Multidisciplinary and Participatory Approach for Assessing Local Vulnerability of Tourism Industry to Climate Change

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ABSTRACT The major part of the attractiveness of Nordic tourism relies on natural resources and features such as the landscape, the flora, the fauna and the four seasons. Lately, it has been predicted that climate change will alter these preconditions of nature-based tourism destinations, which may have severe consequences for the tourism industry. Nevertheless, tourism is also bound to many other societal changes that may influence the economics and the development of peripheral communities dependent on tourism and bring new challenges in maintaining their vitality. For assessing these challenges and potential adaptation measures a multidisciplinary and participatory approach was developed in the EU LIFE+ project VACCIA (Vulnerability Assessment of ecosystem services for Climate Change Impacts and Adaptation) Action 12: Tourism. The aim of this article is to evaluate this approach for assessing the local vulnerability and adaptation of tourism to the challenges of climate change in two tourism municipalities of Northern Finland.

KEY WORDS: climate change, vulnerability assessment, adaptation, tourism, Northern Finland

Introduction

The Arctic and sub-Arctic regions are predicted to face climate change of a higher magnitude than the global average (IPCC, 2007). Progress in future climate modelling has led to the development of more regional and local climate estimates emphasising local...
changes especially in the Arctic (Acia, 2006; Carpenter, 2005). This downscaling of
global environmental change (GEC) was the starting point for the project “Vulner-
ability Assessment of ecosystem services for Climate Change Impacts and Adaptation”
(VACCIA) coordinated by the Finnish Environment Institute and funded by the Euro-
pean Union. The EU Life+ VACCIA consortium project was built by the existing
Long-Term Socio-Ecological Research network (LTSER). The original project plan
was based on the hypothesis that climate change cannot be avoided. Therefore,
weight was put on developing methodologies for assessing vulnerability, transferring
knowledge and building adaptation capabilities rather than concentrating on mitigation
even though its importance is high especially in the context of tourism (see the debate
by Weaver, 2011 and Scott, 2011). The project aimed to develop adaptation measures
that are grounded on the understanding of (i) the likelihood of change, (ii) the vulner-
ability of specific sectors to predicted change, and (iii) the knowledge production of
local-scale possibilities for adaptation (Bergström, Mattsson, Niemelä, Vuorenmaa,
& Forsius, 2011). It was acknowledged there was a need for contriving methodology
and tools, which would have connected the global and regional scale climate change
scenarios with local practices.

This paper is based on the VACCIA project (Forsius et al., 2013) and its Research
Action 12, which focused on nature-based tourism in Northern Finland utilising the
ecosystem services approach (Carpenter, 2005; Costanza et al., 1997). From this theor-
etical point of view, snow and other winter conditions, for instance, are considered as
ecosystem elements the winter tourism communities rely on. In the categorisation of
ecosystem services, nature-based tourism is part of cultural ecosystem services
(Carpenter, 2005).

The tourism research literature on climate change, adaptation, mitigation and vulner-
ability has expanded quickly during the past decade (Becken, 2013) and as the con-
structive debate between Weaver (2011) and Scott (2011) has shown, the climate
with its uncertainties provides a major challenge for the viability of societal settings
and sustainable management of tourism. Climate change predictions for Finland indi-
cate, for example, a $7 \pm 5\%$ increase in precipitation and a $2 \pm 1\,\text{°C}$ increase in air
temperature by the period 2020–2049 (Figure 1) (Perrels et al., 2010), and respectively
$5–40\%$ and $2–7\,\text{°C}$ by 2080, depending on the climate model and scenario used (Jylhä
et al., 2010). Furthermore, planned adaptation to these changes is accepted as a major
target in order to minimise the harm and maximise the benefits to society (Acia, 2006;
IPCC, 2007; White Paper, 2009).

