The last resort? Ski tourism and climate change in Arctic Sweden

Osman Cenk Demiroglu, Linda Lundmark, Jarkko Saarinen and Dieter K. Müller

Abstract

Purpose – *The purpose of this paper is to discuss the external and internal factors that support or challenge a possible transformation of Arctic Sweden into a major ski destination under a changing climate.*

Design/methodology/approach – *The paper questions future availability of the physical and the human factors that foster ski tourism development in Arctic Sweden and suggests a comparative case study in relation to the already existing large resort-based ski destinations in Arctic Finland.*

Findings – *Preliminary documentary analysis shows that the governmental and the industrial discourses over the past decade have acknowledged a competitive edge for Sweden and its northernmost regions in particular and may even propose a structural shift for ski tourism in the near future agenda. The visualisations based on natural snow projections presented in this paper confirm this comparative advantage but other technical and socioeconomic development factors are further discussed, in relation to Arctic Finland.*

Research limitations/implications – *Future research agenda is suggested to cover, first, assessment of natural and technical snow reliability of existing and all potential ski areas in Sweden and within its competitive set extending to all the Nordics and the Alps, then, incorporation of adaptive capacities of the suppliers but especially the likely substitution tendencies of the consumers, and finally, evaluation of the overall situation in terms of the regional development needs.*

Social implications – *It is apparent that land use conflicts will arise in case of large ski resort-based destination development in Arctic Sweden, especially around the environmentally protected areas, which are not only already important attractions for nature-based tourism but also traditional livelihoods for the Sami.*

Originality/value – *This is the first paper to discuss a potential regional and structural shift of ski tourism in Sweden.*

Keywords *Finland, Climate change, Sweden, Adaptation, Arctic tourism, Ski tourism*

Paper type *Research paper*

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Introduction

For the past millennia, skiing had been a major mode of transport for commuting, herding and hunting throughout Northern Eurasia (Edlund and Yttergren, 2016). Relatively recently, however, skiing has almost exclusively become more of a mode of recreation and sports. Despite this turn towards recreation and entertainment, modern skiing represents an increasingly important tool for local and regional development. Especially in rural and peripheral areas, skiing activities are used for supporting outdoor recreation and large-scale tourism development initiatives in the mountainous areas of Northern Europe, the Alps, North America and emerging domains in Eastern Europe, Russia and China, for example (Hudson and Hudson, 2015). Presently the number of skiers, including different variations of skiing such as snowboarding, is estimated to be around 130m and snow-based sports are practiced in approximately 6,000 ski areas in around 70 countries (Vanat, 2018). While the skiing activities are economically important in many regions, they also need to compete with new substitute leisure activities and generations. In addition, as a weather and climate sensitive activity skiing is increasingly challenged by the impacts of global warming.

While the warming-led deterioration of snow reliability conditions at downhill ski areas, resorts and destinations lead most policy makers and businesses to engage in adaptation efforts such

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as the instalment of snowmaking systems, some regions are expected to benefit from the change due to their relative resilience. High latitudes and altitudes are the two major determinants of such comparative advantage for the (potential) ski destinations, yet these physical aspects need to be elaborated together with other natural and socioeconomic components. This viewpoint paper aims to analyse and discuss the external and internal factors that support or challenge a possible future transformation of Arctic Sweden into a major ski destination under a changing climate. In doing so, the paper questions future availability of the physical and the human factors that may foster ski tourism development in Arctic Sweden. In addition, the paper suggests a comparative case study in relation to the already existing large resort-based ski destinations in Arctic Finland.

Ski destination development in a changing climate

Practically informed literature (Li *et al.*, 2016; Yang *et al.*, 2017) identifies suitability factors for ski tourism destination development. These factors are connected to climate, topography, land use, land cover, availability of non-ski attractions and accessibility to suitable markets. Among the key factors are climate and natural and technical snow conditions in particular as they form the main prerequisites for snow-based tourism. In this respect, the futures of existing and potential ski tourism destinations are highly dependent on their vulnerabilities to climate change.

