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Nature-based tourism, outdoor recreation and adaptation to climate change

Tuija Sievänen, Kaarina Tervo, Marjo Neuvonen, Eija Pouta,
Jarkko Saarinen and Arvo Peltonen

FINADAPT Working Paper 11

FINNISH ENVIRONMENT INSTITUTE

NATURE-BASED TOURISM, OUTDOOR RECREATION AND ADAPTATION TO CLIMATE CHANGE

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FINADAPT WORKING PAPER 11

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Preface

The Intergovernmental Panel on Climate Change (IPCC) defines adaptation as "Adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities"[1]. The IPCC lists two reasons why adaptation is important in the climate change issue. First, an understanding of expected adaptation is fundamental in evaluating the costs or risks of climate change. Second, adaptation is a key response option or strategy, along with mitigation. Even with reductions in greenhouse gas emissions, some climate change is regarded as inevitable, and it will be necessary to develop planned adaptation strategies to deal with the associated risks as a complement to mitigation actions.

In Finland, there has been substantial progress during the past decade in investigating the potential impacts of climate change on natural and human systems. In contrast, there has been much less attention paid to adaptation. This was recognised by the Finnish Parliament as early as 2001, when it recommended that a separate programme for adaptation to climate change be initiated. As a result, a task force co-ordinated by the Ministry of Agriculture and Forestry completed Finland's first National Strategy for Adaptation to Climate Change in 2005.[2]

At about the same time as the Strategy document was being drafted, a research consortium named FINADAPT also began its work. The goal of the consortium, involving 11 partner institutions co-ordinated by the Finnish Environment Institute, was to undertake an in-depth study of the capacity of the Finnish environment and society to adapt to the potential impacts of climate change. FINADAPT was funded for the period 2004-2005 as part of the Finnish Environmental Cluster Research Programme, co-ordinated by the Ministry of the Environment. It comprised 14 work packages (WP) covering: 1) co-ordination, 2) climate data and scenarios, 3) biodiversity, 4) forests, 5) agriculture, 6) water resources, 7) human health, 8) the built environment, 9) transport, 10) energy infrastructure, 11) tourism and recreation, 12) economic assessment, 13) urban planning, and 14) a stakeholder questionnaire. The primary objective of FINADAPT was to produce a scoping report based on literature reviews, interactions with stakeholders, seminars, and targeted research.

This report presents the findings of work package 11, which considers how future climate change may affect the viability of tourism and outdoor recreation in Finland. The study, one of the first to be conducted on this theme, brought together experts specialising in tourism and outdoor recreation studies from four different research institutions in northern, eastern and southern Finland.

Timothy Carter, Consortium Leader
Helsinki, December 2005

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[1] IPCC, 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* [McCarthy, J.J., O.F. Canziani, N.A. Leary, D.J. Dokken, and K.S. White (eds)]. Cambridge University Press, Cambridge and New York, p. 982.

[2] MMM, 2005. *Ilmastomuutoksen kansallinen sopeutumisstrategia* (Finland's National Strategy for Adaptation to Climate Change) [Marttila, V., Granholm, H., Laanikari, J., Yrjölä, T., Aalto, A., Heikinheimo, P., Honkatuki, J., Järvinen, H., Liski, J., Merivirta, R. and Paunio, M. (eds)], Ministry of Agriculture and Forestry, Helsinki (available in Finnish, 276 pp. and English, 280 pp.) http://www.mmm.fi/sopeutumisstrategia/

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Executive summary

Tourism, especially nature tourism, and outdoor recreation are considered climate-sensitive human activities. Although the first international studies to examine the implications of climate change for tourism and recreation appeared in the mid-1980s, the subject area has only been moderately researched up to the turn of the century. In the Finnish context, there have not been empirical studies on the relation between climate change and tourism or recreation, or how the tourism industry perceives climate change and its related impacts.

Adapting outdoor recreation and travel behaviour to climate change concerns the majority of Finns. In the context of outdoor recreation and nature tourism, adaptation for climate change takes place in two ways: 1) people will adapt autonomously and reactively by changing their recreation and travel behaviour to the new conditions, 2) the supply of recreational and tourism services will adapt to the new climatological conditions. Adaptation by the public sector and tourism enterprises takes place partly reactively and partly in an anticipatory way. It is probable that adapted recreation and travel behaviour may have health-related, economic and cultural impacts. This report presents new information about both types of adaptation in the Finnish nature tourism and recreation sector.

The first part of the report focuses on climate change in the context of the Finnish nature-based tourism business. A case study is presented that sought to identify: (1) knowledge about climate change and its effects on enterprises' operations, (2) where the knowledge originated, and (3) what kind of adaptation strategies are in place and how are they going to prepare their tourism operations in the face of changing climate. Nineteen interviews were conducted of tourism entrepreneurs in Northern Finland and the Lake District, southeastern Finland.