The Research Action focused on evaluating the local vulnerability of tourism and
assessing the potential impacts and adaptation measures to climate change in two
tourism municipalities in Northern Finland predefined by the LTSER network, where
winter tourism and nature-based activities are a mainstay of the local economy: Kuusamo with its tourism resort Ruka and Sotkamo with Vuokatti (Figure 1). Respectively for Kuusamo in 2010 and Sotkamo in 2009, the direct economic income from tourism was 91 and 50 million euros, the total economic income with multiplicative effects was 115 and 70 million euros, the number of jobs created in the tourism industry was 674 and 426, and 816 and 486 jobs were generated by tourism (Kauppila, 2011,
2012). The most important economic vulnerability is the fact that 17% of the overall
turnover of the economies and 21% of the jobs in Kuusamo were accounted for by
tourism with multiplicative effects. In Sotkamo, the corresponding figures were 19% and 19% (Kauppila, 2011, 2012).

Climate change adaptation and direct involvement of various stakeholders are needed in the vulnerability assessment process (Salter, Robinson, & Wiek, 2010). According to Smit and Wandel (2006), the main aim of participatory vulnerability assessment (PVA) is to identify feasible and practical adaptation strategies in a community. The PVA approach presented in this paper is a multiphase methodological framework emphasising the participation of diverse disciplines and stakeholders and the utilisation of diverse climatic and meteorological, economic, societal and health data. It reflects the diverse societal sectors which participate in, influence or are affected by tourism, including local healthcare and security services. In comparison, Moreno and Becken (2009) have developed a similar kind of vulnerability assessment methodology for the tourism industry but not as interactive as the present one.

This paper critically evaluates the applied PVA approach in the context of Finnish winter tourism by discussing the conceptual grounding of the study and describing the research methods and processes before summarising the main results of the multidisciplinary research process. Nevertheless, the main aim of the article is to evaluate the benefits and challenges of the applied approach and to discuss the way to improve the method further. The evaluation is based on the hypothesis that assessment requires multidisciplinary co-operation and co-development of knowledge with stakeholders with a two-way iterative process of dialogue and exploration of “what-ifs” (Hukkinen, 2008; Salter et al., 2010). Moreover, when the topic of climate change adaptation frequently...
appears on the EU policy agenda, member states, stakeholders and “publics” call for policy-relevant, meaningful and applicable research results for local communities. The questions to be answered include: Does the vulnerability assessment facilitate stakeholder involvement and a two-way iterative process of dialogue in the different phases of the research process? Is the assessment successful in enhancing the knowledge basis and other capabilities for adaptation?

Conceptual and Methodological Background

Tourism is considered to be one of the most vulnerable sectors in view of climate change. Indeed, climate is a major driver of tourism and plays an important role when determining a tourist destination: Hamilton and Lau (2006) have underlined the role of the climate in the destination image – decisive element in destination choice, and Becken and Hay (2007) have highlighted the particular importance of the temperature in the destination choice. Tourism is always part of the local community and economy in the sense that it needs services and affects local security and healthcare conditions. For example, the increase in the number of weather-related accidents can be connected to both increasing traffic and climatic variations (Haines, Kovats, Campbell-Lendrum, & Corvalan, 2006; Luukinen, Koski, & Kivelä, 1996; Martens & McMichael, 2002). The need for new methods for assessing and addressing climate change context-sensitively and proactively among developers, enterprises and local communities in diverse tourism destinations is evident. The call for more participatory study methods has been necessary in tourism since the early stages of climate change-related tourism research (Abegg, König, Bürki, & Elsasser, 1998; de Freitas, 2005), while there has also been a shift in vulnerability assessments from focusing mainly on climatic factors to including social dimensions, and from quantitative to qualitative assessment (Carter et al., 2007; Jonsson et al., 2012). The assessment method presented in this article contributes to these needs and its approach can be labelled as “participatory integrated vulnerability assessment” (Jonsson et al., 2012) utilising knowledge from a wide range of academic disciplines, sectors and stakeholders.

