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Winter tourism in the European Alps: Is a new paradigm needed?

Thomas Bausch [a,*], William C. Gartner [b]

[a] Competence Center Tourism and Mobility, Free University of Bozen-Bolzano, Piazzetta dell'Università 1, 39031, Brunico, Italy
[b] Department of Applied Economics, University of Minnesota in St. Paul, 332E Ruttan Hall 1994 Buford Avenue, St. Paul, MN, 55108, USA

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ABSTRACT

Winter tourism in the Alps has been dominated, both in marketing and in academic publications, by an almost exclusive focus on winter sports activities, primarily on skiing. This paper shows that there exist other substantial markets for winter tourism in the Alps that have largely been ignored. Using results from a nationwide survey of German tourists and supplemented by primary research, numerous resorts/destinations and market segments are shown in a two-dimensional space. This multidimensional representation reveals that most Alpine winter tourism destinations are focusing on skiing and related winter sports (i.e. snowboarding). Yet a large share of the potential winter tourism market has other interests that are often not considered by destination developers as viable products. This paper offers evidence for reflection as resorts/destinations compete for a static or shrinking market while also facing the effects of external forces, primarily climate and demographic change. The future of many resort destinations in the Alps will depend on how they diversify and adapt to changing conditions. The face of winter tourism is changing and the European Alps are on the frontlines of the challenges brought by change.

Management implications

Winter tourism destinations should focus beside the "winter sport tourist "on the "alpine winter tourist". This segment is a promising substantial market for alpine destinations. This new focus requires:

- New products designed for a non-sports market
- New strategic positioning and marketing
- Adapted government structures and decision making.

1. Introduction

The European Alps are one of the top world tourism destination areas. Yearly more than 100 million visitors travel to Alpine destinations (Becken, 2007, p. 27). The location in the center of the European continent in combination with a dense network of highways, high-speed train routes, and nearby international and regional airports, allows very good accessibility for domestic and international visitors. On a territory of about 1200 km in length and 150 km–250 km in width, with a height of 2864 m in Slovenia to 4810 m in France, a combination of nature and culture offers guests a rich set of unique attractions. Historically, the summer season was the starting point for tourism in the Alps based on early types of alpinism. Later, health- and cure-tourism using natural remedies as clean air, thermal and mineral water or the high level of ultra-violet radiation lead to a significant growth of year-round tourism. However, with increasing accessibility by train and later by car during winter, new sports activities (e.g. ski jumping, skiing, sledging), advances in cold weather clothing, and advances in technology (e.g. high performant ropeways, snow groomers, snow making machines), the winter season now exceeds the summer season in many places as the main income generator for a destination (Tranos & Davoudi, 2014). Today the main product offered by many Alpine destinations is winter sport activities, especially alpine skiing and snowboarding. The development of ski resorts with investments in cable cars, ski lifts and snow making systems has facilitated the use of previously inaccessible mountain slopes. Therefore, modern ski resorts require high capital investments in technical infrastructure. For example, in the Austrian region of Tyrol investments for winter season facilities aggregate to 2.79 billion euros over the seasons 2009/2010 to 2018/2019 (Tyrol Chamber of Commerce, 2019). Even though the climate of many Alpine destinations offers year-round opportunities for tourism businesses, the present paper focuses on the winter season.

Two major exogenous forces nowadays impact the winter tourism market: climate change and demographic change (Steiger, 2012).

* Corresponding author.
E-mail addresses: thomas.bausch@unibz.it (T. Bausch), wcg@umn.edu (W.C. Gartner).

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Climate change is a threat to all Alpine winter destinations but especially for those with skiing resorts in lower altitudes. An increasing lack of snow reliability, despite artificial snow production facilities, in combination with a later start and earlier end of the winter use period, appears to be today's reality. Demographically it can be seen that "baby boomers", born in the late 50's and early 60's, are a large proportion of the current ski market. The threat from this demographic imbalance is that more and more will stop skiing because of age and health constraints and it does not appear that an equal number of replacement skiers will staunch the decline (Witting & Schmude, 2019). A major additional endogenous force is the emergence of new competitors. Reasons for this trend include ever expanding travel options from warm winter destinations, a rapid growing cruise market (Papathanassis, 2019), or city trips offering attractive alternatives with potential for prestige travel experiences. The millennial generation is now equal to the baby boomer population but does not appear to share its preference for similar recreation activities. Partially due to the above trends, the German origin travel market is undergoing a transformation.

Between 2014 and 2017 winter vacations during November and March in Germany showed volumes between 8.8 million (2014) to around 10.4 million (2017) (data from German Travel analysis from Lohmann, Sonntag, & Wagner, 2017). The share of Alpine destinations for these winter holidays varied in a spread of 18.3%–20.7%. A steady and significant increase over the last decade can be observed for long haul winter destinations. In 2017, about 20.8% of the winter vacation trips had a distance of more than 5,000 km from Germany, whereby warm sun and beach destinations as the Caribbean, Maldives, Middle East or Thailand had the highest share of guests. This part of the winter market is spending nearly the triple per vacation and person (Euro 2780) as the guests at Alpine winter holiday places (Euro 965). Furthermore, mid-range destinations (22.2% of market) as the Canaries Islands, Egypt or Turkey offer alternative warm holiday options. Also, in this segment consumers are willing to pay a higher price (Euro 1265).

During the last decade new competitors with attractive and often prestigious travel products have developed and entered the market as e.g. club cruise trips to warm Asian countries, sun and beach combined with shopping in the Middle East or budget holiday in large resorts along Egypt's red sea coast. Furthermore, the availability and diversification of short trips, especially city trips using cheap flights offered by low cost airlines, have grown rapidly. But not only in the field of vacation trips the options of consumers have changed. In the past outdoor activities changed in late fall from summer to winter activities. Nowadays, many people practice their preferred activities year-round. Improved outdoor equipment protecting people against cold and wet uncouple the activities from weather and winter climate. A side effect of this development can be found in tourism. Some Mediterranean destinations offer early season or spring season travel products tailored to bikers, hikers or runners. So, winter travelers can choose among a variety of options where skiing is just one of several.

These current and in the future foreseeable changes of demand and competition lead to three key questions relevant for European Alpine winter destinations:

Q1: does there exist a potential for winter guests currently not reached by the European Alpine destinations,

Q2: if so, how must the winter product be designed to reach th ose guests, and.

Q3: are strategic approaches being utilized to offset the expected loss of current guests by enticing new guests representing different market segments.

2. Literature review

Research on winter tourism in Alpine regions has gained increasing interest over the last two decades. The main focus has been on skiing and related industries. Early research about gender specific differences in motivation, expectations and related services was provided by Williams & Lattey, 1994, showing that women have other needs they wish being met through travel and therefore exhibit lower affinity for the sport of skiing. More generally, Williams & Fidgeon, 2000 analyzed constraints for non-skiers. They showed that many people are not aware about beneficial experiences and positive physical effects of skiing. This missing awareness is a major constraint for attracting non-skiers to skiing destinations. Different motivation bundles among skiers, grouped to beginner, intermediate and advanced, and snowboarders in general, were shown to be determinant factors for levels of engagement (Holden, 1999). His work revealed that advanced skiers and snowboarders search for thrills. While snowboarders also look to reinforce relationships in their chosen sport, skiers look more for relaxation from the activity. A different approach for segmenting skiers and snowboarders, based on service considerations and personal lifestyle, was used by Joppe, Elliot, & Durand, 2013. Their approach led to seven skier profiles showing that some segments, and therefore a significant share of winter guests, are looking more for socializing by skiing than practicing heavy sports.