In general, nature-based tourism entrepreneurs were aware of the issue and discussions of global climate change. However, half of the interviewees did not believe that the phenomenon of climate change actually exists and has influence on the business, and the rest lacked precise, more detailed and spatially informed knowledge about the effects of climate change on tourism in Finland. Nature-based tourism entrepreneurs were also relatively ignorant of the likely effects of climate change on their specific operations. Therefore, opinions concerning the effects of the change differed; most of the interviewees believed that projected changes would not have any impact on the tourism sector while the rest considered them to have some influence. However, the perception was highly dependent on the location of the enterprise and its operations: entrepreneurs in the Lake District considered climate change to be positive while operators in Northern Finland had a more negative view. The tourism industry in Northern Finland is dominated by skiing and other snow-related tourism, which is estimated to be most sensitive to warming climate. The scepticism towards the factual basis for global climate change may explain the fact that there were almost no adaptation plans. The future of nature-based tourism, and the tourism industry in general, in northern and eastern Finland was seen in an optimistic light and climate change was considered to represent only a minor future threat, if a threat at all, among other challenges that might have an effect on the industry.

The second part of the report focuses on the changes in participation in recreational activities. In this study, scenarios of recreation participation are based on the FINADAPT Sustainability (B1) and Retrenchment (A2) climate scenarios and socioeconomic scenarios. Recreation participation models have been developed based on data from the national inventory of outdoor recreation (LVVI). The models represent those activities which were found to be the most sensitive to changes in weather conditions. These activities are winter activities which are dependent on natural snow cover (cross-country skiing, downhill skiing and snowmobiling), and also summer activities which are related to warm temperature and sunshine conditions (swimming in natural waters). Using future scenarios, a decrease in participation rates and days are estimated to occur in winter activities, particularly in cross-country skiing and snowmobiling as expected consequences of climate change. Participation in downhill skiing is less sensitive to changes in climate conditions. As an example of summer activities, swimming in natural waters, seems to have an increase in participation associated with an increase in warm days, but a slight decrease caused by socioeconomic factors, particularly age structure.

These scenarios of recreation participation offer a vision of how current patterns of recreation behaviour follow changes in climate, demography and socio-economic development. Beyond these model-based scenarios, in permanently changing conditions, several other changes in recreation behaviour patterns can be identified: a) shifting to activities which are less sensitive to weather conditions, b) by travelling to more distant locations, and c) by investing on new types of recreation equipments with high-tech solutions in changed climate conditions.

Several research needs related to recreation and tourism were identified. Based on the empirical results, the Finnish tourism industry seems to need more detailed and spatially informed (i.e. location based) scenarios concerning climate change and more information on its impacts on the different activities in the tourism sector. In order to gain information, more effort could be placed on research on the subject of climate change in cooperation with the tourism industry and other experts on tourism. General media information was perceived to be partly unreliable. Therefore, other information sources and training processes should be developed. There is an increasing need for monitoring changes in recreational behaviour and following recreation trends, as providing information for adaptation in recreation service provision also on public sector. Recreation inventories on regular basis are necessary to provide the information basis. Secondly, there is a need for contingent behaviour studies which use survey methods, for example in studying skiers reactions to changing skiing conditions. Indirect effects of climate change (changes in wildlife populations, fish populations and the composition of vegetation, berry or mushroom crops) affect the recreationists decisions about the frequency and duration of future visits. Health, economic and cultural impacts of individual adaptation can be considerable but are unknown.

Anticipatory planned adaptation is needed by the public sector bodies providing recreation opportunities as well as by private entrepreneurs. Providing cross-country skiing opportunities close-to-home is a particular challenge for municipalities in southern Finland. It is expected that sport clubs and private enterprises will provide fee-based skiing opportunities on artificial snow. In Northern Finland, the warming climate may even increase demand for skiing opportunities, and for skiing tourism services. In the short term, this may be a positive impact on the tourism industry and regional economy, but over the long term, as the number of skiers may decline, the demand may begin to diminish.

1. Introduction

[Sievänen, Tervo, Neuvonen, Pouta, Saarinen]

Outdoor recreation and nature-based tourism are recognized to be increasingly important use form of natural resources, and a substantial source of health and wellbeing for the urbanized, aging populations in western societies. Outdoor recreation and nature-based tourism is very dependent on the climate as a precondition for the activities, and on the weather for the action itself. The changes in climate and unpredictable weather may cause serious threats to the supply of recreation opportunities, and the related businesses and economic activity. Changing climate will cause changes in people's recreation and travel behaviour and consequence to the tourism industry serving nature-related travelling.

Research on climate-related tourism issues began in the 1960s, but it was not until the 1980s that researchers began to show interest in climate change and its impacts on tourism (see Wall et al., 1986). Since then, climate change has had moderate visibility in tourism research, but only lately, during the present century, has the issue provoked more interest among policymakers and institutions such as the World Tourism Organisation and the United Nations. International research among tourist operators has shown that knowledge and interest concerning climate change is at a low level; global change and its impacts are not yet perceived as of importance or concern. In Finland the impacts of climate change on tourism and outdoor recreation has got very little attention until very recently (MMM, 2005).