Key term to various interconnected research fields, such as food security (Bohle, 2001), poverty and livelihoods (Prowse, 2003), and climate change (Downing et al., 2001), the concept of vulnerability can be confusing (Costa & Cropp, 2012). It has been equated to such concepts as susceptibility, adaptability, fragility, risk, exposure, sensitivity, coping capacity and criticality (Füssel & Klein, 2006). The diversity of definitions can be seen primarily as a consequence of the term being used in different policy contexts, referring to different systems exposed to different hazards (Füssel, 2007). When vulnerability assessments are increasingly used as tools for supporting policy making, new confusion is introduced. While stakeholders expect vulnerability studies to deliver concrete solutions for coping with specific threats, scientists may use the concept of vulnerability to understand the general principles of a system (Füssel & Klein, 2006).

However, in recent GEC research, the key conceptual tools for studying the dynamics of socioecological systems have emerged around the concepts of resilience, vulnerability, adaptive capacity and adaptation (Adger, 2006; Folke, 2006). These concepts underline the adaptive nature of human societies via such cultural means as
applying new technologies and behaviour, but they also refer to the unequal possibilities for adaptation of societies, livelihoods and individuals (Alwang, Siegel, & Jørgensen, 2001; Smit & Wandel 2006).

Interrelated, these concepts reveal the dilemmas of change from different perspectives. Indeed, resilience means that every system, including humans, can absorb a certain amount of external stresses while still being able to restore its functions (Folke, 2006), while vulnerability refers to a threshold where systems lose their integrity (Adger, 2006; Nuttall, 2012). Adaptation, on the other hand, shows the adjustment of the original system to better fit to new conditions, and adaptation measures concern interventions that could reduce the vulnerability. In this paper, the focus is on cultural and societal adaptation, which is dependent on available adaptive means, including educational, economic and societal aspects, but also on political requisites in a certain context. This dilemma regarding the preconditions of adaptation is referred to by the concept of “adaptive capacity” (Smit & Wandel, 2006).

PVA frameworks related to climate change adaptation have been developed recently (Ford & Smit, 2004; Jonsson et al., 2012; Lim, Spanger-Siegrfried, Burton, Malone, & Huq, 2004; Vásquez-León, West, & Finan, 2003), but not so much in relation with tourism. Climate-related tourism research dates back to the 1960s when the dependence of tourism on local climatic factors started to become a centre of interest for researchers (Gössling & Hall, 2006; Kaján & Saarinen, 2013; Tervo, 2008a). The earliest climate change studies focusing mainly on impacts were conducted in the 1980s, but it was not until the beginning of the 21st century that climate change studies became more common in tourism. Studies assessed, for instance, the impacts of climate change (Abegg et al., 1998; Agnew & Viner, 2001), then investigated adaptation methods (Aall & Høyer, 2005; Scott, McBoyle, & Mills, 2003) and later on focused on mitigation activities of tourism (Gössling & Hall, 2008; Peeters, 2007; Scott, 2011; Weaver, 2011). For example Abegg et al. (1998) and de Freitas (2005) have stated out the need for developing more interactive and comprehensive research methods in tourism. Moreno and Becken (2009) have proposed a vulnerability assessment which includes five steps that aim at increasing tourism destination managers’ understanding of the vulnerability of tourism to climate change and the development of appropriate adaptation methods. Their methodology is, however, developed mainly for coastal destinations, and it is not a participatory approach. On the other hand, even if some studies have used participatory approaches (Hasse & Milne, 2005; Turton et al., 2010), they have not considered the climate scenario exercises.

Indeed, this vulnerability assessment approach, even if it is based on qualitative methods, utilises some ideas of the quantitative modelling approach of de Freitas (2005): while de Freitas divides the scenario and the sensitivity assessment approaches, this one aims at gathering both points of view in order to develop a comprehensive picture of potential futures of tourism-dependent communities and their adaptations.