The discussion about impact of climate change on tourism has been lively and increasing since the millennium. One part of the discussion has been about the impact on winter guest behavior and destination choice, the other about the impact on ski resorts and related industry. Studying consumer reactions three aspects had been investigated: activity, spatial and temporal substitution. Pickering, Castley, & Burtt, 2010 showed the importance of snow reliability (availability) for skiers and snowboarders and their decreasing visiting intentions in case of a lack of snow. These results were confirmed by Steiger, 2011, showing a significant decline of visitors in small and lower located ski resorts in Austria in the record warm season of 2006/2007. But Steiger also found that the variability of demand on a larger area scale, including the big and higher located resorts, was still small. More general, the impact of climate change on destination choice and winter sport tourists' activities was analyzed by Unbehaun et al., 2008, Landauer, Pröbstl, & Haider, 2012, Pröbstl-Haider and Haider , 2013, Rutty et al., 2015 and Cocolas, Walters, & Ruhanen, 2016. Dawson, Scott, and Havitz (2013) showed by a scenario-based study that temporal substitution seems not to be a strong effect of climate change. They conclude that ski area operators might observe in future a slight reduction of individual skiers as result of temporal substitution. All these studies show the need for snow reliability in the long term as well as the effect that ski sport vacationists either substitute their preferred destination for one in a higher altitude or stop skiing altogether because of increasing distance or prices for alternative options.

The discussion of adaptation of mountain winter destinations is focusing specifically on two topics: product and adaptation processes. Many publications dealing with product adaptation are linked to climate change adaptation and therefore the field of machine snow production. One field of research focuses on climate change scenarios for snowmaking (Bark, Colby, & Dominguez, 2010; Falk & Hagsten, 2019; Falk & Lin, 2018; François, Morin, Lafaysse, & George-Marcelpoil, 2014; Haanpää, Juhola, & Landauer, 2015; Pickering & Buckley, 2010; Scott, Steiger, Rutty, Pons, & Johnson, 2019; Soboll & Dingeldey, 2012). All studies show a long-term and a midterm component. While on the long term most studies predict serious uncertainties for snowmaking, they differ in the midterm conclusions depending on the location and especially the altitude of the ski resorts. Another focus is the economic impact of snowmaking and future profitability of the ski industry (Caskey, 2011; Damm, Köberl, & Prettenthaler, 2014; Demiroglu, Kučerová, & Ozcelebi, 2015; Gonseth & Vielle, 2019; Steiger & Mayer, 2008). The research findings differ due to the location (i.e. altitude) of resorts but also based on the analyzed time period. Current investments in snowmaking might pay off for the economic lifetime of an infrastructure but long-term profitability of snowmaking adaptions is uncertain and carries with it a substantial element of risk.

Adaptation processes are discussed numerous times in the literature, again, primarily focusing on climate change adaptation. Two perspectives are taken: adaptation of industry and adaptation of destinations and related stakeholder communities. Scott & McBoyle, 2007 provided a first overview about climate change awareness, vulnerability and adaptation options. They conclude that in the ski industry at that time (2007) awareness was still low or the vulnerability mostly denied. This changed in succeeding years as climate change has generally been accepted by the ski industry as a fact and a driver forcing adaptation (Morrison & Pickering, 2013). Steiger, Scott, Abegg, Pons, & Aall, 2019 concluded in their critical review of climate change risk for ski tourism that there is “a growing interest for climate risk information and expert advice on the implications of climate change for individual ski areas and the ski industry as a whole". Similarly, interest in climate change adaptation at the stakeholder level has increased (Trawöger, 2014). Of highest interest were aspects of sustainability (Bonzanigo, Giupponi, & Balbi, 2016) and governance (Amundsen, Berglund, & Westskog, 2010; Nordin, Volgger, Gill, & Pechlaner, 2019; Wyss, Luthe, & Abegg, 2015). Only a few studies could be found dealing with other major drivers having an impact on Alpine winter tourism. Demographic change in combination with climate change was discussed by Steiger, 2012 and Witting & Schmude, 2019. Both studies point out that by demographic change alone the share of guests practicing snow-based activities will decline and therefore a diversification of the product portfolio is needed.

As general result of the literature review, the conclusion can be drawn that research on winter tourism in mountain areas is almost directly linked with snow-based sport tourism. It seems very likely that winter sport and especially skiing is just one part of the market, yet winter sport dominates the research output. Only a few studies mentioned in the context of climate change or demographic change adaptation a more holistic thinking about new guest groups or all year tourism adaptation strategies. Our study therefore will analyze the demand side for winter vacations in the Alps in general and contrast it with the presentation of the supply of leading winter destinations.

3. Survey design

This study is based, in part, on data generated as part of the German Travel Analysis 2016 (FUR, 2016). The German Travel Analysis is a yearly survey with data gathered from approximately 7700 persons, aged 14 years and older, living in Germany and speaking the German language. The sample for face to face interviews is generated by using the ADM master sampling system (The ADM Sampling System n. d.), which is the reference system for representative studies in Germany. The survey takes place each year during the first quarter. The realized sample is weighted to guarantee a representative socio-demographic profile of the German population. All analysis was done using SPSS 25.

Items used to measure Alpine winter holiday guest expectations were derived from a study by Bausch & Unseld, 2018. Later, they were incorporated into the nationwide German travel analysis which is a yearly conducted representative study of Germans' travel behavior. These items cover aspects as winter outdoor activities, accommodation and lodging, leisure or wellness and spa. For the items, 20 in total, a forced binary scale was applied, where respondents had to answer either yes or no. This method follows a suggestion made by Dolnicar & Grun, 2014 to improve data quality and consistency. To filter those respondents who expressed an interest to travel during the winter season to a European Alpine destination, additional questions about travel preferences and motivation were added using, again, a binary yes/no scale. After filtering, 1586 completed cases of people travelling regularly or being interested in a winter holiday stay in an Alpine destination resulted. These cases can be seen as a representative sample of the German market potential for winter holiday stays in the European Alps.

For comparison purposes including destination positioning and guest expectations, Alpine winter holiday places from Bavaria (DE), Salzburg (AT), Tyrol (AT), South-Tyrol (IT) and Grisons (CH) were selected. Based on the official tourism statistics of each region, the destinations with the highest number of overnight stays during the winter season 2016/2017 were selected. Finally, 25 Alpine winter destinations with between 230,000 and 3 million overnight stays were included in this study (Table 1).

