

Nordia
Geographical Publications

Volume 41:2

Climate change awareness and adaptation
in nature-based winter tourism

Regional and operational vulnerabilities in Finland

Kaarina Tervo-Kankare

ACADEMIC DISSERTATION

to be presented with the permission of the Doctoral Training Committee for Human Sciences of the University of Oulu Graduate School (UniOGS), for public discussion in the lecture hall GO101, on 11th of September, 2012, at 12 noon.

Nordia
Geographical Publications

Volume 41:2

Climate change awareness and adaptation
in nature-based winter tourism

Regional and operational vulnerabilities in Finland

Kaarina Tervo-Kankare

Nordia Geographical Publications

Publications of
The Geographical Society of Northern Finland
and
The Department of Geography, University of Oulu

Address: Department of Geography
P.O. Box 3000
FIN-90014 University of Oulu
FINLAND
juho.luukkonen@oulu.fi

Editor: Teijo Klemettilä

Nordia Geographical Publications
ISBN 978-951-42-9909-4
ISSN 1238-2086

Uniprint, Suomen yliopistopaino Oy
Oulu 2012

Climate change awareness and adaptation
in nature-based winter tourism

Regional and operational vulnerabilities in Finland

Contents

Abstract	vii
List of original articles	ix
Foreword (alkusanat)	x
1 Introduction	1
1.1 Climate change challenges the future of tourism	1
1.2 Quest for a comprehensive understanding of adaptation in nature-based winter tourism	3
1.3 Structure of the thesis	6
2 The impact of climate change calls for adaptation in tourism	11
2.1 Impacts of climate change in tourism research	11
2.2 Changes in climate and weather	13
2.3 Adaptation needed throughout the tourism system	16
2.4 Nature-based tourism and sustainability in relation to climate change	18
2.5 Nature-based winter tourism in Finland	20
3 Tourism-environmental relations, environmental perceptions and decision-making	25
3.1 Tourism geography and tourism-environment relations	25
3.2 Environmental perceptions guiding human action and decision-making	27
4 Research material and methods	31
4.1 Multiple methods and data	31
4.2 Continuum of case studies, content analyses and statistics	37
5 Emerging awareness of climate change in the tourism industry	41
5.1 Emerging awareness of climate change and talk about local weather	41
5.2 Diversifying adaptation strategies	43
5.3 Operational and regional vulnerability and reliance on tourists' decision-making	45
5.4 Collaboration towards sustainability	48

6 Discussion and conclusions	51
6.1 Increasing awareness and adaptation before mitigation	51
6.2 Critical examination of adaptation methods' feasibility is needed	52
6.3 Factors behind adaptive capacity	54
6.4 The role of the media for climate change awareness and perceptions	56
6.5 Concluding remarks and future research prospects	57
References	61
Appendices	
Original articles	

Abstract

Climate change awareness and adaptation in nature-based winter tourism: Regional and operational vulnerabilities in Finland

Tervo-Kankare, Kaarina, Department of Geography, University of Oulu, 2012

Keywords: nature-based tourism, winter tourism, climate change, vulnerability, adaptation, adaptive capacity, environmental perceptions, Finland

The tourism industry is highly dependent on natural resources such as climate. Besides being one of the most important motivational factors for many tourists and thus guiding the flows of tourists, climatic conditions also determine and define the attractiveness and activities of tourism destinations and influence their accessibility. Therefore, changes in any climatic elements affect the industry's future and development. The impacts of projected climate change will have severe implications for the regional and operational structures of the tourism industry, especially in nature-based tourism which is considered one of the most vulnerable forms of tourism in relation to changing climate. In order to cope with these implications, to gain from the positive impacts and to avoid or lessen the negative consequences the industry has to implement adaptation measures while participation in mitigation activities is also required. For a fragmentary industry consisting of several stakeholders and varying types of attractions and destinations this may not be an easy task, especially when knowledge of tourism's interrelationship with climate change is still somewhat limited.

This thesis contributes to the knowledge of the relationship between tourism and climate change by examining climate change awareness and perceptions and the adaptation processes of the nature-based winter tourism industry. Finland, a country where tourism relies heavily on natural resources, and where snow-based winter tourism consists of a variety of activities, forms an interesting context for the study. The thesis assesses the factors affecting the development of climate change perceptions and knowledge among nature-based tourism stakeholders and the adaptation processes and adaptive capacity of the industry from the perspectives of supply and demand.

The study consists of a continuum of case studies that shed light on the vulnerability and adaptive capacity of the winter tourism sector in Finland. The research process has included several stages and both qualitative and quantitative data have been used to examine the multifaceted research questions. The empirical data include thematic interviews (two sets, realised in 2005 and 2009/2010) and two questionnaire surveys (one for tourism entrepreneurs and the other for tourists). Moreover, a variety of secondary data (e.g. statistics, development documents, newspaper articles) have been utilised during the research process.

The findings of the study indicate that the tourism industry's awareness and belief in climate change as a real phenomenon have increased and strengthened during the research process. The media and recent weather anomalies have affected tourism stakeholders'

perceptions of climate change. Consequently, the industry's attitudes towards adaptation have changed, but not significantly. Several interrelated factors affecting the industry's vulnerability and adaptive capacity were identified. Nevertheless, their importance varies depending on the scale of examination. In general, the geographical location, the nature and relative importance of tourism, and certain social aspects of tourism and the community (e.g. traditions of collaboration, attitudes and support of the community) together with the pursuit of sustainable and year-round tourism were considered central determinants guiding the future of tourism in a changing climate.

List of original articles

I

Saarinen, J. & K. Tervo * (2006). Perceptions and adaptation strategies of the tourism industry to climate change: The case of Finnish nature-based tourism entrepreneurs. *International Journal of Innovation and Sustainable Development* 1: 3, 214–228.

II

Saarinen, J. & K. Tervo * (2010). Sustainability and emerging awareness to changing climate: tourism industry's knowledge and perceptions of the future of nature-based winter tourism in Finland. In Hall, C. M. & J. Saarinen (eds): *Tourism and change in Polar regions: Climate, environment and experiences*, 147–164. Routledge.

III

Tervo-Kankare, K. (2011). The consideration of climate change at the tourism destination level in Finland: Coordinated collaboration or talk about weather? *Tourism Planning & Development* 8: 4, 399–414.

IV

Tervo, K. (2008). The operational and regional vulnerability of winter tourism to climate variability and change: the case of the nature-based tourism entrepreneurs in Finland. *Scandinavian Journal of Hospitality and Tourism* 8: 4, 317–332.

V

Tervo-Kankare, K., C. M. Hall & J. Saarinen ** (in press). Christmas tourists' perceptions to climate change in Rovaniemi, Finland. *Tourism Geographies* doi:10.1080/14616688.2012.726265.

* The author was responsible for collecting and analysing all data. The article was written in collaboration with Jarkko Saarinen.

** The author was responsible analysing all data. The survey was designed and the article written in collaboration with C. Michael Hall and Jarkko Saarinen.

Foreword (alkusanat)

Writing the foreword for a work that has taken quite long to prepare and write, and the writing process which has included so many phases, incidents and outputs of various people is not an easy task. Other sections of this thesis have in a sense been much easier to write as there are some guidelines to follow and examples to apply. Therefore it was no wonder that the melody and lyrics of Love Story kept returning to my head when I opened the file to write this foreword...”where do I begin”, “where do I start”?

First I have to say that writing a thesis is by no means the love story of my life. It has, nevertheless, formed an important part of my life. The path from my very first day in university to this final stage, the completion of my thesis has taken almost twelve years, more than one third of my life. When I entered the premises of the Department of Geography for the first time in September 2000 as a geography student, I did not have a clear picture of my orientation between the sub-disciplines of geography, nor did I know that I would still be here in 2012. But here I am, having succeeded in combining the two interesting aspects of geography – environmental issues and tourism – and making my living out of them. Not bad, eh?

The research process that was launched in 2005 when I started to prepare my master’s thesis in the FINADAPT project has since then included many phases. Most of my research contributing to this thesis has been funded by the Academy of Finland under the auspices of the FiDiPro programme ‘Human-Environment Relations in the North: Resource development, climate change and resilience’, but also the European Social Fund has participated in funding through the KeMMI project. The participation of diverse tourism stakeholders has been essential at all stages. I have been very lucky and happy to have so many tourism entrepreneurs participating in interviews and answering our surveys. Also other stakeholders and Christmas tourists have shared their views on climate change with me, for which I am grateful – the realisation of this study would not have been possible without them.

My three supervisors, professors Jarkko Saarinen, C. Michael Hall and Mark Nuttall have all had important roles in the research and writing process of this thesis; they have not only guided me through the processes of becoming a researcher and writing a thesis but acted, among others, as co-authors of my articles, as commentators and proof readers, as chauffeurs, as couriers, as entertainers, as chefs and as providers of accommodation services. Therefore, I wish to express my gratitude to all of you: Jarkko “the Merciful”, Michael “the Guru” and Mark “the Anthropologist”.

Both Jarkko and Michael have besides co-authoring also ghost-edited (as Michael says) my articles. Their comments and suggestions have been invaluable, and Michael’s “nativity” (Kaarina’s saying, means that someone is native speaker of English) has speeded up many writing processes when the need for outside (or paid) proof readers has been minimal. I sincerely hope that both Thule Institute and Department of Geography fully understand your true value in this sense! Mark’s and his family’s support and hospitality have been great, especially during my visit to the University of Alberta. I hope

you all have enjoyed the joys and pleasures – and sorrows – of supervising me. At least I have enjoyed my time being supervised by this magnificent trio. Hopefully the ending of this peculiar era is not the ending of all collaboration.

During the process, I have had the pleasure of getting to know, working with and learning from colleagues from different departments and institutes. I would like to thank all the staff in Department of Geography, in Thule Institute and in the Canadian Circumpolar Institute, the project members of KeMMI and Vaccia and the FiDiPro group for providing a friendly and encouraging environment for doing research.

With geography being my “home discipline” my closest colleagues can be found from the Department of Geography in Oulu. They, if anyone, deserve my gratitude for their friendship and support in various issues. With Katri Suorsa, we have become very close friends while sharing the ups and downs of becoming geographers since our very first day in the university. Tanja Löytynoja, Vilhelmiina Vainikka, Eva Kaján, Eeva-Kaisa Prokkola, Maaria Niskala and others have also engaged in several ways and offered their companionship outside the walls of this architectural miracle (a.k.a. our university). It has been a pleasure getting to know you and working with you.

Moreover, Jari Järviluoma and Jackie Dawson have done a great job as pre-examiners of this thesis. They both did their job in a relatively short time period and still managed to give many valuable tips to improve my work, for which I am very grateful.

The academic world is a tricky one in the sense that it follows you everywhere. It is not an eight-to-four day job that you leave behind when you close the door to your office to go home. No, quite the contrary, the working hours are somewhat muzzy and it is not uncommon for research-related issues to penetrate the poor doctoral student’s head in the weirdest possible places and moments. Therefore, also the people at home and friends outside the academy have co-experienced some of the joys of becoming a real researcher. Thank you for your participation.

Silläkin uhalla, että alkusanat venyvät luvattoman pitkiksi, haluan kirjoittaa loppuun muutamana sanan suomeksi. Se on minun ja monien tämän työn syntymiseen vaikuttaneiden ihmisten äidinkieli, jolla tulemme parhaiten ymmärretyiksi. Sen vuoksi haluan välittää kiitokseni teille suomen kielellä.

Väitöskirjani tutkimusprosessi on ollut monivaiheinen ja edellyttänyt useiden eri toimijoiden osallistumista toteutuakseen. Olen ollut hyvin onnekas, ja iloinen siitä, että monet matkailuyrittäjät ovat suostuneet kiireistään huolimatta osallistumaan haastatteluihini ja vastaamaan kyselyihini. Myös muut matkailualalla toimivat ja joulumatkailijat ovat jakaneet kanssani näkemyksiään ilmastonmuutoksesta. Olen erittäin kiitollinen teille kaikille ja arvostan panostustanne suuresti – ilman teitä tätä tutkimusta ei olisi ollut mahdollista toteuttaa!

Akateeminen maailma on siinä mielessä hankala, että se seuraa poloista väitöskirjan parissa pakertavaa tutkijantekelettä joka paikkaan. Työ ei rajoitu virka-aikaan, eikä useinkaan jää työhuoneeseen odottamaan paluutani, kun suljen työhuoneen oven perässäni lähtiessäni kotiin. Ei, työajat ja -paikat vaihtuvat, eikä ole mitenkään harvinaista, että tutkimusasiat tunkevat tutkijan päähän mitä oudoimmissa paikoissa ja tilanteissa. Senpä

takia kotijoukot ja ”akatemian” ulkopuoliset ystäväni salibandykaukaloista valtuustosaaliin ovat päässeet osallisiksi väitöskirjan tekemisen riemuista. Teille kuuluu myös kiitos osallistumisestanne tähän pitkään prosessiin.

Äiti ja isä, te olette tukeneet opiskelua ja työntekoa monin eri tavoin ja kannustaneet minua valinnoissani. Toivon, että osaan tukea omaa jälkikasvuani yhtä hienosti kuin te olette tehneet. Pekkaa, Merjaa ja Jussia haluan kiittää erityisesti kaikenlaisesta teknisestä tuesta ja aivojen nollailusta hulvattomilla metsä- ja muilla reissuilla. On ihana tietää, että kun pitää hoitaa vaikeita työhön liittyviä tietoteknisiä asioita keskellä yötä, voi soittaa isoveljelleen, joka on aina valmis auttamaan. Tai jos tekee mieli purkaa aggressioitaan, voi pyytää pikkuveljen mukaansa kuntonyrkkeilyyn tai tandemlenkille...silläkin uhalla, että toisen rillit vääntyvät ja toinen saa kuhmun nenäänsä. Kanariankotijoukot Terhi, Ben, Roque ja Charina ovat tarjonneet mahdollisuuksia irrottautua väitöskirja-arjesta vaikkapa au-paureilun merkeissä ja jakaneet auliisti kotinsa aina Carnua-tädin saapuessa. On pakko myöntää, että kun yrittää pysyä juoksemalla ratsukon perässä Gran Canarian kukkuloilla, eivät tutkimuskysymykset pyöri ihan päällimmäisinä mielessä (mutta kunto säilyy hyvänä).

Kotijoukoista 24/7-myötäeläjän rooli on kuulunut ja kuuluu Jooselle, omalle arkkitehdilleni. En tiedä, missä olisin ilman järkkymätöntä tukeasi ja rakkauttasi. Unohtaa ei sovi myöskään visuaalisen alan koulutuksen merkitystä kaikessa yhteistoiminnassamme. Ilman kykyjäsi tämän väitöskirjan viimeistelyyn olisi kulunut huomattavasti pidempi aika (tai sitten siinä ei olisi ollenkaan kuvia). Kullanmurumme Maisa on seurannut tutkijan- elämää koko pienen ikänsä. Hän ja tuleva pikkusisaruksensa ovat potkineet ajoittain vauhtia kirjoitustöihini (takomalla pöydänreunaa äidin istuessa koneellaan kirjoittamassa) ja asettaneet väitöskirjaprosessin oikeisiin mittasuhteisiinsa. Tämä työ on nyt valmis, mutta muu elämä – myös akateeminen – jatkaa kulkuaan.

Oulussa, elokuussa 2012
Kaarina

1 Introduction

1.1 Climate change challenges the future of tourism

Climate change has, without doubt, emerged as one of the most prominent (or hottest) issues attracting the world's attention. This also holds true in Finland, where climate change -related news has regularly appeared in the media, but especially in conjunction with international events, such as the publication of the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) in 2007, and the climate conferences in Bali, Copenhagen and Cancun (Haglund 2010; Scott, Hall & Gössling 2012). In addition, climate-related issues have been in the headlines in the form of stories regarding exceptional weather conditions and their consequences (Article II; Tervo-Kankare & Saarinen 2011).

On the global scale, climate change is projected to manifest as increasing average temperatures, shifting of atmospheric and oceanic circulation patterns, rising sea-levels and variations in precipitation (ACIA 2004; Pachauri & Reisinger 2007). The intensity of these changes is expected to vary between regions, and one region where the changes will be experienced particularly intensely is the Arctic where the temperature rise has occurred at twice the rate as in the rest of the world. Other early signs of climate change have included rising river flows, declining snow cover, increasing precipitation and thawing permafrost (ACIA 2004). Similar changes have been projected for Finland locating partly in the Arctic and partly in the sub-Arctic region (Ilmatieteen laitos, Helsingin yliopisto & Suomen ympäristökeskus 2011). The implications of these kinds of changes will have manifold forms, depending on the region and on the point of view for assessing them. One viewpoint has been from that of tourism; an industry that is highly dependent on climate and other natural resources, and therefore very susceptible to climatic changes.

The relationship between tourism and climate is well known and acknowledged (Hall 2008; Scott, Hall & Gössling 2012). Climatic conditions have an important role in defining the potential of diverse destinations for tourism (e.g. accessibility, nature of activities) and they also affect tourists' travel preferences. The attractiveness of destinations is often based on climatic factors such as temperature, amount of sunshine and precipitation. Also other natural resources upon which tourism is dependent are connected to climate: beaches, forests, mountains, flora and fauna and their associated ecosystems provide attractions for many tourism destinations (Scott, Jones & Konopek 2007; Holden 2008). In addition, both climate and weather influence tourism demand and supply, and the flows of tourists (Mieczkowski 1985; Smith 1990; Abegg 1996; Perry 1997; Hamilton & Lau 2006; Eugenio-Martin & Campos-Soria 2010). Even though climate-related factors are not the only ones determining the world's tourism supply and demand, they constitute one of the most important motivational factors for many tourists as travel is often timed according

to favourable climatic conditions (Mieczkowski 1985). In fact, most tourism depends on stable, tourism-favourable environmental conditions, which are often dependent on or closely connected to climate (Gössling & Hall 2006).

Considering the abovementioned, it is logical to assume that changes in any climatic elements may influence the current flows of tourists considerably. For example, it has been suggested that the impact of climate change could have severe implications for the regional and operational structures of the tourism industry (Abegg 1996; Perry 1997; Hamilton & Lau 2006), especially in the context of nature-based tourism. Nature-based tourism, with its high dependence on natural and climatic resources, can be considered one of the most vulnerable forms of tourism in relation to climate change, especially in peripheral regions (Hall 2005). The vulnerability to climate change does not only refer to the changes in climate-related natural resources but also to the location. For example, it is possible that new regulatory measures and other mitigation policies to combat climate change hinder accessibility and may also increase the cost of travel (Hall 2005; Peeters 2007). Furthermore, temperature rise, precipitation increase (or decrease), diminishing snow cover and the more frequent occurrence of extreme weather events such as heat waves and storms are the most regularly cited climatic changes in this context (Tervo & Saarinen 2006; see also UNWTO & UNEP 2008). Even though their significance is emphasised in nature-based tourism, studies have shown that cultural and urban tourists also consider climate conditions when making their travel decisions (Mieczkowski 1985; Perry 2003; Hamilton & Lau 2006).

The history of climate change -related research in tourism goes back almost thirty years. Since its emergence in the mid-1980s, this field of study has evolved and matured (see Wall & Badke 1994; Scott, Jones & McBoyle 2006) from presenting general overviews (e.g. International Institute for Sustainable Development 1999; Viner & Agnew 1999) to assessing the impacts of climate change (e.g. Abegg 1996; Agnew & Viner 2001; Balazik 2001; Fukushima *et al.* 2002) and to examining potential adaptation methods (e.g. Bürki 2000; Scott, McBoyle & Mills 2003). Lately, the focus of climate change and tourism research has shifted towards climate change mitigation in tourism and to the considerations of sustainability (Peeters 2007; Gössling & Hall 2008; Gössling *et al.* 2010; Hall 2010; Scott 2010; Weaver 2010; Becken & Hay 2012).

In Finland, the history of climate change related tourism research is somewhat shorter. Until 2005, hardly any research data was available on the subject (Sievänen *et al.* 2005; Tervo & Saarinen 2006). Considering the importance of tourism – and especially nature-based tourism – as a regional development function in Finland (Hakkarainen & Tuulentie 2008; Työ- ja elinkeinoministeriö 2010), this dearth of scientific information seems odd. Nevertheless, the situation is not unique, since knowledge of these issues has remained limited also on a global scale as Scott, de Freitas and Matzarakis (2009; see also Hall 2008; Hall & Lew 2009; Becken & Hay 2012) note. They have defined several factors that have affected the slow pace of the accumulation of climate change related (biometeorological) knowledge in tourism, the most important ones being the poor understanding of the

economic importance of tourism (in comparison to other sectors) and the relatively young age of the tourism research community (mass tourism is a new phenomenon compared to other more mature sectors such as agriculture). Some explanatory factors for the lacking research data and comprehensive (or even partial) scientific understanding of the future of the tourism industry in relation to climate change have also been determined in the Finnish context (Tervo 2008a; 2008b). One of the most important reasons is the fragmentary character of the nature-based tourism industry in Finland: the industry consists of a variety of operators, most of whom are small- and medium-sized (SMEs), and it includes multiple activities that aim to fulfil the demand of diverse set of tourists in a variety of seasons (Petäjistö & Selby 2011). Moreover, the economic importance of tourism in different regions varies (Saarinen 2003), and the relationships with other livelihoods or industries may vary from synergy and close collaboration to territorial disputes (over land-use, for example) (Järviluoma 1998; Saarinen 2005; Tuulentie 2007; Tervo 2008a; Sarkki & Heikkinen 2010). Therefore, formulating a comprehensive statement of the future of nature-based tourism in changing climate is a difficult task.

1.2 Quest for a comprehensive understanding of adaptation in nature-based winter tourism

This study seeks to contribute to our understanding of the relationship between tourism, global climate change, adaptation and their research. The main aim of this thesis is to examine the processes of perception and awareness with relation to climate change in tourism, and to thoroughly analyse adaptation by assessing the adaptive capacity of nature-based winter tourism, and the factors affecting it. In addition, the study aims to develop new approaches to the human geographical study on tourism and climate change. Still another objective is to contribute to diverse areas of knowledge and practice such as the theoretical and methodological literature on tourism geography and tourism and global environmental change and to the understanding of different adaptation strategies in tourism. One important aspect is that of vulnerability, especially with relation to the operational dimension, i.e. the consideration of winter tourism activities other than downhill skiing, which have so far received only little attention among researchers. Also, as the findings of Brouder and Lundmark (2011), for example, have showed, geographical location affects the perceptions of tourism stakeholders. Therefore this study also examines the importance of location in a Finnish north-south axis.

Both knowledge and perceptions are considered to affect people's willingness to act in order to face environmental problems (O'Connor, Bord & Fisher 1999). Therefore, they both hold central roles in the reciprocal and multi-scale system of tourism and climate change as they may emerge differently depending on the scale (global-local), the region, the actors involved or the nature of tourism activities. This becomes concretised

especially in relation to potential or expected impacts and planned and realised adaptation and mitigation. The international and national policy processes and their outcomes such as the Kyoto Protocol and Finland's Long Term Climate and Energy Strategy (Työ- ja elinkeinoministeriö 2008) create structures that guide (and limit) tourism development, mobility and consumption (see Peeters 2007; Hakkarainen & Tuulentie 2008). Tourism entrepreneurs and development agencies as regional and local representatives of the industry have important roles as providers, marketers and developers of tourism activities and destinations (Becken 2004; Pearce 2005; Hall 2006; Becken & Hay 2012) – either with high awareness of climate change and under the influence of the above-mentioned guiding structures or unaware of them. Furthermore, tourists are the ones making the travel decisions based on their knowledge, motives, expectations and resources (Becken 2004; Pearce 2005; Williams 2009; see also Hall, Müller & Saarinen 2009).