The vulnerability assessment approach presented in this article combines the conceptualisations of Smit and Wandel (2006), Füssel and Klein (2006) and Keskitalo (2008, 2010) as well as the workshop-based participatory future studies discussed, for example, by Hukkinen (2008) which emphasise the co-production of knowledge throughout the assessment. Vulnerability is understood to include an
external dimension represented by the concept of “exposure” of a system to climate variation, as well as an internal dimension comprising its “sensitivity” and “adaptive capacity” to these stressors. The assessment began by evaluating the current overall sensitivity, the current sensitivity specifically to climatic factors and the current adaptive strategies. From this basis the work proceeded to the assessment of the future exposure to climatic changes and of potential adaptive strategies as well as of the potential risks and critical factors regarding adaptation. According to Hukkinen’s formulation (2008, p.102), the emphasis of the scenario building does not predict any specific future but opens discussions on multiple ones on a “what if” basis. The overall aim enhanced the cognitive adaptive capacity of the participating stakeholders to face various future challenges (Nuttall, 2012). The beforehand scenarios were presented in workshops in the form of short future narratives (Figure 2) including information on various interrelated potential future developments and accessible for the multi-audience workshop conditions (Heikkinen, et al., 2003; Hukkinen 2008).

**Flying to Ruka in 2020s (A2-scenario)**

International mitigation of the climate change has failed, and energy consumption in Finland has increased. In a decade, the share of electricity produced by nuclear power has increased from 20% to 35%. In an effort to increase the domestic production of nuclear energy, a new uranium mine has been opened in Kausamo. Air travelling has become more expensive due to increasing gasoline prices, but the use rate of the local airport has increased with the aid of subsidies paid by the government. Due to the relatively secure snow conditions, an increasing number of tourists is selecting Kausamo instead of the southern ski resorts as their Christmas holiday destination. Local travel is arranged by car rental, which is one of the fastest increasing tourism businesses. However, the bulk of the tourists is unused to driving in winter conditions, which causes a lot of accidents during the more prevalent frost and thaw cycles during the winter. In general, the major Finnish tourism attraction has emerged to be safety, because in other parts of the world tourism has become one of the major targets for international terrorism.

The shortened snowy period has congested the winter tourism season, and the needed extra seasonal workers come by first charter flights from southern Finland. The tourism facilities are built for the seasonal winter tourism peaks, and for most of the year they are empty. Year-round tourism has not developed, and three fourths of tourist visits in Kausamo take place between December and April with the usual stay being a few days. The number of daily visitors in the Oulanka National Park has also increased, and routes are being built for mechanised tourism safaris. In general, cross-country traffic in forests has increased because river and lake ice are no longer secure for cross-country movement.

Municipal healthcare in the Kausamo region has been privatised, and health services for tourists are provided by seasonal doctor’s clinics. Only basic healthcare services are provided on a year-round basis, and the special services needed by the ageing population are arranged by private companies in the coastal cities. During the winter tourism season special doctoral services are needed, because a lot of accidents happen to tourists in snow activities in which most tourists do not have previous experience. Another constant worry is the common threat of global epidemics, which spread rapidly due to the frequent long-distance travelling by wealthy people.

Figure 2. An example of a future narrative.
Research Methods and Material

This vulnerability assessment for tourism utilised different scientific approaches and data from climate science, health research, cultural anthropology, sociology, geography and biology. Figure 3 shows the different stages as well as the methodology and material used in the three-year project.

The Data Compilation

The purpose of the data compilation was to draw a picture of the climatic variations and the situation of tourism in the municipalities of Kuusamo and Sotkamo including the

![Diagram](image_url)

Figure 3. Participatory integrated vulnerability assessment approach.
socioeconomic and health aspects. It consisted of gathering statistical data as well as conducting interviews and questionnaires.

The economic statistics investigated the importance of seasonal variations for tourism and its economic impacts in these municipalities. The study results formed the starting point for assessing the general vulnerability of the communities to climate change: the more substantial the nature-based tourism industry is, the more vulnerable the economic base of these communities is to climate change. It is noteworthy that along with the absolute quantity of the tourism phenomenon, the relative proportion of the industry indicates the contribution of tourism to the local economy. The economic impacts of tourism were measured by applying a monitoring system (Kauppila, 2011, 2012) mostly based on up-to-date data provided by Statistics Finland as well as certain parameters from previous reports (Juntheikki, 2002; Juntheikki & Korhonen 2005).

