose". The tourism officer did not accept that climate change was a danger, mentioning other types of nature-based tourism. He argued that "we have the opportunity to introduce and develop our products in Dizin such as grass skiing, hiking, trekking, etc.". The owner of a tourist accommodation unit said that

> nowadays we could see a big market of non-skiers that come here every year to enjoy the nature and very pleasant climate, especially during the summer season. We have many products to offer from agro-tourism to eco and nature-based tourism.

A snow ski instructor confirmed the socio-cultural advantages which had accompanied snow ski tourism, opining that "skiers are also a market for locally produced goods and non-ski services". Despite the seasonality of some jobs, the snow skiing industry and tourism as a whole had encouraged locals to remain in the village rather than migrate to densely populated urban areas, thereby helping counter the trend towards rural

depopulation. It was the opinion of a representative from the Ski Federation that "snow ski tourism has brought not only economic benefits but also a sense of pride because many national skiing team members are from Velayat Rood and neighbouring villages". Their selection had led to opportunities to meet different people, broadening horizons and promoting cross-cultural communication and understanding. An interviewee from a ski club expressed the community's sense of "pride of having almost all the national [ski team] team members from this area".

Discussion

Analysis of the interview material indicates that climate change has impacted snow ski tourism in Dizin and undermined its viability. Although it still draws large numbers of domestic skiers (Iran Ski Federation, 2012), many prefer to visit other resorts due to insufficient snow for skiing and more affordable prices elsewhere within Iran or abroad. It would seem that Dizin cannot guarantee its previously fairly long season, tarnishing its reputation among skiers in a manner which has been seen in other centres around the world (Scott et al., 2008). The livelihood of many residents in the Dizin area, largely dependent on snowfall and its qualities, is thus at risk and the more the area is affected by climate change and decreased snowfall, the greater the adverse effects. At the same time, not all problems can be attributed to climate change alone and other factors have contributed to putting Dizin in a position of competitive disadvantage. For example, the absence of profits means that funds are not available for essential spending on repairs and the upgrading of infrastructure and amenities, which is also necessary for the sustainability of the snow ski tourism industry.

Adaptive strategies to cope with the impacts of climate change focus on product diversification and marketing and promotion. Product diversification has been employed by many ski resorts around the world in an effort to entice non-skiers (Burki et al., 2003; Wolfsegger et al., 2008); for instance, some North American resorts have been transformed into winter theme parks through heavy investment in a process which has been labelled the *Disneyification* of the winter sports industry by critics (Scott & McBoyle, 2007). The feasibility of diversification is a topic of discussion in Dizin. Several tourism stakeholders would prefer to present it as a year-round destination with a variety of tourism offerings, but this could create misunderstanding among tourists about the image of Dizin as a snow ski tourism destination.

Certain other strategies are also inapplicable in Dizin. Artificial snowmaking is not a realistic option because of the expenses incurred. In addition, the experiences of Australian snow ski resorts in New South Wales and Victoria show that snowmaking may not be sufficient to halt a fall in visitors and revenues (Pickering, Castley, & Burtt, 2010). Moreover, artificial snowmaking calls for large quantities of water and energy so that there are environmental costs (Becken & Hey, 2007). These have become a main concern in European and North American ski resorts which rely on the snowmaking technology (Koing & Abegg, 1997; Pickering et al., 2010; Scott et al., 2007). There is already a shortage in Dizin of the two main resources of water and electricity which are essential for snowmaking, and the price of the latter in Iran has increased dramatically in the past few years.

Government interest in solving the problems of snow ski resorts in an era of global warming is also limited in Iran. Little confidence was shown by those interviewed in the ability of officials to devise and execute mitigating policies. Authorities are aware of the situation, and various plans related to diversifying and exploiting both cultural and natural

heritage for non-ski tourism purposes have been discussed, but budgetary weaknesses have frustrated the progress towards implementation and more could be done. There are no references to skiing in Iranian tourism master plans, and environmental planning as a whole is deficient. The absence of effective planning and formal support to deal with climate change has frustrated the capacity of ski resorts in Iran to adapt.