If the perceptions about climate change and its impacts, and the above-mentioned actors' reactions to these changes do not coincide, the consequences for the tourism industry may be catastrophic: tourists may cancel trips or start to avoid certain destinations while the representatives of the industry may decide on radical or unfounded measures such as shutting down their operations (König 1998; Bürki *et al.* 2005). The level of knowledge and awareness, as well as the attitudes and perceptions of climate change (and its impacts) guide actions at all levels and among all actors, and for this reason it is important to recognise the perceptions of the diverse actors in order to develop a comprehensive understanding of the adaptive capacity of any tourism sector to climate change. Furthermore, because climate change is a global phenomenon with far-reaching effects on the whole tourism system, it is an issue that requires intense collaboration between diverse actors. Thus, it is justified to assume that awareness of climate change may lead to increasing collaboration and the enhancement of existing and new networks.

In order to develop a good understanding of the adaptation and adaptive capacity of the Finnish nature-based winter tourism sector to climate change, four main research questions were defined:

- 1) What issues affect the awareness, and the constitution of perceptions and knowledge of climate change at local (tourism destination) level, and among individual entrepreneurs?
- 2) How and in which direction are/have the planned and realised adaptation strategies and practices in winter tourism developing/developed?
- 3) What are the main factors affecting the capacity and capability of the winter tourism sector to prepare for and to adapt to climate change in different regional and activity contexts?

4) Are there specific collaborative or potential elements/networks formed and utilised in the adaptation processes and in the constitution of knowledge and perceptions of climate change?

Rather than answering one single research question at a time, the research process has progressed by gathering information simultaneously from different points of view. The choice of standpoints is based on the positioning of climate change in the tourism system (Hall 2005; see Figure 2 in subsection 2.3). In this system, the tourism entrepreneurs are considered to hold a central role in the adaptation of the tourism sector to climate change. Tourists hold high adaptive capacity with relation to travel decision making while tourism development agencies view the implications of climate change from the viewpoint of tourism development, and therefore potentially adopt a longer time frame than the other two groups.

The perceptions of all these actors are taken into consideration in this thesis. First, tourism entrepreneurs' perceptions, knowledge and actions determine the use of adaptation measures and also highly influence the current adaptive capacity of the industry. By studying these perceptions, knowledge and actions the study aims at understanding the supply element of the tourism system. Other tourism stakeholders, mainly the tourism development agencies influence tourism entrepreneurs' perceptions and actions with their far-reaching development strategies. In addition, these agencies are considered to possess information concerning national and even international development and mitigation strategies. Therefore, their perceptions can also correlate with the tourism mobility element of the tourism system. Finally, the tourists' perceptions are included in the study to complement the examination of adaptation and adaptive capacity by bringing insights into the demand element of the tourism system. Their considerations are understood to define the feasibility and potential success of the adaptation measures implemented by the tourism stakeholders discussed above. For practical reasons, this thesis only focuses on Christmas tourists who travel to Christmas destination during the most critical season when a snowy landscape cannot always be guaranteed (see subsection 2.5 for definition of Christmas tourism), as the diversity of winter tourism and tourists restricts the realisation of a more general assessment within the resources and time frame of the study. Including the demand element, nevertheless, offers an important, even though only partial, perspective for completing and diversifying the analysis on adaptation in winter tourism.

The research framework is based on international literature and studies on tourism and global climate change and the adaptation processes needed to cope with a changing climate (e.g. de Freitas 2005; Hall & Higham 2005; Gössling & Hall 2006; Becken & Hay 2007; Matzarakis, de Freitas & Scott 2007). The sensitivity approach introduced by de Freitas (2005)(see article IV) is used to examine the winter tourism industry's present vulnerabilities to climatic conditions in order to assess factors affecting the adaptive capacity and the potential future of nature-based winter tourism in a changing climate.

Moreover, the wider contextualization of the study has been done considering the ongoing interdisciplinary debates on the transforming nature of the tourism industry and activities, environment and global climate and the debates on the future of tourism and its research (e.g. Shaw & Williams 1994; Rojek & Urry 1997; Butler 1999; Sharpley 2000; Hall & Higham 2005; Gössling & Hall 2006; Saarinen 2006; Hall & Page 2009). Other literature that has guided the study consists of existing international geographical, environmental and socio-political literature, tourism policy reports and empirical case studies. They, and their relevance for the study will be discussed further below.

1.3 Structure of the thesis

The thesis consists of a synopsis, two appendices and five individual research articles that are included as attachments. The synopsis brings together and discusses the empirical findings of the articles. It consists of six subsections that form four sections (Figure 1). The first section (subsection *1 Introduction*) introduces the theme and presents the objectives of the study. These objectives have also formed the basis of the research articles. Section two (subsections *2 The impact of climate change calls for adaptation in tourism*, and *3 Tourism-environmental relations, environmental perceptions and decision-making*) discusses the starting points and the theoretical framework of the study and introduces the main concepts utilised. It presents the climate change projections of the research area, and discusses their importance in relation to nature-based winter tourism in Finland. In addition, the section situates this study in the field of tourism geography, and examines the relevance of tourism-environment relations and environmental perceptions for the study. The third section (subsection *4 Research material and methods*) presents the multiple methods and material used in order to achieve the objectives of the study. Finally, the fourth section of the thesis (subsections *5 Emerging awareness of climate change in the tourism industry*, and *6 Discussion and conclusions*) first summarises the results of the study and then discusses their significance in a wider context. In subsection 5, the findings of the individual articles are discussed in relation to the four research questions, while subsection 6 focuses on examining them in relation to the wider theoretical framework. The two appendices of the thesis consist of copies of the two surveys realised as part of the study.

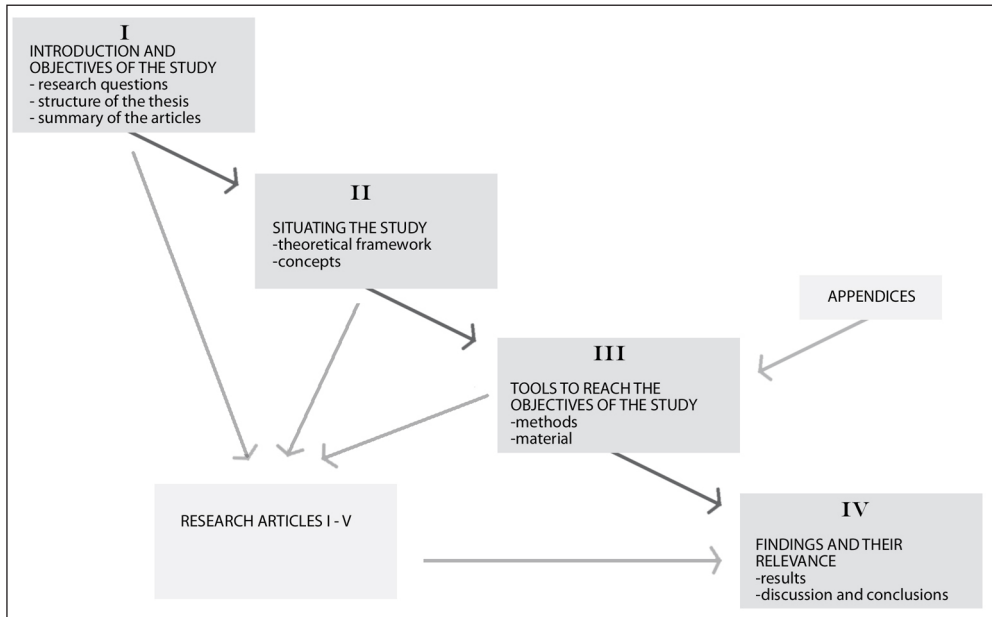


Figure 1. Structure of the thesis.

The five articles (see the summary in Table 1) present and discuss the findings of this study where both multiple-methods and multiple-data sources have been used. Article I (Saarinen & Tervo 2006) presents the findings of a pilot study, the results of which were also utilised in determining the focus areas of the further study. In the article, we examine the general awareness of climate change and the adaptation plans of nature-based tourism entrepreneurs. Article II (Saarinen & Tervo 2010) discusses the changes in climate change attitudes and perceptions among winter tourism entrepreneurs that have taken place during the research process, whose data collection took place between 2005 and 2010. In article III (Tervo-Kankare 2011) the focus is set on the destination level perceptions of diverse tourism stakeholders and assessing the future of winter tourism in this context. Articles IV (Tervo 2008) and V (Tervo-Kankare, Hall & Saarinen, in press) approach the research questions from the viewpoint of adaptation. In Article IV, the present vulnerabilities of diverse forms of snow-based winter tourism activities are under scrutiny in order to assess the differences in the existence and feasibility of adaptation strategies between them. Article V also brings insights into the feasibility of adaptation methods by examining the perceptions towards adaptation from the point of view of tourists, thus completing the study of factors influencing the adaptive capacity of winter tourism.

Table 1. Summary of the articles.

Article	Aim of the study	Main findings
I Perceptions and adaptation strategies of the tourism industry to climate change: the case of the Finnish nature-based tourism entrepreneurs	<p>To identify the perceptions and awareness of Finnish nature-based tourism entrepreneurs to climate change and to gain knowledge about their information sources and needs for information and collaboration;</p> <p>To examine how the entrepreneurs have adapted or are planning to adapt to potential changes in their businesses.</p>	<p>The general awareness of climate change is good, but a lack of knowledge and scepticism towards the potential implications of climate change and the existence of the phenomenon seems to be common among entrepreneurs.</p> <p>Hardly any adaptation plans or strategies have been created; the entrepreneurs have been adapting reactively to the 'normal' short-term climatic variability and market changes, and consider themselves capable of adjusting to future climatic changes.</p> <p>The amount and reliability of climate change information receives criticism.</p>
II Sustainability and emerging awareness of a changing climate	<p>To examine the potential effect of the media and past climate conditions on the tourism entrepreneurs' conceptions (attitudes and perceptions) of climate change and its effects on the tourism industry.</p>	<p>Climate change awareness in the winter tourism sector has increased lately. Nevertheless, the increasing awareness does not necessarily lead to increasing adaptive capacity or mitigation.</p> <p>Both the media coverage of climate change related issues and the occurrence of abnormal winter conditions support the observed changes in the climate change perceptions among entrepreneurs.</p>
III The consideration of climate change at the tourism destination level in Finland: Coordinated collaboration or talk about weather?	<p>To analyse the diffusion and the level of climate change awareness and the emergence of new forms of collaboration and networking among tourism stakeholders at the tourism destination level;</p> <p>To examine how different level considerations of climate change support each other.</p>	<p>The different stakeholders share identical views on climate change and its relevance for the tourism destinations' futures. Issues that are manifested locally, e.g. shortening winters, abnormal snow conditions, are considered more significant than regional or global level issues.</p> <p>Even though several adaptation measures are considered, hardly any have been put into effect yet.</p> <p>Climate change is considered to be a minor factor among all factors affecting tourism development plans, but it is often hidden in the agendas of sustainable development and pursuit of all-year tourism.</p> <p>Stakeholders regard the information about climate change to be low in quality and insufficient for their needs.</p>

Table 1 continued.

Article	Aim of the study	Main findings
<p>IV The operational and regional vulnerability of winter tourism to climate variability and change: the case of the Finnish nature-based tourism entrepreneurs</p>	<p>To assess the present and future sensitivity to climatic conditions and the impact of climate change on nature-based winter tourism sector;</p> <p>To review the dominance of downhill skiing in winter tourism research;</p> <p>To assess the significance of different climatic factors in winter tourism.</p>	<p>Winter tourism activities' dependence on snow and ice and their sensitivity to climatic factors varies. Downhill skiing, snowmobiling and cross-country skiing are the activities most prone to weather-related cancellations.</p> <p>Several adaptation methods are being used in winter tourism but cancellations do occur, mainly due to extremely low and high temperatures and high wind.</p> <p>Variation in vulnerability is high, suggesting that climate change assessments should be conducted at regional level and activity-wise.</p>
<p>V Christmas tourists' perceptions to changing climate in Rovaniemi, Finland</p>	<p>To examine the potential impacts of climate change on Christmas tourism from the perspective of tourists;</p> <p>To gain understanding of the climate-dependence and potential future of the Christmas landscape in its current form.</p>	<p>Environmental factors have an important role underlying both the potential to undertake certain tourism activities and the authenticity of the Santa Claus experience.</p> <p>Christmas tourists appear to react negatively to potential changes and to planned adaptations, therefore tourism businesses may be forced to reconsider the consequences of their adaptation strategies.</p> <p>It seems likely that changes in the location of Christmas landscapes will require the construction and promotion of a new set of Christmas place myths in Lapland, in the longer term, the shift of the tourist base to create new product and seasonal offerings, and even to develop a new Finnish Santa mythology appropriate for a planet coping with climate change.</p>

2 The impact of climate change calls for adaptation in tourism

2.1 Impacts of climate change in tourism research

The concept of *impact* is frequently used and often holds a central position in tourism geography and tourism studies in general (Järviluoma 2006; Wall & Mathieson 2006; Hall & Lew 2009). Often, the impacts in tourism studies refer to the impacts of tourism and are divided, somewhat artificially, into economic, environmental and social impacts (Wall & Mathieson 2006). Nevertheless, impacts are often interrelated and interactive changes rather than one-way effects to certain elements of the tourism system; moreover, they occur on different scales from the local to global (Hall & Lew 2009; see also Scott, Hall & Gössling 2012). Lately, the concept has been regularly connected to climate change – both as a one-way effect and as an interactive relationship (Hall & Higham 2005; Gössling & Hall 2006; Hall & Lew 2009).

Hall and Lew (2009: 84) define impact as a “change in a given state over time as the result of an external stimulus”. Following this definition, impacts play an important role in this study also, even though the viewpoint is that of adaptation rather than impacts as such. Impacts and impact assessments are, nevertheless closely connected to the concepts of adaptation and vulnerability (Smit & Pilisofova 2001). They are the elements that form the basis and need for adaptation. Furthermore, the way the impacts are conceived affects the ways they are approached in research (see Carter *et al.* 1994; Abegg *et al.* 1998; König 1998; de Freitas 2005). Therefore, the concept’s occurrence in tourism – climate change studies is discussed in more depth in the following paragraphs.

The definition and use of the term ‘impact’ has often echoed König’s (1998) suggestion that the impacts of climate change on tourism are divided into direct and indirect categories. This division has become commonly accepted among tourism researchers and its shortcomings have not been examined critically in the climate-change related tourism literature. According to König (1998), the direct impacts refer to impacts that affect the realisation of tourist activities directly. They occur when changing climate transforms the nature and availability of resources that are crucial for the production of activities. Conditions such as lack of snow, rising water level, more frequent heavy rains, increasing cloudiness, high wind speeds or uncomfortable temperatures are, for example, considered factors that either prevent the realisation of tourism activities or lead to cancellations (Hall & Lew 2009; Hein, Metzger & Moreno 2009; Pickering 2011; Gössling *et al.* 2012b). Certain tourist activities that take place outdoors, such as beach activities, tramping, downhill skiing and skating, are considered more sensitive to these impacts, but changing conditions may affect other forms of tourism as well, if, for example, the timing of the peak season shifts (Jones, Scott & Abi Khaled 2006; Scott, Jones & Konopek 2007). These so-called direct

impacts are not always negative, but may also enhance either the production of tourist activities or tourism demand in certain areas, or both.

Indirect impacts take place when climate change leads to changes in both natural and built environments which may affect the attractiveness of the landscape and the environments where tourist activities take place. Coral bleaching and sea level rise, for example, may change the attractiveness of destinations where beach tourism and diving are of great importance. Changes in soil frost or permafrost (depth, timing), or in the availability of water can, on the other hand, be considered indirect impacts as they affect the stability of the foundations of infrastructure or reshape the use of certain areas for tourism purposes and, in this way, affect the realisation of tourism activities (e.g. Craig-Smith, Tapper & Font 2006; Jones, Scott & Gössling 2006).

The dichotomy of impacts presented by König (1998) may have been well justified in the early stage of climate change related tourism studies, as a starting point for research. Nevertheless, the exact determination of boundaries between the two types is challenging and sometimes, due to the complex and interactive relationships between tourism and climate, artificial. For example, according to König's classification, sea level rise can be considered as both a direct and indirect impact as sea level rise both causes the loss of beaches (essential primary resource is lost) and alters the attractiveness of coastal landscapes. Moreover, impacts may have interactions whose implications have not yet been fully understood as Bigano *et al.* (2008) argue.

Besides the challenges in defining how the impacts can be divided, it is problematic to decide by whom and with whose criteria the division should be made. If both direct and indirect impacts are addressed in the tourism system (see Hall 2005) the division becomes even more blurred. Whether the impacts are direct or indirect, the end results are rather monotonous; the conditions for realising tourism in destinations alter, while changes in the very same conditions in tourist generating regions lead to changes in tourist demand. Temperatures, for example, are getting more comfortable, too hot or, with less certainty, too cold. Water levels, amount of snow and ice, frequency of occasions of high wind, drought, storms or forest fires can also change at both ends of the tourism system. This leads to either more difficult or easier realisation of activities in tourist destinations. On the demand side, tourists start to have new preferences for activities, for destinations and possibly become familiar with new modes of travel (Scott, de Freitas & Matzarakis 2009; Gössling *et al.* 2012b). In addition, the third element of the tourism system, the mobility between tourist sending and receiving regions, is influenced by climate change (e.g. Peeters 2007; Gössling *et al.* 2012b). Should the potential changes in regulatory structures, for example, be labelled as direct or indirect?

In this light, the above discussed division of impacts into direct and indirect ones does not necessarily give enough tools for the tourism industry to ease the adaptation processes needed to keep the industry viable. A more expedient way to conceptualise and assess climate change derived impacts is needed in order to prepare the tourism industry to face

and cope with climatic changes. Jopp, DeLacy and Mair (2010) suggest that a potential breakdown could be that of biophysical and socio-economic impacts, where also the induced impacts of climate change would be under scrutiny. This approach is also limited if the interrelations between them are not acknowledged (Simpson *et al.* 2008). Gössling *et al.* (2012b: 37) very recently identified four major types of climate change impacts on tourism demand (“direct impacts of a changed climate; indirect impacts of environmental change; mitigation policy and tourist mobility; and societal change related to reduced economic growth, consumer cultures and social-political stability”), but also pointed out that most tourism literature still focuses on the direct and indirect consequences of climate change.

Bearing in mind the above discussed problematics of impacts studies, this study approaches the impacts of climate change in the tourism system framework as outlined by Hall (2005: 242). The perspective chosen is that of adaptation (see Figure 2) arising from vulnerability. The latest predictions about the future climate indicate radical changes in the conditions that are crucial for the tourism industry’s operations, which mean that the industry is forced to participate in adaptation in order to stay viable. Adger (2003: 388), among others, has stressed the demand for adaptation studies that aim in understanding the processes of adaptation: “there is an urgent need to learn from past and present adaptation strategies to understand both the processes by which adaptation takes place and the limitations of the various agents of change – states, markets, and civil society – in these processes”. This also holds true in Finland, where several research projects have provided a knowledge basis on climate change and its impacts but where studies on adaptation have been on a less established level (Carter & Kankaanpää 2004). Even though the international research focus has already started to move towards climate change mitigation in tourism (Peeters 2007; Gössling *et al.* 2010), the need for impact analyses and adaptation continues to exist, especially where the knowledge basis on these matters is still somewhat limited (see Hall 2008; Hall & Lew 2009; Scott 2010; Becken & Hay 2012). Moreover, scientists have started to reach a general opinion that both are needed in order to cope with climate change to avoid the unmanageable and manage the unavoidable (Bierbaum *et al.* 2007; Peeters 2007).

2.2 Changes in climate and weather

Tourism’s dependence on stable environmental conditions makes it vulnerable to environmental changes such as climate change. In general, the term *climate change* refers to a change in the state of the climate that manifests as changes in the mean and/or the variability of its properties and that persists for an extended period, typically decades or longer (Parry *et al.* 2007). In this study, the term mainly refers to the anthropogenic (or human-induced) climate change which results from increased concentrations of

greenhouse gases in the atmosphere. This definition is used acknowledging the dissolving boundaries of nature and culture as discussed by Hulme (2010), and the problematic nature of the terms such as climate change and natural weather events in this sense.

Globally, the increasing concentrations of greenhouse gases are expected to lead to warming. According to the IPCC Fourth Assessment Report (Pachauri & Reisinger 2007), warming will be greatest over land areas and especially in high northern latitudes. High latitudes are also subject to precipitation increases and, due to the high warming, a reduction of snow and ice cover. Moreover, increases in the frequency of hot extremes, heat-waves and heavy precipitation are expected to take place globally and warming will also lead to rising sea-levels (Pachauri & Reisinger 2007).

In Finland, national and regional projections of the past and future climate have been created through a variety of research projects such as FINADAPT (Carter *et al.* 2005) and ACCLIM (Jylhä *et al.* 2009). According to their findings, the mean temperature has risen 0.9 degrees Celsius during the last hundred years (1908–2008) with springtime warming being the strongest (1.6 °C). The winters have, nevertheless, been warming the most during the last decades, a trend that is expected to continue in the future, especially in the northern parts of the country (Jylhä *et al.* 2009; Ilmatieteen laitos, Helsingin yliopisto & Suomen ympäristökeskus 2011). Climate change is expected to also shorten the winter season and lengthen either the summer or the shoulder-seasons, or both. Until 2040 wintertime (December–February) warming (1.2–5 °C) is predicted to be much higher than summertime (June–August) warming (0.6–1.6 °C) (Jylhä, Tuomenvirta & Ruosteenoja 2004; Jylhä *et al.* 2008). The occurrence of hot days and the length of heat periods (summertime) are expected to increase while the occurrence of extremely cold days becomes more unlikely. Warming in general will also lengthen the growing season (Ilmatieteen laitos, Helsingin yliopisto & Suomen ympäristökeskus 2011).

According to ACCLIM projections (Jylhä *et al.* 2009; Ilmatieteen laitos, Helsingin yliopisto & Suomen ympäristökeskus 2011), the frequency of high rains will also increase. Precipitation increases, especially in wintertime, will lead to the shortening of dry periods. Nevertheless, the summer time dry periods may lengthen. The short-range effects of precipitation changes may increase the amount of snow in Northern and Central Finland; however, by the end of the twenty-first century, the number of days with snow is estimated to decrease by forty to sixty days (Jylhä *et al.* 2008). In addition, the warming and precipitation changes will affect frost and lead to wetter ground with less bearing capacity, which makes certain areas more difficult to access. It is also possible that wind speeds in winter and autumn will increase slightly (Ilmatieteen laitos, Helsingin yliopisto & Suomen ympäristökeskus 2011). In addition, the climate model estimates indicate that future winters will be darker due to increasing cloudiness and sunless days (Jylhä *et al.* 2009).

An important concept relating to climate change is *natural climatic variability*. It refers to natural temporal and spatial scale variations in the mean state and other statistics of the climate beyond that of individual weather events (Parry *et al.* 2007; Ilmatieteen laitos,

Helsingin yliopisto & Suomen ympäristökeskus 2011). Natural variability is of high relevance to models projecting climate change as it is a source of uncertainty. Both inter-annual and inter-decadal climatic variability can speed up or slow down climate changes and thus lead to misrepresentations of future climate (Jylhä *et al.* 2009). Moreover, the high natural climatic variability in Finland can hide the signs of predicted change so that they will not become perceptible until after 2020 (Marttila *et al.* 2005; Jylhä *et al.* 2009).