Vulnerability is a function of three main components, i.e. direct exposure to change (e.g. changes in snow depth and duration), demand sensitivity to the exposure (e.g. visitation response to the changing snow conditions) and supplier adaptation to the exposure and the relevant sensitivity (e.g. increased snowmaking and/or marketing efforts). Adaptation, however, is also a matter of adaptive capacity (Smit and Wandel, 2006), e.g. access to relevant resources, such as funding and know-how, by the adapting unit. In addition, a scale of operations can play a major role in adaptation and adaptive capacity. As an adaptive unit, a small ski operator has different capacity to adapt compared to large-scale resorts or policy makers governing an overall ski tourism destination or wider destination system. In this respect, management or policymaking can play a major role on how active or passive the adaption mechanisms are in practice. The active perspective treats adaptation as a proactive and voluntary investment, whereas a passive perspective involves reactive and involuntary adaptation (see Tervo-Kankare *et al.*, 2018).

In ski tourism literature, there are numerous studies that assess the future impacts of climate change (see Demiroglu *et al.*, 2013; Steiger *et al.*, 2017 for a review). In the Eastern Alps, Steiger and Abegg (2018) assessed the snow reliability of 310 ski areas by taking account of the snowmaking possibilities. They found out that only 69 per cent of the ski areas could survive by 2050, with major losses taking place in the eastern and the northern parts of the region. Such survival would also imply an increase in snowmaking requirements, and their associated costs and environmental consequences, reaching as high as 88 per cent in the Bavarian Alps and Upper Austria. Likewise, Damm *et al.* (2017) assessed Austria and Italy as the two Alpine countries with the highest risks for losses in winter overnight stays due to deteriorating natural snow conditions, under a business as usual scenario (RCP8.5 – see van Vuuren *et al.*, 2011), while Switzerland and France were estimated to be relatively resilient for changes. However, recent research in the French Alps demonstrated that even with the utilisation of snowmaking, the reliability line could rise by up to 300 metres by 2050 (Spandre *et al.*, 2019). In the USA, the ski industry is estimated to have lost $1bn worth revenues and 15,000 to 27,000 jobs during the 2000–2010 period due to bad snowfall years (Burakowski and Magnusson, 2012) and future assessments based on the business as usual scenario indicate an annual loss of 11m visits and $780m worth revenues for 2050 (Wobus *et al.*, 2017).

Scott (2006) categorises ski tourism climate change adaptation strategies into “hard” (technical), “soft” (business) and “policy” options. These categories aim to acknowledge the various degrees of involvement by different stakeholders, such as investors and operators, consumers, locals, NGOs, industrial associations, and local, provincial and national governments. Slope development, for instance, provides businesses with the opportunity to expand their lift systems to higher, pole-facing elevations where better snow reliability exists. These investments are further justified for a future when consumers are likely to spend more time and money on snow-secure ski holidays (Unbehaun *et al.*, 2008). Indeed, empirical findings (Mayer *et al.*, 2018)

point out that certain ski resort areas can become "winners" in relation to climate change based on their snow reliability. In the case of Sweden, the high latitude and altitude areas around the Arctic Circle turn out to be the potential future alternatives to downhill skiing tourism development.

Climate change and ski tourism in the Arctic

There has always been an interest in the Arctic, first as a goal of exploration and then as an exotic, yet wild and challenging, destination. In the recent decades, the quest for the Arctic has been much commercialised and exponentially popularised due to the growing international interest for the region's resources and a domestic need to provide livelihood to the region's populations as well as its typical position as a showcase of the global climate change. Today what is meant by "Arctic" as a tourism destination depends on the (marketed) constructs in the minds of tourists rather than the physical borders such as the Arctic Circle, the Arctic isotherm, the Arctic tree line and the permafrost zone (Hall and Saarinen, 2010; Müller, 2013a), which themselves may well become the objects of consumption. Besides these landmarks, snow and ice-based attractions and activities such as the "Ice Hotel" (Kiruna, Sweden), the "Santa Claus Village" (Rovaniemi, Finland), ice-driving, dog-sledding, snowmobiling, fjord/ice cruising as well as sightseeing of unique natural phenomena such as the midnight sun and the northern lights and the presence of wildlife and indigenous cultures constitute the main product, for which a notable overall growth has been reported for the past decade (Maher, 2017).