For each of these destinations an in-depth analysis of the official winter destination web page for the winter season 2017/2018 took place to determine if offered amenities and attributes matched the 20 guest expectation items. For each item and each destination web page it was analyzed at which level the supply elements linked with guest expectation (e.g. skiing = practicing my winter sports, winter hiking trails or snowshoeing = having walks and hiking trips during stay) could be found. The following scale was used to determine where on the web page a particular item of interest could be found: 1 = landing page and sliders of landing page, 0.75 = main menu topic with own sub-page/micro-page, 0.5 = sub menu with own information section, 0.25 = mentioned elsewhere and 0 = no information available. This follows the common understanding that each destination addresses its core target group by the most competitive elements through the landing page, while side elements of the supply are placed on the second or third level. Using this scale demand and supply data are fully comparable both on 0 = no to 1 = yes scales.

4. Findings

The annual German Travel Analysis results have revealed that for many years 75%–78% of the German population makes at least one holiday/leisure trip each year with a minimum duration of 4 overnight stays. However, 44.4% of these German holiday travelers do not consider a holiday trip during the winter months. Of the remaining 55.6% of the German travelers, who express an interest in winter holiday trips, only 44.1% indicate the Alps as a potential winter holiday destination. This group of potential winter Alpine visitors will subsequently be referred to as AWG (Alpine Winter Guests). AWG therefore make up about a quarter (24.5%) of the total German holiday traveler market or 18.9% of the total German population.

The socio-demographic structure of those considering the Alps as a winter destination is shown in Table 2.

Compared with the total German population this subset is slightly younger, more male and higher educated with better income. Couples and families with children are above the average. This supports the premise that a winter holiday trip to the Alps is an upscale product where outdoor activities and sports are core elements of the stay and relationship reinforcement is a further expected goal.

The expectations for experiences during the winter holiday stay are multifarious. The qualitative study for the German winter travel market referenced earlier (Bausch & Unseld, 2018) derived the twenty most important expectations travelers have of a cold winter destination. Table 3 shows these expectations in declining order for AWG.

First of all, it is obvious that guests expect snow not only for skiing but in general as a marker for denoting a winter holiday. Snow is a landscape element framing their activities which are augmented by typical Alpine cultural and other natural elements. Additionally, within the AWG winter sports is very important to more than half (57.4%) of them. But the share of those not having a focus on winter sports (42.3%) is similarly high and represents the potential for offering such activities as walks and hiking tours (59.9%), enjoying calm nature, scenery and landscape (59.7%) or visiting a thermal spring or spa complex (46.1%). These different profiles between guests having alpine and cross-country ski or snowboarding as their focus and those seeing a winter holiday trip in the Alps not necessarily connected with snow-based sports suggests an opportunity for a more precise segmentation of the AWG.

Using K-Means Clustering (Verma, 2013a) and confirming the found clusters by average linkage based hierarchical clustering, a ten clusters solution, consistent and stable, revealed itself. Table 4 shows the results of the segmentation analysis whereby the expectation level is expressed by numbers between 0 (0%) and 1 (100%).

Analyzing the segments very different expectation profiles can be identified. Segment 4 has very high expectations in winter sports (99%),

Table 1
European Alpine winter destinations and overnight stays selected for the study. All data were taken from the official statistics of the five regions.

Bavaria (DE)		Salzburg (AT)		Tyrol (AT)	
Berchtesgadener Land	457,983	Nationalpark Hohe Tauern	1,847,494	Ferienreg. im Zillertal	1,355,320
Chiemsee Alpenland	669,706	Obertauern	960,823	Mayrhofen/Zillertal	1,363,242
Oberstdorf	640,112	Saalbach-Hinterglemm	1,506,022	Ötztal-Tourismus	2,900,009
Zugspitzland	522,694	Salzburger Sportwelt	2,842,557	Paznaun - Ischgl	2,257,163
		Zell am See/Kaprun	1,396,699	Serfaus-Fiss-Ladis	1,552,289
				St. Anton am Arlberg	1,260,356
Grison (CH)		**South-Tyrol (IT)**			
Arosa	263,757	Alta Badia	1,205,265		
Davos Klosters	547,279	Eisacktal	1,665,996		
Engadin St. Moritz	810,891	Gröden	1,377,660		
Flims Laax	225,160	Kronplatz	2,526,962		
Scuol Samn. Val Müstair	253,197	Meraner Land	1,680,459		

Table 2
Socio-demographic structure of German travelling population considering the Alps as destination.

age group		gender	
14–19	11.2	male	55.8
20–29	21.5	female	44.2
30–39	15.5		
40–49	19.5	size of household	
50–59	16.6	1 person	17.9
60 and older	15.7	2 persons	33.8
		3 persons	24.6
personal status		4 and more persons	23.7
unmarried without partner	31.7		
living with partner	14.0	children in household	
Married	47.5	below 6 years	7.8
formerly married without partner	6.8	6 to below 14 years	14.4
		14 to below 18 years	16.3
profession		no children	61.5
worker	16.7		
employee	51.3	monthly net income household	
public official	5.6	up to euro 1.499	11.5
self-employed	8.8	euro 1.500–1.999	13.1
on education/studies	16.8	euro 2.000–2.499	13.3
other	0.8	euro 2.500–2.999	13.7
		euro 3.000–3.499	13.4
education		euro 3.500–3.999	12.7
secondary school	21.6	euro 4.000 or above	22.3
junior high school	34.8		
high school	27.9		
university/polytechnic	15.7		

winter landscape (86%), typical huts (43%) and entertainment (37%). All other elements of a winter holiday stay are not very interesting to them. The stay is just about skiing, snow and having a bit of fun. With 14.2% of the AWG, representing a market potential of 1.9 millions of German winter travelers, it is the second largest segment found. By contrast segment 8 shows nearly no interest in winter sports but has very high expectations for snow covered landscape (94%), comfortable cozy accommodation (95%), authentic huts (80%), enjoying calm nature (92%), walks and hiking (77%), typical regional winter food & beverage (88%), thermal springs and spa (91%) or wellness and getting pampered (85%) and authenticity of the place (81%). This segment is looking for the alpine winter spirit in combination with comfort and relaxation. It may also be a more difficult segment to satisfy as it has more expectations and seems to focus on higher quality amenities than the sports segment. Segment 10 has the largest percentage of the AWG market at 16.4%, representing 2.2 million people, but it is also the most

Table 3
Guests expectations of a winter holiday stay in the Alps.

expectations of guests	all	winter sport very important	
		no	yes
snow-covered winter landscape	86.6%	79.5%	92.0%
comfortable and cozy accommodation	62.8%	60.1%	64.9%
typical authentic huts/mountain inns	58.7%	48.4%	66.3%
winter sports: alpine or cross-country ski, snowboard	57.4%	0.0%	100.0%
enjoying calm nature/scenery/landscape	53.3%	59.7%	48.5%
walks/hiking trips	48.4%	59.9%	39.8%
typical regional winter food & beverages	47.4%	39.9%	53.0%
getting out into the cold and clear air	41.4%	34.3%	46.8%
thermal spring/spa worlds	40.3%	46.1%	36.1%
sledging/sleigh trips	38.9%	40.2%	37.9%
entertainment/après-ski/disco	35.8%	25.2%	43.8%
wellness/getting pampered	33.4%	37.8%	30.1%
stocking up on some sunshine	30.4%	32.0%	29.2%
authenticity of the place and its residents	28.9%	33.1%	25.7%
shopping at place or nearby cities	27.5%	34.0%	22.6%
nature observation/experiences	25.9%	35.2%	19.1%
villages with Christmas decoration	25.1%	31.5%	20.4%
visiting sports events	17.4%	14.2%	19.8%
cultural experiences	14.7%	19.9%	10.9%
ice-skating/curling	14.2%	11.6%	16.2%

undifferentiated. What is clear is that a winter landscape is important (57%), with a preference for walking or hiking (33%), being pampered or engaged in wellness activities, possibly at spas (28%), along with some shopping (25%) and comfortable accommodations (28%).