Another significant manifestation of climate change is expected to be the changing occurrence of extreme *weather* events. Both weather and climate are important factors affecting tourism demand and supply, especially in the case of nature-based tourism. Nevertheless, they should not be used as synonyms. In short, ‘climate is what you expect, weather is what you get’. Weather deals with the variation of atmospheric conditions such as temperature, precipitation, humidity, cloud cover, wind and visibility at any one place over a short period of time. In tourism, the weather conditions have an important role in affecting travel decision making in a short time frame, and in determining the travel experience and activities during the trip (Coghlan & Prideaux 2009). *Climate* and climatic conditions refer to a combination of weather conditions at a particular place over a longer period of time, normally thirty years; therefore they encompass averages (Hutchinson Dictionary of Geography 2005; Holden 2008). Nevertheless, long-term averages as such have no physiological or psychological meaning for humans, therefore climate as understood by lay people often refers to the likelihood of occurrence of diverse climatic conditions (see de Freitas 2003). Understanding climate this way makes it possible for lay people to experience and gain knowledge about climate, especially if their livelihoods are closely related to the environment and dependent on climatic conditions. Agriculture and (nature-based) tourism, for example, are livelihoods where a thorough knowledge of climate is essential for viability (de Freitas 2003).

Even though the signs of future climate change are still to become visible some current phenomena such as abnormally short or snow-deficient winters can be associated with climate change and can be seen as representations of possible future conditions. Thus, even though they are not, in a strict scientific sense, proofs or manifestations of climate change, they can be used as analogues (see Dawson, Scott & McBoyle 2009) to give important experiential information about the adaptations to changes and extreme weather conditions (Marttila *et al.* 2005; article IV). Past experiences may also influence people’s attitudes towards climate change and its impacts. An example from the Australian Alps indicates that the occurrence of extreme summer bushfires sweeping through the Alps in 2003 and 2006 has led to fire risk management arising as a major adaptation strategy among Australian tourism stakeholders (see Morrison & Pickering 2012).

2.3 Adaptation needed throughout the tourism system

Changing temperatures and precipitation, occurrence of extreme weather events, and their indirect impacts such as eroding beaches (Buzinde *et al.* 2010b) or forest fires (Scott, Jones & Konopek 2007) change the tourism destinations' operational conditions in ways that require actions from the tourism industry. One solution to lessen these impacts is to mitigate climate change, to act in order to prevent or slow down the change. *Mitigation* refers to an anthropogenic intervention to reduce the sources or enhance the sinks of greenhouse gases (Parry *et al.* 2007). In tourism, it plays an important role as tourism is an activity that causes greenhouse gas emissions (Peeters 2007; Gössling *et al.* 2010). Nevertheless, there is a consensus among scientists that at this stage, mitigation can only slow climate change, not prevent it. Therefore, there is need for adaptation, not as an only solution, but complementary to mitigation efforts (Pachauri & Reisinger 2007; Simpson *et al.* 2008).

In general, the term *adaptation* refers to the adjustment in natural or human systems to new or changing environments (e.g. Yohe & Tol 2002; Parry *et al.* 2007). The term's origins are in natural sciences but several disciplines have adopted the term for their own purposes (Smit & Wandel 2006). In the context of climate change, adaptation refers to adjustments of the systems that are needed to cope with actual or expected climatic stimuli or their impacts, and in order to moderate harm and/or to exploit beneficial opportunities (Smit *et al.* 2000; Parry *et al.* 2007). There are various types of adaptation such as anticipatory and reactive adaptation, private and public adaptation, and autonomous and planned adaptation (Smit *et al.* 2000; Marttila *et al.* 2005; Parry *et al.* 2007; Scott, de Freitas & Matzarakis 2009).

Moreover, adaptation types can be further classified according to their characteristics, for example to behavioural, structural, education and research (see Scott, de Freitas & Matzarakis 2009; Jopp, DeLacy & Mair 2010), technological, government programmes and insurance, production practices and financial management (Smit & Skinner 2002) or, as suggested by Scott (2006) in the context of skiing, to hard technological, soft business and government and industry policy related adaptations (see also McEvoy *et al.* 2010). Some of the classifications are close to the concept and classification of innovation as discussed by Hjalager (2010). She mentions product or service innovations, process innovations, managerial innovations and management innovations. In a sense, following Kanter's (cited by Hall & Williams 2008) definition for innovation, according to which innovation can be any process that brings any new, problem-solving ideas into use, adaptation is very closely linked to innovation. Therefore, the ability to innovate may be crucial for the tourism industry's survival in changing climate. Nevertheless, in this study innovation is considered an element within adaptation: the term adaptation refers to all kinds of adaptation, i.e. all initiatives and measures to reduce vulnerability in the tourism sector against the impacts of climate change (including climate variability and extremes).

The future of the tourism industry depends on its resilience and capacity to adapt to changes throughout the tourism system: to changes in the resource base (the realisation of activities) (supply), to changes in tourists' preferences (demand), and to changes in mobility (Hall 2005). Figure 2 illustrates the main elements of the tourism system susceptible to change, and therefore calling for adaptation measures. One possibility to examine the future of tourism is to measure and examine its *adaptive capacity*, the whole of capabilities, resources and institutions of a country/region/tourism destination to implement effective adaptation measures that aim in moderating the potential damages, taking advantage of opportunities, or coping with the consequences of the climate change (see Parry *et al.* 2007).

Smit and Pilisofova (2001) discussed the factors that may determine adaptive capacity. According to them (see also Yohe & Tol 2002; Vincent 2007; Armitage & Plummer 2010), the capabilities to adapt (at a community or region level) seem to depend upon economic wealth, technology, information and skills, infrastructure, institutions and equity. Yohe and Tol (2002) discuss these elements or determinants further and list characteristics such as the availability of resources, the stock of human and social capital, the decision-makers abilities to manage information and the public's perceptions of the source causing stress. These elements of the capacity may be latent and only become visible when needed (see Smit & Pilisofova 2001). Moreover, the capabilities differ considerably from system to system, sector to sector, and region to region (Yohe & Tol 2002; Bohensky *et al.* 2010; Hill, Wallner & Furtado 2010) as, for example, the adaptation measures in the tourism

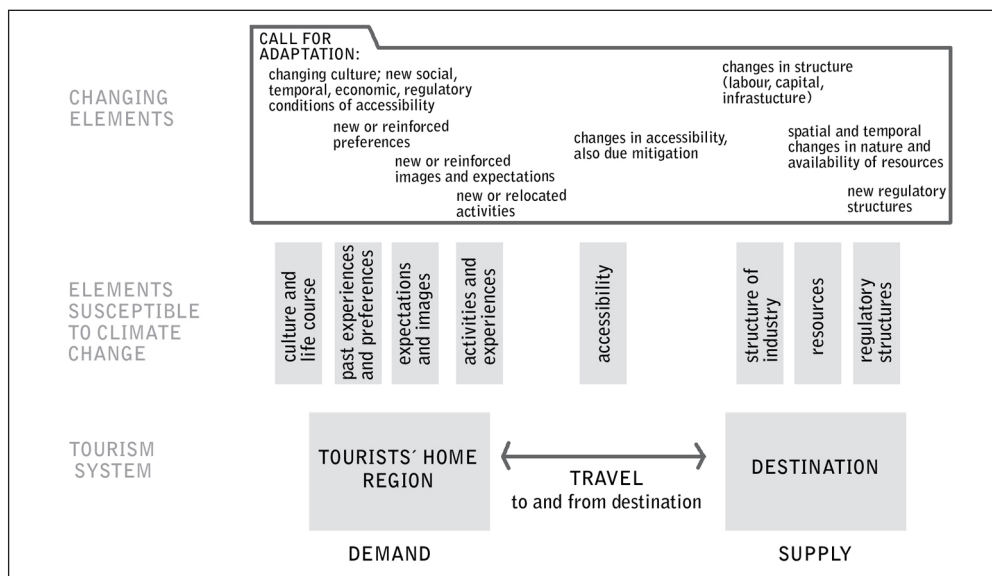


Figure 2. The impacts of climate change call for adaptation throughout the tourism system (following the idea of Hall 2005).

sector include the actions of various stakeholders in diverse spatial and temporal scales (Scott, de Freitas & Matzarakis 2009). Therefore, adaptive capacity is dynamic by nature (Smit & Pilisofova 2001; Vincent 2007; Lundmark *et al.* 2008).

In general, the tourism sector as a whole (including all stakeholders, as well as the tourists) is considered to hold high adaptive capacity (Scott, de Freitas & Matzarakis 2009; Jopp, DeLacy & Mair 2010). Depending on the scale (e.g. tourism destination vs. country), the actors involved (e.g. international or local businesses), and the importance of diverse livelihoods, the adaptive capacity may, nevertheless, vary considerably (Simpson *et al.* 2008) as studies of Norway's and Northern Europe's forest communities' vulnerability illustrate (O'Brien, Sygna & Haugen 2004; Lundmark *et al.* 2008). For example, a global scale, multinational, mobile and non-locally owned tourism business is more flexible in relocating its tourism activities or investing in adaptation than small-scale, locally owned and place and resource embedded tourism enterprise. In addition, elements or adaptation methods considered to increase the capacity in one region may, in a different context, prove to have the opposite effect (Scott, de Freitas & Matzarakis 2009). In view of these aspects, assessing adaptive capacity is not a simple task.

Another important aspect related to adaptive capacity is that of individuals. First of all, the individual's willingness to react to changes (behavioural intentions, see O'Connor, Bord & Fisher 1999) is considered an important element of adaptive capacity. This holds true especially when discussing adaptation measures from the point of view of tourism businesses (Dewar 2005; Hall 2006; article I). However, when tourists are the ones making the final travel decisions, it is necessary to notice that their reactions (perceptions of destinations, behaviour at them and the decisions to travel in the first place) are in a central position when examining the feasibility, the success or the failure of any adaptation measure (Gössling *et al.* 2012b; Jopp, DeLacy & Mair 2010; Weaver 2010).

2.4 Nature-based tourism and sustainability in relation to climate change

As mentioned earlier, nature-based tourism as a form of tourism is considered one of the most vulnerable to climate change. *Nature-based tourism* refers to the form of tourism and tourism activities that are either produced in the nature (using natural or slightly modified settings such as forests or hills) or dependent on natural assets such as snow (focus on specific elements of the natural environment) (Hall & Boyd 2005; Tyrväinen & Tuulentie 2009; Fredman & Tyrväinen 2010). Thus, they are particularly sensitive to climatic and environmental change.

In this study, the definition of the term follows the definitions of the Ministry of the Environment in Finland (Working group for recreation in the wild and nature tourism 2002) and Buckley (2009). Therefore, the concept is very broad: nature-based tourism includes all forms of tourism that are somehow based on nature; nature's elements are

either the primary attraction or nature forms the environment where activities take place. Following this definition, a considerable part of tourism in Finland is nature-based. Nature is an important element of tourism in, for example, skiing and other resorts, in second-home tourism and camping, in boating, in snowmobiling, and in fishing or hunting tourism (Working group for recreation in the wild and nature tourism 2002; Sievänen & Neuvonen 2011). Nature-based tourism is sometimes connected to sustainable tourism, or even to ecotourism (Hemmi 1994; Pickering & Weaver 2003; Buckley 2009; Fredman & Tyrväinen 2010). In this context, a rigid definition of nature-based tourism (see Place 1998; Fennell 1999; Hall & Boyd 2005) is inexpedient since the environmental, cultural or economic sustainability (Swarbrooke 1999) of tourism or the well-being of the host communities, for example, is irrelevant for the study design (even though of high importance in general).

Nevertheless, the concept of *sustainable tourism* is closely linked to climate change tourism research (e.g. Hall 2010; Scott 2010; Weaver 2010). It is also referred to on several occasions in the findings of this study; therefore the term cannot be ignored. In general, the term refers to tourism that follows the principles of sustainable development: an activity that meets the needs of the present without compromising the ability of the future generations to meet their needs (World Commission on Environment and Development 1987). According to the World Tourism Organization (UNWTO) the simple definition for sustainable tourism is as follows: “Tourism that takes full account of its current and future economic, social and environmental impacts, addressing the needs of visitors, the industry, the environment and host communities” (UNWTO 2012). Nowadays, the sustainability aspects of tourism development are of interest especially in impact research and destination management issues (Hall & Lew 2009).

Lately, the concept’s inconsistency in relation to climate change has received considerable attention and criticism among academics (e.g. Lumsdon & Peeters 2009; Sharpley 2009; Hall 2010; Scott 2010; Weaver 2010; Filimonau *et al.* 2011), especially with respect to the tourism industry’s contribution to climate change in the form of greenhouse gas emissions and the negligible efforts to reduce them (e.g. Scott 2010; Weaver 2010). Both these issues undermine the pursuit of sustainability in tourism. Also, Weaver (2010: 5) argues that adaptation by the industry is a mere “rational business response to climate change” rather than a measure relating to environmental (or socio-cultural) sustainability. In this thesis, the term is mainly utilised by the tourism stakeholders, therefore the contradictions of the concept are not elaborated further even though it is one of the most problematic issues in tourism and climate change research.

2.5 Nature-based winter tourism in Finland

In many Nordic countries, nature-based tourism is a crucial element of the tourism industry (Hall & Boyd 2005; Müller & Jansson 2007; Hall, Müller & Saarinen 2009; Fredman & Tyrväinen 2010). Moreover, nature-based tourism in these countries is highly diversified. According to Saarinen (2004), the popularity and growth of adventure tourism has led to the increasing commodification of natural elements and to the emergence of new tourism activities such as snowmobiling and dog sledding, while also the so-called indigenous tourism in the form of reindeer and Sami activities has been growing in popularity in the Nordic countries (Pettersson 2004; Hall, Müller & Saarinen 2009). Domestic nature-based tourism in these countries is particularly popular as the Nordic people are often very interested in participating in nature-based activities (Gössling & Hultman 2006; Sievänen & Neuvonen 2011). This may be at least partly due to the right of public access which grants everyone access to nature for recreational purposes such as hiking, berry picking and ice fishing (Working group for recreation in the wild and nature tourism 2002; Fredman & Tyrväinen 2010). Nevertheless, the international tourists visiting Nordic countries also consider nature as one of the most important motivational factors; in Finland, for example, approximately one third of foreign tourists participate in nature-based outdoor activities such as snowmobiling, dog sledding, reindeer sledding, or fishing, hiking or animal/bird watching (Krzywacki *et al.* 2009).

The above remarks also hold true in Finland where the main tourism image is largely based on nature and its attractiveness for both the international and domestic tourists (Working group for recreation in the wild and nature tourism 2002). According to Leinonen, Kauppila and Saarinen (2007; see also Vuoristo & Vesterinen 2001; Working group for recreation in the wild and nature tourism 2002), who have examined Finland's tourism regions based on attractions, the regions mostly relying on nature as the basis for attractions are located in the northern and eastern parts of the country (the eastern region being also called the Lake District, see Figure 4 in subsection 4.1). In these regions especially, tourism has to some extent been considered a key tool for maintaining the vitality of a peripheral countryside (Järviluoma 1997). It has been a common trend in the Nordic countries that the decline of traditional livelihoods such as agriculture and reindeer husbandry in rural and peripheral regions has increased the importance of tourism in providing job opportunities and maintaining services in these areas (Gössling & Mattsson 2002; Heberlein, Fredman & Vuorio 2002; Müller & Pettersson 2006; Fredman & Tyrväinen 2010).

Nevertheless, the relevance and range of nature-based tourism in Finland are difficult to determine. It is difficult to separate the proportion of nature-based tourism from the total appreciation of tourism as it is a sector on which individual statistics are not compiled. The difficulties in estimating the relevance of nature-based tourism rest partly on the diversity of the sector, the many actors involved and the fickle dividing line between recreation and tourism. According to the tourism satellite account, tourism in

Finland provided 2.4 per cent of the country's national economy in 1999 (Working group for recreation in the wild and nature tourism 2002), and was then valued at 2.5 billion Euros. The share of revenues derived from nature-based tourism is estimated to be one third of the total tourism income (Saarinen 2003; see also Petäjistö & Selby 2011). The employment effect of nature-based tourism is also considered high, especially in Finnish Lapland, where nature-based tourism provides more employment opportunities than any other regional industry (Saarinen 2003; Lapin liitto 2008). In 2006, for example, the estimated direct employment effect of tourism in Lapland was over 4100 full-time jobs (Lapin liitto 2008).

Some other estimates about the nature and range of the sector are also available. According to a study on the nature recreation habits of Finnish people (Sievänen & Neuvonen 2011), forty-three per cent of Finns annually make one or more nature-based tourism trips (an overnight trip the main purpose of which is to participate in nature or outdoor activities). Moreover, for twenty-seven per cent of them the trip includes a visit to a national park. As Hall, Müller and Saarinen (2009) suggest, the development of tourism in the national parks corresponds with the development of the use of wilderness areas and thus reflects the general development of nature-based tourism in the Nordic context. Therefore, another way to explore the relevance and development of nature-based tourism in Finland is to examine the number of visits to Finnish national parks that form an important arena for nature-based recreation and tourism (Hall, Müller & Saarinen 2009; Sievänen & Neuvonen 2011; Sievänen, Neuvonen & Pouta 2011): in 2000 the national parks drew 1 million visits while in 2010 the number had almost doubled, being 1.96 million (Working group for recreation in the wild and nature tourism 2002; Puhakka 2008; Sievänen, Neuvonen & Pouta 2011).

As noted, the diversity of activities and multiple actors characterise nature-based tourism in Finland. The main focus of this study, nature-based winter tourism in Finland nowadays consists of a variety of destinations and activities, and according to Komu and Kivelä-Pelkonen (2012) the most important attractions for international markets are snow and ice buildings (castles, hotels) and other constructions (e.g. ice bars, sculptures), dog and reindeer sledding, snowmobiling (driving or sitting in a sleigh), ice-breaker cruises and ice dipping, ice fishing, driving (and rally) on ice and snow, ice swimming, skating on natural ice and snowshoeing. In Lapland, for example, ninety-seven per cent of foreign tourists participate in winter outdoor activities (Krzywacki *et al.* 2009). In domestic markets, also the more traditional attractions and activities such as skiing (both cross-country and downhill), snowboarding and down-hill sledding are high in popularity (Sievänen & Neuvonen 2011). Other activities offered by tourism entrepreneurs include, among others, visits to reindeer and dog farms, visits to meet Santa Claus, snow-tubing, kick-sledding, ice climbing, winter golf, hunting, horse activities (riding, skiing etc.) and seeing the northern lights.

One interesting form of nature-based winter tourism in Finland, namely Christmas tourism, has been developed around the image of Finland (or Finnish Lapland) as a winter

wonderland, the northern lights and the myth of Santa Claus (Hakulinen, Komppula & Saraniemi 2007; see Article V for more detailed information about the history and characteristics of Christmas tourism in Finnish Lapland). Even though all the activities related to Christmas tourism nowadays are not strictly based on nature and some of its features take place in a relatively urban environment, it is also considered part of the nature-based winter tourism industry in this study. Nature is an evident element in the marketing material for Christmas tourism (see figure 1 in article V) which reflects tourists' expectations of Christmas tourism being nature-based tourism. Moreover, despite the attempts to create and increase year-round visitation in Rovaniemi, the capital of Christmas tourism in Finland, the Christmas period has remained the key season. This means that it is a highly snow-dependent form of tourism, as tourists visiting Santa around Christmas time often associate him with a snow-covered landscape.

The importance and characteristics of nature-based tourism in Finland makes the country's tourism industry vulnerable to climate change, in particular when the main regions for nature-based tourism are somewhat peripheral. Especially winter tourism that is often based on snow and ice and the scenic landscape attractions and activities built on them (Komu & Kivelä-Pelkonen 2012), is highly sensitive in this sense. *Vulnerability* refers to the degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes. The character, magnitude, and rate of climate variation to which a system is exposed, its sensitivity, and its adaptive capacity are the parameters determining it (McCarthy *et al.* 2001; Adger 2006; see also Kelly & Adger 2000; O'Brien, Sygna & Haugen 2004; Lundmark *et al.* 2008). Therefore, vulnerability links closely with adaptation and adaptive capacity (Moreno & Becken 2009). Ribot (2011) suggests that the three concepts can be related through the concept of risk, when vulnerability and adaptation are considered to focus on risk generation and its avoidance, and vulnerability and adaptive capacity are defined as the inability and ability to avoid risk. *Sensitivity* on the other hand refers to the degree to which a system is affected, either adversely or beneficially, by climate-related stimuli (Adger 2006; Parry *et al.* 2007). As discussed in article IV, this study approaches sensitivity from the point of view of tourism supply by examining the operational vulnerability of diverse tourism activities.

Considering the above-mentioned, it is logical to assume that the occurrence of weather anomalies such as snow deficiency has led the tourism industry to consider the potential impacts of climate change seriously, especially when the consequences of anomalies have been discussed in the media (Table 2). For example, the Levi World Cup has been cancelled twice (and received wide international attention) during the research and writing process of this thesis, the season of the Kemi Snowcastle has shortened considerably and the newspapers have also reported on the growing numbers of cancellations of the ice-breaker tours and difficulties in organising ice- and snow-related events.

Table 2. Examples of newspaper headlines relating to snow deficiency and its consequences for winter tourism.

Headline	Source/author	Date
The warmest ever measured December in Finland	Helsingin Sanomat/ Jokela	2.1.2007
Mild weather has prevented snowmaking and now menaces Levi World Cup	Helsingin Sanomat/ Alatalo	30.10.2007
The fate of Rovaniemi's Christmas tourism under speculation – Snow security crucial: Mild winters shift the season to north	Lapin Kansa/ unknown	17.12.2007
Levi World Cup slalom races cancelled owing to lack of snow	Helsingin Sanomat/ Kovanen	2.11.2011
Faith in winter still alive. The time reserved for building the Kemi Snowcastle record-breaking short	Kaleva/ Knihtilä	8.1.2012

3 Tourism-environmental relations, environmental perceptions and decision-making

3.1 Tourism geography and tourism-environment relations

Tourism offers a fruitful study ground for geographers focusing on place, space and environment. It is, without doubt, a geographic phenomenon (Williams 2009). As Hall and Page (2009; 2012) mention, geographers and geographical institutions have long contributed to the study of tourism in many ways thus assisting the emergence of tourism geography as an independent sub-discipline in geography (Mieczkowski 1978; Pearce 1987). Robinson (1976), Mieczkowski (1978), and Hall and Page (2002), for example, emphasise the role and contribution of geographers to studies focusing on the social, political and environmental relations existing and forming within the tourism system, on tourist decision-making and tourist behaviour, on the placelessness or on the spatial structures of tourism. Since the 1980's, tourism geographers have – in the vanguard of researchers – also participated in climate change studies (Scott, Jones & McBoyle 2006; Tervo 2008b), first by analysing the impacts of change on tourism destinations and their structures (e.g. McBoyle *et al.* 1986; Wall *et al.* 1986; Galloway 1988; Koenig & Abegg 1997; Balazik 2001), then with focus on adaptation processes, perceptions and decision-making (e.g. Abegg 1996; König 1998; Hall 2006; Brouder & Lundmark 2011), and lately, with focus on assessing tourism's contribution to climate change and its mitigation processes (Becken 2004; Gössling & Hall 2008; Gössling *et al.* 2010; Gössling 2011; Becken & Hay 2012).