In most Arctic countries, tourism plays a major role in regional development. In this respect, one may expect the use of downhill skiing tourism in utilisation of the rich cryospheric resources to attract masses of visitors, but this has not been the common case in the Arctic, despite the region's millennia old heritage of skiing (Kulberg, 2007; Edlund and Yttergren, 2016). This may be attributed to a major lack of physical accessibility in the circumpolar region, in general. Moreover, the darker and usually colder winters at higher latitudes may also be hindering development. However, a notable exception to this pattern can be found, as Finland is a leading downhill skiing destination in the high latitudes. Thus, Arctic Finland could act as a benchmark for development of ski tourism in Arctic Sweden which may hold similar preconditions as well as competitive advantages in a changing climate. Below, recent research on ski tourism in Arctic Finland from resilience and development perspectives is briefly presented, followed by implications for Arctic Sweden.

Arctic Finland setting the stage

There are around 80 larger downhill skiing resorts and areas throughout Finland, yet the three largest resorts, namely, Levi, Ruka and Ylläs, which together lead the nationwide market by generating 40 per cent of the skier days as of 2017–2018 season (Suomen Hiihtokeskusyhdistys ry, 2018), are concentrated in Finnish Lapland, along and above the Arctic Circle. Based on the estimated impacts of climate change Finnish downhill skiing tourism faces major risks due to temperature increase and snow cover duration reductions by the end of the century (Tervo, 2008). However, a preliminary and site-specific impact assessment for two of the three Arctic resorts has proven them to be relatively snow reliable at least until 2050 by meeting the minimum requirement of 30 cm snow depth for at least 100 days and during the Christmas – New Year breaks per season (Demiroglu *et al.*, 2017). The same study also showed that the number of seasonal closure days due to extreme cold, based on a threshold of –20°C, would be down from 7 to 4 days at the bottom stations for the future period, and down to 6–7 from 11–13 days at the summits, providing the operators with the much sought improvement (Tervo, 2008; Tervo-Kankare *et al.*, 2018). However, questions remain on what degree these resorts may benefit from a spillover from less fortunate resort areas, given their peripheral locations. Previous research (Unbehaun *et al.*, 2008) shows that most Viennese skiers would tolerate only 10 per cent additional cost and 2h of additional driving for reaching more snow-reliable ski areas in the Alps.

While there is comparative advantage for Arctic Finland's ski resorts, at least in terms of their climatic presence and future, their socioeconomic contribution to regional development varies and can be questioned. Ruka, for instance, has been characterised as a tourism enclave (see Kauppila, 2009) and Kulusjärvi (2016) has stated such enclave destination patterns lead to a

high concentration of resources, preventing the spillover of tourism based benefits for the wider Kuusamo region (see also Kulusjärvi, 2017).

Arctic Sweden: blessed or cursed in disguise?

In the recent years, Northern Sweden has been associated with the Arctic, especially now that this brand is built further with growing media attention to climate change. Implicitly, the region encompasses the northernmost counties of Sweden, Norbotten and Västerbotten. The mountain range at the border to Norway has an Arctic character as the altitude transforms the climate and the land cover accordingly and permafrost and tundra, as well as glaciers on peaks exceeding 2,000 m a.s.l., become prominent.