The climate was long considered an unchanging resource for the tourism industry and recreation service providers, but lately the tourism industry and other stakeholders have awoken to possible changes in climate (Scott et al., 2005a). The tourism sector needs information on both the prospective climatic and local weather conditions to be able to prepare for possible changes. The same applies to local municipality and government agencies, which are the major providers for recreation services.

In the context of outdoor recreation and nature-based tourism, adaptation to climate change takes place in two ways: people will adapt autonomously and reactively by changing their recreation and travel behaviour to the new conditions and the supply of recreational and tourism services needs to be adapted to the new climatic conditions. Adaptation by the public sector and enterprises takes place partly reactively and partly in anticipation of future changes. The time perspective of investments in recreation and tourism services vary a lot, but typically many investments demand a long term planning. Information of the possible changes in recreation demand is crucial for planning provision of recreation services.

Adapting recreation and travel behaviour to climate change concerns the majority of Finns. Almost all (97 %) participate in outdoor recreation and 40 % makes at least one nature trip during a year (Pouta and Sievänen, 2001). Outdoor recreation either close to home or at a tourism destination is the most common way how urbanized people get into contact with natural environment. Changes in climate patterns will influence recreation environment as well as all other sectors essential for recreation and nature tourism such as forestry, agriculture and transportation. Changing climate may have profound effects on outdoor recreation opportunities. As a consequence, also the recreation and travel behaviour of Finnish people will be affected. As recreationists are in direct interaction with natural environment, they need to make new choices of activities or modify the way of practicing the

old ones, or their choices of recreation settings or travel destinations differ because of changed climatic conditions. Expected changes in recreation and tourism demand may occur related to issues such as 1) who are the recreationists (local user - tourist), 2) where they go (setting), 3) what they do (activity), and 4) how they do it (for example frequencies or styles) (e.g. Ewert, 1991). Because of the large variety of activities and settings, it is obvious that some settings and some activities in certain settings will either benefit or suffer from the climate change. In any case, people will face the need to adapt to changing conditions and changing recreation opportunities. It is probable that adapted recreational behaviour may have health related, economic and cultural impacts.

In this report, adaptation to climate change in nature-based recreation and tourism sector is studied from two perspectives, 1) tourism entrepreneurs' adaptation and 2) adaptation in recreational behaviour. In the first part the objective was to get a comprehensive picture and understanding of the awareness of climate change and expected impacts to the tourism sector among tourism entrepreneurs and other stakeholders in tourism. Information was also collected on adaptation plans and adaptation capacity in the tourism sector. The results of this pilot study are presented in section 2. In the study of outdoor recreation behaviour, the aim was to identify outdoor activities which are most sensitive to climate change, to develop participation models to predict participation changes in different climatic conditions, and to predict and discuss options for how Finnish people may adapt their recreational behaviour in changing climate conditions. The results of this study are presented in section 3. The main results and conclusions of these two studies are summarized in section 4.

2. The adaptive capacity of nature-based tourism entrepreneurs to climate change

[Tervo, Saarinen, Peltonen]

2.1. Background

Research on climate-related tourism issues began in the 1960s, but it was not until the 1980s that researchers began to show special interest in climate change and its impacts on tourism (e.g. Wall et al., 1986; Scott et al., 2005a). Since then, climate change has had moderate visibility in tourism research, but only lately, during the present century, has the issue provoked interest among policymakers and institutions such as the World Tourism Organisation and the United Nations.

International research among tourist operators has shown that knowledge and interest concerning climate change are at a low level. Based on the individual studies it can be concluded that global change and its impacts are not yet perceived as of importance of concern (see Abegg, 1996; Bürki, 2000; König, 1998; Rátz, 2000; Wall and Badke, 1994).

The climate was long considered an unchanging resource for the tourism industry, but lately the industry has awoken to possible changes in its essential attraction (Scott et al., 2005a). The tourism industry needs information on both the climatic and local weather conditions to be able to prepare and adapt for possible changes.

Abegg (1996) has defined linkages between the climate and tourism; he states that weather and climate are factors that set limits and regulate tourism, so that their importance as factors defining an area's tourism potential, attractiveness and tourism demand and supply is great. To the tourism entrepreneur this means that establishing a tourism firm into an area that has minimal tourism potential due to the climatic conditions is too risky. Establishment and operating a firm may demand high investments without any guarantee of success. In addition, variability of weather conditions and extreme weather phenomena may cause financial pressures; a rainy summer or snow deficient winter may have fatal consequences.

Climate and weather are significant elements also for the tourists. As Matzarakis (2001) has stated, it is the climatic conditions that have more effect while planning a potential trip, but at the destination, the actual *weather* conditions become much more important, affecting to the total image that visitors get from their trip. Also Bigano et al. (2005) have noticed that knowledge and expectations concerning the weather in the destination area are important factors in tourists' decision-making. Considering this, it is legitimate to presume that changes in climatic conditions can have major impact on the tourism industry in the future.