This thesis is positioned in the field of tourism geography with its focus on nature-based tourism and climate change. Even though tourism geography as a discipline, or even as a sub-discipline, is a highly debated concept (see Järviluoma 2006; Butler 2012; Hall & Page 2012), it is difficult to determine the position of this thesis outside geography and its sub-discipline tourism geography (or tourism geographies, as discussed in Wilson 2012). Moreover, the research theme, the relationship between tourism and climate change, is such that emphasises the interrelations between physical and human geography, and requires understanding of the scientific background of climate change as a phenomenon and of human behaviour and decision-making. Therefore, the thesis does not easily fit into either of these main fields of geography. It includes many of the elements discussed above by examining the relationship between environment and tourism, and the perceptions of tourism stakeholders in different regional and operational (activity) settings. The focus of the study is set on adaptation strategies in winter tourism, therefore it follows the approaches utilised in previous adaptation studies. Nonetheless, it aims at increasing diversity in adaptation studies by also assessing operational vulnerability and the feasibility of adaptation from the demand perspective.

The environmental relations are highlighted in the study, as nature-based tourism cannot be discussed in isolation from the physical environment in which it operates. In this study, this environment is considered to encompass the physical reality (topography, flora, fauna, climate, accessibility etc.) that exists in a certain form regardless of the perceptions and thoughts linked with it; it is an object that is impervious to meanings ascribed to it (Sayer 1984). Therefore, the study's philosophical standpoint can be linked to critical realism assuming that "the world exists independently of our knowledge" (Neumann 2005: 9–10). Thus, the human knowledge of the reality is a representation of it rather than reality itself. If humans act according to the nature of the reality – if their knowledge of it follows the true nature of it, the occurrence of conflicts is unlikely (Ambrose 1969). Nevertheless, it is important to recognise that reality is not a static environment but can change for various reasons, both naturally and because of human activities (Stonehouse & Snyder 2010).

Tourism stakeholders operate in these environments on the basis of their knowledge, the perceptions of the surrounding environment. If they have a good understanding of the surrounding reality, the success of operations is more probable. Operational failures, on the other hand, may reflect situations where perceptions do not correspond to physical reality or its thresholds, for example. Climate is one part of their environment, a character that for a long time has been taken for granted in tourism (Hall & Higham 2005). The possibility of climate change and its impacts, however, forces the tourism stakeholders to reconsider the concept and its static nature. At this stage the perceptions of the stakeholders rise to a central role as a changing environment calls for actions in order to keep the tourism industry viable. These potential actions are approached from the point of view of behavioural geography and the concept of perceptions.

Even though in this study the concept 'environment' is used to refer to the physical reality, it is important to notice that tourism-environmental relations are not limited only to those relations that exist between the tourism industry and its physical environment. The tourism-environment relationship is a much more complex system of factors and interrelationships than can be taken into consideration in a single study of an individual researcher. For example Hall (2005) and Sharpley (2009) have discussed the complexity of diverse factors and scales of the tourism-environment relationship, and emphasised the need for multidisciplinary approaches in the study of it. Following Sharpley's (2009) conceptual model of the tourism-environment relationship, Hall's (2005) tourism system analyses, and the ideas presented by Poon (1993), Meethan (2001), Wall & Mathieson (2006), Holden (2008) and Urry and Larsen (2011), for example, it is possible to name dozens of individual factors most of which are dynamic and interrelated (Figure 3). Due to this complexity, this study is outlined by the simplified version of the tourism – climate change system as presented in figure 2 (see subsection 2).

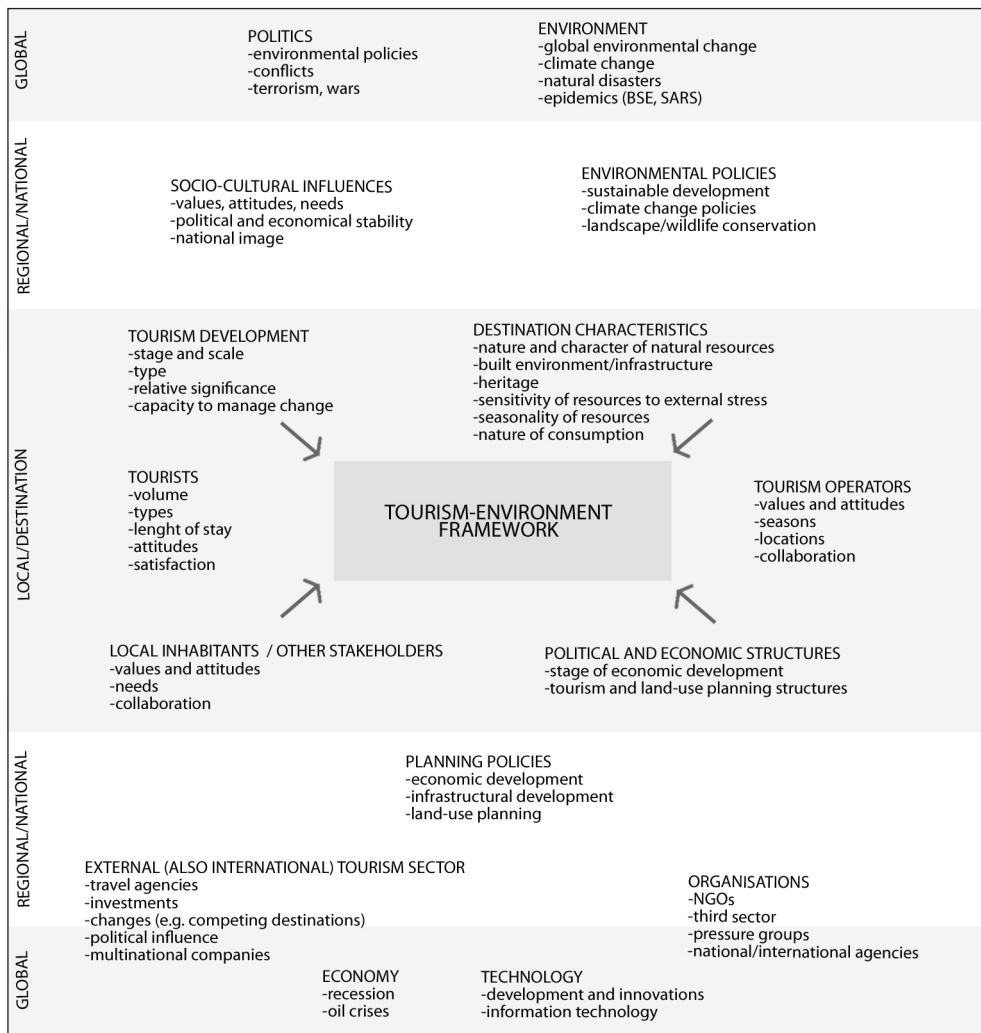


Figure 3. Tourism-environment relations.

3.2 Environmental perceptions guiding human action and decision-making

Humans act on the basis of their perceptions of the environment. This presumption is considered to hold true also in relation to a changing climate: perceptions of changes in climatic conditions (or impacts) determine the actions of diverse tourism stakeholders. As tourism entrepreneurs are the ones most affected by changes in climate, this study considers the issue primarily from their point of view. Nevertheless, other standpoints should not, and will not, be ignored. Wall (1998), Jopp, DeLacy and Mair (2010), Gössling

et al. (2012b) and Scott, Hall and Gössling (2012), for example, discuss the importance of tourists as having the largest adaptive capacity within the tourism system (see also Scott, de Freitas & Matzarakis 2009). Gössling *et al.* (2012b: 36) refer to tourists' "flexibility to substitute the place, timing and type of their holiday, even at very short notice" in validating their argument. Moreover, the state and other agencies responsible for tourism development are taken into consideration as the mere geographical context of this study requires. In the Nordic countries, the state has traditionally had an important role in tourism management through its involvement in "regional economic and social development and welfare provision" (Hall, Müller & Saarinen 2009: 52). Therefore, tourism development agencies may also have a central role in preparing for climate change.

Geography as a discipline has a long tradition in studying environmental perceptions (see Gold 1980; Golledge 1981; Unwin 1992; Johnston & Sidaway 2004) and especially societal understandings, perceptions and knowledge of nature (Castree 2003). In geography, the concept of perception refers to processes whereby individuals (and groups) obtain, store, use and operate upon information, suggesting that individuals base their actions upon how they perceive their environments (Gold 1980; Johnston *et al.* 2005). Attitudes can be considered as outcomes of these transactions where the role of sentiments becomes more obvious. Perceptions, especially in relation to risk and intended behaviour, have been studied widely in geography (Parry 1993; Johnston *et al.* 2005). They hold an important position in explaining how risk and uncertainty affect individuals' and societies' ways to cope with natural hazards (as climate change can also be defined) (Kasperson & Dow 1993; Méheux & Parker 2006). O'Connor, Bord and Fisher (1999), among others, emphasise the importance of perceptions for behavioural intentions.

The term perception is widely used in different contexts, therefore several, sometimes confusing definitions for the term also exist (see Downs & Stea 1977; Ingold 2000). Bearing in mind the critique of Downs and Stea (1977), it is important to clarify here that in this study, perception refers more to the product of the perception process than to the mere perceiving (using senses). Or, as Ingold (2000: 159) suggests, "perception is a two-stage phenomenon: the first involves the receipt, by the individual human organism, of ephemeral and meaningless sense data; the second consists in the organisation of these data into collectively held and enduring representations." This process is considered to lead to action, with the assumption, that the perception differs enough from the current state so that action is considered necessary.

Other notable standpoints are derived from behavioural studies and their interest on factors influencing the interrelationship between thought and action, and the processes which underlie human decision-making (Gold 1980; Xiang & Formica 2007; Song *et al.* 2012). It follows, even though not literally, the principles of behavioural geography, according to which people have perceptions of their environments, and it is possible to identify these perceptions which are closely linked with actions (Unwin 1992; Johnston & Sidaway 2004).

The study is constructed especially upon one of the four features of the behavioural geography approach defined by Gold (1980: 4–5; see also Johnston & Sidaway 2004): people act upon environmental cognitions (or perceptions) which may differ considerably from the true nature of the real world (climate change). In other words, the decision-makers (tourism stakeholders and tourists) “operating in an environment base their decisions on the environment as they perceive it, not as it is” (Brookfield 1969: 53; see also Xiang & Formica 2007) which may sometimes lead to the questioning of the rationality behind environmental decision-making (Häkli 2008; Johnston *et al.* 2005). Behavioural geography has sometimes been criticised for not considering the influence of communities on individual decision-making (Johnston & Sidaway 2004). In this study, the community’s role is acknowledged, and even though perceptions are considered to be individual (depending *inter alia* on the individual’s values, cultural and educational background) some shared cultural factors may have a harmonising effect on people’s perceptions (Walmsley & Lewis 1993; Steg & Sievers 2000; Jensen & Korneliussen 2002). Therefore, it is possible to find common features in people’s attitudes towards their environment. Furthermore, some actions can be considered to reflect the intentions and aspirations of communities (e. g. tourism destination) rather than only those of individuals.

According to Kuruppu and Liverman (2011), the development of adaptation intentions is firstly related to people’s perception of climate change as a process they can affect. Moreover, in order to lead to action, the perception of the potential change and its implication(s) has to exceed the threshold above which adaptation is considered necessary (Gold 1980). On the other hand, it is important to realise that perceptions may also lead to unnecessary adaptation and excesses. Considering this, the accuracy and truthfulness of the perceptions and attitudes guiding the adaptation processes becomes essential.

The adjustment of current tourism products and operations into new conditions is an important challenge, therefore accurate global and local knowledge of the future climate and understanding of climate change among tourism stakeholders is crucial. Perceptions of climate change have not been yet studied widely in tourism, nevertheless, some research has been conducted, both from the viewpoint of tourism entrepreneurs (or experts) and tourists in Australia and New Zealand (Becken 2004 and 2007; Hall 2006; Morrison & Pickering 2012), in Tanzania and Botswana (Gössling *et al.* 2006; Saarinen *et al.* 2012), in Austria (Wolfsegger, Gössling & Scott 2008), in Mexico (Buzinde *et al.* 2010a and 2010b) and in Sweden (Brouder & Lundmark 2011).

The theoretical grounds of the study also include elements of political ecology with its emphasis on the need to understand the social and political factors framing and influencing adaptive processes (see Walker 2005; Smit & Wandel 2006). In this respect political ecology can be seen as one of the most recent expressions of “geography’s long-standing interest in the ideological, material and symbolic relationships of human society to natural environment” (Neumann 2005: 15; see also Forsyth 2003). In the context of this study, political ecology forms a fruitful ground for tourism and climate change issues: It can be used as a framework to understand the importance of global/national political

processes (such as mitigation policies or the lack of them, or development strategies) to local level actions relating to environment and its utilisation in tourism (Stonich 1998; Cole 2012), and to demonstrate the effect of social, political and economic processes on individuals' or a destination's adaptive capacity (Smit & Wandel 2006). In addition, the nature of climate change as a phenomenon – the greenhouse gas emissions lead to global climate change, the impacts of which become concretised at the local level – links it also with another aspect of political ecology; impoverishment and environmental degradation (see Stonich 1998) where local level actions are needed to cope with the degrading environment (elements of which are, for example, the diminishing snow cover, or access to water, which has been discussed by Gössling *et al.* 2012a).

In this study, perception and adaptation are understood as context dependent and inter-related processes rather than one way processes of receiving information and knowledge from 'top-down' (e.g. Hulme 2009). The different contexts are based on regional (northern and southern) and activity (different forms of winter tourism) settings of the tourism industry which are considered to define much of the vulnerabilities, the role of media and regional/local networks and the entrepreneurs' knowledge and experience concerning past, present and future climate. The local scale actors, their networks and the media are considered to actively affect the formation of knowledge and adaptation strategies concerning the global scale processes of climate change. Naturally, it is evident that the processes and discourses regarding the climate change and related policies are not an issue for local-scale discussions only but also for global ones. Processes defined non-locally, such as international regulations on preventing climate change and the need for adaptation policies and strategies, are increasingly coming to determine local realities and practices of tourism industry and related communities (Tervo & Saarinen 2006; Tervo 2008b). Nevertheless – as noted by Teo (2002) – such processes alluding to 'globalisation' are not solely driven from 'out there' as local actors also contribute to them and their local outcomes (see also Giddens 1990; Hulme 2009).

In this kind of 'globalisation from below', different social groups define and contest the appropriate goals, methods and levels for the responses, adaptations and different conceptualisations of the change through negotiations (see Macnaghten & Urry 1998: 29–31; Teo & Li 2003). In this local-global nexus, the intensity of the elements such as networks, norms and trust (also called social capital) in regional tourism systems and communities affects the possibilities of the local actors to influence or potentially control the place-specific policies and mechanisms responding to non-local processes (see Jones 2005). This idea has also been noted by Adger (2003: 401) who considers that processes of adaptation “that are built from the bottom up and are based on social capital can alter the perceptions of climate change from a global to a local problem”. Moreover, when actors (tourism stakeholders) perceive that adaptation to and the risk of climate change are, at least partly, within their powers to alter, they “will be more likely to make the connection to causes of climate change, thereby enhancing their mitigative, as well as adaptive, capacity” (Adger 2003: 401).

4 Research material and methods

4.1 Multiple methods and data

In order to examine the multifaceted problem comprehensively, the methods and data used in the study follow the principles of triangulation or multiple-method research. Triangulation is aimed not so much to the mere validation as to the deepening and widening of the understanding of this complex and interrelated issue (Jick 1979; Philip 1998; Clifford & Valentine 2003; Viinamäki 2007). The use of multiple measures, as suggested by Jick (1979), may also help in uncovering something that could be neglected by relying on a single method only. The reasoning for the use of multiple methods is presented in the following paragraphs along with the introduction of the data and methods to analyse it.

The complexity and scale of the issue under examination resulted in the use of a multiple-method approach. In this sense the thesis' standpoint withdraws from the early principles of behavioural geography which favoured the use of quantitative methods in examining environmental perceptions (see Johnston & Sidaway 2004). Instead, the research data includes both qualitative and quantitative data from different sources. Consequently, diverse methods were needed to analyse the data. Rather than considering quantitative and qualitative methods and data as rivals, both have an equally important role in this study: Quantitative and qualitative research is considered as a continuum where both types of method and data complement each other. Moreover, the research is conducted in phases where earlier stages guide the following stages, e.g. the findings of an interview study are utilised to create questions or themes for a questionnaire or an interview, or a questionnaire (or a part of it) is constructed in order to cross-check or test the potential for making generalisations concerning the findings of an earlier study. The different phases have also influenced the selection of research themes and regions (Figure 4) as discussed in the following paragraphs.

The complete research path is illustrated in figure 5. The very beginning of the thesis dates back to 2005 and to the baseline study realised in cooperation with the FINADAPT project coordinated by the Finnish Environment Institute (see Carter 2007 for details of the project). This baseline study included a thorough review of the tourism and climate change research literature, and realisation of interview study A. It also formed the starting line for the whole research process afterwards. Semi-structured interviews were chosen as a method for the pilot study which aimed to gather information on a subject that had not been studied earlier in Finland – therefore no data existed to form questions for a structured questionnaire, for example. The main aim of interview study A was to examine awareness of climate change and its impacts among nature-based tourism entrepreneurs, therefore the interviews were conducted in Northern Finland (snow-based winter tourism enterprises) and the Lake District (water-based summer tourism enterprises) where the

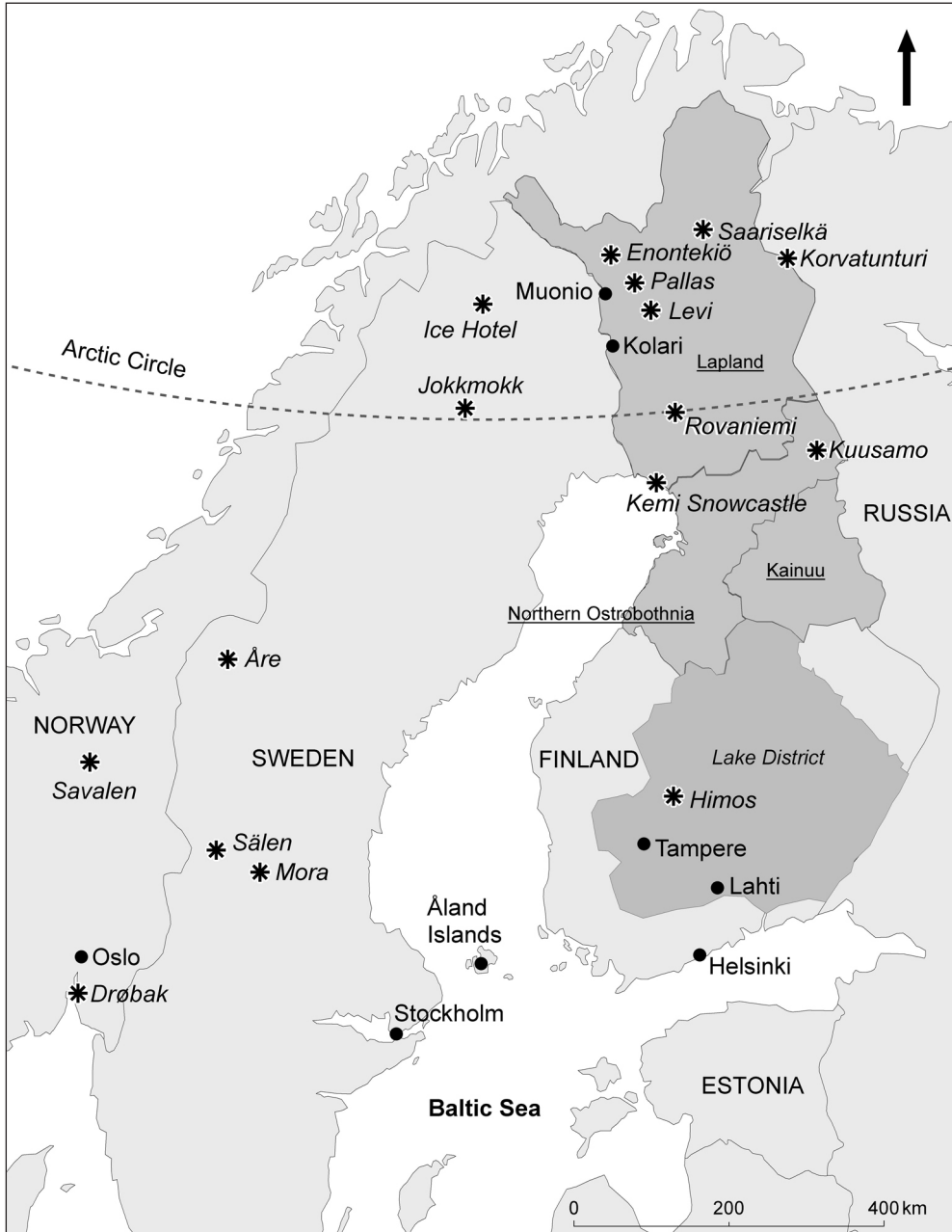


Figure 4. Research area, with stars showing the locations of the winter tourism destinations mentioned in the synopsis and in the individual articles.

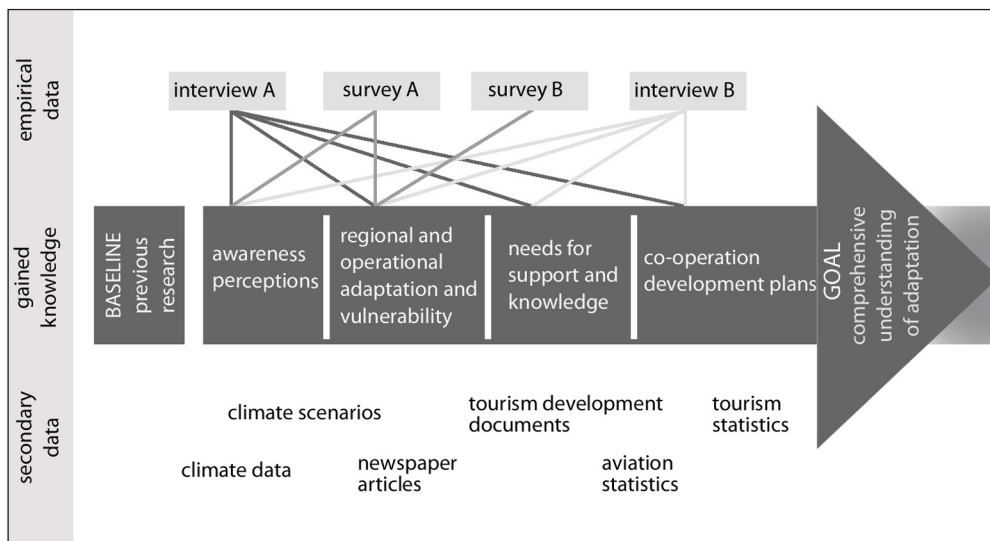


Figure 5. The research process and the contribution of the utilised data to research themes.

attractiveness is based on nature and its attractions. Moreover, the study aimed to assess the entrepreneurs' reactions (=adaptation strategies) to potential impacts of climate change. The interviewees also raised the issue of vulnerability to climatic events, a theme which was developed further and examined in more detail in the following studies. The results of interview study A are utilised and reported in articles I and II.

The findings of interview study A guided the construction of questionnaire survey A which was realised two years later in the summer of 2007. Data from the interviews was utilised to form climate change related wordings that were familiar for the industry (see Denzin 1989). Instead of focusing on Finland's nature-based tourism sector in general, attention was directed to winter tourism only, as the results of interview study A indicated winter tourism to be more vulnerable to climate change than other forms of nature-based tourism. The aim of the survey was to examine the level of climate change awareness and attitudes in the snow-dependent winter tourism sector, to search for vulnerabilities related to climatic events and elements, to assess dependence on snow and ice, and to reveal (potential) regional and operational differences within the sector. The results of questionnaire survey A are reported and utilised in articles II and IV.