Going through all ten segments 1 to 10 the following names based on the revealed characteristics can be given: (1) Traditionalist; those who engage in winter sports in a developed, comfortable authentic mountain setting, (2) Activity Focused; those whose main purpose is skiing and sledging, (3) Winter Enthusiast; with all sports and winter amenities valued highly, (4) Sport Focused; those whose main reason for being there is to ski while enjoying the snow, (5) Winter Naturalist; those who value the importance of nature scenes while engaging in moderate sports activities, but who also value comfortable amenities, (6) Real Winter; those who place a high importance on snow and cold while possibly engaging in some sports, (7) Full Soft Immersion; those who engage in numerous indoor and outdoor activities such as hiking, shopping or nightlife but not intense winter sports, (8) Alpine Winter Spirit; those who enjoy being in an alpine winter destination without engaging in major winter sports, (9) Serenity Seekers; those who prefer the beauty and quiet of nature while hiking or just being in it, (10) Easy Going; those who have no major goals except to enjoy a winter landscape. All segments have clear but different expectation profiles and therefore can be addressed as separate target groups. Therefore, as a main finding it can be stated, that the German winter travelers considering the Alps as a potential destination are not only ski enthusiasts belonging to one

Table 4
Cluster centers of the 10 market segments derived by cluster analysis.

market segment no.	1	2	3	4	5	6	7	8	9	10
market potential in million guests	1.8	0.9	1.1	1.9	1.5	1.1	0.9	1.0	1.3	2.2
share of segment within AWG (%)	12.8	6.5	8.1	14.2	10.7	8.0	6.8	7.3	9.2	16.4
snow-covered winter landscape	0.99	0.84	1.00	0.86	0.95	0.95	0.97	0.94	0.85	0.57
comfortable and cozy accommodation	0.82	0.61	0.95	0.20	0.88	0.67	0.98	0.95	0.64	0.28
typical authentic huts/mountain inns	0.93	0.36	0.88	0.43	0.89	0.47	0.88	0.80	0.49	0.14
winter sports: alpine or cross-country ski, snowboard	0.92	0.86	0.93	0.99	0.58	0.54	0.39	0.13	0.22	0.01
enjoying calm nature/scenery/landscape	0.42	0.18	0.86	0.13	0.81	0.87	0.93	0.92	0.80	0.22
walks/hiking trips	0.12	0.25	0.90	0.09	0.81	0.57	0.93	0.77	0.86	0.33
typical regional winter food & beverages	0.84	0.51	0.62	0.19	0.95	0.12	0.90	0.88	0.11	0.12
getting out into the cold and clear air	0.72	0.11	0.87	0.15	0.33	0.91	0.78	0.60	0.10	0.10
thermal spring/spa worlds	0.27	0.34	0.84	0.11	0.39	0.08	0.90	0.91	0.67	0.26
sledging/sleigh trips	0.21	0.92	0.70	0.04	0.65	0.31	0.72	0.34	0.54	0.16
entertainment/après-ski/disco	0.53	0.54	0.66	0.37	0.28	0.02	0.93	0.10	0.19	0.16
wellness/getting pampered	0.32	0.32	0.62	0.09	0.17	0.10	0.87	0.85	0.31	0.28
stocking up on some sunshine	0.27	0.17	0.84	0.12	0.16	0.31	0.93	0.64	0.07	0.16
authenticity of the place and its residents	0.10	0.05	0.52	0.04	0.55	0.30	0.87	0.81	0.29	0.10
shopping at place or nearby cities	0.14	0.30	0.47	0.09	0.32	0.06	0.87	0.77	0.05	0.25
nature observation/experiences	0.05	0.17	0.12	0.02	0.66	0.23	0.87	0.33	0.61	0.09
villages with Christmas decoration	0.21	0.06	0.15	0.05	0.56	0.16	0.91	0.59	0.12	0.17
visiting sports events	0.17	0.27	0.30	0.10	0.28	0.07	0.51	0.12	0.07	0.08
cultural experiences	0.03	0.06	0.06	0.01	0.17	0.13	0.82	0.53	0.18	0.04
ice-skating/curling	0.06	0.38	0.21	0.05	0.16	0.12	0.50	0.14	0.11	0.05

homogenous group.

Comparing the socio-demographic structure of the segments (see Table 5) some interesting characteristics are revealed. First, the segments 2 and 4, focusing on activities and skiing, are young (29 (male)/35 (female) years), often single (60% (male)/49% (female) and in segment 4 with two thirds male travelers. Conversely in segments 7 and 8, both possessing low interest in skiing but having a high affinity for hiking and regional food, we find a different dynamic. In these two segments the majority of guests is female (58% and 56%), older (46/53 years), very often married (73%/70%) and in most cases without kids. Considering the demographic change in Germany, the potential in the population will be for segments 2 and 4 to shrink, while the segments 7 and 8 can be assumed to be stable.

In order to match the supply characteristics of the leading Alpine winter destinations from the selected regions to the segments of the demand side revealed in the cluster analysis, the presence of 20 guest expectations on the winter version of the destination web pages were analyzed. Table 6 shows the average, minimum, maximum and median score for the 25 destinations. Most prominently presented topics of the destinations are winter sport (0.95), snow covered landscape (0.89), cultural experiences (0.57), and walks (0.52). Compared to the guest expectations, low values can be found for stocking up on some sunshine (0.13), getting out into the cold and clean air (0.15), comfortable and cozy accommodation (0.24), typical authentic huts/mountain inns (0.24) or enjoying calm nature/scenery/landscape (0.36).

To visualize the relative positioning of the 25 destinations based on their web pages presentation in relation to the market segments found by the clustering, demand and supply were merged into one data matrix. Each object, the 10 segments and the 25 destinations were characterized by the 20 expectation items on a scale between 0 (no expectation/no presence on destination web page) and 1 (highest possible expectation by segment/topic on landing page of destination web page). Using multi-dimensional scaling procedure PROXSCAL (Verma, 2013b) and a distance matrix based on Euclidian distance, a two dimensional representation with a stress value of 0.1001 was revealed. The stress value indicates a good fit of the two-dimensional representation. Fig. 1 shows the relative positioning of the segments (squares) to the 25 destination (triangles).