The weather and climate information was based on data gathered from the two nearby stations of the Finnish Meteorological Institute (FMI) in Kajaani and Kuusamo from 1959 to 2010. The daily data covered such variables as average temperature, minimum and maximum temperatures, precipitation and snow. The statistical data treatment showed the climate variability and defined some local climatic trends during the last half a century. It consisted of evaluating, for instance, the absolute deviation from the mean of daily minimum temperatures below −22° C, mean air temperatures in 30-year increments, permanent snow cover above 20 cm and average snow depth per decade for the winters 1960–2010. In addition, the weather and climate data was used to study injuries related to slippery conditions in Sotkamo. In order to define the slippery periods, hourly data obtained by the FMI between 2006 and 2009 was used. The attention was focused on the number of accidents among healthcare visits and on the co-occurring weather conditions during a 33-hour interval.

The information regarding climate change, health and security was an important aspect of the study. The question was integral to many phases of the study in both Sotkamo and Kuusamo. Special health-related information was gathered by using a questionnaire from healthcare personnel, which comprised four open-ended topics: tourists as patients, types of health outcomes, weather and climate change and the future of the municipal healthcare sector. Targeted expert interviews were conducted with chiefs in healthcare centres and security responsible personnel in the police and the fire brigade. Background statistics concerning the use of healthcare services in both Kuusamo and Sotkamo and data from the first aid personnel from the emergency slope service in Kuusamo were also utilised.

In order to understand local experiences on climate change and its effects on tourism, thematic interviews with tourism entrepreneurs, municipal employees and regional tourism developers – all representing different perspectives on the topic – were conducted in Kuusamo and Sotkamo. For determining the importance of climate change in local communities, climate change was used only as one theme among others as the current situation of the local and regional tourism and its expected future. The interviews were usually conducted by one interviewer at the interviewee’s work place, and were recorded, transcribed verbatim and analysed using reflexive ethnographic reading (Davies, 2003) by utilising the N-Vivo software programme.
Building the Narratives

The main method of sharing possible futures was the writing of short future narratives, which were developed through a series of workshops. The final set of future narratives (Figure 2) was preliminarily formulated to resemble the IPCC scenario families A2 (“business-as-usual”), A1B (“balanced”) and B1 (“extremely optimistic”) originally presented in the Special Report on Emission Scenarios (2000). First, the future trends were derived from the Millennium Ecosystem Assessment (Carpenter, 2005), IPCC reports (IPCC, 2007) and the Long-Term Climate and Energy Strategy of Finland (Pitkänen aikavälin ilmasto- ja energiastrategia, 2008). Signals of change mentioned or referred to in the interviews, stakeholder meetings or workshops were also collected from the national and regional tourism strategies, government reports and societal discourses dealing with, for instance, the use and legislation of national parks. Their appearance was crosschecked in the research material to ensure that the chosen premises would have been relevant from the local perspectives. Some weaker signals of change as local worries, stated possibilities and limitations or recognised local trends were assessed and largely derived from the above-mentioned qualitative research material. Others were gathered from other researches (Saarinen & Tervo, 2006; Tervo, 2008b), newspaper articles and other media discussions.

Participatory Approach

The basic participatory work consisted of stakeholder meetings, “vulnerability and the future” workshops and local presentations allowing feedback from local stakeholders and decision-makers. In the stakeholder group meetings in Kuusamo and Sotkamo, preliminary results were presented along with weather observations and temperature and precipitation scenarios produced by the FMI to 94 participants. Possible futures for tourism were sketched in workshops held in both destinations. The final project scenarios included the considered adaptation measures and mostly focused on the desired outcomes after successful adaptation. The last set of participatory efforts included the presentation of research results and discussion in a general meeting of the municipal councils of Kuusamo and Sotkamo (Heikkinen, Kauppila, Lépy, Ponnikas, & Rautio, 2011; see Figure 3).

The workshops were held in two rounds in both research areas. The first workshops took place in October 2009 in Kuusamo and in November 2009 in Sotkamo and were, respectively, attended by 16 and 11 participants – mainly local tourism entrepreneurs, municipal and state officials, tourism developers and representatives from the municipalities’ social, healthcare and security sectors, and by 7 and 5 researchers. The future narratives were introduced to the participants who discussed in workgroups the whole day before presenting their results in a common debate.