Questionnaire survey B was constructed on the basis of the findings of the two earlier studies. They indicated that Christmas tourism in Rovaniemi is in imminent danger from climate change compared to other forms of winter tourism, hence the focus was set on Christmas tourists' attitudes towards the potential implications of climate change, adaptation and mitigation. The survey was realised in December 2007 at the Rovaniemi airport. The results of the study are reported in article V. Besides motivating the realisation of questionnaire survey B, the above-mentioned studies also inspired the examination of

the potential of the media and past climate conditions for affecting the perceptions of climate change (reported in article II).

The last phase of the study was realised as interview study B in 2009 and 2010. Again, semi-structured interviews were chosen as the method to gather more detailed information about attitudes towards climate change and its implications (adaptation, mitigation) at tourism destination level, and especially in relation to tourism destination development. The interview themes were created on the basis of the survey data, as the purpose of the interviews was to deepen the level of analysis. Two case destinations were chosen (Himos and Levi) in order to examine regional differences. The choice of cases was done on the basis of the findings of interview study A and survey A which guided the focus on nature-based, snow-dependent destinations which are located in different geographical regions. Another criteria for choosing the destinations was the availability of climate change -related tourism development material (Table 3) as explained more fully in article III. The main aim of the study was to incorporate the perspective of tourism development agencies (and other potential stakeholders) together with tourism entrepreneurs' perspectives. The findings of the study are reported in article III.

The empirical and main secondary data of the study are summarised in tables 4a and b. Interview studies were designed by the author, but the co-authors of the articles participated in the planning of the themes of the interviews. All interviews were conducted and transcribed by the author. The questionnaire surveys were constructed in cooperation with the co-authors of the articles. In addition, survey B was carried out by geography student Piia Kortsalo. Secondary data was utilised both as research data and in order to guide the complete research process thematically and regionally. Illustrations of the climate scenarios and past climate data were also used as stimulants in the discussions of the interview studies. The author was responsible for all data analyses.

Table 3. Tourism development documents utilised in the study.

Level	Name of the document	Year of publication
National	Tourism Strategy to 2020 & Action Plan for 2007–2013	2006
	Council of State's Decision in Principle on Finland's Tourism Policy	2006
Regional	Central Finland's Strategy for Tourism Industry 2015	2008
	Lapland's Tourism Strategy 2007–2010	2007
Local	Tourism Master Plan (Himos)	2005
	Final Report on Development Plan (Levi)	2004
	Project reports on recent development projects etc.	2007–2009

Table 4a. Summary of the utilised empirical data.

Type of data	Source and use of data
Interview study A	<p data-bbox="465 367 1155 462">19 interviews (19 interviewees) to tourism entrepreneurs: water-based summer activities (10) (in Lake District) snow-based winter activities (9) (in Northern Finland)</p> <hr/> <p data-bbox="465 472 1155 510">Realised in spring 2005</p> <hr/> <p data-bbox="465 519 1155 614">Methods of analysis: content analysis quantification</p> <hr/> <p data-bbox="465 624 1155 662">Reported and utilised in articles I and II</p>
Questionnaire survey A	<p data-bbox="465 672 1155 748">Mail survey to tourism entrepreneurs in whole Finland: 164 responses</p> <hr/> <p data-bbox="465 757 1155 795">Realised in spring/summer 2007</p> <hr/> <p data-bbox="465 805 1155 938">Methods of analysis: statistical analyses using SPSS (e.g. classification, non-parametric statistical methods), content analysis and quantification on responses to open questions</p> <hr/> <p data-bbox="465 948 1155 986">Reported and utilised in articles II and IV</p>
Questionnaire survey B	<p data-bbox="465 995 1155 1071">Contact survey of Christmas tourists in Rovaniemi (airport): 246 responses</p> <hr/> <p data-bbox="465 1081 1155 1119">Realised in December 2007</p> <hr/> <p data-bbox="465 1129 1155 1224">Methods of analysis: statistical analyses using SPSS (both non-parametric and parametric statistical methods)</p> <hr/> <p data-bbox="465 1233 1155 1271">Reported and utilised in article V</p>
Interview study B	<p data-bbox="465 1281 1155 1414">18 interviews (19 interviewees) to tourism stakeholders: tourism entrepreneurs (13) (in Himos and Levi) tourism development officials (5) (in Himos and Levi) related industry (1) (in Himos)</p> <hr/> <p data-bbox="465 1424 1155 1462">Realised in spring/fall 2009, and spring 2010</p> <hr/> <p data-bbox="465 1471 1155 1528">Method of analysis: content analysis</p> <hr/> <p data-bbox="465 1538 1155 1595">Reported and utilised in article III</p>

Table 4b. Summary of the utilised secondary data.

Type of data	Source and use of data
Tourism development strategies Tourism project plans	National, regional and local development agencies Utilised in article III
Climate statistics e.g. length of the snow season, date of arrival of permanent snow, date of melting of permanent snow, temperature, precipitation	Finnish Meteorological Institute Utilised in article II
Climate scenarios	FINADAPT project Finnish Meteorological Institute Scientific publications Utilised in articles I, II, III, IV, V
Aviation statistics	Finavia Utilised in article V
Tourism statistics e.g. overnight stays	Statistics Finland Utilised in articles II and V
Newspaper articles	Helsingin sanomat Utilised in article II

4.2 Continuum of case studies, content analyses and statistics

The research process was in a sense realised as a continuum of case studies, which aimed to study diverse tourism destinations intensively in order to understand a larger class of tourism destinations (i.e. nature-based winter tourism sector in Finland) (see Gerring 2004; Flyvbjerg 2006). As Yin (2009: 18) suggests, “a case study is an empirical inquiry that investigates a contemporary phenomenon in depth and within its real-life context.” Moreover, “it relies on multiple sources of evidence, with data needing to converge in a triangulating fashion...and benefits from the prior development of theoretical prepositions to guide data collection and analysis”. The objective of the study was to produce a comprehensive understanding of the adaptation to climate change in the Finnish nature-based tourism industry, with the presumption that regional or even local differences may affect adaptive capacity.

The tourism destination scale was assumed to be a suitable unit for the examination of adaptation strategies. As Jopp, DeLacy and Mair (2010) mention, while individual adaptation is mostly dependent on personal knowledge and values, at the destination scale the issue becomes more complex because of the large number of stakeholders involved. This complexity should not be overlooked but taken into consideration when examining adaptation and awareness of the nature-based winter tourism industry as an entity. Therefore, focussing on tourism destinations (as sub-cases within the entire Finnish nature-based winter tourism) that differ on geographical or operational grounds was considered a prospective approach. Therefore, Rovaniemi, Levi (Kittilä) and Himos (Jämsä) were chosen as sub-cases. Rovaniemi could have replaced Levi as a representative of Northern Finland's destination, but since the Clim-ATIC project (see Järviluoma & Suopajarvi 2009) was already examining the city's future in relation to climate (from the point of view of tourism entrepreneurs and decision-makers), it was considered more preferable to focus on a different destination, and this way widen the relatively narrow field of climate change -related tourism research in Finland. Furthermore, comparisons between Rovaniemi and some other destination in Southern Finland would have been difficult due to the uniqueness of Rovaniemi's Christmas tourism. Nevertheless, Rovaniemi's Christmas tourism is considered one of the most vulnerable forms of snow-based winter tourism in Finland, and has already struggled with snowless Christmas season starts. Therefore, the case study afforded an interesting research subject in relation to tourists' reactions to climate change.

Several matters supported the use of a case study research strategy. Firstly, a case study approach was chosen due to the high importance of the local aspect in climate change studies. Even though climate change is a global phenomenon, it is very local in character. Climate change manifests itself in diverse ways depending on the region, and its scale and power depend on a variety of local factors. Previous research has shown that generalisations about the impacts of climate change or about the attitudes of tourists or

tourism stakeholders should be considered with caution. Regions and different forms of winter tourism may differ considerably when considering, for example, the so-called critical tourism factors such as the length of the snow season required for viable operations (100 days in Switzerland, 80 days in Australia, see König 1998), or the suitability of adaptation methods (Scott *et al.* 2002) or the significance of diverse weather conditions (Denstadli, Jacobsen & Lohmann 2011; article IV). Also, the importance of other livelihoods in each location is an issue worth considering. The locations that are largely dependent on tourism are more susceptible to changes in tourism while in less-dependent locations the revenues from tourism are more easily compensated if the resources utilised for tourism deteriorate. Moreover, the studies of König (1998) in Australia and Abegg (1996) in Switzerland revealed major differences in climate change attitudes of the representatives of the skiing industry. In Switzerland, the tourism entrepreneurs raised concerns about the potential effects of climate change for the future of skiing while in Australia, the industry denied the phenomenon and tried to overturn the research findings indicating that snow cover was decreasing. Similarly, the tourists' reactions to, and expectations for the destination's conditions, for example snow cover, may differ depending on the home region (Galloway 1988; König 1998).

Secondly, the use of case studies was justified with the aim of producing regionally comparable data to study the current and expected future conditions (for tourism) and the construction of local adaptation strategies (both industry-wise and among individuals). Finally, the study also aimed to examine the ways in which the perceived impacts and their interrelations are manifested in adaptation strategies and practices. This kind of behaviour of tourism stakeholders in relation to climate change has been a little studied and understood issue, thus the case study was considered a suitable method to provide information with more depth (Yin 1998; Finn, Elliot-White & Walton 2000; Rice 2003). The depth of the case study (Yin 2009) was considered to contribute well to the breadth of information gathered by the questionnaires' larger sample sizes (Flyvbjerg 2006).

Content analysis was chosen as a method of analysis for all textual data. In this study, content analysis refers to qualitative content analysis as defined by Hsieh and Shannon (2005) in contrast to quantitative content analysis where explicit categories and statistical methods are used (Crang 2001; Hannam 2002; Franzosi 2009; see also Kohlbacher 2006). Therefore, the choice of research method aimed at fulfilling the main object of the whole study: providing understanding and knowledge of climate change adaptation in the winter tourism sector. Instead of focusing on numbers and statistical description of the text data, the aim was "the subjective interpretation of the content of the text data through the systematic classification process of coding and identifying themes or patterns" (Hsieh & Shannon 2005: 1278).

Text data was classified and coded with relevance to the themes approached in the interviews and in development papers under study. As the themes and ideas were derived from prior studies, the method represents the so-called theory-driven (Tuomi & Sarajärvi 2002) or directed content analysis (Hsieh & Shannon 2005). The method was not,

nevertheless, purely deductive (Potter & Levine-Donnerstein 1999; Tuomi & Sarajärvi 2002) since new themes, such as the connection between sustainable development and climate change were also allowed to emerge during the analyses.

Numerical data mainly gained from the two surveys (winter tourism entrepreneurs and Christmas tourists) was analysed statistically using SPSS statistical software. The statistical information derived from secondary sources was examined and processed using Excel. The statistical analyses were realised in accordance with the characteristics of the data under examination, thus, both parametric and non-parametric tests were utilised. In addition to the statistical analyses introduced fully in the articles, descriptive statistics were used to become acquainted with the data and to illustrate special characteristics of the data.

The participants' anonymity was protected by not revealing any information that could help identifying the recipients. Nevertheless, some of the participants in interview study B gave their permission for releasing certain information about them: some development officials have public roles in their destinations and also the representatives of the skiing centres are well aware of their central, visible roles in the case study destinations (and the difficulty of protecting their privacy in this sense). Therefore, they understood that when the names of the case study areas are mentioned in the research articles, some of the readers may be able to identify them.

5 Emerging awareness of climate change in the tourism industry

5.1 Emerging awareness of climate change and talk about local weather

This thesis aims to contribute to an understanding of the relationship between global climate change, tourism and adaptation. The empirical study focused on examining how tourism entrepreneurs and development officials in Finland and in specific case study sites gain and develop climate change knowledge and how they perceive the processes of climate change. Besides overviewing the knowledge and perceptions of climate change, the empirical study also explored the importance of climate and weather for tourism activities and the current and planned adaptation strategies and practices of the industry. The demand element of the tourism system was integrated in the study by assessing the perceptions and reactions of tourists to changing conditions. Rather than focusing on one single research question at a time, the individual articles attached in this thesis each shed light on one or more research questions from different perspectives. The following paragraphs summarise their findings in relation to the four research questions presented earlier.

Articles I, II, III and IV examined and discussed the perceptions of climate change from the viewpoint of the tourism industry. They contributed to the first research question: *what issues affect the awareness, and the constitution of perceptions and knowledge of climate change at local (tourism destination) level, and among individual entrepreneurs?* In short, the awareness of climate change seems to have been growing during the research process among tourism entrepreneurs and also among other tourism stakeholders such as tourism development officials. The growing awareness does not refer only to the more detailed knowledge about the causes and effects of the change, but also to the higher acceptance of the existence of the anthropogenic climate change (the majority of the tourism stakeholders who participated in this study believe in human-induced climate change) and its importance for the tourism industry. One manifestation of this importance is the entrepreneurs' consideration of climate change as a more relevant issue related to future planning and development than competing land use, for example.

The everyday discussions of climate change mainly revolve around observations of local weather phenomena and focus on destination level impacts rather than the global implications of the changing climate. Moreover, the factors behind the change receive little attention, and the tourism stakeholders do not consider the tourism industry to hold a central role among the contributors to the change. Rather, they refer to the "big countries" as the ones being more responsible for the increasing levels of greenhouse gases in the atmosphere.

Both the media (mainly newspapers, television and radio) and personal experiences of climatic phenomena are mentioned as main sources of obtaining information about the changing climate and its potential impacts. Despite the criticism towards the information provided by the media, a lot of information concerning the global and national aspects of the change is gained through the media. Observations of the (local) climatic phenomena are often related to the formulation of personal opinions about the change and considered to indicate potential impacts. Thus, both the media and climatic phenomena have a central role in conceptualising climate change. The reported growth in awareness and the shifting of attitudes towards the existence of climate change support this assumption, as they have taken place in parallel with the occurrence of high media coverage of climate change and abnormal climatic events.

The media is sometimes considered to provide biased information about climate change. Also, the poor relevance of climate change related information for the tourism industry operating in local scale and the temporal dimension of the climate change predictions receive criticism. Only a minority of the stakeholders are active in searching for relevant climate change information on their own. The majority of stakeholders rationalise their passivity with the nonexistence of relevant information or the ambiguity and incongruity of the available information, and with their lack of competence to interpret information for fear that it leads to incorrect decision-making. Therefore, the tourism stakeholders set their hopes on the state as the provider and conveyor of relevant and reliable information.

Finally, other factors affect the perceptions of climate change. As the results from 2005 and 2007 show, climate change was taking root among the tourism entrepreneurs as an important factor affecting the industry's future, but in 2009 other factors with direct implications (e.g. the recession with its impact on tourism consumption and mobility) had drawn some of the industry's attention to more immediate issues. As the stakeholders base their perceptions on their personal experiences and are directly dependent on the local climate conditions, the local aspect becomes very strong. Nevertheless, because of this local and even individual view of point, it is difficult to assess the constitution of climate change perceptions at the local (destination) level (i.e. the collaborative and shared perceptions). According to the results, strong cooperation in tourism development may assist the constitution of shared perceptions, but more research is needed to form grounded assertions of this issue.

5.2 Diversifying adaptation strategies

Adaptation was a cross-cutting theme in the whole study. Therefore, the second research question (*how and in which direction are/have the planned and realised adaptation strategies and practices in winter tourism developing/ developed?*) was approached in all articles. The main finding is that even though the tourism stakeholders have a good understanding of the industry's (local) vulnerabilities they seem to be lacking the tools and/or the willingness to reduce these vulnerabilities permanently (anticipatory adaptation). Rather, the preferred solution is to operate according to prevailing conditions (reactive adaptation). The justification for reactive adaptation is grounded in the slowness of the change and in the characteristics of the SMEs: their adaptation strategies often focus on the short term implications rather than on the distant future. Moreover, the entrepreneurs consider themselves, because of their experience of high natural variability of climate, very capable of adjusting to new conditions even at short notice. Other reasons for the reactive nature of adaptation were related to the limited availability and relevance of information that could be used to support decision-making. The SMEs do not have the resources to invest in new technology or make radical changes based on uncertain projections of the future climate.

Nevertheless, the variety of adaptation practices has increased since 2005. Furthermore, the adaptation measures discussed in the latter part of the study (articles II, III, IV, V) (Tables 5a and b) respond more openly to the implications of climate change as compared to 2005. In 2005, the entrepreneurs stated that their measures were mainly aimed to help cope with the natural variability of the climate (e.g. the snowless season starts). An examination of the use of current adaptation methods to cope with snow-deficiency by activities showed that cross-country skiing is the activity least equipped to cope with snowless conditions. Downhill skiing, on the other hand, is the activity with highest variety of adaptation methods available (see Table 3 in article IV). The local aspect is very clear also in relation to adaptation: local conditions determine the needs for adaptation. Furthermore, the implemented adaptation strategies mainly focus on the local implications, and aim in maintaining the winter season in its current form. The anticipated ones also address the global implications of climate change and are more future-oriented as they mainly relate with destination development and marketing activities.

The analysis of tourism destination development plans indicates that also the general development objectives of the tourism destinations – sustainability and year-round tourism – are considered to support adaptation to climate change. The pursuit of all-year tourism, for example, lessens the risk of losses during snowless winters by making the destinations less dependent on snow-based activities and encouraging the development of non-snow activities. It is also worth noting that the high natural variability of the climate in Finland has given the tourism industry a good basis for adaptation to permanent change in climate.

Table 5a. Implemented adaptation methods and practices discussed in the articles.

Main aim	Adaptation method	Other reasoning/explanation
Maintaining the destination's winter image	Investments and innovations in snow technology	Focus on energy use (cut energy costs) and operation tempera-
	Offering substitute activities	
	Relocation of activities	
	Organising high-level international winter events (e.g. World Cup openings)	Attracting winter tourists from destinations suffering from lack of snow
Cutting extra costs	Shorter work contracts for seasonal workers	Work contracts coincide with winter season length
Shifting emphasis from early winter to spring	Reduced pricing in late winter season	Creating demand for a new late spring season

Table 5b. Anticipated and partly implemented adaptation methods and practices discussed in the articles.

Main aim	Adaptation method
Destination development	Updating tourism supply to coincide with climatic conditions/ variability (e.g. construction of a spa or fitness centre)
	Emphasising summer and shoulder seasons
	Product development
	Innovations
Careful marketing	Updating of marketing to coincide with seasons (e.g. not selling snow-guaranteed activities for early winter)
Attracting the potential ecotourists	Low carbon footprint marketing
	Emphasising energy efficiency
	(Green) innovations

5.3 Operational and regional vulnerability and reliance on tourists' decision-making

The findings of the articles I, III, IV and V relate with the third research question, *what are the main factors affecting the capacity and capability of the winter tourism sector to prepare and to adapt to climate change in different regional and activity contexts?* The issue was approached from the point of view of vulnerability and the feasibility of adaptation strategies. As in the results presented above, the strong local aspect was highlighted also in this context. Several factors affecting the industry's capacity were identified, but they varied between regions (and destinations), and also depending on the activities (e.g. cross-country skiing vs. snowmobiling). Moreover, the factors are highly intertwined, even though presented as a list of individual factors in table 6.

The findings of the articles indicate that the geographical location of the tourism destination forms the basis for adaptation, as it determines the intensity and nature of the predicted climate change, and has often formed the basis for tourism destinations' attractions and seasonality in the first place. It also defines the accessibility of the destination, a factor which may be of even greater importance in the future if climate change mitigation impacts tourism mobility. In relation to adaptation strategies, location affects tourism stakeholders in a sense that both the need for, and the usability of, the adaptation measures vary between locations, not only between activities as discussed below. Also, the current weather-related problems vary both by location and activity (Table 7). Therefore, knowledge of local climate and environment is essential when planning for adaptation.

The nature of activities determines adaptation as activities are sensitive to different aspects of climate and have diverse prerequisites for their realisation (see Table 8 below and Tables 2, 5 and 6 in article IV). Some activities, for example, can be relocated easily, while others' images may not support the inclusion of snowmaking technology. In this sense, the diversity of activities – both at the destination scale and within individual enterprises – increases adaptive capacity. Enterprises offering multi-activities (combinations of activities that may include cross-country skiing, snow-shoeing, snowmobiling, dog sledding, reindeer activities, ice fishing, skating, ice breaker cruises or ice rally) are less prone to weather-derived cancellations. Multi-activities also require less natural snow for their realisation. In addition, as the diversity of activities often goes hand in hand with the size of the enterprise/destination, greater size can increase capacity at different scales. Nevertheless, a small enterprise may be more flexible in adjusting to new conditions, therefore also small size can be an advantage. Still another issue related to the nature of the activities is the image of the destination. As the results of article V show, the destination's image (as a touristic landscape) and the perceptions of the tourists of it may hinder the destination's potential to adapt by limiting the suitability of potential adaptation measures. The invention and marketing of a completely new destination image may prove a difficult task.

Table 6. Factors affecting the adaptive capacity of a tourism destination or an enterprise.

Physical aspects		Social and community aspects
Location	Accessibility	Public support (community/state)
	Climatic conditions	Dependence on tourism as a livelihood
	Climate change projections	Knowledge of the local environment
	Topography and other environmental factors	Climate change knowledge, awareness and attitudes
Size of the destination (and enterprise)		Ability to innovate
Nature of the activities		Image of the destination (history, development)
Seasonality	Timing of the season peaks	Tourists and their reactions
		Level and networks of collaboration

Table 7. The weather events causing most cancellations in snow-based activities by region (frost refers to extreme cold weather <-20 °C in SW Finland, <-25 °C in Eastern Finland, and <-30 °C in Northern Finland).

	Southern/Western Finland	Eastern Finland	Northern Finland
Downhill skiing	Frost	Frost	High wind
Snowmobiling	Frost	Frost	Frost
Cross-country skiing	High temperature	Frost	Frost
Reindeer activities	N/A	N/A	High temperature/frost
Ice activities	High temperature	High temperature	High temperature
Dog sledding	Other (no snow)	High temperature	Rain
Multi-activities	Other	N/A	High temperature/high wind

Table 8. Operational vulnerability to weather events and prerequisites for natural snow (or ice).

	Proportions of enterprises offering diverse activities who have suffered from weather-derived cancellations	Required depth for natural snow/ice cover
Downhill skiing	96 %	0 cm
Snowmobiling	87 %	> 20 cm
Cross-country skiing	76 %	11–20 cm
Reindeer activities	73 %	11–20 cm
Ice activities	67 %	15–25 cm (ice)
Dog sledding	52 %	11–20 cm
Multi-activities	25 %	6–10 cm

A destination's image and activities are also linked with the seasonality and the timing of the peak seasons as the example of Rovaniemi's Christmas tourism shows. Seasonality as such is not necessarily considered fatal in the light of changing climate, but the timing of the peaks within the winter season causes differences between destinations and activities in relation to adaptive capacity. Seasonality is also linked with the dependence on tourism as a livelihood. Both at the destination and at the enterprise scale other livelihoods may bring essential income during the low seasons, and increase the adaptive capacity (of the community) by helping to maintain tourism.

Climate change awareness, attitudes and the availability of information also hold an important role in the building of the adaptive capacity. As discussed before, climate change awareness in the tourism sector has been growing lately which stimulates discussions about adaptation among tourism stakeholders. Besides accepting the existence of climate change, the tourism industry needs to be aware of the potential impacts of the changing conditions (not only in relation to climate but to the whole tourism system). If the understandings of the industry are not in accordance with the impacts taking place in reality, the capacity to adapt is very limited. Therefore, there is a constant need for research information that can be of assistance when planning adaptation. This dearth of information especially concerns the local scale information and the potential reactions of tourists. Lastly, the climate change attitudes are a major issue for the realisation of adaptation: is the change considered worth reacting to and expending the (often scarce) resources of the SMEs.