The complicated interactive relationship between tourism and climate change is represented in Figure 1. Here it can be seen that climate change affects tourism but tourism influences the climate as well (i.e. through emissions of greenhouse gases). Because of the complexity of the relationship, the impacts of climate change on tourism are challenging to define and large amounts of information and precise place-specific scenarios are needed to gain an accurate picture of the whole.

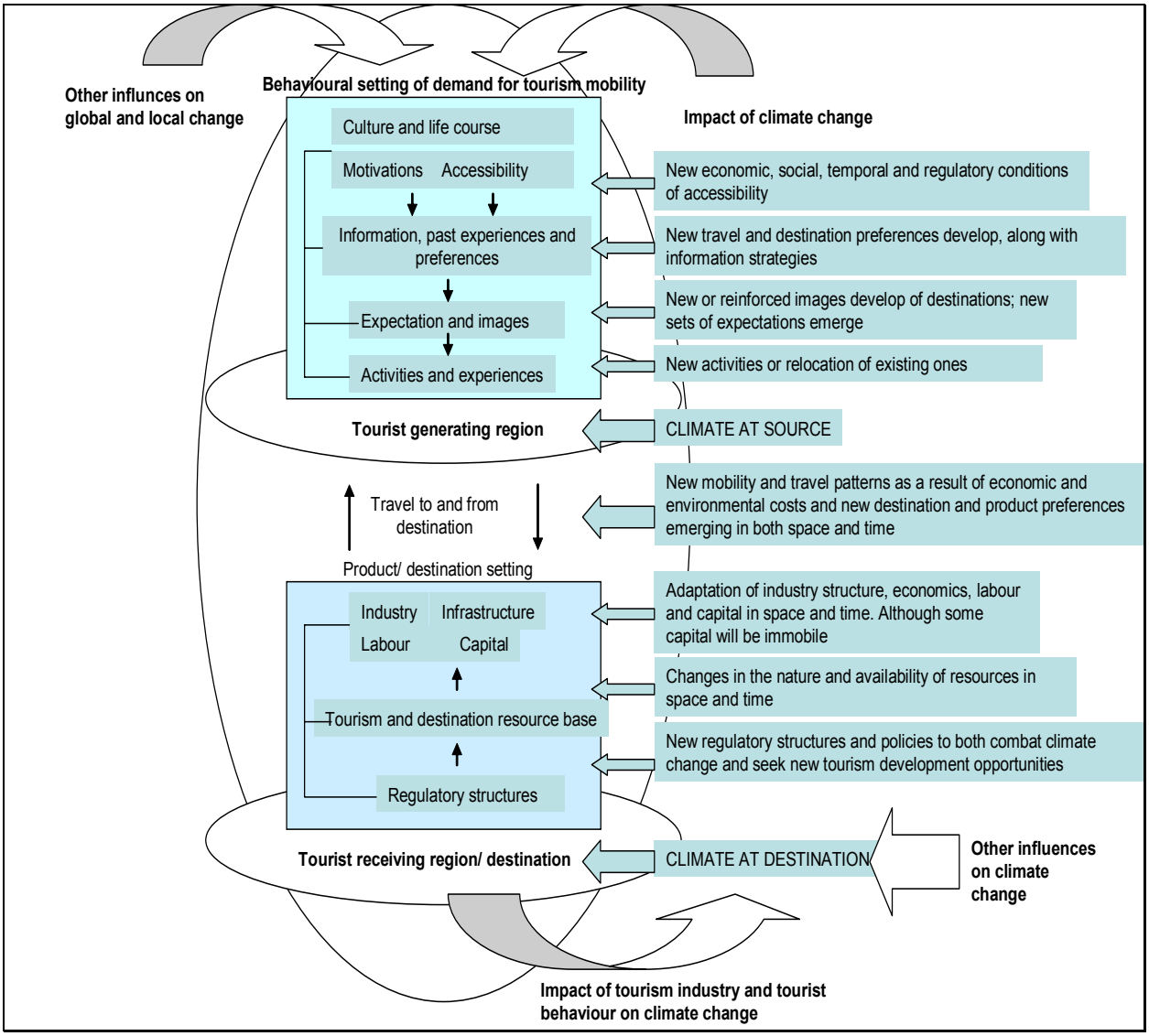

Figure 1 Tourism system and climate change (Hall, 2005, after Hall and Higham, 2005: 14, revised by authors).