In a warmer future, while most existing ski resorts, especially in the Alps, are expected to expand to higher altitudes, as noted above, such adaptation may also be realized beyond a site-specific extension and result in a wider relocation of the ski tourism market to more polar latitudes, where, for instance, the more snow-reliable Arctic emerges to capture ski demand from the Alps to Nordic Europe as well as within Nordic Europe (Brouder and Lundmark, 2013). Indeed, relevant lines from an early official report of the Swedish Government read as:

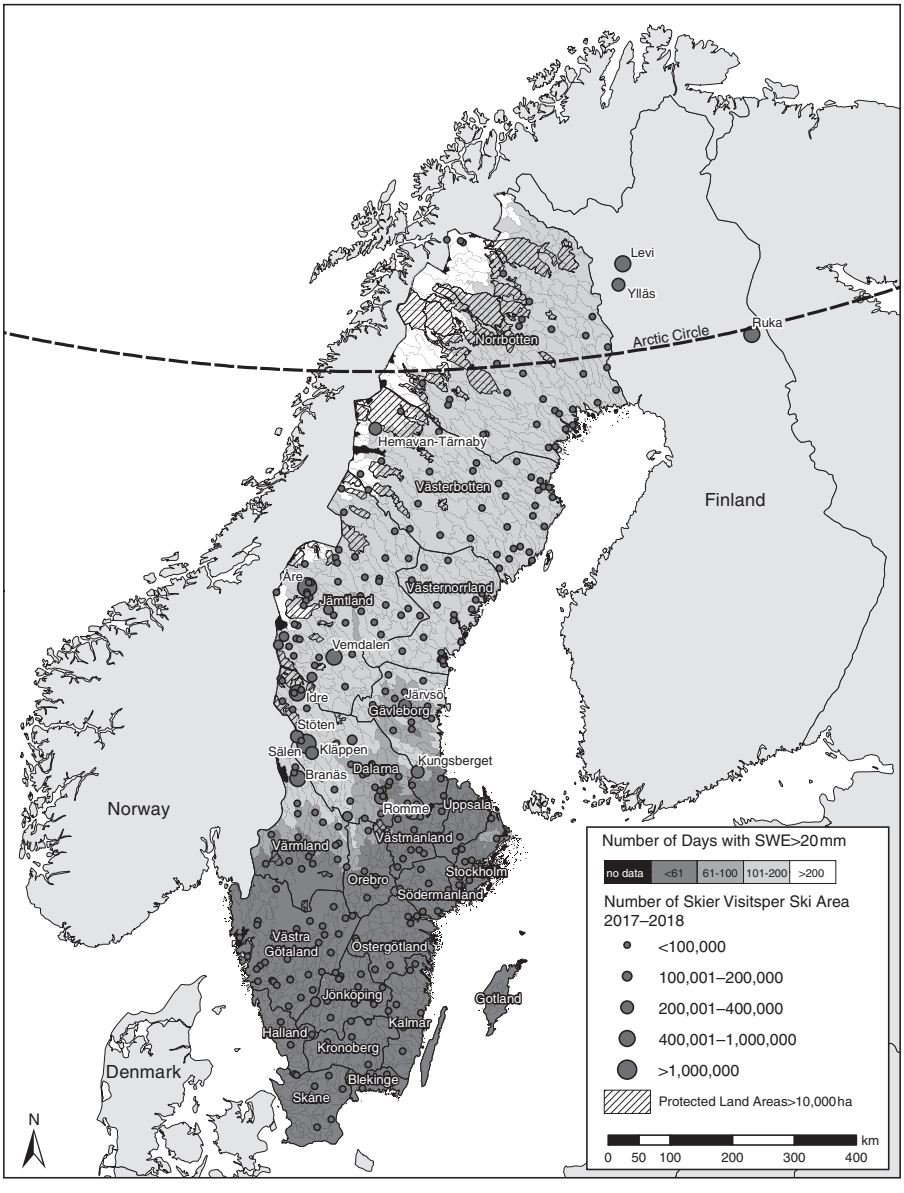
> After the year 2040, the situation for winter tourism looks more serious. The high season weeks around Christmas and New Year, as well as Easter, will be "green" to an increasing extent. As far as we can judge, this trend will increase towards the end of the century. A structural shift of winter tourism towards areas that are more assured of having snow in the northernmost parts of the country may then become necessary. (Swedish Commission on Climate and Vulnerability, 2007, p. 395)