The second workshops were organised at the beginning of 2010 in the same way as previously (working groups, common debate) with participants representing the same organisations. The main idea was to elaborate the way tourism in Kuusamo and Sotkamo could adapt to the changing climate and the choices that need to be made. Between the workshops the researchers wrote two alternative future narratives based on the material collected for this research: one based on the A2 (“business-as-usual”)...
scenario and the other one based on the optimistic B1 scenario focusing more on the ideals of sustainable development (SRES, 2000).

Both scenarios differ from each other in their response to climate change, and particularly to the way the municipality and local tourism react to winters with less snow and ice cover. For example, the A2 scenario concentrates on creating energy-demanding artificial winter circumstances and the B1 scenario focuses on finding alternative outdoor services for tourists when there is no snow and on developing all-year tourism.

Local Complexities of Adaptation

In Northern Finland, regions and resorts where tourism is based on ice and snow-related activities – cross-country and downhill skiing (Figure 4), snowmobiling, and husky and reindeer safaris – are more vulnerable to climate change than summer-oriented destinations. About two-thirds of domestic tourist overnights were accumulated between October and April in Kuusamo in 2011 as well as in Sotkamo in 2009 and, respectively, almost 85% and over 70% of international tourist overnights (Kauppila, 2011, 2012). In both communities nature-based tourism is important but vulnerable to changes of winter conditions, such as the shortening of the season (Heikkinen et al., 2011; Kauppila et al., 2011). The treatment of the climate and weather data has not shown any significant trend even though the last two decades have been affected by a diminution of snow thickness and season, and have recorded fewer days with minimum temperatures below −20°C (Heikkinen et al., 2011).

Figure 4. Ski resort centre of Vuokatti, Sotkamo (photo by Élise Lépy).
The healthcare personnel \((n = 14)\) and health and security experts \((n = 4)\) emphasised that the number of tourists as patients in the public healthcare system has significantly increased: about one-third in the summer and even more during the winter season. Indeed, there is a remarkable increase in injuries during wintertime – sprains, strains and fractures caused by slippery conditions – and it mainly concerns Finnish junior males and Russian teenagers – Russian people representing the largest foreign group of tourists, which causes language problems and administrative workload due to differences in healthcare insurance systems. In the future, the number of patients was estimated to remain at least at the present level, but with a higher amount of older and sicker tourists. The vulnerability of healthcare and security sectors will then increase with weather variations and the shortening and crowding of tourism seasons.

Additionally, tourism entrepreneurs and developers disclosed the complexity of the cross-country skiing, husky and reindeer safari trails when long and warm autumn postponed the ice formation of waterways causing problems of trail relocation on land due to the high amount of private landowners. They also noticed the strengthening of the winds, which posed a risk in freezing conditions. Unfortunately the FMI did not provide statistics of wind conditions requested by entrepreneurs and ended in 2000 local snow measurements – another indicator with strong local interest.

In the workshop discussions, the majority of the participants voted for neither the “business-as-usual” A2 nor the “greener” B1 future scenario. They emphasised the need for new and innovative outdoor activities for snowless weather conditions as well as for enhancing the possibilities for artificial winter circumstances. Sustainable solutions posed the problem of the energy production and cost and the reorganisation of services for shorter winter seasons with similar or increasing number of customers. Also, the unpredictability of weather conditions and the uncertainty of ice and snow cover formation in the wetlands and water bodies were raised as a major challenge. Changes in summertime were predicted as uncertain despite the increasing possibilities for warmer and longer season even though new threats on water quality were considered (Figures 5 and 6).