Climate influences tourism industry by creating the foundation of the attractiveness, such as snow cover, water level etc. (Scott et al., 2005a). Also the length and quality of the season are dependent on climatic factors. In general, climate change is predicted to affect tourism in two ways. According to König (1998), it has direct impacts on tourism activities such as many winter activities (skiing, snowmobiling, cross-country skiing, ice-fishing), summer/beach activities (surfing, sunbathing, swimming) and the possibilities to do these activities. These effects may be both positive and negative. It also has indirect impacts, by affecting the natural and built environment and changing the attractiveness of the landscape (i.e. the environment tourism industry is based on). The impacts and their intensity vary in different regions depending on the type of tourism in the area, the financial dependence on tourism revenues and the manner of climate change in the area (Abegg et al., 1998). This variability of impacts in different areas makes it difficult to predict the effect the climate change might have in specific contexts and makes it impossible to apply international studies or generalizations to a certain region without modification. Smith (1990) has also emphasized that within one area the different kinds of tourism operations are exposed to changes in diverse ways. Within a single area there may be a complex network of winners and losers.

2.2. Objectives of the pilot study

The objective of the pilot study reported below was to survey Finnish tourism entrepreneurs' perceptions and awareness of climate change and to investigate how they have adapted, or are planning to adapt, to possible changes in their businesses. This was studied by interviewing Finnish tourism entrepreneurs in Northern Finland and the Lake District, southeastern Finland. In addition, a survey of literature on climate change and tourism was also carried out (see Appendix 1).

International research on climate change and tourism has defined the most climate change sensitive types of tourism, which were in special focus of this study. The focus was set on nature-based tourism, because other types of tourism, such as cultural tourism, are considered less vulnerable to climate change. Since it is estimated that climate change in Finland will cause warming and increase both average precipitation and some extreme weather events, snow and water related activities were considered the most vulnerable in the Finnish tourism sector. On this basis, nine representatives of enterprises operating on snow and winter time activities (in Northern Finland) and ten enterprises whose operations are based mainly on water summer nature activities (in the Lake District) were selected to be interviewed. The basic characteristics of the participated enterprises are shown in Table 1. Because of the small size of the pilot study, the data were not statistically tested.

Table 1 Basic characteristics of interviewees' nature-based tourism enterprises in Northern Finland and the Lake District, southeastern Finland (n=19).

	Location	Size, personnel (max.)			Main season			Foreign customers (%)		
		<5	5-10	>10	Summer	Winter	Both	<33	33-66	>66
N. Finland	9	2	2	5	0	8	1	3	2	4
Lake District	10	8	2	0	9	1	0	8	2	0
Total	19	10	4	5	9	9	1	11	4	4

The issues covered in the interviews were: 1) knowledge about climate change and its effects on the enterprise's operation, 2) where does the knowledge originate, and 3) what kind of adaptation strategies they have and how are they going to prepare their tourism operations in the face of a changing climate. In addition, the entrepreneurs' thoughts and opinions about the need to be better informed, the role of the public sector in their adaptation plans and the need for co-operation were also identified. The main results are represented in Table 2.

Table 2 Perceptions on the climate change phenomenon and the existence of adaptation strategies (n=19).

Perceptions of climate and adaptation (n=19)		Northern Finland	Lake District	Total
Climate change exists:	yes	5	5	10
	no	2	2	4
	no opinion	2	3	5
Effect on area's tourism:	positive	1	4	5
	negative	5	1	6
	no effect	3	5	8
Climate change adaptation plan:	yes	1	1	2
	no	8	9	17
Backup plan for climate variability:	yes	8	3	11
	no	1	7	8
Climate variability affects operations:	yes	8	4	12
	no	1	6	7

2.3. Perceptions, awareness and knowledge of climate change

The awareness and basic knowledge concerning the climate change was relatively good in general. The interviewees were familiar with the term and had a correct conception of the phenomenon, with some exceptions; climate change was occasionally mixed up with common environmental problems such as air pollution. Overall, the tourism operators seemed to be aware of climate change and were able to identify many examples of the effects the phenomenon could have, if it persisted (Figure 2).