The above report has been one of the first documents to shape Swedish political discourse on climate change adaptation. It was followed by other assessment reports (Andersson *et al.*, 2015; Sjökvist *et al.*, 2015) undertaken by the Swedish Meteorological and Hydrological Institute, altogether forming the backgrounds to the recent adoption of the National Climate Change Adaptation Strategy (Regeringen, 2018) as well as regional and sectorial action plans. The strategy document stresses the challenges winter tourism could face due to changing snow conditions (p. 40) while the underlying assessment by Andersson *et al.* (2015), the sectorial note by the Swedish Knowledge Centre for Climate Change Adaptation (2017), and Sweden's Seventh National Communication on Climate Change (The Swedish Environmental Protection Agency, 2017) mention potential indirect benefits of climate change through spatial substitution due to the relatively worsening snow reliability in the Alps. Action plans of the two northern counties, Norbotten (Bredefeldt, 2014) and Västerbotten (Länsstyrelsen Västerbotten, 2014), on the other hand, highlight possible future technical adaptation needs such as continued snowmaking and placement of ski slopes at north-facing and higher elevations. The counties expect shorter but more intensive ski seasons, too, especially because of deteriorating snow conditions in the southern parts of the country. In the case of Västerbotten, it is noted that mountain regions are already positively affected in this respect (p. 30).

In addition to these governmental reports on the possible need/opportunity for a "regional/structural shift", the industrial discourse at the highest level sounds more confident. The Swedish Ski Areas Industry Association stresses their climate resilience for the first half of the century, while acknowledging the increased snowmaking requirements and their financial and environmental burdens (SLAO, n.d.). However, there is very little scientific research done for ski tourism in Sweden (Demiroglu *et al.*, 2013), compared to the Alps and North America, to reach a conclusion on the country's overall and intraregional vulnerability. Nonetheless, preliminary visualisations (Figures 1–3), based on projections from SMHI (2015), confirm the comparative climatic advantage that Sweden may hold, especially along the mountain range where topographic conditions are also favourable for ski resort development. A future retreat of reliable natural snow cover, i.e. a minimum snow water equivalent (SWE) of 20 mm for at least 100 days per season, towards north and inlands is most apparent.

The projected snow reliability, together with less extreme cold events, may imply a position for Arctic Sweden as the last resort to the survival of ski tourism, as well as making ski tourism the last resort to socioeconomic development in the peripheral North, in the extreme sense. Yet in order for this equation to hold true, other factors such as limited winter daytime, backyard effects, accessibility and land use conflicts need to be taken into consideration.