The success of marketing endeavours in increasing snow ski tourist arrivals and thereby alleviating the financial difficulties of the industry is debatable. Skiers in Iran are likely to be discouraged by poor communications, including the regular closure of access roads to the pistes and the deteriorating quality of facilities. Overseas skiers and those from Iran might also be deterred by religious rules which call for segregation of sexes on the slopes and ski lifts, even if these are no longer rigorously enforced. Inbound international tourism to Iran in general is severely inhibited by political circumstances and is likely to remain depressed for some time to come, notably from the principal generating markets of the West (Zamani-Farahini & Henderson, 2010).

Conclusion and implications

Numerous analyses of climate change and its repercussions for the snow ski tourism industry have been completed and conclude that snow cover is decreasing due to rising temperatures and different precipitation patterns. This paper has revealed the operation of such forces in Iran and the harmful effects for ski resort businesses and locals. Numerous stakeholders are thus affected, not least village communities in areas such as that surrounding Dizin. Overcoming the dilemmas confronting ski resorts and businesses in Dizin will require substantial economic investment and careful environmental planning, demonstrating an adaptive capacity which is vital to the survival of winter resorts. To date, strategies employed by stakeholders have been mostly profit oriented and relate to the encouragement of non-snow ski tourism and a summer season. However, these actions are unlikely to be sufficient to reverse an ultimate decline in the fortunes of Dizin. Skiers are already switching to other ski resorts in Iran and those in proximate countries which are serious competitors. Climatic considerations are only one aspect of the barriers to tourism and development as a whole in the region, and more comprehensive and better resourced policies are necessary to protect the well-being of resident communities. Due regard must also be given to matters of sustainability which are frequently overlooked by all parties.

Finally, the shortcomings of this paper should be acknowledged. The lack of official statistics on ski tourists and long-term climatic patterns makes it difficult to properly assess the changes in climate and their impacts on the ski tourism industry. The discussion is based mainly on conversations with individuals who may not have been fully aware of the issues. Interviews were conducted in the summer which was low season, and some active and informed stakeholders were not available. Climate change is a somewhat sensitive topic in Iran, and a few respondents were reluctant to talk openly and share ideas which might have yielded richer data. The exercise highlights the need for further empirical studies in order to improve the understanding of climate change and its consequences for snow ski tourism. More details are required about climate trends and snow conditions, as well as outcomes and the reactions of those exposed to the threat. Climate change will continue to impinge on the snow ski business which has proved itself economically vulnerable, and the results of research will help inform public and private sector decision-makers about how best to respond in the interests of all stakeholders.

References

Abegg, B., Koning, U., Burki, R., & Elsasser, H. (1997). Climate impact assessment and tourism. *Erde*, *128*, 105–116.

Agnew, M., & Viner, D. (2001). Potential impact of climate change on international tourism. *Tourism and Hospitality Research*, *3*, 37–60.

Alipour, H., & Heydari, R. (2005). Tourism revival and planning in Islamic Republic of Iran: Challenges and prospects. *Anatolia: An International Journal of Tourism and Hospitality Research*, *16*, 39–61.

Allen, E. J. B. (2012). *Historical dictionary of skiing*. Plymouth, MA: Scarecrow Press.

Amiri, M., & Eslamian, S. (2010). Investigation of climate change in Iran. *Journal of Environmental Science and Technology*, *3*, 208–216.

Attride-Stirling, J. (2001). Thematic networks: An analytic tool for qualitative research. *Qualitative Research*, *1*, 385–405.

BBC. (2000). New face for Iran's ski slopes. Retrieved October 20, 2012, from http://news.bbc.co.uk/2/hi/middle_east/692411.stm

Becken, S., & Hay, J. E. (2007). *Tourism and climate change: Risks and opportunities* (*Vol. 1*). Clevedon: Channel View Publications.

Breiling, M., & Charamza, P. (1999). The impact of global warming on winter tourism and skiing: A regionalised model for Austrian snow conditions. *Regional Environmental Change*, *1*, 4–14.

Burke, A., & Elliott, M. (2008). *Iran*. London: Lonely Planet.

Burki, R., Elasser, H., & Abegg, B. (2003). *Climate change impacts on the tourism industry in mountain areas*. Paper presented at the 1st International Conference on Climate Change and Tourism, Djebra, Tunisia. Retrieved from: http://www.world-tourism.org/sustainable/climate/pres/rolf-buerki.pdf

Cockerell, N. (1994). Market segments: The international ski market in Europe. *EIU Travel Tourism Analyst*, *3*, 34–55.