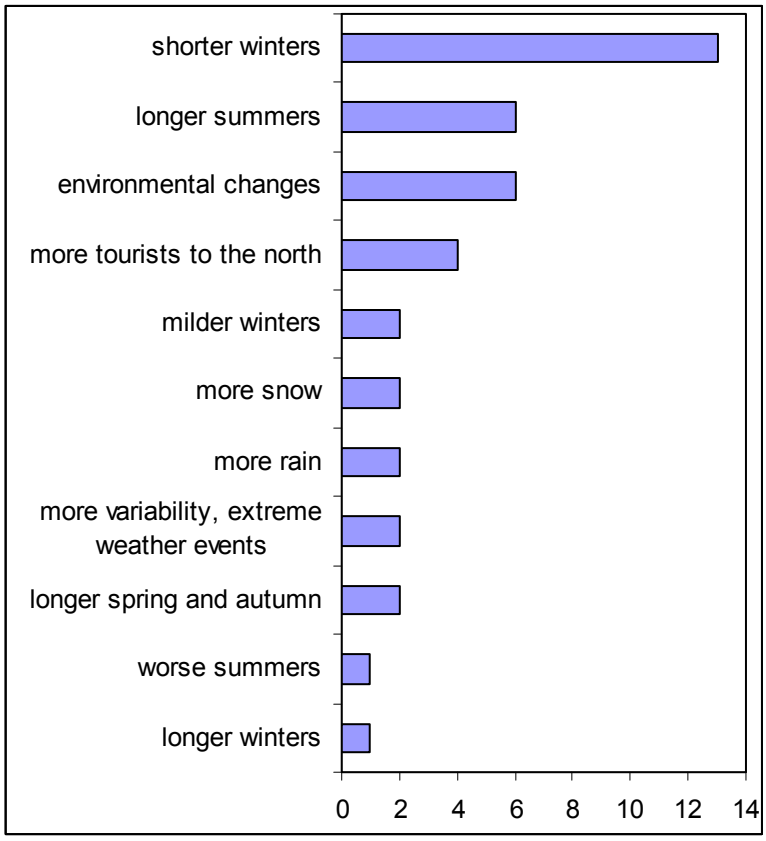

Figure 2 Number of mentions of different impacts of predicted climate change by tourism entrepreneurs

The level of common awareness about climate change was moderate. The effects listed are very similar to the ones listed in studies conducted in other countries (see Abegg, 1996; Bürki, 2000, Giles and Perry, 1998; König, 1998). Respondents considered that a shortening of the winter season might be the most serious consequence, in particular if the start of the season shifts permanently to after Christmas and the New Year, since these are the critical periods bringing in most revenues, especially by the safari operators. The early winter periods are currently under threat in some areas, so operators' concerns appear to be justified. However, the interviewees did not regard a shortening of the season in the spring to be problematic; practice has shown that it is difficult to attract tourists after Easter or end of April even though according to the climatic conditions, the winter season could continue. In some areas, the entrepreneurs regarded milder winters as a positive phenomenon, since the occurrence of extreme cold days, when tourists cannot participate in outdoor activities, would decrease. In addition, an increase of wintertime precipitation, if it led to an increasing amount of snow was considered positive, since it would enhance the attractiveness of these areas and lessen the need for artificial snow.

Entrepreneurs have already noticed that during warmer winters the tourism operators around Rovaniemi area lose customers to Levi, Saariselkä and other resorts in the northern parts of Lapland. The effect is mirrored in the Lake District; with entrepreneurs aware of tourists from southern Finland heading to northern parts of the country instead of the Lake District because of a (currently false) perception that winters in eastern parts of Finland are less likely to be "real" winters and suitable for activities such as skiing, snowmobiling or cross-country skiing, compared to winters in Northern Finland and especially Lapland. Thus, the practice of tourists heading northwards to guarantee reliable winter conditions may become of importance not only at a European scale (e.g. winter tourism resorts in the Alps could face problems if tourists head, for example, to Nordic countries instead), but also as a regional phenomenon within Finland and Northern Finland.

An increase in summer precipitation was also considered a negative phenomenon; tourists are not willing to go canoeing, boating or tramping if the weather is too rainy or stormy, and the tourism operators were not willing to take the risk of organising activities in unpleasant and dangerous conditions. As long as the flora and fauna of a region do not change entirely, environmental changes were not considered fatal, since they are not usually the primary attractions. Nevertheless, the survival of some key species such as the (Saimaa) ringed seal was a severe issue, since they may be the most important individual attractions that affect tourist's decision-making and attract travellers to the Lake District area. The entrepreneurs found the lengthening of summer season as a positive thing, even though the holiday periods were thought to be the decisive factor for the timing of the peak season.

There was relatively strong belief among the entrepreneurs that climate change will not actually have any effect on the industry, at least during the next twenty years or so. Even though they could name many individual consequences of climate change, they were not too eager to consider the effect it might have on their operations or on the region's tourism industry in general. Almost half of the interviewees had an opinion that climate change is not going to affect their business, while the rest considered it to have either a somewhat positive or a slightly negative effect on the tourism business in their region. The direction of this effect was highly dependent on the geographical location of the enterprise operations: operators in the Lake District considered climate change and its effects positive while operators in Northern Finland had a more pessimistic view (Figure 3).

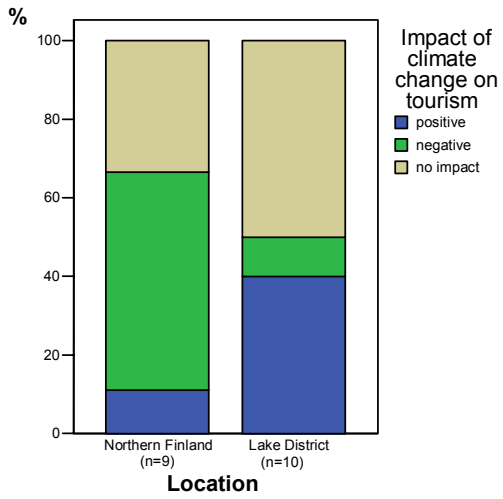

Figure 3 Entrepreneurs' assumptions about the impact of climate change on the tourism industry in Northern Finland and in the Lake District.