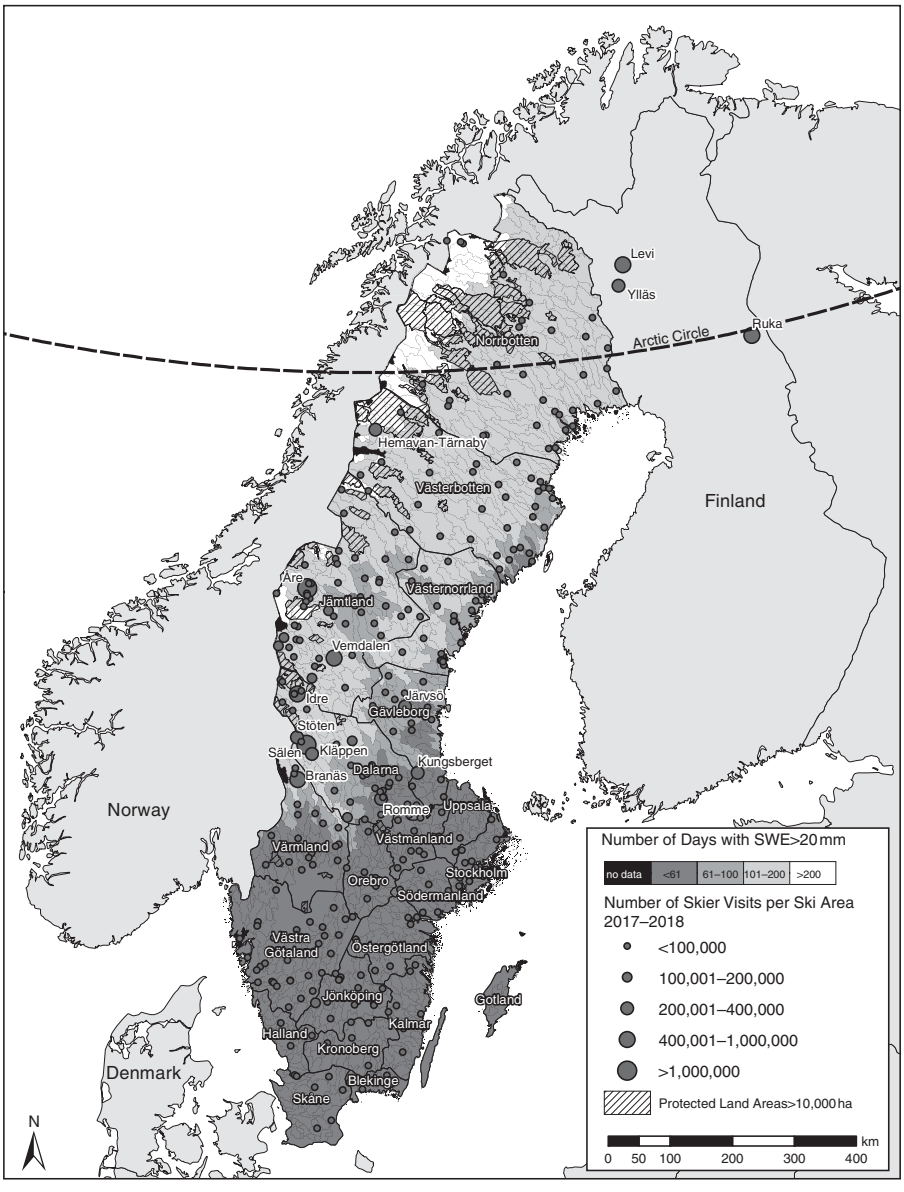
Figure 1 Snow reliability of downhill skiing areas in Sweden 1991–2013



Sources: Adopted from Demiroglu *et al*. (2019), data sources: SMHI (2015); SLAO (2018); Suomen Hiihtokeskusyhdistys ry (2018); Lantmäteriet (2019). The final figure is Authors' own work

At the Arctic latitudes, winter daylight can vary considerably in short distances during the ski season. For instance, while Levi experiences complete darkness around Christmas time, Ruka, which is on a latitude just 200 km south of Levi, gets 2–3 h of daytime (Figure 4). This may explain why physically large ski areas such as Dundret (Norrbotten) do not perform as good as their southern competitors or Riksgränsen, the northernmost ski area in Sweden, focusing on the spring season. Nonetheless, these Swedish ski areas and any proposal around their potential surroundings could benchmark Levi and Ylläs, who anyway have satisfactory business performances during the dark periods. However, we should also note that the ski resorts of Arctic Finland do not face a strong competition from the rest of their country, while Arctic Sweden needs to cope with strong conventional players in Dalarna and Jämtland.