After presenting the results to the municipal councils and taking their feedback into consideration, the final vulnerability analysis was prepared on the basis of the concepts of current and forthcoming exposure, sensitivity and adaptation strategies (Smit & Wandel, 2006). The key results (Figures 5 and 6) were that the winter season was more affected by the weather variations than the summer season and that warmer temperatures and an increase in rain precipitation had been forecast. Both case resorts have already started to cope with the lack of snow by using snowmaking technology, stockpiling and, for example, installing a ski tunnel in Vuokatti. Future adaptive strategies could be based on improving technologies for generating artificial winter conditions and creating policies for sharing the increasing costs between the local industries, entrepreneurs and communities. The critical factors in this adaptation strategy are energy policies, the costs of the technological solutions and local success in adopting renewable energy production. The healthcare and security services are year-round tourism-related services, but they will be more vulnerable to climate variability during the wintertime. The temperature variability and zero point (frost and thaw) fluctuations may have important impacts on increasing the risk of car accidents in road...
traffic, reinforced by the higher number of drivers inexperienced with winter conditions. Although technical remedies have already been implemented to improve road safety, the prevention of the increase in road traffic as well as the distribution of information to customers could be part of the future adaptation strategies. On the other hand, water-based summer activities (Figure 7) might be sensitive to warmer water temperatures, and changes in the run-off may harm the water quality, increase cyanobacteria density and harm lake fish populations. Improvements in water purification could be one adaptation strategy.

Evaluation and Discussion

There is a fairly rich body of literature related to vulnerability to climate change (Füssel, 2007; Smit & Wandel, 2006). However, tourism as a coupled human-environment system with a high dependency on the natural environment has not been so abundantly addressed (Becken, 2013). This paper introduced a participatory methodology for assessing the vulnerability and adaptation possibilities of northern winter tourism destinations. During the assessment, it became apparent that for gaining a more holistic
understanding of the potential futures of tourism, even broader and more complex assessment methods should be developed. Particularly, the approach should be expanded to better recognise that tourism is a geographical system which consists of the region of origin, the region of destination and the routes connecting these. All of these should be included in the same assessment to gain a better understanding of possible outcomes in future. On the other hand, through the two case destination analyses, the applied approach highlighted tourism as a complex system which includes many different vulnerability situations, many of which are not solely connected to climatic or weather conditions (Hall & Higham, 2005). Therefore, vulnerability assessment benefits from various disciplines, stakeholders and data sources in order to obtain
feasible and applicable knowledge for the decision-makers and local communities to respond to the risks of climate change impacts and to assess opportunities for adaptation.

The applied methodology was successful in obtaining policy-relevant information of the local tourism communities’ vulnerability context and situations related to both climate change and societal changes. The results underlined that the adaptive capacity of local communities is shaped and constrained by social, political and economic processes at higher scales (Smit & Wandel, 2006). Although the specific results (e.g. the sensitivity of snow-based activities) did not contain any surprising new information, the complexities of climate change impacts and adaptation problems in practice became more obvious when global and regional-scale observations and scenarios of the climate sciences were downscaled to the local level. This helped the local stakeholders to consider the impacts of climate change on their activities and possible adaptation measures. The co-production of knowledge among the research team and stakeholders was enabled by using different kinds of data and methods: interviews, climate data and modelling, workshops, scenario exercises, questionnaires and statistics. In this way, not only the current sensitivity and adaptive strategies but also the potential future exposure to climatic stressors and adaptive strategies could be described and discussed more precisely than before the project. The results of the assessment informed the decision-makers about the wide range of complexities of possible, locally feasible and acceptable adaption measures. The results can be beneficial in formulating adaptation strategies for the winter tourism industry in Finland and elsewhere.

Figure 7. Rafting in Oulanka National Park, Kuusamo (photo by Tiina Suopajärvi).
Major challenges concerning the utilised PVA approach were related to (1) involving the relevant stakeholders and enabling a two-way process of knowledge making, (2) varying modes of background data and differences in reasonable spatial and temporal scales of science, planning and livelihoods and (3) qualitative/quantitative tensions in the assessment.