As discussed earlier, the ability to innovate refers to the skills to develop new tourism products and adaptation methods. Moreover, it also includes the ability to see beyond the traditional tourism regions, destinations and products and to envisage tourism in a future world where the old assumptions of the climate's significance to tourism are no longer relevant. According to the findings of this study, this issue may be a potential pitfall considering adaptation – the tourism stakeholders who participated in the study did not report any adaptation measures they considered 'innovative'. Rather, the innovations

mentioned by the entrepreneurs mainly stood for the development of linkages with local communities, cities and research organisations (in comparison to the traditional collaboration between tourism entrepreneurs and businesses). As the example from Central Finland (see article III) indicates, climate change related innovations are sometimes included in development projects, but their realisation fails if the driving innovative force(s) leaves the project or does not succeed in convincing the other project members.

5.4 Collaboration towards sustainability

Also collaboration and networking are listed in Table 6 as factors affecting the capacity to adapt. They do, nevertheless, relate more with the fourth research question, *are there specific collaborative or potential elements/networks formed and utilised in the adaptation processes and in the constitution of knowledge and perceptions of climate change*, therefore they are discussed in this last subsection summarising the findings this study. Networks and collaboration are mainly discussed in articles I and III.

One presumption in this study was that the awareness of climate change and its impacts would lead to increasing collaboration in the winter tourism sector. The findings of the study did not support this assumption. Tourism stakeholders did not recognise climate change as a stimulant for collaboration. However, they consider that existing collaboration (and networks) may help in preparing for the changing climate. In regions where the traditions of close cooperation and networking are stronger, their utilisation in relation to climate change is accepted more readily. Tourism entrepreneurs have also started to increase collaboration to offer multi-activities (activities marketed and sold as packages where individual enterprises organise separate activities, may also include accommodation and food services), mainly due to increasing demand for 'single window' services by tourists and travel agencies and savings in marketing, but also because of increasing flexibility and opportunities to provide substitute activities when needed. Nevertheless, at the destination scale the collaborative activity related to climate change is still in its infancy and often reactive by nature. Furthermore, the emergence of joint efforts is dependent on individuals' activity and enthusiasm. The tourism stakeholders seemed to share the opinion that unless strict environmental laws are designed and put into effort, the individuals are unlikely to truly participate in mitigation activities. In view of these issues, the role of collaboration for building adaptive capacity may be questioned.

Nevertheless, the discussions with tourism stakeholders in two case study destinations (Levi and Himos) shed light on the role of collaboration in relation with climate change. According to the representatives of tourism development offices, climate change is considered to be hidden in the development agendas for sustainability and all-year tourism. In this respect, the continuing collaborative efforts to increase year-round tourism (and the history of coping with natural variability) affect the collective adaptive capacity positively

while the development goals of sustainable tourism include several aspects that can be related to climate change mitigation. Moreover, if the potential development of linkages with new partners takes off, it is possible that new specific forms of collaboration relating to climate change start to form.

6 Discussion and conclusions

6.1 Increasing awareness and adaptation before mitigation

This thesis has examined the nature-based winter tourism sector in Finland with a focus on perceptions of climate change and adaptation strategies. The main aim of the study was to develop a comprehensive understanding of adaptation to climate change in this specific field of tourism. As the findings indicate, several issues affect and define adaptation at the local level. The adaptive capacity of a single tourism enterprise is dependent on, and builds on, diverse factors such as the geographical location, enterprise's size, entrepreneur's attitudes and the nature of activities. At the destination level, the number of factors is multiplied because of the many stakeholders involved (Jopp, DeLacy & Mair 2010).

In general, the findings of the study support the common attitude of the vulnerability of nature-based winter tourism to climatic changes, and the close relationship of the nature-based tourism operators with their surrounding environments. Moreover, the author's misgivings towards the generalisations of winter tourism on the basis of studies focusing mainly on down-hill skiing are also backed up. Nature-based winter tourism should not be viewed as one entity, but the operational and regional differences should be considered carefully when estimating the sector's vulnerabilities and its future in a changing climate.

Even though the awareness of climate change seems to have increased among tourism stakeholders during the realisation of this study, the actions of the industry do not seem to have increased or developed at the same pace. Adaptation measures have been diversifying and the representatives of the industry have started to use the term climate change when rationalising some of their development actions that relate both to adaptation and mitigation. Nevertheless, as both Weaver (2010) and Scott (2010) agree, the industry is still lacking in its commitment to confront and take responsibility for the change at the global level. Considering the nature and characteristics of the nature-based tourism industry in Finland, this lack of commitment becomes more understandable. The small and medium sized enterprises operating on short time scales do not have the resources to participate independently in mitigation efforts unless the benefits of the actions are not realised in a short time span, or unless environmental laws force them to act in some way.

Therefore, as noted also by Simpson *et al.* (2008; see also UNWTO & UNEP 2008) and Jopp, DeLacy and Mair (2010), adaptation may be a more preferred option as its benefits become apparent at a shorter time span and locally while mitigation aims in global level changes and does not necessarily benefit the local level industry at all – even though Gössling (2011) suggests that also mitigation can indeed be profitable for tourism businesses as mitigation may bring rewards in employee and customer loyalty, in cost avoidance and positive media attention. Similar attitudes have been reported in relation to the pursuit of sustainability in tourism, as the comments of some entrepreneurs

participating in interview study B and the findings of Bonilla-Priego, Najera and Font (2011) indicate. Environment-friendly actions are often grounded on, and relate with, economical matters such as energy cost savings achieved by increasing energy efficiency.

Nevertheless, as the examples of Gössling (2011) indicate, several issues increase the sustainability of tourism in relation to climate change, issues that are often already included in the development plans. One good example is the pursuit of lengthening the visitor stays in destinations, a trend that was considered alluring in the destinations participating in the study. During longer visits the tourists have more chances to participate in activities, and one rainy day, for example, does not have such a negative impact on the travel experience as during a one or two-day visit. The findings of article V support this idea as the willingness to return was higher among tourists staying a bit longer at the destination, suggesting that customer loyalty increases with longer stays. Also, the acceptance of changing conditions seemed to be higher among tourists who stayed longer in Rovaniemi. Both of these examples support the pursuit of sustainability. Furthermore, the findings of the study support Gössling's (2011) views when examining the level of pro-climate action among tourism stakeholders. Both the tourism stakeholders participating in this study and Gössling (2011) conclude that voluntary action to increase sustainability is possible but that regulatory approaches such as environmental laws are needed to involve most stakeholders in pro-climate action (see also Scott, Hall & Gössling 2012).

6.2 Critical examination of adaptation methods' feasibility is needed

The sensitivity approach presented in the article IV has not been used previously. The approach was first introduced by de Freitas (2005), but, until now, it has not been applied to examine the operational vulnerability of diverse winter tourism activities. Vulnerabilities have been assessed from other viewpoints, such as the potential of snowmaking to compensate for the diminishing snow cover in downhill skiing (Scott, McBoyle & Mills 2003; Scott *et al.* 2006; Moen & Fredman 2007; Scott, Dawson & Jones 2008) or at destination level in a coastal setting (Moreno & Becken 2009) or with relation to tourism demand (Agnew & Palutikof 2006). According to the findings of article IV, it is possible to assess the future of winter tourism in a changing climate by studying the current vulnerabilities of the industry's elements. Nevertheless, the approach alone does not provide a comprehensive understanding of the future, but other methods are needed to complement the picture. Together with the tourist landscape approach introduced in the article V it is possible to develop adaptation studies to a more advanced level.

The above-mentioned approach also proved to be a potential tool for assessing the importance of diverse elements for the tourism landscape and the suitability of certain adaptation methods from the tourists' point of view. Even though the study indicated

that some adaptation methods are more acceptable for tourists, the article did not commit itself to the evaluation of the general feasibility of the accepted methods for the activities in question. A more comprehensive picture can be constructed when the findings of the two articles are combined.

According to article V, the most important activities related to Christmas tourism are a visit to Santa Claus, a visit to the Arctic Circle, reindeer activities, dog sledding and snowmobile riding. The first two are activities that can be considered weather-independent, but since snow and real winter are also closely associated to these core elements of Christmas tourism, snowy landscapes should be provided to secure tourists' satisfaction. As both are also place-bound and rather small-scale activities (referring to the size of the needed area) the creation of snow-covered landscape is not an impossible task, depending on the available technology, assets of the entrepreneur and temperatures (a temperature below 0 °C is still required to produce snow). Reindeer activities and dog sledding both require 11–20 centimetres snow cover for realisation, while snowmobiling needs more than 20 centimetres of snow. Both reindeer and dog sledding are possible on small-scale trails, but snowmobiling requires much longer trails (see also McBoyle, Scott & Jones 2007). Moreover, snowmobiling is the activity most prone to cancellations. Therefore, one suggestion for adaptation strategy could be that the role of snowmobiling is weakened and that activities having less demanding prerequisites are strengthened through marketing activities (Scott, Dawson & Jones 2008). Further on, the focus should be directed to even less-demanding activities, even though the shift to all-terrain vehicles, as suggested by Scott, Dawson and Jones (2008) may not be a feasible option for environmental reasons and because of operators' and landowners' attitudes (the damage to nature caused by ATVs being more serious than that of snowmobiling).

A commonly suggested adaptation method for winter tourism is the development of year-round tourism and snow-independent activities. The introduction of a cable wakeboard in Ukkohalla skiing centre, for example, can in some sense be considered a successful and innovative adaptation method even though the activity as such is 50 years old. The cable wakeboard has boosted Ukkohalla's development and increased its summer tourism considerably (Turun Sanomat 2008; YLE Kainuu/Kinnunen 2010) and helped in this way to achieve year-round tourism. As this example shows, at this stage, the snow-independent often refers to existing summer (or spring/autumn) tourism activities rather than to genuinely new innovations such as the introduction of unheard-of activities developed especially for cold, wet and dark conditions. Not all activities are suitable in winter conditions without snow. One should remember that the conditions depending on the latitude are not changing, but the winters in Finland continue to stay dark (and may even get darker), nor are the temperatures changing to summer readings. Therefore, the realisation of adaptation should be done with caution, as unforeseen factors may affect their success. Moreover, the mere number of potential adaptation methods should not be an indicator for the value of adaptive capacity. The tourism entrepreneurs participating in this study seem to have a good understanding of this dimension (e.g. cautious in extending

the canoeing season from its present season due to darkness and water temperatures), but also researchers should bear in mind the fact that some elements of the environment are stable or changing less than others.

Instead, tourism stakeholders are lacking the tools to assess the tourists' reactions and sensitivity to diverse adaptation methods (as examined in article IV), and the methods' feasibility in wider contexts. For example, how do the plans to compress the Christmas season in Rovaniemi respond to tourists' negative attitude towards increasing numbers of tourists at the destination; or how much can the ski season be compressed before crowding starts to affect the tourists negatively? Or, as discussed by Landauer, Pröbstl and Haider (2012) in relation to cross-country skiing; how do the tourists' home region and their traditions of participating in certain activities affect the suitability of adaptation techniques? Together with producing tourism relevant information about the magnitude and impacts of the change these two aspects can help to increase the adaptive capacity of tourism sector considerably.

In a sense, these aspects follow the dichotomy presented by König (1998) when he divides the impacts of climate change into direct and indirect. Therefore, the concepts of direct and indirect can be applied to adaptation studies assessing the feasibility of adaptation: the need for adaptation (arising from vulnerabilities) closely relates with direct impacts, while the consequences of adaptation (the changes in tourism destination and the tourists' reactions) can be defined as indirect. The application of the two concepts in adaptation studies should also be carried out with caution as the two are interrelated also in the context of adaptation. Nonetheless, as mentioned earlier, the concept impact is inseparable from climate change research in tourism, regardless of the approach chosen.

6.3 Factors behind adaptive capacity

The nature of local level discussions on climate change and adaptation depend on several issues as listed earlier in subsection 5 summarising the findings of this study (e.g. public support, information, awareness, ability to collaborate, experience of natural variability of climate, etc). It is difficult to differentiate the roles of these factors as individual contributors to the whole adaptive capacity, especially when they are intertwined and interrelated. Rather, they could be utilised in studies assessing adaptive capacity in the sense that, since they all contribute to the capacity, it is possible to increase capacity by enhancing these individual factors.

Location determines the resources for realising tourism, the destination's accessibility and seasonality, and the intensity and nature of the change. The tourism destination's location is, without doubt, an important factor affecting the perceptions towards climate change and preparedness for adaptation. Therefore, it is interesting that the comparisons

between the case destinations indicated only minor differences in the readiness to accept climate change and to plan for adaptation. According to Brouder's and Lundmark's (2011) findings, the perceptions of vulnerability are stronger in regions where the exposure to change is higher. Considering only this point of view, the tourism entrepreneurs in the southern case destination should have been more concerned about the change and more willing to accept the need for adaptation. This was not the case, the tourism entrepreneurs operating in the north responded to the potential challenge of climate change more openly.

In view of this, it becomes clear that the role of the geographical location is not necessarily the determining factor, but other factors relating to social and community aspects also guide and affect the attitudes towards climate change, and further determine the adaptive capacity. The so-called social capital of the destination – which refers here to the balance between cooperation and competition and to the overall organisation of the destination – seems also to be an important and potentially determining element of the adaptive capacity. Social capital of the destination was not a central focus of this study, but the findings support and coincide with Adger's (2003, see also Adger *et al.* 2009) views on the importance of collective action and social capital for adaptation. The concept and the consideration of it as being a geographical concept (Mohan & Mohan 2002; Adger 2003) could help to explain the readiness to adapt and the success of adaptation in diverse destinations. Adger (2003: 388) for example states that “the social acceptability of options for adaptation, the institutional constraints on adaptation and the place of adaptation in the wider landscape of economic development and social evolution” define the effectiveness of climate change adaptation strategies. Therefore, in light of the findings of the study, the inclusion and examination of the concept social capital may bring interesting new insights into the study of adaptation in the tourism sector.

Moreover, tourism cannot be discussed in isolation from the community in which it takes place. The community scale has been emphasised by Smit and Wandel (2006) when they state that the practical initiatives aiming to improve (societal) adaptive capacity are often most evident at this scale. As tourism in Finland is often used as a tool for regional development, the tourism sector's adaptive capacity is closely linked with the community's reliance on tourism as the provider of well-being. As some of the essential resources for tourism are also used by other livelihoods, the community's values and support in land-use issues, for example, may be crucial in certain aspects (Adger 2003; see also Adger *et al.* 2009; Jopp, DeLacy & Mair 2010). Also, issues related to other socio-economic and institutional indicators such as the demographics are important to recognise when examining the general adaptive capacity (and vulnerabilities) of any community (Hill, Wallner & Furtado 2010).

However, as discussed earlier, the driving forces behind adaptive capacity can vary from system to system. Smit and Pilisofova (2001) recognise that adaptive capacity can be latent, too. This means that adaptive capacity materialises into adaptation when the

systems are exposed to climate stimuli, if the actual or perceived stimuli are strong enough to be considered as worth reacting to. Therefore, also adaptive capacity is closely linked with perceptions.

Still another issue relating to adaptive capacity is the fact, discussed also by Scott, Hall & Gössling (2012), that tourism as a phenomenon, and when approached as a system, is susceptible to changes in the broader environment that can relate with any of the system's elements. Therefore, even though the tourism stakeholders are very much aware of the importance of local scale issues for their operations, they are not immune to global issues and trends such as the global economics, and the economic recession that took place during the research period or to the influence of the SARS epidemic the impacts of which the entrepreneurs reported. With climate change being a phenomenon that proceeds at a relatively slow pace, it is also a phenomenon the reactions to which will have to step aside when more acute events call for action.

6.4 The role of the media for climate change awareness and perceptions

Supporting the findings and understanding of Wolfsegger, Gössling & Scott (2008) and Gössling *et al.* (2012b), several outcomes of the study indicate that the media holds an important role in relation to climate change. First of all, it is the main source of climate change information for most tourism stakeholders and thus an important factor in the creation of perceptions. Nevertheless, the stakeholders still regard the information provided by the media with suspicion, which affects the acquisition of information. This so, even though during the realisation of this study, the tourism – climate change research has increased and advanced tremendously. More research-based information is nowadays available that is of relevance for the tourism industry than was seven years ago, also in the Nordic context. Research information does not, however, necessarily reach the tourism stakeholders via the easy-accessible media, and the stakeholders, especially entrepreneurs have scarce resources to search for and to acquaint themselves thoroughly with the newest and most relevant knowledge on climate change (Dodds & Graci 2009; Becken & Hay 2012). Nevertheless, as perceptions of climate change are crucial for the realisation and potential success of adaptation (O'Connor, Bord & Fisher 1999), alternative routes for knowledge sharing are needed.

The media also has a role in generating and directing the flows of tourists. The newspaper headlines such as the ones presented earlier in this thesis (Table 2 in subsection 2.5) may affect tourists' opinions and travel decision-making. Olsen, Koster and Youroukos (2012), for example, mention Newsweek's list of last chance tourism destinations from 2010 and discuss possibilities to use this kind of publicity in future marketing of the destinations. The so-called last chance tourism (see Lemelin, Dawson & Stewart 2012)

has lately received growing attention, but the influence of “normal” news reporting climate change related events on people’s travelling has not yet been studied extensively. Therefore, it is difficult to assess to what extent the tourism entrepreneurs’ claims about the media’s role in promoting destinations and contributing to tourists’ decision-making holds true. It is, nevertheless, probable that news receiving international attention such as the cancelling of the Levi World Cup influence tourists’ perceptions of Levi as a snow-secure destination. Tourism entrepreneurs’ concerns are therefore justifiable, especially when the event has been considered as an adaptation method that has helped in marketing and keeping up the snowy image of Finnish Lapland.

As a researcher, and contributor of scientific information it is important to notice the importance of diverse information sources for the end users, the representatives of the tourism industry. Providing the media with relevant and accurate knowledge about tourism – climate change issues seems to be one of the most influential ways to inform the industry about the potential implications of climate change.

6.5 Concluding remarks and future research prospects

This thesis alone does not provide a comprehensive understanding of human perceptions of climate change. It does, however, contribute to the information about tourism stakeholders’ ways to come to terms with their changing physical environments, hopefully enhancing both the adaptive capacity of the industry and the general pursuit of sustainability in tourism in Finland.

The findings of this study show that climate change awareness among tourism stakeholders in Finland has increased, as has the acceptance of the scientific reasoning for its existence. Nevertheless, adaptation to climate change is still in its early stage, partly due to insufficient knowledge of its implications among tourism stakeholders. The main reasons seem to be the slow pace of the change and the characteristics of the nature-based tourism industry in Finland. Also Kietäväinen’s, Tuulentie’s and Rovannerä’s (2011) study supports this conclusion: tourism entrepreneurs in Lapland considered climate change to affect tourism industry in the long term (15–30 year timeframe) rather than within the following five years. Nonetheless, adaptation and also mitigation are to a certain degree included in the general development programs that focus on sustainability and year-round tourism and often follow the principles presented in national scale development papers (see also Hakkarainen & Tuulentie 2008; Kietäväinen, Tuulentie & Rovannerä 2011). Therefore, one option to strengthen both adaptation and mitigation at the destination level could be emphasising these aspects on the national level strategies, or by incorporating tourism-specific issues in climate change policies (see Gössling & Hall 2008; Becken & Clapcott 2011; Becken & Hay 2012). Furthermore, the high natural variability both helps and hinders the development of adaptation processes. On the one hand, the tourism

industry is experienced in coping with extreme and changing conditions. On the other hand the natural variability is hiding the true nature of climate change and causing uncertainty in climate change projections, thus it is more difficult to prepare and plan for the actual changes that will take place in the future.

Both the vulnerability and adaptation capacity depend on several factors. The geographical location of a destination is important, but not necessarily the determining factor when assessing the potential future of tourism and tourism businesses. The nature of activities, a community's social capital, and the origin and expectations of tourists also highly affect the adaptive capacity of a destination. Nevertheless, these factors and their importance vary between destinations; in addition they are interrelated. Therefore, knowledge of local conditions is crucial for assessing adaptive capacity and planning for future development. Moreover, it is important to recognise the scale at which assessments are made. At the national scale the adaptive capacity appears in a different light than at the community scale.

As the first attempt to construct a comprehensive picture of climate change adaptation in the winter tourism sector in a Finnish context, the thesis leaves several knowledge gaps to be approached in future research. One aspect is the focus of this study mainly on destinations where one activity or attraction (downhill skiing or Santa Claus) has a central role. In destinations, where the dominance of a single activity is smaller or non-existent, the challenges for adaptation and the factors contributing to adaptive capacity may differ. Hence, new research activities should be directed to destinations representing different kinds of activity settings. Also, as discussed in article IV, the tourism entrepreneurs often offer a variety of activities which affects their capabilities to adapt on an individual level (through increasing resilience towards extreme weather events, knowledge of and accessibility to diverse adaptation methods). This aspect, the combination of activities within an enterprise, should be taken into consideration in future studies.

Tourists' role as stakeholders becomes concretised in relation to images and flows of tourists. Currently, most studies examining tourists' perceptions of climate change have often focused on reactions to mitigation measures (e.g. carbon taxes, energy saving initiatives) (e.g. Becken 2007; Gössling *et al.* 2009) and to changing snow conditions in skiing resorts (e.g. König 1998; Pickering, Castley & Burt 2010). Less attention has been directed to studies on images, importance of the diverse elements of them (Jacobsen 2007) and to the potential to change these images in parallel with climatic changes (Frochot & Kreziak 2008; Buzinde *et al.* 2010a). In the Nordic context, for example, several destinations are competing for winter and Christmas tourists from different countries and their futures in a changing climate are dependent on their success in developing and diversifying their images. Information is needed to increase adaptive capacity also in this sector.

Moreover, certain stakeholders have been ignored in this study. Travel agencies act as gate-keepers to destinations from the tourist generating region's point of view. Their role in directing tourist flows is also an important one, even though in this study, the tourism

entrepreneurs and development officials were considered to represent them and transmit their ideas. The tourism entrepreneurs participating in this study were also chosen in order to represent the ones directly dependent on environmental factors and thus directly affected by climate change. The supporting (and crucial) elements of nature-based tourism such as the enterprises focusing on accommodation were mostly ignored in this study even though some interviewees were operating in accommodation sector, too. Brouder and Lundmark (2011) demonstrate that the accommodation sector is also concerned about, and susceptible to, the implications of changing climate. Therefore, the focus should be directed to examine the tourism sector as whole with all its stakeholders, and possibly even following the conceptual model of the tourism-environment relationship as discussed in subsection 3.1. Nevertheless, this kind of approach calls for multi- and interdisciplinary collaboration between researchers, tourism stakeholders and decision-makers, the demand for which has been acknowledged on several occasions prior to this study (e.g. Hall 2005; Sharpley 2009; Scott, Hall & Gössling 2012). Enhancement of collaboration between researchers representing diverse disciplines, in ways that also support participation of tourism stakeholders, is probably one of the greatest challenges for the development of tourism and climate change research.

At present, when climate change permeates all sectors of the society, people are becoming more aware of its implications. Even though shared cultural factors may lead to shared perceptions about the phenomenon, individuals still address climate change on the basis of their personal knowledge and values. Nonetheless, as Jopp, DeLacy and Mair (2010: 603) conclude, adaptation is a process where the success is dependent on the “environment that encourages knowledge sharing and enables those involved to make well-informed sustainable decisions based on solid information”. Therefore, there is need for information regarding the ways tourism stakeholders construct and share their perceptions of climate change in diverse environments. Comparing the findings of similar studies conducted in New Zealand (Hall 2006) or in Botswana (Saarinen *et al.* 2012), for example, and developing common research agendas will help to fill these knowledge gaps relating to climate change awareness and adaptation.