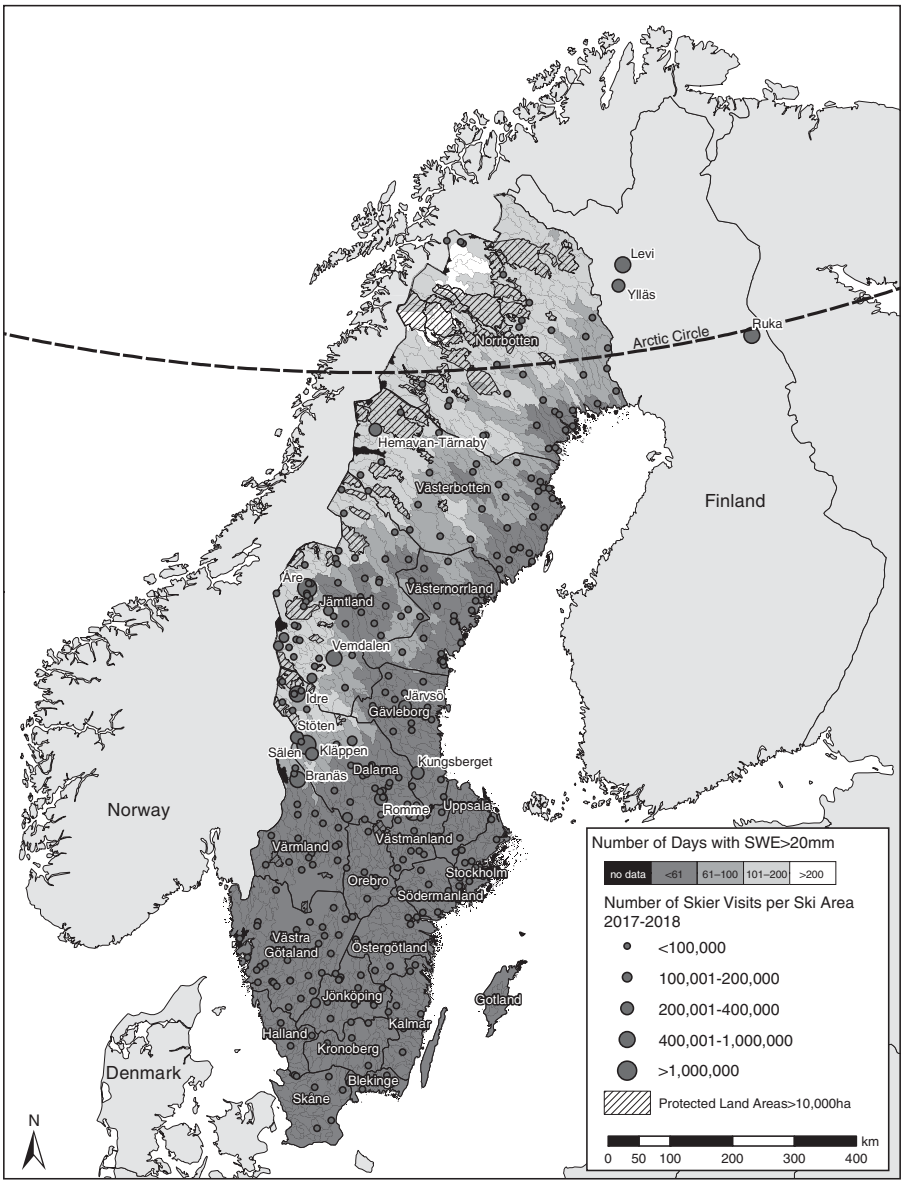
Figure 2 Snow reliability of downhill skiing areas in Sweden 2021–2050 (RCP8.5)



Sources: Adopted from Demiroglu *et al*. (2019), data sources: SMHI (2015); SLAO (2018); Suomen Hiihtokeskusyhdistys ry (2018); Lantmäteriet (2019). The final figure is Authors' own work

Deteriorating snow cover in the urbanized coastal areas, where the immediate market exists, may lead to a reduced "backyard effect" of urban snow that drives ski trip decisions, as empirically it is realized that the weather conditions at the origins are as important as the destination conditions (Hamilton *et al.*, 2007). Whereas a newly developed airport, albeit on the Norwegian side of the border, could compensate such loss by bringing more extra-regional visitors at least to Hemavan-Tärnaby area, the region also faces the risk of rebound effects, e.g. entailed by mitigation-oriented carbon tax or common awareness regarding impacts of travel emissions for climate change (Demiroglu and Sahin, 2015), may discourage long haul travellers. Indeed, the region's largest ski resort operators already claim that they have observed a decline in visitation because of a more expensive air fare (Boström, 2017), whereas a decade ago they had been

Figure 3 Snow reliability of downhill skiing areas in Sweden 2069–2098 (RCP8.5)