Multidimensional scaling as a method does not necessarily deliver an

Table 6
Level of presence of guest expectation topics on destination web pages.

presence of expectations on destination websites	average	min	max	median
snow-covered winter landscape	0.89	0.75	1.00	1.00
comfortable and cozy accommodation	0.24	0.00	1.00	0.00
typical authentic huts/mountain inns	0.24	0.00	1.00	0.25
winter sports: alpine or cross-country ski, snowboard	0.95	0.50	1.00	1.00
enjoying calm nature/scenery/landscape	0.36	0.00	1.00	0.25
walks/hiking trips	0.52	0.25	0.75	0.50
typical regional winter food & beverages	0.34	0.00	1.00	0.25
getting out into the cold and clear air	0.15	0.00	0.75	0.00
thermal spring/spa worlds	0.37	0.00	0.75	0.50
sledging/sleigh trips	0.47	0.00	0.75	0.50
entertainment/après-ski/disco	0.31	0.00	0.75	0.50
wellness/getting pampered	0.35	0.00	0.75	0.50
stocking up on some sunshine	0.13	0.00	0.75	0.00
authenticity of the place and its residents	0.28	0.00	1.00	0.00
shopping at place or nearby cities	0.36	0.00	1.00	0.50
nature observation/experiences	0.22	0.00	1.00	0.00
villages with Christmas decoration	0.44	0.00	1.00	0.50
visiting sports events	0.47	0.00	1.00	0.50
cultural experiences	0.57	0.25	1.00	0.50
ice-skating/curling	0.36	0.00	1.00	0.25

Table 5
Socio-demographic structure of the 10 identified market segments.

cluster no.	1	2	3	4	5	6	7	8	9	10
male (%)	60	56	51	65	54	55	42	44	60	55
female (%)	40	44	49	35	46	45	58	56	40	45
kids <18 in household	33	37	35	27	38	44	31	23	28	31
age (average in years)	40	29	39	35	46	40	46	53	45	43
single (%)	35	60	36	49	30	41	27	30	34	36
married/living with partner (%)	65	40	64	51	70	59	73	70	66	64
income household p.m. €	3230	3092	3194	2943	3205	3262	2866	3011	3035	2893

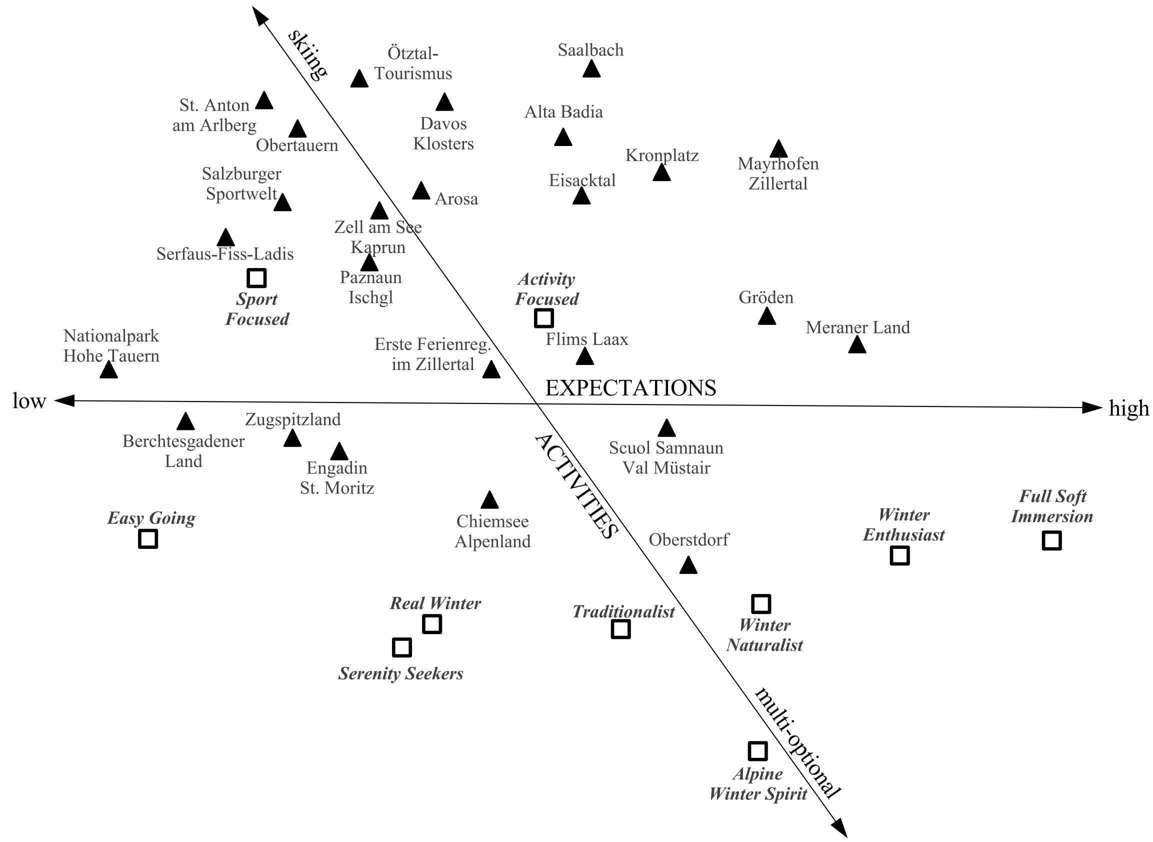

Fig. 1. Joint representation of demand and supply using optimal scaling.

x,y axis. But by analyzing the destinations and their web pages in a two-dimensional representation it can be detected that from left to right the number of topics presented increases as well as at the demand side the expectation level. From the left upper corner to the right lower corner the importance of skiing decreases, while the prominence of other winter nature and landscape related activities such as hiking, nature observation, stays in mountain huts or family experiences, increase. By this, the weight of the web page presentation of the multi-optional character of the destinations increases to the right lower corner, as well as the multi-optional expectation profile of a many of the segments.

At first glance it can be seen that the majority of destinations just address two segments: the groups "Sport Focused" and "Activity Focused". About 75% of the market will not find their expectations in first or second row of the destination web pages. Especially the target group "Alpine Winter Spirit" is not served by the top destinations but also the segments "Serenity Seekers" and "Real Winter" find themselves relatively far away from well-fitting destinations.

5. Discussion and conclusions

Our findings show that the Alpine winter tourist as well as the winter holiday market have to be understood in much more general terms. There seems to exist the dominant picture "Alpine winter holidays = winter sport holidays" in the minds of the public as well as the majority of scholars addressing winter tourism. Additionally, and more importantly, from a development perspective it appears that the majority of the destinations analyzed in this study also accept that winter tourism means winter sports activity, with many of them investing in ecosystem modifications such as cutting ski trails, building ski lifts or employing snow machines, in order to offer alpine sports adventures. As the results show, these destinations may be missing out on a large share of the winter market that shows little interest for intensive winter sports activities. Thus, the first question posed in this study, "does there exist a potential for winter guests currently not reached by the European Alpine destinations" must be answered in the affirmative. Not only does the potential exist, but it is also substantial.