De Freitas, C. (2003). Tourism climatology: Evaluating environmental information for decision making and business planning in the recreation and tourism sector. *International Journal of Biometeorology*, *48*, 45–54.

Elsasser, H., & Bürki, R. (2002). Climate change as a threat to tourism in the Alps. *Climate Research*, *20*, 253–257.

Fukushima, T., Kureha, M., Ozaki, N., Fujimori, Y., & Harasawa, H. (2002). Influences of air temperature change on leisure industries: Case study on ski activities. *Mitigation and Adaptation Strategies for Global Change*, *7*, 173–189.

Gilbert, D., & Hudson, S. (2000). Tourism demand constraints: A skiing participation. *Annals of Tourism Research*, *27*, 906–925.

Godfrey, K. B. (1999). Attributes of destination choice: British skiing in Canada. *Journal of Vacation Marketing*, *5*, 18–30.

Guoyu, R. (1996). Global climate changes and the tourism of China. *Chinese Geography*, *6*, 97–102.

Hamilton, J. M., Maddison, D. J., & Tol, R. S. J. (2005). Climate change and international tourism: A simulation study. *Global Environmental Change*, *15*, 253–266.

Harrison, S., Winterbottom, S., Johnson, R., Hall, C., & Higham, J. (2005). *Changing snow cover and winter tourism and recreation in the Scottish Highlands*. Bristol, CT: Channelview Press.

Hennessy, K. J., Whetton, P., Smith, I., Bathols, J., Hutchinson, M., & Sharples, J. (2003). *The impact of climate change on snow conditions in Mainland Australia* (*Vol. 47*). Aspendale, Australia: CSIRO Atmospheric Research Aspendale.

IPCC. (1990). *Impact assessment of climate change: Report of working group II*. Geneva: United Nations Intergovernmental Panel on Climate Change.

IPCC. (1996). *Climate change 1995: Impacts, adaptions and mitigation of climate change: Scientific-technical analyses*. Geneva: United Nations Intergovernmental Panel on Climate Change.

IPCC. (2001). *Climate change 2001: Impacts, adaptation and vulnerability*. Geneva: United Nations Intergovernmental Panel on Climate Change.

IPCC. (2007). *Climate change 2007 synthesis report*. Geneva: United Nations Intergovernmental Panel on Climate Change.

Iran Meteorological Organization. (2012). Data about climate and weather conditions in Northern Tehran from 1986–2005. Unpublished report. Iran's Meteorological Organization.

Iran Ski Federation. (2012). The condition of the country's ski resorts. Retrieved August 24, 2012, from http://www.skifed.ir/web/guest/95

Iran Sport. (2011). A look at the history of skiing in Iran. Retrieved August 24, 2012, from http://iransport24.com/?PageName=news&Action=Subjects_Details&ID=538

Koenig, U., & Abegg, B. (1997). Impacts of climate change on winter tourism in the Swiss Alps. *Journal of Sustainable Tourism*, *5*, 46–58.

Lamb, P. J. (2002). The climate revolution: A perspective. *Climatic Change*, *54*(1), 1–9.

Leary, N. A. (1999). A framework for benefit-cost analysis of adaptation to climate change and climate variability. *Mitigation and Adaptation Strategies for Global Change*, *4*, 307–318.

Lise, W., & Tol, R. S. J. (2002). Impact of climate on tourist demand. *Climatic Change*, *55*, 429–449.

Maddison, D. (2001). In search of warmer climates? The impact of climate change on flows of British tourists. *Climatic Change*, *49*, 193–208.

McBoyle, G., & Wall, G. (1987). The impact of CO_2-induced warming on downhill skiing in the Laurentians. *Cahiers de Géographie du Québec*, *31*, 39–50.

Moen, J., & Fredman, P. (2007). Effects of climate change on alpine skiing in Sweden. *Journal of Sustainable Tourism*, *15*, 418–437.

Patten, M. L. (2007). *Understanding research methods: An overview of the essentials*. Glendale, CA: Pyrczak Publishing.

Perry, A. (2000). Tourism and recreation. In M. L. Parry (Ed.), *Assessment of potential effects and adaptations for climate change in Europe: The Europe ACACIA Project* (pp. 217–226). Norwich: Jackson Environment Institute.

Pickering, C. M., Castley, J. G., & Burtt, M. (2010). Skiing less often in a warmer world: Attitudes of tourists to climate change in an Australian ski resort. *Geographical Research*, *48*, 137–147.