The first challenge was about the way to involve the relevant stakeholders in the assessment process. In the study cases, the participation of tourism entrepreneurs in the three-year research process was compromised due to a very tight schedule during the high seasons. Therefore, the views of tourism industry developers and officials were over-represented in the interviews and workshops, which probably affected the outcomes of the research. Hence, it can be questioned whether the organisation of a two-way iterative dialogue process with local stakeholders was successful. However, it can be claimed that the tourism industry developers are very well acquainted with the views and the normal modes of operation of the local tourism entrepreneurs in the studied communities and, therefore, most of the essential information was nevertheless obtained.

The second challenge concerned the varying modes of background data and differences in the time scales of climate science, planning and local tourism operations. When downscaling climate change impacts and adaptation to local scales and livelihoods, deficiencies or incompatibilities in data become evident. For example, regarding the case study on health aspects of climate change, it would be necessary to have more local weather data and detailed health records for researching the possible connections between injuries/accidents and weather conditions. One problem concerning the studied case was the lack of information about the time, place and circumstances of the accidents. In general, a major challenge for local adaptation studies concerns the fact that data usually comes from several, in this case two, local weather stations but the study concerns a considerably larger area. In addition, the minimum time frame of 30 years for the meteorological scenarios was too long for the entrepreneurs who were mostly concerned about the next year or the next few years for their adaptation strategies. On the other hand, the use of meteorological data and scenarios as background material led to discussions of local adaptation strategies. Another problematic issue is the small amount of statistical data (economic, health, etc.) dealing only with tourism.

The last challenge is related to the tension between qualitative and quantitative information in PVA and the epistemological differences between disciplines regarding the scientific information. This tension is present in climate change studies, especially where scientific or technical information meets with human values. Scientists coming from a social or natural science background may differently define and study the vulnerability and resilience/adaptation. Understanding the relevance of diverse data is not obvious even for researchers with different backgrounds due to problems in explaining their approaches. In this paper, the development of the sensitivity and adaptation measure tables (Figures 5 and 6) and the creative storylines was the means of combining different kinds of information and domains, and discussing the data and epistemological differences. Moreover, the development of creative storylines and scenarios for the future encouraged the non-academic participants to present their views and desires concerning future conditions and adaptation measures in their own terms.
The short future narratives mainly served in the workshop conditions as an orientating tool, which detached the audience from their everyday worries and turned their attention towards the future. Besides, the flexible work modes considerably differed from the state-of-the-art methods and data utilised in the mainstream of the climate sciences. A challenging and later criticised task concerned the arduous knowledge translation between scientists (dissatisfaction about the qualitative nature of the knowledge produced) and local actors (difficult assimilation of scientific information). Nevertheless, policy makers who are halfway between realms of science and tourism practitioners were satisfied.

To conclude, the applied PVA approach was successful in the co-production of knowledge among the research team and stakeholders by using various data sources and methods: interviews, questionnaires, climate data and modelling, statistics, workshops and scenario exercises with storylines. The results of the assessment successfully informed decision-makers about possible, locally feasible and acceptable adaptation measures. However, a major weakness concerned the low participation of tourism entrepreneurs, resulting in over-representation of the tourism planning/development sector. Finally, a conscious move was made in this study to emphasise the local applicability of the produced knowledge.

Acknowledgements

The LIFE+ instrument of the EU is acknowledged for financial support for the VACCIA project (project LIFE07 ENV/FIN/141). This paper was finalised with the support of the CLICHE (Impacts of Climate Change on Arctic Environment, Ecosystem Services and Society 2011–2015) project funded by the Academy of Finland under the Finnish Climate Change Adaptation programme, the DILACOMI (Different Land-use Activities and local Communities in Mining projects) project funded by TEKES, and the European Agricultural Fund for Rural Development. The Oulanka Research Station of Thule Institute and Jouko Inkero are also acknowledged for their administrative and infrastructural support as well as Dr. Kirsti Jylhä and the Finnish Meteorological Institute for providing climate data and scenarios. The authors would like to thank all the researchers and students of the VACCIA research team and all the local actors who have participated in the surveys, questionnaires and workshops in Kuusamo and Sotkamo. Finally, the authors would like to express their gratitude to the anonymous reviewers for their comments.

References

Assessing Local Vulnerability of Tourism