Focusing primarily on sports activities has led to a very narrow research focus for winter tourism. This is surprising since some scholars have clearly pointed out that consumers in general, and tourists in particular, are not one dimensional in terms of what they seek from their purchase decisions (Boztug, Babakhani, Laesser, & Dolnicar, 2015). Further, support for that position is found in a study of tourists who decided after some trips to the Alps to forego future travel there, as there was very little attention paid to those who prefer pure winter nature (unmodified for winter sports), routes or tours through alpine destinations or a sense of calmness or being alone (Bausch, Humpe, & Gössling, 2019). This underlines the lack of research conducted on non-sports related winter tourism. By this, research-based marketing and strategy implications for destinations have almost exclusively be seen as simply a subset of options addressing the winter sport and skier market. This line of thinking may lead to more risky and competitive destination development by focusing on the same consumer segments as everyone else and ignoring the more diffuse and in total larger market of consumers, who are not focused on high level developed winter sports.

Currently, the understanding of competition seems to be limited to destinations offering the same or a similar winter sport product. Competitiveness studies in winter tourism primarily focus on winter sport destinations that cater to the same segment of winter sport guests (Hallmann, Mueller, & Peters, 2015; Hallmann, Müller, & Feiler, 2014; Zehrer, Smeral, & Hallmann, 2016). Especially in the context of climate change and demographic change a more comprehensive understanding of the market, which means the demand as well as the supply side, is needed. Highly developed Alpine winter sport destinations are characterized by low levels of product diversification, leading to a high level of product intensification. This leads to a position typical for concentrated mass tourism with highly standardized products (Benur & Bramwell, 2015). These products can be easily substituted by other destinations with the same product type. From the perspective of destination management, product and consumer diversification would serve to reduce the vulnerability of the current tourism system against the negative impacts of climate change as well as the gradual, unavoidable withdrawal of older guests from skiing without a corresponding replacement market. Addressing at the same time several target groups requires product diversification and a new paradigm regarding winter tourism. Each resort/destination must come up with its own strategic initiatives to capture new markets and the results shown in this paper reveal the potential to do so exists. A focus on the non-sports market must be reflected in resort/destination web pages as well as in the products designed specifically for these segments. At the moment, from the analysis of web pages previously discussed, it appears that very little attention has been paid to the non-sports market, therefore the first few resorts/destinations that decide to go after this market could be able to capture a competitive advantage.

Diversification is not just an adaptation of the existing product. As shown by the literature review, the thinking of adaptation, when it comes to winter tourism, is highly linked with climate change and the reliability of snow by artificial snow making. This is, however, only adaptation to the same model and does not represent new thinking or strategic repositioning. It is a recipe for long-term decline. The type of adaptation occurring today in winter tourism destinations is neither an answer to climate change for destinations in lower altitudes (Pütz et al., 2011) nor does it offer alternatives to people from the non-skier or part-time skier markets. Furthermore, even in the skier market snow reliability is not equivalent to a quality guarantee. With an increase of average daily temperatures now being experienced, the number of skiing days where snow is heavy and muddy will increase (Rutty et al., 2017; Scott et al., 2019). Especially for the older group of skiers as well as for young children and beginners, this is a serious constraint. In addition, investments in further infrastructure for artificial snowmaking have three negative side effects: a degradation of the Alpine landscape, a negative environmental impact caused by high energy consumption, noise, and a change in water balance and finally increasing ticket prices. For the segments consisting of part-time skiers, who are also interested in other winter outdoor activities, these effects have to be seen as very serious. The degradation of Alpine nature and landscape reduces the perceived value of the other non-skiing related activities and higher ticket prices lead to high expectations in regard to the perfect skiing experience, which, however, cannot be guaranteed.

The discussion of diversification towards nature-based activities or place-bound products also raises the question of how such transformation processes and related governance oversight systems shall be realized. High-competitive winter sport destinations in the European Alps are mostly characterized by a dualistic governance situation. On the one side there is the skiing industry and on the other the large group of tourism stakeholders from the accommodation sector, restaurants, retail businesses and even local farmers producing foodstuff for local tourism consumption. During the last few decades these community-based governance systems changed from one of public policy dominance with a broader participatory approach by all tourism stakeholders to one controlled by private companies or even large consortiums for composite ski resorts (Nordin et al., 2019). Efficiencies and economies of scale are a big reason for the evolution of ski resorts into systems favoring greater integration. However, these same integrated systems may make it much harder to pivot away from the traditional markets into more niche or more differentiated market segments, even if there is evidence that by doing so a larger overall share of the winter tourism market can be captured. The „brands" developed in this way are static and not easily adjusted. A great deal of image formation effort has gone into creating the type of brand that is featured on the resort web page and it will not be easy or inexpensive to change (Gartner, 1994).

Therefore, the type of leadership role in place often leads to a conflict of interest discussion regarding adaptation and diversification. The ski industry does not see a way to reach the same daily revenues by catering to non-skiers and therefore is fixated on the skiers. The accommodation sector has options to increase profitability in the segment of non-skier by offering custom-tailored services in house as well through outdoor activities. But for the most part they remain focused on the skier segment because the ski industry dominates the local development strategy with the other sectors (e.g. accommodations), benefitting (or not) from the marketing effort of the ski industry. Given the current economic environment, a case can be made that there is no more destination independence. All stakeholders in ski industry dominated destinations are dependent on the ski industry for their customers. Therefore, in most European Alpine winter sports destinations the ski industry keeps controls of the destination development processes, avoiding diversification as long as possible. But as was shown in Fig. 1, the clustering of destinations that cater to the skier market is substantial and in light of external forces such as climate change and increased competition, not only from other similar destinations but from non-winter destinations as well, an existential threat exists for many of them. Reviewing marketing web pages for resorts/destinations, it is clear that most of them are competing for the same guests and offering essentially the same services. There are of course product differences between the resorts/destinations due to their geographic location and other intangible cultural characteristics such as local food offering, but these differences may not be enough to guarantee survival in a changing environment. New development paradigms are needed for success in the future.

It is not the intent of this paper to advise ski destinations as to how they should change to engage in product diversification strategies. Rather the purpose of this research was to show the relative lack of attention paid to non-skiing research for winter tourism and to show the potential disruption of winter destinations focusing on skiing, from external forces no one can control. It is a good bet that snow levels brought on by climatic conditions of the past are truly in the past. Therefore, the future belongs to those who figure out how to innovate. This applies to both private sector businesses and entire communities that rely on tourism for winter income.

6. Limitations

This paper represents an overview of serious issues facing winter tourism destinations in the Alps. Obviously, each destination has its own resources and attractions and together with the image and brand identity that they build they may be more or less subject to some of the inevitable challenges that will continue to affect winter tourism destinations in the Alps. Not all destinations are created equal and not all develop in the same manner. Therefore, some of the cautionary notes sounded in this paper may not apply to some of the destinations identified and positioned (see Fig. 1) in the study. There is also the unknown of new product development that can tie directly to existing winter sports destinations. The snowboard market is relatively new and has provided a boost to some destinations that have embraced the sport. New markets such as those originating in Asia may also play a role. Although the Asian market is not yet a major source of tourists for European Alpine destinations, astute marketing and product packaging may be able to change this current situation.

This study is also focused solely on the German market. Possibly, other geographically based markets may differ with respect to the segments that exist within them. However, this paper could be viewed as a cautionary call for other Alpine winter tourism markets to be examined to find consistency or divergence from the results presented herein for the German winter tourism market.