References

- Abegg, B. (1996). *Klimaänderung und Tourismus. Klimafolgenforschung am Beispiel des Wintertourismus in den Schweizer Alpen*. Hochschulverlag AG an der ETH, Zürich.
- Abegg, B., U. König, R. Bürki & H. Elsasser (1998). Climate impact assessment in tourism. *Applied Geography and Development* 51: S, 81–93.
- ACIA (2004). *Impacts of a warming Arctic: Arctic climate impact assessment*. Cambridge University Press, Cambridge.
- Adger, W. N. (2003). Social capital, collective action, and adaptation to climate change. *Economic Geography* 79: 4, 387–404.
- Adger, W. N. (2006). Vulnerability. *Global Environmental Change* 16, 268–281.
- Adger, W. N., S. Dessai, M. Goulden, M. Hulme, I. Lorenzoni, D. R. Nelson, L. O. Naess, J. Wolf & A. Wreford (2009). Are there social limits to adaptation to climate change? *Climatic Change* 93, 335–354.
- Agnew, M. D. & J. P. Palutikof (2006). Impacts of short-term climate variability in the UK on demand for domestic and international tourism. *Climate Research* 31: 1, 109–120.
- Agnew, M. D. & D. Viner (2001). Potential impacts of climate change on international tourism. *Tourism and Hospitality Research* 3: 1, 37–60.
- Alatalo, J. (2007). Lauha sää on estänyt lumetuksen ja uhkaa maailmancupia. *Helsingin Sanomat* 30.10.2007. <<http://www.hs.fi/urheilu/artikkeli/Lauha+s%C3%A4%C3%A4+on+est%C3%A4nyt+lumetuksen+ja+uhkaa+maailmancupia/1135231480136>>
- Ambrose, P. (1969). Perceptions of space, distance and the environment. In Ambrose, P. (ed.): *Analytical human geography. A collection and interpretation of some recent work*, 172–179. Longman Group Limited, London.
- Armitage, D. & R. Plummer (eds) (2010). *Adaptive capacity and environmental governance*. Springer, Heidelberg.
- Balazik, M. R. (2001). The economic impact of climate change on the mid-Atlantic region's downhill skiing industry. *Michigan Journal of Economics* 17.
- Becken, S. (2004). How tourists and tourism experts perceive climate change and carbon-offsetting schemes. *Journal of Sustainable Tourism* 12: 4, 332–345.
- Becken, S. (2007). Tourists' perceptions of international air travel's impact on the global climate and potential climate change policies. *Journal of Sustainable Tourism* 15: 4, 351–368.
- Becken, S. & R. Clapcott (2011). National tourism policy for climate change. *Journal of Policy Research in Tourism, Leisure and Events* 3: 1, 1–17. doi: 10.1080/19407963.2011.539378.
- Becken, S. & J. E. Hay (2007). *Tourism and climate change. Risks and opportunities*. Channel View Publications, Clevedon.
- Becken, S. & J. E. Hay (2012). *Climate change and tourism. From policy to practice*. Routledge, Oxon.
- Bierbaum, R., J. P. Holdren, M. MacCracken, R. H. Moss & P. H. Raven (eds) (2007). Confronting climate change: Avoiding the unmanageable and managing the unavoidable. United Nations Foundation and Sigma XI, Washington. 25.5.2012. <http://www.globalproblems-globalsolutions-files.org/unf_website/PDF/climate%20change_avoid_unmanagable_manage_unavoidable.pdf>
- Bigano, A., F. Bosello, R. Roson & R. S. J. Tol (2008). Economy-wide impacts of climate change: a joint analysis for sea level rise and tourism. *Mitigation and Adaptation Strategies for Global Change* 13: 8, 765–791.
- Bohensky, E., S. Stone-Jovicich, S. Larson & N. Marshall (2010). Adaptive capacity in theory and reality: Implications for governance in the Great Barrier Reef. In Armitage, D. & R. Plummer (eds): *Adaptive capacity and environmental governance*, 23–42. Springer, Heidelberg.
- Bonilla-Priego, M. J., J. J. Najera & X. Font (2011). Environmental management decision-making in certified hotels. *Journal of Sustainable Tourism* 19: 3, 361–381.
- Brookfield, H. C. (1969). On the environment as perceived. *Progress in Geography* 1, 51–80.
- Brouder, P. & L. Lundmark (2011). Climate change in Northern Sweden: intra-regional perceptions of vulnerability among winter-oriented tourism businesses. *Journal of Sustainable Tourism* 19: 8, 919–933.
- Buckley, R. (2009). *Ecotourism. Principles and practices*. CABI, Wallingford.

- Butler, R. W. (1999). Sustainable tourism: A state-of-the-art review. *Tourism Geographies: An International Journal of Tourism Space, Place and Environment* 1: 1, 7–25.
- Butler, R. W. (2012). Tourism geographies or geographies of tourism: where the bloody hell are we? In J. Wilson (ed.): *The Routledge handbook of tourism geographies*, 26–34. Routledge, London and New York.
- Buzinde, C. N., D. Manuel-Navarrete, D. Kerstetter & M. Redclift (2010a). Representations and adaptation to climate change. *Annals of Tourism Research* 37: 3, 581–603.
- Buzinde, C. N., D. Manuel-Navarrete, E. Yoo & D. Morais (2010b). Tourists' perceptions in a climate of change: eroding destinations. *Annals of Tourism Research*, 37: 2, 333–354.
- Bürki, R. (2000). *Klimaänderung und Anpassungsprozesse im Wintertourismus*. Ostschweizerischen Geographischen Gesellschaft, St. Gallen.
- Bürki, R., H. Elsasser, B. Abegg & U. Koenig (2005). Climate change and tourism in the Swiss Alps. In Hall, C. M. & J. Higham (eds): *Tourism, recreation and climate change*, 155–163. Channel View Publications, Clevedon.
- Carter, T. (ed.) (2007). Suomen kyky sopeutua ilmastomuutokseen: FINADAPT. Yhteenveto päättäjille. Assessing the adaptive capacity of the Finnish environment and society under a changing climate: FINADAPT. Summary for Policy Makers. *Suomen ympäristö 1/2007*.
- Carter, T. R., K. Jylhä, A. Perrels, S. Fronzek & S. Kankaanpää (2005). FINADAPT scenarios for the 21st century: Alternative futures for considering adaptation to climate change in Finland. FINADAPT Working Paper 2. *Finnish Environment Institute Mimeographs* 332.
- Carter, T. R. & S. Kankaanpää (eds) (2004). Adapting to climate change in Finland: Research priorities. Proceedings of the FINADAPT seminar, Finnish Environment Institute (SYKE), Helsinki, 14 November 2003. FINADAPT Working Paper 1. *Finnish Environment Institute Mimeographs* 318.
- Carter, T. R., M. L. Parry, H. Harasawa & S. Nishioka (1994). *IPCC Technical Guidelines for Assessing Climate Change Impacts and Adaptations*. University College London, London.
- Castree, N. (2003). *Nature*. Routledge, London.
- Clifford, N. J. & G. Valentine (2003). Getting started in geographical research: how this book can help. In Clifford, N. J. & G. Valentine (eds): *Key methods in geography*, 1–16. Sage Publications, London.
- Coghlan, A. & B. Prideaux (2009). Welcome to the Wet Tropics: the importance of weather in reef tourism resilience. *Current Issues in Tourism* 12: 2, 89–104.
- Cole, S. (2012). A political ecology of water equity and tourism. A case study from Bali. *Annals of Tourism Research* doi:10.1016/j.annals.2012.01.003.
- Craig-Smith, S. J., R. Tapper & X. Font (2006). The coastal and marine environment. In Gössling S. & C. M. Hall (eds): *Tourism and global environmental change. Ecological social, economic and political interrelationships*, 107–127. Routledge, Oxon.
- Crang, M. (2001). Field work: making sense of group interviews. In Lomb, M. & C. Dwyer (eds): *Qualitative methods for geographers. Issues and debates*, 215–233. Arnold, London.
- Dawson, J., D. Scott & G. McBoyle (2009). Climate change analogue analysis of ski tourism in the northeastern USA. *Climate Research* 39, 1–9.
- Denstadli, J. M., J. K. S. Jacobsen & M. Lohmann (2011). Tourist perceptions of summer weather in Scandinavia. *Annals of Tourism Research* 38: 3, 920–940.
- Denzin, N. K. (1989). *The research act. A theoretical introduction to sociological methods*. 3rd ed. Prentice-Hall, Englewood Cliffs.
- Dewar, K. (2005). Everyone talks about the weather...'. In Hall, C. M. & J. Higham (eds): *Tourism, recreation and climate change*, 233 – 246. Channel View Publications, Clevedon.
- Dodds, R. & S. Graci (2009) Canada's tourism industry – Mitigating the effect of climate change: A lot of concern but little action. *Tourism and Hospitality Planning and Development* 6: 1, 39–51.
- Downs, R. M. & D. Stea (1977). Cognitive maps and spatial behaviour: process and products. In Downs, R. M. & D. Stea (eds): *Image and environment: Cognitive mapping and spatial behaviour*, 8–26. Aldine Publishing Company, Chicago.
- Eugenio-Martin, J. L. & J. A. Campos-Soria (2010). Climate in the region of origin and destination choice in outbound tourism demand. *Tourism Management* 31, 744–753.
- Fennell, D. A. (1999). *Ecotourism: An introduction*. Routledge, London.
- Filimonau, V., J. E. Dickinson, D. Robbins & M. V. Reddy (2011). A critical review of methods for tourism climate change appraisal: life cycle assessment as a new approach. *Journal of Sustainable Tourism* 19: 3, 301–324.

- Finn, M., M. Elliot-White & M. Walton (2000). *Tourism & leisure research methods. Data collection, analysis and interpretation*. Pearson Education Limited, Harlow.
- Flyvbjerg, B. (2006). Five misunderstandings about case-study research. *Qualitative Inquiry* 12: 2, 219–245.
- Forsyth, T. (2003). *Critical political ecology. The politics of environmental science*. Routledge, Oxon.
- Franzosi, R. P. (2009). Content analysis. In Hardy M. & A. Bryman (eds): *The handbook of data analysis*, 547–566. Sage Publications, London.
- Fredman, P. & L. Tyrväinen (2010). Frontiers in nature-based tourism. *Scandinavian Journal of Hospitality and Tourism* 10: 3, 177–189.
- de Freitas, C. R. (2003). Tourism climatology: evaluating environmental information for decision making and business planning in the recreation and tourism sector. *International Journal of Biometeorology* 48, 45–54.
- de Freitas, C. (2005). The climate-tourism relationship and its relevance to climate change impact assessment. In Hall, C. M. & J. Higham (eds): *Tourism, recreation and climate change*, 29–43. Channel View Publications, Clevedon.
- Frochot, I. & D. Kreziak (2008). Customers' perceptions of ski resorts' images: Implications for resorts' positioning strategies. *Tourism and Hospitality Research* 8, 298–308.
- Fukushima, T., M. Kureha, N. Ozaki, Y. Fujimori & H. Harasawa (2002). Influences of air temperature change on leisure industries: case study on ski activities. *Mitigation and Adaptation Strategies for Global Change* 7, 173–189.
- Galloway, R. W. (1988). The potential impact of climate changes on Australian ski fields. In Pearman, G. I. (ed.): *Greenhouse –planning for climate change*, 428–437. CSIRO Australia, Melbourne.
- Gerring, J. (2004). What is a case study and what is it good for? *American Political Science Review* 98: 2, 341–354.
- Giddens, A. (1990). *The consequences of modernity*. Polity Press and Blackwell Publishers, Oxford.
- Gold, J. R. (1980). *An introduction to behavioural geography*. Oxford University Press, Oxford.
- Golledge, R.G. (1981). Misconceptions, misinterpretations, and misrepresentations of behavioral approaches in human geography. *Environment and Planning A* 13: 1, 1325–1344.
- Gössling, S. (2011). *Carbon management in tourism. Mitigating the impacts on climate change*. Routledge, Abingdon & New York.
- Gössling, S., M. Bredberg, A. Randow, E. Sandström & P. Svensson (2006). Tourist perceptions of climate change: A study of international tourists in Zanzibar. *Current Issues in Tourism* 9: 4–5, 419–435.
- Gössling, S., L. Haglund, H. Kallgren, M. Revahl & J. Hultman (2009). Swedish air travellers and voluntary carbon offsets: towards the co-creation of environmental value? *Current Issues in Tourism* 12: 1, 1–19.
- Gössling, S. & C. M. Hall (eds) (2006). *Tourism and global environmental change. Ecological social, economic and political interrelationships*. Routledge, Oxon.
- Gössling, S. & C. M. Hall (2008). Swedish tourism and climate change mitigation: An emerging conflict? *Scandinavian Journal of Hospitality and Tourism* 8: 2, 141–158.
- Gössling, S., C. M. Hall, P. Peeters & D. Scott (2010). The future of tourism: Can tourism growth and climate policy be reconciled? A mitigation perspective. *Tourism Recreation Research* 35: 2, 119–130.
- Gössling, S. & J. Hultman (eds) (2006). *Ecotourism in Scandinavia: Lessons in theory and practice*. CAB International, Oxon.
- Gössling, S. & S. Mattsson (2002). Farm tourism in Sweden: Structure, growth and characteristics. *Scandinavian Journal of Hospitality and Tourism* 2: 1, 17–30.
- Gössling, S., P. Peeters, C. M. Hall, J-P. Ceron, G. Dubois, L. Lehmann & D. Scott (2012a). Tourism and water use: Supply, demand and security. An international review. *Tourism Management* 33, 1–15.
- Gössling, S., D. Scott, C. M. Hall, J-P. Ceron & G. Dubois (2012b). Consumer behaviour and demand response of tourists to climate change. *Annals of Tourism Research* 39: 1, 36–58.
- Haglund, L. (2010). Yli kolmannes ei pidä ilmastonmuutoksen uhkaa kovinkaan suurena. Huoli ilmastosta hiipunut. *Helsingin Sanomat* 15.9.2010.
- Hakkarainen, M. & S. Tuulentie (2008). Tourism's role in rural development of Finnish Lapland: interpreting national and regional strategy documents. *Fennia* 186: 1, 3–13.
- Hakulinen, S., R. Komppula & S. Saraniemi (2007). *Lapin joulumatkailutuotteen elinkaari: Concorde-lennoista laajamittaiseen joulumatkailuun*. Matkailun edistämisskeskus, Helsinki.

- Hall, C. M. (2005). *Tourism. Rethinking the social science of mobility*. Pearson Education Limited, Harlow.
- Hall C. M. (2006). New Zealand tourism entrepreneur attitudes and behaviours with respect to climate change adaptation and mitigation. *International Journal of Innovation and Sustainable Development* 1: 3, 229-237.
- Hall, C. M. (2008). Tourism and climate change: Knowledge gaps and issues. *Tourism Recreation Research* 33: 3, 339–350.
- Hall, C. M. (2010). Changing paradigms and global change: From sustainable to steady-state tourism. *Tourism Recreation Research* 35: 2, 131–143.
- Hall, C. M. & S. Boyd (eds) (2005). *Nature-based tourism in peripheral areas. Development or disaster?* Channel View Publications, Clevedon.
- Hall, C. M. & J. Higham (eds) (2005). *Tourism, recreation and climate change*. Channel View Publications, Clevedon.
- Hall, C. M. & A. Lew (2009). *Understanding and managing tourism impacts: An integrated approach*. Routledge, London.
- Hall, C. M., D. K. Müller & J. Saarinen (2009). *Nordic tourism: issues and cases*. Channel View Publications, Bristol.
- Hall, C. M. & S. Page (2002). *The geography of tourism and recreation. Environment, place and space*. 2nd ed. Routledge, London.
- Hall, C. M. & S. J. Page (2009). Progress in tourism management: From the geography of tourism to geographies of tourism – A review. *Tourism Management* 30, 3–16.
- Hall, C. M. & S. J. Page (2012). From the geography of tourism to geographies of tourism. In Wilson, J. (ed.): *The Routledge handbook of tourism geographies*, 9–25. Routledge, London and New York.
- Hall, C. M. & A. Williams (2008). *Tourism and innovation*. Routledge, London.
- Hamilton, J. M. & M. A. Lau (2006). The role of climate information in tourist destination choice. In Gössling, S & C. M. Hall (eds): *Tourism and global environmental change. Ecological social, economic and political interrelationships*, 229–250. Routledge, Oxon.
- Hannam, K. (2002). Coping with archival and textual data. In Shurmer-Smith, P. (ed.): *Doing cultural geography*, 189–198. Sage Publications, London.
- Heberlein, T. A., P. Fredman & T. Vuorio (2002). Current tourism patterns in the Swedish Mountain Region. *Mountain Research and Development* 22: 2, 142–149.
- Hein, L., M. J. Metzger & A. Moreno (2009). Potential impacts of climate change on tourism: a case study for Spain. *Current Opinion in Environmental Sustainability* 1, 170–178.
- Hemmi, J. (1994). Ekoturismin käsite ja sisältö. In Aho, S. (ed.): *Matkailun vetovoimatekijät tutkimuskohteina*, 157–170. Oulun yliopisto ja Pohjois-Suomen tutkimuslaitos, Oulu.
- Hill, M., A. Wallner & J. Furtado (2010). Reducing vulnerability to climate change in the Swiss Alps: a study of adaptive planning. *Climate Policy* 10: 1, 70–86.
- Hjalager, A-M. (2010). A review of innovation research in tourism. *Tourism Management* 31: 1, 1–12.
- Holden, A. (2008). *Environment and tourism*. 2nd ed. Routledge, London.
- Hsieh, H. & S. E. Shannon (2005). Three approaches to qualitative content analysis. *Qualitative Health Research* 15: 9, 1277–1288.
- Hulme, M. (2009). *Why we disagree about climate change. Understanding controversy, inaction and opportunity*. Cambridge University Press, New York.
- Hulme, M. (2010). Cosmopolitan climates: hybridity, foresight and meaning. *Theory, Culture and Society* 27: 2–3, 267–276.
- Hutchinson dictionary of geography* (2005). Helicon Publishing, Oxfordshire.
- Häkli, J. (2008). *Meta hodos. Johdatus ihmismaantieteeseen*. 4th ed. Vastapaino, Tampere.
- Ilmatieteen laitos, Helsingin yliopisto & Suomen ympäristökeskus (2011). Lyhyt loppuraportti. ACCLIM II – Ilmastonmuutosarvot ja asiantuntijapalvelut sopeutumistutkimuksia varten. ACCLIM II – Climate change survey and expert service for adaptation assessment. 15.2.2012. <http://ilmatieteenlaitos.fi/c/document_library/get_file?uuid=f72ce783-0bae-4468-b67e-8e280bec1452&groupId=30106>
- Ingold, T. (2000). *Perception of the environment: Essays on livelihood, dwelling and skill*. Routledge, London.
- International Institute for Sustainable Development (1999). The effects of climate change on recreation and tourism on the prairies. A status report. 17.2.2012. <<http://www.iisd.org/publications/publication.asp?pno=423>>

- Jacobsen, J. K. S. (2007). Use of landscape perception methods in tourism studies: A review of photo-based research approaches. *Tourism Geographies* 9: 3, 234–253.
- Jensen, Ø. & T. Korneliusson (2002). Discriminating perceptions of a peripheral 'Nordic destination' among European tourists. *Tourism and Hospitality Research* 3: 4, 319–330.
- Jick, T. D. (1979). Mixing qualitative and quantitative methods: Triangulation in action. *Administrative Science Quarterly* 24: 4, 602–611.
- Johnston, R. J., D. Gregory, G. Pratt & M. Watts (2005). *The dictionary of human geography*. 4th ed. Blackwell Publishing, Oxford.
- Johnston, R. J. & J. D. Sidaway (2004). *Geography and geographers: Anglo-American human geography since 1945*. 6th ed. Arnold, London.
- Jokela, M. (2007). Joulukuu lämpimin koskaan Suomessa mitattu. *Helsingin Sanomat* 2.1.2007. <<http://www.hs.fi/kotimaa/artikkeli/Joulukuu+l%C3%A4mpimin+koskaan+Suomessa+mitattu/1135224030250>>
- Jones, B. E., D. Scott & S. Gössling (2006). Lakes and streams. In Gössling S. & C. M. Hall (eds): *Tourism and global environmental change. Ecological social, economic and political interrelationships*, 76–94. Routledge, Oxon.
- Jones, B., D. Scott & H. Abi Khaled (2006). Implications of climate change for outdoor event planning: A case study of three special events in Canada's National Capital Region. *Event Management* 10, 63–76.
- Jones, S. (2005). Community-based ecotourism. The significance of social capital. *Annals of Tourism Research* 32: 2, 303–324.
- Jopp, R., T. DeLacy & J. Mair (2010). Developing a framework for regional destination adaptation to climate change. *Current Issues in Tourism* 13: 6, 591–605.
- Jylhä, K., S. Fronzek, H. Tuomenvirta, T. R. Carter & K. Ruosteenoja (2008). Changes in frost, snow and Baltic sea ice by the end of the twenty-first century based on climate model projections for Europe. *Climatic Change* 86: 3–4, 441–462.
- Jylhä, K., K. Ruosteenoja, J. Räisänen, A. Venäläinen, H. Tuomenvirta, L. Ruokolainen, S. Saku & T. Seitola (2009). Arvioita Suomen muuttuvasta ilmastosta sopeutumistutkimuksia varten. ACCLIM-hankkeen raportti 2009. *Ilmatieteen laitos. Raportteja* 2009: 4.
- Jylhä, K., H. Tuomenvirta & K. Ruosteenoja (2004). Climate change projections for Finland during the 21st century. *Boreal Environment Research* 9: 2, 127–152.
- Järviuoma, J. (1997). Matkailu kehittämisen välineenä paikallistason elinkeinomurroksessa: tapaus Kolari. In Aho, S., H. Iloa & J. Järviuoma (eds): *Matkailu ja kehitys. Näkökulmia alueiden ja kohteiden tarkasteluun*, 128–139. *Lapin yliopiston matkailun julkaisuja* B 2.
- Järviuoma, J. (1998). Matkailun ja luonnon välisten suhteiden viitekehys. In Saarinen, J. & J. Järviuoma (eds): *Kestävyys luonnon virkistys- ja matkailukäytössä. Pallas-symposium 1997*, 175–186. *Metsäntutkimuslaitoksen tiedonantoja* 671.
- Järviuoma, J. (2006). *Turistin luonto. Tutkimus luonnon merkityksestä matkailun vetovoimatekijänä neljässä Lapin matkailukeskuksessa*. Lapin yliopisto, Rovaniemi.
- Järviuoma, J. & L. Suopajarvi (2009). *Ilmastomuutoksen ennakoituihin vaikutuksiin sopeutuminen Rovaniemellä. Clim-Atic-hankkeen raportti*. Lapin yliopisto, Rovaniemi.
- Kasperson, R. E. & K. Dow (1993). Hazard perception and geography. In Gärling, T. & R. G. Colledge (eds): *Behavior and environment: Psychological and geographical approaches*, 193–222. Elsevier, Amsterdam.
- Kelly, P. M. & W. N. Adger (2000). Theory and practice in assessing vulnerability to climate change and facilitating adaptation. *Climatic Change* 47: 4, 325–352.
- Kietäväinen, A., S. Tuulentie & S. Rovannerä (2011). Lapin matkailun sopeutuminen ilmastonmuutokseen. Clim-ATIC -hankkeen työraportti. *Metlan työraportteja* 194.
- Knihtilä, J. (2012). Usko talveen vielä tallella. Kemin lumilinnan rakentamisaika jää ennätyslyhyeksi. *Kaleva* 8.1.2012.
- Koenig, U. & B. Abegg (1997). Impacts of climate change on winter tourism in the Swiss Alps. *Journal of Sustainable Tourism* 5: 1, 46–58.
- Kohlbacher, F. (2006). The use of qualitative content analysis in case study research. *Forum, Qualitative Social Research* 7: 1, article 21. 19.3.2012. <<http://www.qualitative-research.net/index.php/fqs/article/view/75/153>>
- Komu, H. & L. Kivelä-Pelkonen (2012). Lumen ja jään hyödyntäminen matkailussa Suomessa ja muissa maissa. *Työ- ja elinkeinoministeriön raportteja* 6/2012.