In total, the future of the regional tourism industry was considered to be fairly healthy, even in the case of permanent changes in the climate. Operators in Northern Finland believed that climate change could only threaten the industry if it completely ruined the important Christmas season, since many of the (nature) safari firms are highly dependent on the revenues made during the Christmas holidays. Besides an actual lack of snow during this vital season, conveyance of an image, albeit a false one considering the winter as a whole, of Finland as a country without snow to foreign markets could have a large impact. The lack of strong summer tourism also constitutes a possible threat to Northern Finland's tourism industry if the winter season had to be cancelled due to a lack of snow. In the Lake District, opinions were quite similar; lengthening of the summer season was seen as a positive thing, and it might even slightly flatten and extend the high season. However, the (summer tourism) entrepreneurs were concerned about the problems the Lake District's winter tourism operators might confront and, in the case of increasing summer precipitation, about the actual benefits of a lengthening summer season.

The main source of information concerning climate change was the media; every entrepreneur mentioned it as means to gain information. However, it was very common for personal observations of climatic phenomena to be used to reinforce the information provided by the media. Half of the interviewees have observed events that have strengthened their image of climate change. These included both events that back up the theory of a changing climate but also events that seem to have run counter to the theory. Besides personal observations, information was also gained from studies on the subject. Less than one third of the interviewees relied only on the media. Professional studies or observations were also used as the primary source, especially when media-related information was sometimes considered to be inconsistent, too generalized, slanted or only a tool for the media to gain more publicity, since the phenomenon is currently on everyone's lips. More than three-quarters of the interviewees criticised the information transmitted by the media. They also stated that it is hard to find the relevant information for their particular enterprise from the overflow of information in the media. The most accurate information was believed to be gained from personal studies or from experts doing research work on the issue.

2.4. Climatic phenomena and inter-annual variation in the tourism industry

All the interviewed tourism operators were somehow dependent on the natural environment and climatic conditions because of their type of tourism products. This meant that they have to be aware of the weather conditions and sometimes to be prepared to change their plans, if, for example the snow were to arrive late or melt early one year, or if storms that could risk the safety of the operations were to occur. To keep their customers satisfied and to avoid a loss of revenue, they have to have contingency plans.

Almost half of the interviewees have noticed that climatic variability, both interannual and abrupt phenomena, affects their operations. Enterprisers have observed changes in the lengths of summer and winter seasons, great climatic variability between years and an increase of extreme weather conditions. It was also noted that summers seem to be rainier than before and that the annual rhythm of seasons seems to be shifting. The frequency of these observations is dependent on the location of the enterprise; the ones situated in Northern Finland had more often experienced climatic variability affecting their operations than enterprises in the Lake District (ninety percent of the interviewees in Northern Finland as compared to fifty percent in the Lake District - see Figure 4). The frequency of observations in Northern Finland and among winter tourism operators suggests that winter tourism is more vulnerable to climatic variability.

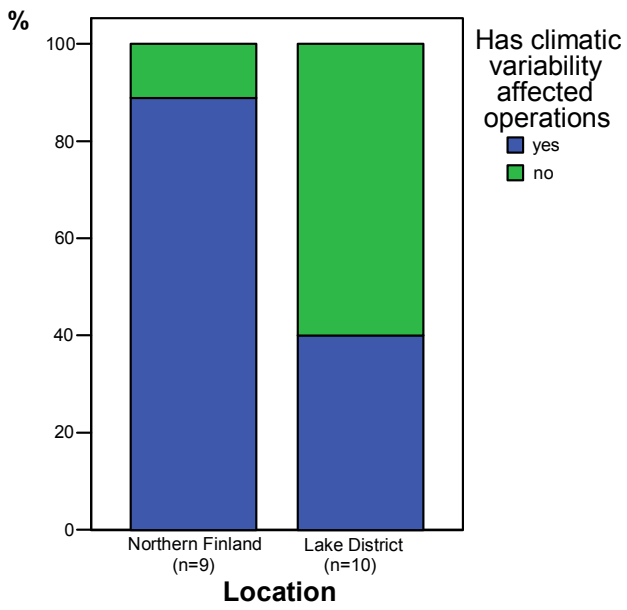

Figure 4 Experiences of climatic variation affecting operations.

Recently observed climatic events have caused, among others, cancellations and adaptations of routines to altered circumstances and loss of customers and revenue. In the Lake District area, effects are more neutral, or even positive - they include longer summer season and tourists paying more attention to climatic issues. To avoid losses operators (especially in Northern Finland) have devised methods and strategies that are very similar to the methods used elsewhere to adapt to climate change. Figure 5 lists the methods mentioned in Northern Finland and the number of enterprises that had been using them at some point due to climatic variability.