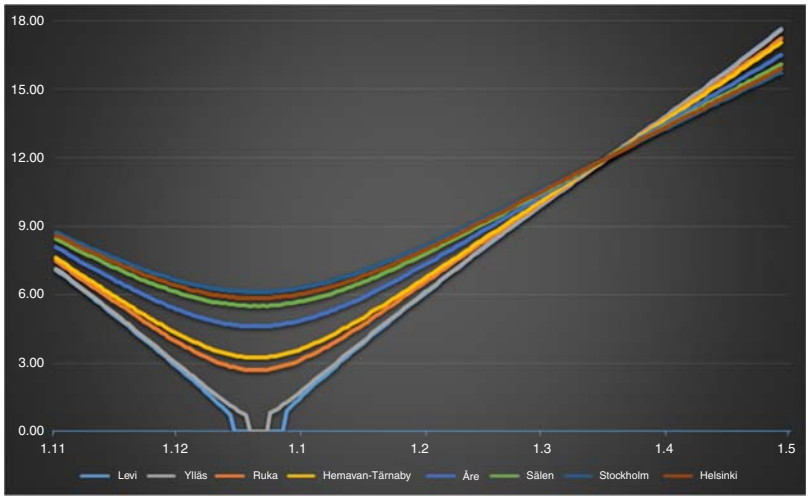


Sources: Adopted from Demiroglu *et al*. (2019), data sources: SMHI (2015); SLAO (2018); Suomen Hiihtokeskusyhdistys ry (2018); Lantmäteriet (2019). The final figure is Authors' own work

expecting major gains from climate change by counting on their superior snow reliability (Brändström, 2008). Today, they engage in efforts to position their resort as climate friendly focusing their efforts on the development of a railroad connection (Hemavan Tärnaby Turistbyrå and Visit Hemavan Tärnaby AB, 2018).

Besides the existing ski areas, in Arctic Sweden potential areas with more than 200 days of natural skiable snow cover are available even by the end of the century but so far not developed. The two major zones, in this respect, are in extreme northwest, around the Kebnekaise Massif and the Padjelanta and Sarek national parks, both of which constitute a major part of the UNSECO World Heritage Site – Laponia. The fact that most of this potential

Figure 4 Ski season (November–April) daytimes at selected ski resorts in Finland and Sweden



Source: Authors' own

ski tourism development zone intersects with established protected areas (Figures 1–3) signals future conflicts among the public opinion on and central governance for environmental protection, local needs of regional development and tourism entrepreneurship (Stjernström and Lundmark, 2009; Müller, 2013b). These regions are not only protected for their ecological uniqueness but also as important attractions for nature-based tourism. Even in the context of ski tourism, such environments are highly appreciated with high per tourist spending (Berbeka, 2018), yet with rather low aggregate receipts for their regions, compared to the potential from resort-based mass ski tourism. The situation gets even complex when one takes into account the traditional livelihoods of the locals and especially the indigenous Sami. Previously, conflicts resulting from Sami rights to reindeer herding, fishing, hunting and harvesting were reported during the expansion plans for Sälen and Idre ski resorts (Dalarna) into the Städjan National Park (Vail and Heldt, 2000). An inclusive and sustainable trajectory involving indigenous and other local stakeholders, as observed in Ylläs, where the local networks from the bottom-up rejected an urban-like development path, as pursued by their northern neighbour, Saariselkä ski resort, and instead opted for a steady growth (Kulusjärvi, 2017), could be targeted.

Conclusion

The climate change-led publicity of the "North" as the endangered "Pole", and more recently the "Arctic", has brought new opportunities to the Sweden's North to promote itself as an emerging, as well as a "last chance", destination. In the future, such market awareness could be combined with the relative climate resilience of the region's (potential) ski areas, as partly highlighted by this study, to foster regional development. Major challenges remain with destination governance issues and land use conflicts in search for the sustainability of this quest. In the light of these parameters, future research should, first, assess natural and technical snow reliability of existing and all potential ski areas in Sweden and within its competitive set extending to all the Nordics and the Alps, then, incorporate adaptive capacities of the suppliers but especially the likely substitution tendencies of the consumers, and finally, evaluate the overall situation in terms of the regional development needs.

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