Furthermore, it has to be mentioned that the discussed community-based governance system is typical in most Alpine winter destinations. At a global level, but also at some places in the Alps, (e. g. France), corporate destinations frequently can be found thereby needing a slightly different interpretation of our findings primarily from a management perspective. Different management systems will lead to different strategies in dealing with the existential threat of climate change.

What we are fairly comfortable in defending is the conclusion that climate change will not recede into the past and this by itself will have an effect on winter snow sports destinations, especially those in the lower altitude, vulnerable zone. Combined with that is the aging in the European core markets will cause still unknown additional disruptions on the demand side. The future of winter tourism in the Alps is not clear. There are forces that lead us to believe current offerings will need to be modified or enhanced to continue to attract a viable number of tourists for resort/destination success.

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CRediT authorship contribution statement

Thomas Bausch: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing - original draft, Writing - review & editing. **William C. Gartner:** Conceptualization, Investigation, Methodology, Validation, Visualization, Writing - original draft.

References

Amundsen, H., Berglund, F., & Westskog, H. (2010). Overcoming barriers to climate change adaptation—a question of multilevel governance? *Environment and Planning C: Government and Policy, 28*(2), 276–289. https://doi.org/10.1068/c0941.

Bark, R. H., Colby, B. G., & Dominguez, F. (2010). Snow days? Snowmaking adaptation and the future of low latitude, high elevation skiing in Arizona, USA. *Climatic Change, 102*(3–4), 467–491. https://doi.org/10.1007/s10584-009-9708-x.

Bausch, T., Humpe, A., & Gössling, S. (2019). Does climate change influence guest loyalty at alpine winter destinations? *Sustainability, 11*(15), 4233. https://doi.org/10.3390/su11154233.

Bausch, T., & Unseld, C. (2018). Winter tourism in Germany is much more than skiing! Consumer motives and implications to Alpine destination marketing. *Journal of Vacation Marketing, 24*(3), 203–217. https://doi.org/10.1177/1356766717691806.

Becken, S. (2007). *Tourism and climate change: Risks and opportunities*. Channel View Publ.

Benur, A. M., & Bramwell, B. (2015). Tourism product development and product diversification in destinations. *Tourism Management, 50*, 213–224. https://doi.org/10.1016/j.tourman.2015.02.005.

Bonzanigo, L., Giupponi, C., & Balbi, S. (2016). Sustainable tourism planning and climate change adaptation in the Alps: A case study of winter tourism in mountain communities in the dolomites. *Journal of Sustainable Tourism, 24*(4), 637–652. https://doi.org/10.1080/09669582.2015.1122013.

Boztug, Y., Babakhani, N., Laesser, C., & Dolnicar, S. (2015). The hybrid tourist. *Annals of Tourism Research, 54*, 190–203. https://doi.org/10.1016/j.annals.2015.07.006.

Caskey, K. R. (2011). When should a ski resort make snow? *Tourism Economics, 17*(6), 1219–1234.

Cocolas, N., Walters, G., & Ruhanen, L. (2016). Behavioural adaptation to climate change among winter alpine tourists: An analysis of tourist motivations and leisure substitutability. *Journal of Sustainable Tourism, 24*(6), 846–865. https://doi.org/10.1080/09669582.2015.1088860. Scopus.

Damm, A., Köberl, J., & Prettenthaler, F. (2014). Does artificial snow production pay under future climate conditions? – a case study for a vulnerable ski area in Austria. *Tourism Management, 43*, 8–21. https://doi.org/10.1016/j.tourman.2014.01.009.

Dawson, J., Scott, D., & Havitz, M. (2013). Skier demand and behavioural adaptation to climate change in the US Northeast. *Leisure/Loisir, 37*(2), 127–143. https://doi.org/10.1080/14927713.2013.805037.

Demiroglu, O. C., Kučerová, J., & Ozcelebi, O. (2015). Snow reliability and climate elasticity: Case of a Slovak ski resort. *Tourism Review, 70*(1), 1–12. https://doi.org/10.1108/TR-01-2014-0003.

Dolnicar, S., & Grun, B. (2014). Including Don't know answer options in brand image surveys improves data quality. *International Journal of Market Research, 56*(1), 33. https://doi.org/10.2501/IJMR-2013-043.

Falk, M., & Hagsten, E. (2019). Climate zone crucial for efficiency of ski lift operators. *Current Issues in Tourism, 22*(6), 664–681. https://doi.org/10.1080/13683500.2017.1297781.

Falk, M., & Lin, X. (2018). The declining dependence of ski lift operators on natural snow conditions. *Tourism Economics, 24*(6), 662–676. https://doi.org/10.1177/1354816618768321. Scopus.

François, H., Morin, S., Lafaysse, M., & George-Marcelpoil, E. (2014). Crossing numerical simulations of snow conditions with a spatially-resolved socio-economic database of ski resorts: A proof of concept in the French Alps. *Cold Regions Science and Technology, 108*, 98–112. https://doi.org/10.1016/j.coldregions.2014.08.005.

FUR. (2016). Reiseanalyse 2016 (German travel analysis). www.reiseanalyse.de.

Gartner, W. C. (1994). Image formation process. *Journal of Travel & Tourism Marketing, 2* (2–3), 191–216. https://doi.org/10.1300/J073v02n02_12.

Gonseth, C., & Vielle, M. (2019). A general equilibrium assessment of climate change impacts on Swiss winter tourism with adaptation. *Environmental Modeling & Assessment, 24*(3), 265–277. https://doi.org/10.1007/s10666-018-9641-3.

Haanpää, S., Juhola, S., & Landauer, M. (2015). Adapting to climate change: Perceptions of vulnerability of down-hill ski area operators in Southern and Middle Finland. *Current Issues in Tourism, 18*(10), 966–978. https://doi.org/10.1080/13683500.2014.892917. Scopus.

Hallmann, K., Mueller, S., & Peters, M. (2015). The assessment of competitiveness: The case of three alpine winter sports destinations. *Tourism Analysis, 20*(6), 677–687. https://doi.org/10.3727/108354215X14464845878110.

Hallmann, K., Müller, S., & Feiler, S. (2014). Destination competitiveness of winter sport resorts in the Alps: How sport tourists perceive destinations? *Current Issues in Tourism, 17*(4), 327–349. https://doi.org/10.1080/13683500.2012.720247.

Holden, A. (1999). Understanding skiers motivation using PearcesTravel career construct. *Annals of Tourism Research, 26*(2), 435–438. https://doi.org/10.1016/S0160-7383(98)00082-6.

Joppe, M., Elliot, S., & Durand, L. (2013). From ski market to ski traveller: A multidimensional segmentation approach. *Anatolia, 24*(1), 40–51. https://doi.org/10.1080/13032917.2012.762316.

Landauer, M., Pröbstl, U., & Haider, W. (2012). Managing cross-country skiing destinations under the conditions of climate change – scenarios for destinations in Austria and Finland. *Tourism Management, 33*(4), 741–751. https://doi.org/10.1016/j.tourman.2011.08.007.