Richards, G. (1996). Skilled consumption and UK ski holidays. *Tourism Management*, *17*, 25–34.

Richardson, R. B., Loomis, J. B., Hall, C., & Higham, J. (2005). Effects of climate change on tourism demand and benefits in alpine areas. In M. Hall & J. Higham (Eds.), *Tourism, recreation and climate change* (pp. 164–180). Clevedon: Channel View Publications.

Scott, D. (2006). Climate change and sustainable tourism in the 21st century. In J. Cukier (Ed.), *Tourism research: Policy, planning, and prospects* (pp. 175–248). Waterloo: Department of Geography Publication Series, University of Waterloo.

Scott, D., Hall, C. M., & Gossling, S. (2012). *Tourism and climate change: Impacts, adaptation and mitigation*. New York: Routledge.

Scott, D., Amelung, B., Becken, S., Ceron, J., Dubois, G., Gössling, S., & Simpson, M. (2008). *Climate change and tourism: Responding to global challenges*. Madrid: World Tourism Organization.

Scott, D., & McBoyle, G. (2007). Climate change adaptation in the ski industry. *Mitigation and Adaptation Strategies for Global Change*, *12*, 1411–1431.

Scott, D., McBoyle, G., & Minogue, A. (2007). Climate change and Quebec's ski industry. *Global Environmental Change*, *17*, 181–190.

Scott, D., McBoyle, G., & Mills, B. (2003). Climate change and the skiing industry in southern Ontario (Canada): Exploring the importance of snowmaking as a technical adaptation. *Climate Research*, *23*, 171–181.

Scott, D., Wall, G., & McBoyle, G. (2005). The evolution of the climate change issue in the tourism sector. In M. Hall & M. Higham (Eds.), *Tourism, recreation and climate change* (pp. 44–60). Clevedon: Channel View Publications.

Smith, K. (1990). Tourism and climate change. *Land Use Policy*, *7*, 176–180.

Smit, B., Burton, I., Klein, R. J., & Wandel, J. (2000). An anatomy of adaptation to climate change and variability. *Climatic Change*, *45*, 223–251.

Starling, M. (1987). Iran Ski Scam. *Ski*, p. 238.

Steiger, R. (2011). The impact of snow scarcity on ski tourism. An analysis of the record warm season in 2006/2007 in Tyrol (Austria). *Tourism Review*, *66*, 4–13.

Tavallai, S. (2007). Winter tourism as an economic alternative in Iran. *Anatolia: An International Journal of Tourism and Hospitality Research*, *18*, 355–360.

UNWTO. (2008). *Climate change and tourism: Responding to global challenges*. Madrid: World Tourism Organisation.

Viner, D. (2007). Tourism and its interactions with climate change. *Journal of Sustainable Tourism*, *14*, 317–322.

Wall, G. (1992). Tourism alternatives in an era of global climatic change. In V. Smith & W. Eadington (Eds.), *Tourism alternatives: Potentials and problems in the development of tourism* (pp. 194–215). Philadelphia: University of Pennsylvania Press.

Wall, G., & Badke, C. (1994). Tourism and climate change: An international perspective. *Journal of Sustainable Tourism*, *2*, 193–203.

Wall, G., Harrison, R., Kinnaird, V., McBoyle, G., & Quinlan, C. (1986). The implications of climatic change for camping in Ontario. *Recreation Research Review*, *13*, 50–60.

Witmer, U. (1986). Bearbeitung und Kartierung von Schneedaten in der Schweiz. Bern: Geographisches Insitut de Universität Bern.

Witt, S. F., & Witt, C. A. (1995). Forecasting tourism demand: A review of empirical research. *International Journal of Forecasting*, *11*, 447–475.

Wolfsegger, C., Gossling, S., & Scott, D. (2008). Climate change risk appraisal in the Austrian ski industry. *Tourism Review International*, *12*, 13–23.

Zamani-Farahani, H., & Henderson, J. C. (2010). Islamic tourism and managing tourism development in Islamic societies: The cases of Iran and Saudi Arabia. *International Journal of Tourism Research*, *12*, 79–89.

Zeppel, H., & Beaumont, N. (2011). *Climate change and Australian tourism: A research bibliography*. (ACSBD) Working Paper (I) Springfield: Australian Center for Sustainable Business and Development, University of Southern Queensland.