- Kovanen, V. (2011). Levin maailmancup peruuntuu lumipulan takia. *Helsingin Sanomat* 2.11.2011. <<http://www.hs.fi/urheilu/Levin+maailmancup+peruuntuu+lumipulan+takia/a1305548537441>>
- Krzywacki, J., A-K. Potila, L. Viitaniemi & E. Tanskanen (2009). Rajahaastattelututkimus, osa 22: Ulkomaiset matkailijat Suomessa 1.1.–31.12.2008. Matkailun edistämiskeskus. *MEK A*: 164.
- Kuruppu, N. & D. Liverman (2011). Mental preparation for climate adaptation: The role of cognition and culture in enhancing adaptive capacity of water management in Kiribati. *Global Environmental Change* 21: 2, 657–669.
- König, U. (1998). Tourism in a warmer world. Implications of climate change due to enhanced greenhouse effect for the ski industry in the Australian Alps. *Wirtschaftsgeographie und Raumplanung* 28.
- Landauer, M., U. Pröbstl & W. Haider (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.
- Lapin Kansa* (2007). Rovaniemen joulumatkailun kohtalo askarruttaa – Lumivarmuus ratkaisee: Lauhat talvet siirtävät sesonkia pohjoisemmaksi. 17.12.2007.
- Lapin liitto (2008). Lapin matkailustrategia 2007–2010. Julkaisu A22/2008. 12.5.2012. <http://www.lapinliitto.fi/c/document_library/get_file?folderId=21330&name=DLFE-659.pdf>
- Leinonen, R., P. Kauppila and J. Saarinen (2007). Suomen matkailun aluerakenne 2005: Tutkimusraportti. Matkailun edistämiskeskus. *MEK A*:155 2007.
- Lemelin, R. H., J. Dawson & E. Stewart (eds) (2012). *Last chance tourism: Adapting tourism opportunities in a changing world*. Routledge, Oxon and New York.
- Lumsdon, L. & P. Peeters (2009). Transport and tourism: Is there a sustainable future? *Tourism and Hospitality Planning & Development* 6: 1, 1–5.
- Lundmark, L., A. Pashkevich, B. Jansson & U. Wiberg (2008). Effects of climate change and extreme events on forest communities in the European North. *Climatic Change* 87: 1–2, 235–249.
- Macnaghten, P. & J. Urry (1998). *Contested natures*. Sage, London.
- Marttila, V., H. Granholm, J. Laanikari, T. Yrjölä, A. Aalto, P. Heikinheimo, J. Honkatukia, H. Järvinen, J. Liski, R. Merivirta & M. Paunio (2005). Ilmastonmuutoksen kansallinen sopeutumisstrategia. *Maa ja metsätalousministeriön julkaisuja* 1/2005.
- Matzarakis, A., C. R. de Freitas & D. Scott (eds) (2007). *Developments in tourism climatology*. Commission on Climate, Tourism and Recreation and International Society of Biometeorology, Freiburg.
- McBoyle, G., D. Scott & B. Jones (2007). Climate change and the future of snowmobiling in non-mountainous regions of Canada. *Managing Leisure* 12: 4, 237–250.
- McBoyle, G. R., G. Wall, R. Harrison, V. Kinnaird & C. Quinlan (1986). Recreation and climatic change: a Canadian case study. *Ontario Geography* 28, 51–68.
- McCarthy, J. J., O. F. Canziani, N. A. Leary, D. J. Dokken & K. S. White (eds) (2001). Climate change 2001: Impacts, adaptation and vulnerability. Contribution of working group II to the third assessment report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge.
- McEvoy, D., P. Matczak, I. Banaszak & A. Chorynski (2010). Framing adaptation to climate-related extreme events. *Mitigation and Adaptation Strategies for Global Change* 15: 7, 779–795.
- Meethan, K. (2001). *Tourism in global society. Place, culture, consumption*. Palgrave Macmillan, New York.
- Méheux, K. & E. Parker (2006). Tourist sector perceptions of natural hazards in Vanuatu and the implications for a small island developing state. *Tourism Management* 27, 69–85.
- Mieczkowski, Z. (1985). The tourism climatic index: a method of evaluating world climates for tourism. *The Canadian Geographer* 29: 3, 220–233.
- Mieczkowski, Z. T. (1978). The place of geography of tourism and recreation. *Wiener Geographische Schriften* 51/52, 87–94.
- Moen, J. & P. Fredman (2007). Effects of climate change on alpine skiing in Sweden. *Journal of Sustainable Tourism* 15: 4, 418–437.
- Mohan, G. & J. Mohan (2002). Placing social capital. *Progress in Human Geography* 26: 2, 191–210.
- Moreno, A. & S. Becken (2009). A climate change vulnerability assessment methodology for coastal tourism. *Journal of Sustainable Tourism* 17: 4, 473–488.
- Morrison, C. & C. M. Pickering (2012). Perceptions of climate change impacts, adaptation and limits to adaptation in the Australian Alps: the ski-tourism industry and key stakeholders. *Journal of Sustainable Tourism* DOI:10.1080/09669582.2012.681789.

- Müller, D. & B. Jansson (eds) (2007). *Tourism in peripheries: Perspectives from the far north and south*. CABI, Wallingford.
- Müller, D. K. & R. Pettersson (2006). Sámi heritage at the winter festival in Jokkmokk, Sweden. *Scandinavian Journal of Hospitality and Tourism* 6: 1, 54–69.
- Neumann, R. P. (2005). *Making political ecology*. Hodder Education, London.
- O'Brien, K., L. Sygna & J. E. Haugen (2004). Vulnerable or resilient? A multi-scale assessment of climate impacts and vulnerability in Norway. *Climatic Change* 64, 193–225.
- O'Connor, R. E., R. J. Bord & A. Fisher (1999). Risk perceptions, general environmental beliefs, and willingness to address climate change. *Risk Analysis* 19: 3, 461–471.
- Olsen, D. H., R. L. Koster & N. Youroukos (2012). Last chance tourism? Public sector views of marketing endangered tourism destinations in North America. In Lemelin, R. H., J. Dawson & E. J. Stewart (eds): *Last chance tourism. Adapting tourism opportunities in a changing world*, 105–116. Routledge, London and New York.
- Pachauri, R. K. & A. Reisinger (eds) (2007). *Climate change 2007. Synthesis report*. Intergovernmental Panel on Climate Change, Geneva.
- Parry, M. (1993). Geographers and the impact of climate change. In Johnston, R. J. (ed.): *The challenge for geography. A changing world: a changing discipline*, 138–147. Blackwell, Oxford.
- Parry, M. L., O. F. Canziani, J. P. Palutikof, P. J. van der Linden & C. E. Hanson (eds) (2007). *Climate change 2007: Impacts, adaptation and vulnerability. Contribution of working group II to the fourth assessment report of the Intergovernmental Panel on Climate Change*. Cambridge University Press, Cambridge.
- Pearce, D. (1987). *Tourism today: A geographical analysis*. Longman Group, Harlow.
- Pearce, P. L. (2005). *Tourist behaviour*. Channel View Publications, Clevedon.
- Peeters, P. (ed.) (2007). *Tourism and climate change mitigation. Methods, greenhouse gas reductions and policies*. NHTV Academic Studies No. 6.
- Perry, A. (1997). Recreation and tourism. In Thompson, R. D. & A. Perry (eds): *Applied climatology: principles and practice*, 240–248. Routledge, London.
- Perry, A. (2003). Position paper 1. Current activities, areas and gaps in research. In Viner, D & B. Amelung (eds): *Climate change, the environment and tourism: The interactions*. Proceedings of the ESF-LESC Workshop, Milan 4–6th June, 11–18. eCLAT, Climatic Research Unit, Norwich, 11–18. 31.5.2012. <<http://www.tec-conseil.com/IMG/pdf/climamil.pdf>>
- Pettersson, R. (2004). Sami tourism in northern Sweden – supply, demand and interaction. *ETOUR Vetenskapliga bokserien* 2004:14. *GERUM Kulturgeografi* 2004:1.
- Petäjäistö, L. & A. Selby (2011). Luontomatkailuyritystoiminnan laajuus: Internet-aineistoon pohjautuva selvitys. *Metlan työraportteja* 217.
- Philip, L. J. (1998). Combining quantitative and qualitative approaches to social research in human geography – an impossible mixture? *Environment and Planning A* 30, 261–276.
- Pickering, C. (2011). Changes in demand for tourism with climate change: a case study of visitation patterns to six ski resorts in Australia. *Journal of Sustainable Tourism* 19: 6, 767–781.
- Pickering, C. M., J. G. Castley & M. Burt (2010). Skiing less often in a warmer world: Attitudes of tourists to climate change in an Australian ski resort. *Geographical Research* 48, 137–147.
- Pickering, C. & D. B. Weaver (2003). Nature-based tourism and sustainability: Issues and approaches. In Buckley, R., C. Pickering & D. B. Weaver (eds): *Nature-based tourism, environment and land management*, 7–10. Cab International, Wallingford.
- Place, S. E. (1998). How sustainable is ecotourism in Costa Rica? In Hall, C. M. & A. A. Lew (eds): *Sustainable tourism. A geographical perspective*, 77–118. Pearson Education, Essex.
- Poon, A. (1993). *Tourism, technology and competitive strategies*. CAB International, Oxon.
- Potter, W. J. & D. Levine-Donnerstein (1999). Rethinking validity and reliability in content analysis. *Journal of Applied Communication Research* 27, 258–284.
- Puhakka, R. (2008). Increasing the role of tourism in Finnish national parks. *Fennia* 186: 1, 47–58.
- Ribot, J. (2011). Vulnerability before adaptation: Toward transformative climate action. *Global Environmental Change* 21: 4, 1160–1161.
- Rice, S. (2003). Sampling in geography. In Clifford, N. J. & G. Valentine (eds): *Key methods in geography*, 223–248. Sage Publications, London.
- Robinson, H. (1976). *A geography of tourism*. Macdonald and Evans Limited, Norwich.
- Rojek, C. & J. Urry (eds) (1997). *Touring cultures. Transformations of travel and theory*. Routledge, London and New York.

- Saarinen, J. (2003). The regional economics of tourism in northern Finland: The socio-economic implications of recent tourism development and future possibilities for regional development. *Scandinavian Journal of Hospitality and Tourism* 3: 2, 91–113.
- Saarinen, J. (2004). Tourism and touristic representations of nature. In Lew, A. A., C. M. Hall & A. M. Williams (eds): *A companion to tourism*, 438–449. Blackwell, Oxford.
- Saarinen, J. (2005). Tourism in the northern wildernesses: Wilderness discourses and the development of nature-based tourism in Northern Finland. In Hall, C. M. & S. Boyd (eds): *Nature-based tourism in peripheral areas. Development or disaster?*, 36–49. Channel View Publications, Clevedon.
- Saarinen, J. (2006). Traditions of sustainability in tourism studies. *Annals of Tourism Research* 33: 4, 1121–1140.
- Saarinen, J., W. L. Hambira, J. Althopheng & H. Manwa (2012). Tourism industry reaction to climate change in Kgalagadi South District, Botswana. *Development Southern Africa* 29: 2, 273–285.
- Sarkki, S. & H. I. Heikkinen (2010). Social movements' pressure strategies during forest disputes in Finland. *Journal of Natural Resources Policy Research* 2: 3, 281–296.
- Sayer, A. (1984). *Method in social science. A realist approach*. Hutchinson Publishing Group, London.
- Scott, D. (2006). US ski industry adaptation to climate change: hard, soft and policy strategies. In Gössling, S. & C.M. Hall (eds): *Tourism and global environmental change. Ecological, social, economic and political interrelationships*, 262–285. Routledge, London.
- Scott, D. (2010). Why sustainable tourism must address climate change. *Journal of Sustainable Tourism* 19: 1, 17–34.
- Scott, D., J. Dawson & B. Jones (2008). Climate change vulnerability of the US Northeast winter recreation–tourism sector. *Mitigation and Adaptation Strategies for Global Change* 13, 577–596.
- Scott, D., C. de Freitas & A. Matzarakis (2009). Adaptation in the tourism and recreation sector. In Ebi, K. L., I. Burton & G. McGregor (eds): *Biometeorology for adaptation to climate variability and change*, 171–194. Springer.
- Scott, D., C. M. Hall & S. Gössling (2012). *Tourism and climate change: Impacts, adaptation and mitigation*. Routledge, London and New York.
- Scott, D., B. Jones & J. Konopek (2007). Implications of climate and environmental change for nature-based tourism in the Canadian Rocky Mountains: A case study of Waterton Lakes National Park. *Tourism Management*, 28: 2, 570–579.
- Scott, D., B. Jones, C. Lemieux, G. McBoyle, B. Mills, S. Svenson & G. Wall (2002). *The vulnerability of winter recreation to climate change in Ontario's Lakelands Tourism Region*. Department of Geography, University of Waterloo.
- Scott, D., B. Jones & G. McBoyle (2006). Climate, tourism and recreation: A bibliography 1936 to 2005. 15.4.2012. <http://www.geography.uwaterloo.ca/faculty/danielscott/PDFfiles/CTREC%20Biblio_June%202006.pdf>
- Scott, D., G. McBoyle & B. Mills (2003). Climate change and the skiing industry in southern Ontario (Canada): exploring the importance of snowmaking as a technical adaptation. *Climate Research* 23, 171–181.
- Scott, D., G. McBoyle, A. Minogue & B. Mills (2006). Climate change and the sustainability of ski-based tourism in eastern North America: A reassessment. *Journal of Sustainable Tourism* 14: 4, 376–398.
- Sharpley, R. (2000). Tourism and sustainable development: Exploring the theoretical divide. *Journal of Sustainable Tourism* 8: 1, 1–19.
- Sharpley, R. (2009). *Tourism development and the environment: beyond sustainability?* Earthscan, London.
- Shaw G. & A. M. Williams (1994). *Critical issues in tourism. A geographical perspective*. Blackwell, Oxford.
- Sievänen, T. & M. Neuvonen (eds) (2011). Luonnon virkistyskäyttö 2010. *Metlan työraportteja / Working papers of the Finnish Forest Research Institute* 212.
- Sievänen, T., M. Neuvonen & E. Pouta (2011). National park visitor segments and their interest in rural tourism services and intention to revisit. *Scandinavian Journal of Hospitality and Tourism* 11: sup1, 54–73.
- Sievänen, T., K. Tervo, M. Neuvonen, E. Pouta, J. Saarinen & A. Peltonen (2005). Nature-based tourism, outdoor recreation and adaptation to climate change. FINADAPT Working Paper 11. *Finnish Environment Institute Mimeographs* 341.
- Simpson, M. C., S. Gössling, D. Scott, C. M. Hall & E. Gladin (2008). *Climate change adaptation and mitigation in the tourism sector: Frameworks, tools and practices*. UNEP, University of Oxford, UNWTO, WMO; Paris.

- Smit, B., I. Burton, R. J. T. Klein & J. Wandel (2000). An anatomy of adaptation to climate change and variability. *Climatic Change* 45: 1, 223–251.
- Smit, B. & M. W. Skinner (2002). Adaptation options in agriculture to climate change: A typology. *Mitigation and Adaptation Strategies for Global Change* 7: 1, 85–114.
- Smit, B. & O. Pilisofova (2001). Chapter 18. Adaptation to climate change in the context of sustainable development and equity. In McCarthy, J. J., O. F. Canziani, N. A. Leary, D. J. Dokken & K. S. White (eds): *Climate change 2001: Impacts, adaptation and vulnerability*. 24.4.2012. <http://www.grida.no/climate/ipcc_tar/wg2/pdf/wg2TARchap18.pdf>
- Smit, B. & J. Wandel (2006). Adaptation, adaptive capacity and vulnerability. *Global Environmental Change* 16: 3, 282–292.
- Smith, K. (1990). Tourism and climate change. *Land Use Policy* 7: 2, 176–180.
- Song, H. J., C-K. Lee, S. K. Kang & S-j. Boo (2012). The effect of environmentally friendly perceptions on festival visitors' decision-making process using an extended model of goal-directed behavior. *Tourism Management* doi:10.1016/j.tourman.2012.01.004.
- Steg, L. & I. Sievers (2000). Cultural theory and individual perceptions of environmental risks. *Environment and Behavior* 32: 2, 250–269.
- Stonehouse, B. & J. M. Snyder (2010). *Polar tourism. An environmental perspective*. Channel View Publications, Bristol.
- Stonich, S. C. (1998). Political ecology of tourism. *Annals of Tourism Research* 25: 1, 25–54.
- Swarbrooke, J. (1999). *Sustainable tourism management*. CAB International, Wallingford.
- Teo, P. (2002). Striking a balance for sustainable tourism: Implications of the discourse on globalisation. *Journal of Sustainable Tourism* 10: 6, 459–474.
- Teo, P. & L. H. Li (2003). Global and local interactions in tourism. *Annals of Tourism Research* 30: 2, 287–306.
- Tervo, K. (2008a). Climate change from the perspective of tourism geography. *Nordia Geographical Publications* 37: 6, 73–82.
- Tervo, K. (2008b). Globaali ilmastonmuutos matkailun tutkimuksessa. *Terra* 120: 1, 15–21.
- Tervo, K. & J. Saarinen (2006). Ilmastonmuutos ja matkailu. Katsaus ilmaston ja matkailun suhteeseen. *Matkailututkimus* 2: 1, 57–70.
- Tervo-Kankare, K. & J. Saarinen (2011). Climate change and adaptation strategies of the tourism industry in northern Europe. In Maher, P., E. Stewart & M. Lück (eds): *Polar tourism: Human, environmental and governance dimensions*, 221–235. Cognizant Communication Corporation, Elmsford.
- Tuomi, J. & A. Sarajärvi (2002). *Laadullinen tutkimus ja sisällönanalyysi*. Kustannusosakeyhtiö Tammi, Helsinki.
- Turun Sanomat* (2008). Hyrynsalmelle Suomen ensimmäinen vesihiihtorata. Kaapelin perässä pitkin järvenselkää. 29.5.2012. <<http://www.ts.fi/teemat/matkailu/1074290466/Kaapelin+perassa+pitkin+jarvenselkaa>>
- Tuulentie, S. (2007). Local participation as a prerequisite for socially sustainable tourism: Case studies from Ylläs and Levi ski resorts in northern Finland. In Jokimäki, J, M-L. Kaisanlahti-Jokimäki, S. Tuulentie, K. Laine, & M. Uusitalo (eds): *Environment, local society and sustainable tourism*, 75–88. *Arctic Centre Reports* 50.
- Tyrväinen, L. & S. Tuulentie (2009). Luontomatkailun tulevaisuus. *Futura* 28: 3, 46–54.
- Työ- ja elinkeinoministeriö (2008). Pitkän aikavälin ilmasto- ja energiastrategia (Finland's long term climate and energy strategy). *Työ- ja elinkeinoministeriön julkaisuja* 36/2008.
- Työ- ja elinkeinoministeriö (2010). Suomen matkailustrategia 2020. 5.7.2012. <http://www.tem.fi/files/27053/Matkailustrategia_020610.pdf>
- UNWTO (2012). Sustainable development of tourism. 26.3.2012. <<http://sdt.unwto.org/en/content/about-us-5>>
- UNWTO & UNEP (2008). Climate change and tourism – Responding to global challenges. World Tourism Organization, Madrid and United Nations Environment Programme, Paris. 29.7.2012. <<http://sdt.unwto.org/sites/all/files/docpdf/climate2008.pdf>>
- Unwin, T. (1992). *The place of geography*. Longman, Harlow.
- Urry, J. & J. Larsen (2011). *The tourist gaze 3.0*. Sage, London.
- Vincent, K. (2007). Uncertainty in adaptive capacity and the importance of scale. *Global Environmental Change* 17, 12–24.

- Viinamäki, L. (2007). Triangulatiivisen tutkimusasetelman soveltamismahdollisuudet. In Viinamäki, L. & E. Saari (eds): *Polkuja soveltavaan yhteiskuntatieteelliseen tutkimukseen*, 173–197. Kustannusosakeyhtiö Tammi, Helsinki.
- Viner, D. & M. Agnew (1999). Climate change and its impacts on tourism. Report prepared for WWF-UK. 22.5.2005. <http://www.wwf-uk.org/filelibrary/pdf/tourism_and_cc_full.pdf>
- Vuoristo, K.-V. & N. Vesterinen (2001). *Lumen ja suven maa. Suomen matkailumaantiede*. WSOY, Porvoo.
- Walker, P. A. (2005). Political ecology: where is the ecology? *Progress in Human Geography* 29: 1, 73–82.
- Wall, G. (1998). Implications of global change for tourism and recreation in wetland areas. *Climatic Change* 40: 2, 193–203.
- Wall, G. & C. Badke (1994). Tourism and climate change: An international perspective. *Journal of Sustainable Tourism* 2: 4, 193–203.
- Wall, G., R. Harrison, V. Kinnaird, G. McBoyle & C. Quinlan (1986). The implications of climatic change for camping in Ontario. *Recreation Research Review* 13: 1, 50–60.
- Wall, G. & A. Mathieson (2006). *Tourism: change, impacts and opportunities*. Pearson Education Limited, Harlow.
- Walmsley, D. J. & G. J. Lewis (1993). *People and environment: behavioural approaches in human geography*. 2nd ed. Longman Group, Essex.
- Weaver, D. (2010). Can sustainable tourism survive climate change? *Journal of Sustainable Tourism* 19: 1, 5–15.
- Williams, S. (2009). *Tourism geography: a new synthesis*. 2nd edition. Routledge, Oxon.
- Wilson J. (ed.) (2012). *The Routledge handbook of tourism geographies*. Routledge, London and New York.
- Wolfsegger, C., S. Gössling & D. Scott (2008). Climate change risk appraisal in the Austrian ski industry. *Tourism Review International* 12: 1, 13–23.
- Working group for recreation in the wild and nature tourism (2002). Ohjelma luonnon virkistyskäytön ja luontomatkailun kehittämiseksi. *Suomen ympäristö* 535.
- World Commission on Environment and Development (1987). *Our common future*. Oxford University Press, Oxford and New York.
- Xiang, Z. & S. Formica (2007). Mapping environmental change in tourism: A study of the incentive travel industry. *Tourism Management* 28, 1193–1202.
- Yin, R. K. (1998). The abridged version of case study research. In Bickman L. & D. J. Rog (eds): *Handbook of applied social research methods*, 229–250. Sage Publications, London.
- Yin, R. K. (2009). *Case study research. Designs and methods*. 4th ed. Sage Publications, Thousand Oaks.
- YLE Kainuu/Ville Kinnunen (2010). Ukkohallan majoituspaikat tuplataan. 29.5.2012. <<http://yle.fi/alueet/kainuu/article2561992.ece>>
- Yohe, G. & R. S. J. Tol (2002). Indicators for social and economic coping capacity – moving towards a working definition of adaptive capacity. *Global Environmental Change* 12: 1, 25–40.