Lohmann, M., Sonntag, U., & Wagner, P. (2017). Die Reiseanalyse –Instrument für Forschung und Marketingplanung. In B. Eisenstein (Ed.), *Marktforschung für Destinationen: Grundlagen—Instrumente—Praxisbeispiele* (pp. 193–206). Erich Schmidt Verlag.

Morrison, C., & Pickering, C. M. (2013). Perceptions of climate change impacts, adaptation and limits to adaption in the Australian Alps: The ski-tourism industry and key stakeholders. *Journal of Sustainable Tourism, 21*(2), 173–191. https://doi.org/10.1080/09669582.2012.681789.

Nordin, S., Volgger, M., Gill, A., & Pechlaner, H. (2019). Destination governance transitions in skiing destinations: A perspective on resortisation. *Tourism Management Perspectives, 31*, 24–37. https://doi.org/10.1016/j.tmp.2019.03.003.

Papathanassis, A. (2019). The growth and development of the cruise sector: A perspective article. *Tourism Review, ahead-of-print(ahead-of-print)*. https://doi.org/10.1108/TR-02-2019-0037.

Pickering, C. M., & Buckley, R. C. (2010). Climate response by the ski industry: The shortcomings of snowmaking for Australian resorts. *Ambio, 39*(5–6), 430–438. https://doi.org/10.1007/s13280-010-0039-y.

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*(2), 137–147. https://doi.org/10.1111/j.1745-5871.2009.00614.x.

Probstl Haider, U., & Haider, W. (2013). Tools for measuring the intention for adapting to climate change by winter tourists some thoughts on consumer behavior research and an empirical example. *Tourism Review, 68*(2), 44–55. https://doi.org/10.1108/TR-04-2013-0015.

Pütz, M., Gallati, D., Kytzia, S., Elsasser, H., Lardelli, C., Teich, M., et al. (2011). Winter tourism, climate change, and snowmaking in the Swiss Alps: Tourists' attitudes and regional economic impacts. *Mountain Research and Development, 31*(4), 357–362. https://doi.org/10.1659/MRD-JOURNAL-D-11-00039.1. Scopus.

Rutty, M., Scott, D., Johnson, P., Jover, E., Pons, M., & Steiger, R. (2015). Behavioural adaptation of skiers to climatic variability and change in Ontario, Canada. *Journal of Outdoor Recreation and Tourism, 11*, 13–21. https://doi.org/10.1016/j.jort.2015.07.002. Scopus.

Rutty, M., Scott, D., Johnson, P., Pons, M., Steiger, R., & Vilella, M. (2017). Using ski industry response to climatic variability to assess climate change risk: An analogue study in Eastern Canada. *Tourism Management, 58*, 196–204. https://doi.org/10.1016/j.tourman.2016.10.020.

Scott, D., & McBoyle, G. (2007). Climate change adaptation in the ski industry. *Mitigation and Adaptation Strategies for Global Change, 12*(8), 1411–1431. https://doi.org/10.1007/s11027-006-9071-4.

Scott, D., Steiger, R., Rutty, M., Pons, M., & Johnson, P. (2019). The differential futures of ski tourism in Ontario (Canada) under climate change: The limits of snowmaking adaptation. *Current Issues in Tourism, 22*(11), 1327–1342. https://doi.org/10.1080/13683500.2017.1401984.

Soboll, A., & Dingeldey, A. (2012). The future impact of climate change on alpine winter tourism: A high-resolution simulation system in the German and Austrian Alps. *Journal of Sustainable Tourism, 20*(1), 101–120. https://doi.org/10.1080/09669582.2011.610895.

Steiger, R. (2011). The impact of snow scarcity on ski tourism: An analysis of the record warm season 2006/2007 in Tyrol (Austria). *Tourism Review, 66*(3), 4–13. https://doi.org/10.1108/16605371111175285.

Steiger, R. (2012). Scenarios for skiing tourism in Austria: Integrating demographics with an analysis of climate change. *Journal of Sustainable Tourism, 20*(6), 867–882. https://doi.org/10.1080/09669582.2012.680464.

Steiger, R., & Mayer, M. (2008). Snowmaking and climate change: Future options for snow production in tyrolean ski resorts. *Mountain Research and Development, 28*(3–4), 292–298. https://doi.org/10.1659/mrd.0978. Scopus.

Steiger, R., Scott, D., Abegg, B., Pons, M., & Aall, C. (2019). A critical review of climate change risk for ski tourism. *Current Issues in Tourism, 22*(11), 1343–1379. https://doi.org/10.1080/13683500.2017.1410110.

The ADM Sampling System. ADM e.V. n.d.Retrieved November 12, 2019, from https://www.adm-ev.de/en/services/the-adm-sampling-system/.

Tranos, E., & Davoudi, S. (2014). The regional impact of climate change on winter tourism in Europe. *Tourism Planning & Development, 11*(2), 163–178. https://doi.org/10.1080/21568316.2013.864992.

Trawöger, L. (2014). Convinced, ambivalent or annoyed: Tyrolean ski tourism stakeholders and their perceptions of climate change. *Tourism Management, 40*, 338–351. https://doi.org/10.1016/j.tourman.2013.07.010.

Tyrol Chamber of Commerce (Ed.). (2019). *Tyrolean cable car industry in figures 2018 (Tiroler Seilbahnwirtschaft in Zahlen 2018)*. https://www.wko.at/branchen/t/transport-verkehr/seilbahnen/Seilbahnen_Zahlen_2018.pdf.

Unbehaun, W., Pröbstl, & Haider, W. (2008). Trends in winter sport tourism: Challenges for the future. *Tourism Review, 63*(1), 36–47. https://doi.org/10.1108/16605370810861035.

Verma, J. P. (2013a). Cluster Analysis: For segmenting the population. In J. P. Verma (Ed.), *Data Analysis in Management with SPSS Software* (pp. 317–358). Springer. https://doi.org/10.1007/978-81-322-0786-3_10.

Verma, J. P. (2013b). Multidimensional scaling for product positioning. In J. P. Verma (Ed.), *Data Analysis in Management with SPSS Software* (pp. 443–460). Springer. https://doi.org/10.1007/978-81-322-0786-3_14.

Williams, P., & Fidgeon, P. R. (2000). Addressing participation constraint: A case study of potential skiers. *Tourism Management, 21*(4), 379–393. https://doi.org/10.1016/S0261-5177(99)00083-7.

Williams, P. W., & Lattey, C. (1994). Skiing constraints for women. *Journal of Travel Research, 33*(2), 21–25. https://doi.org/10.1177/004728759403300204.

Witting, M., & Schmude, J. (2019). Impacts of climate and demographic change on future skier demand and its economic consequences – evidence from a ski resort in the German Alps. *Journal of Outdoor Recreation and Tourism, 26*, 50–60. https://doi.org/10.1016/j.jort.2019.03.002.

Wyss, R., Luthe, T., & Abegg, B. (2015). Building resilience to climate change – the role of cooperation in alpine tourism networks. *Local Environment, 20*(8), 908–922. a9h.

Zehrer, A., Smeral, E., & Hallmann, K. (2016). Destination competitiveness—a comparison of subjective and objective indicators for winter sports areas. *Journal of Travel Research*. https://doi.org/10.1177/0047287515625129.