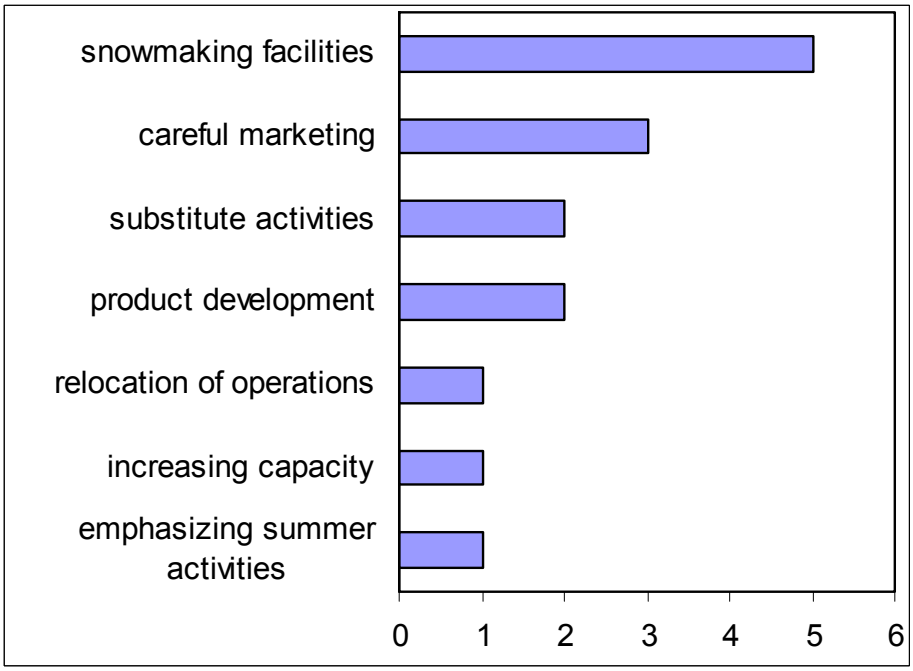

Figure 5 Adaptation methods in use to cope with climatic variation in Northern Finland.

More than half of the enterprises in Northern Finland had used artificial snow, which is a very common adaptation method for the skiing industry on ski slopes in Australia, North America and the European Alps. It is notable, though, that snow-making facilities are nowadays used almost everywhere in the ski industry, and Finland is no exception; approximately eighty percent of the downhill ski slope area in Finland is covered with artificial snow (MMM, 2005:161). This is partly due to the fact the composition of artificial snow is better and more resistant for grounding the ski fields than natural snow and, according to the interviewed ski tourism operators, nowadays a skiing centre functioning exclusively on natural snow is exceptional. The diffusion of artificial snowmaking facilities to, for example, safari firms, suggests that winter tourism operators are becoming more cautious about the climate factor in their operations. As one of the interviewees stated, "these days we have to, and are already actively trying to prepare ourselves for these snowless starts to the season, whereas ten years ago, or probably even five years ago, it wouldn't even have occurred to us that we safari firms would be forced to invest in the use of snowmaking systems to prepare artificial snow. During the last two Christmases we have actively prepared for and requested equipment, and at the moment this organisation here (Lumipooli) in co-operation with the city (Rovaniemi), and other authorities, is investigating different opportunities to acquire these kinds of snow-making installations that would serve us and not only the skiing centres."

Wariness in marketing was also a common adaptation method; the operators do not market or sell snow-based activities until the end of December, when the chances of permanent snow cover are better. If there happens to be snow earlier than that, the customers can be positively surprised. Marketing issues are essential especially in the firms whose customers are mainly foreigners, since many tourists come to Finland for one purpose - to see snow - and that is what the operators have to offer. Negative experiences easily lead to an internationally bad image that can harm the whole area's tourism industry. Substitute activities are also important: if the weather does not allow the planned trip, the operator has to offer something else instead. Besides these activities, the operators have designed activities that can replace, at least partly, the former snow-dependent activities. However, replacement is not always possible; skiing, for example, has certain requirements. During warm winters, the bigger firms may also relocate their activities, or can offer to transport their customers to locations where activities are possible.

Since the operators in the Lake District area had not reported that climatic conditions altered their operational possibilities too negatively, they did not mention methods to assure their operations. Only one third does have backup plans to protect their operations, while the number in Northern Finland is almost ninety percent (Figure 6). The methods identified in the Lake District area were very similar to the ones mentioned in Northern Finland.

2.5. Adaptation plans and mitigation measures

None of the interviewees could present a precise scenario of a changing climate and its likely impacts. Instead, they presented lists of possible effects, without concrete quantitative information on impacts. Entrepreneurs did not appear to be willing to admit to having an opinion about the existence of the phenomenon. Instead, they were very reluctant to offer any strong opinions for or against it, which hinders attempts to define their information needs or to identify the issues in which more research is needed to help the tourism sector adapt to the climate change. Even though ten of the nineteen interviewees did believe climate change is a real phenomenon, only three of these were certain of this.

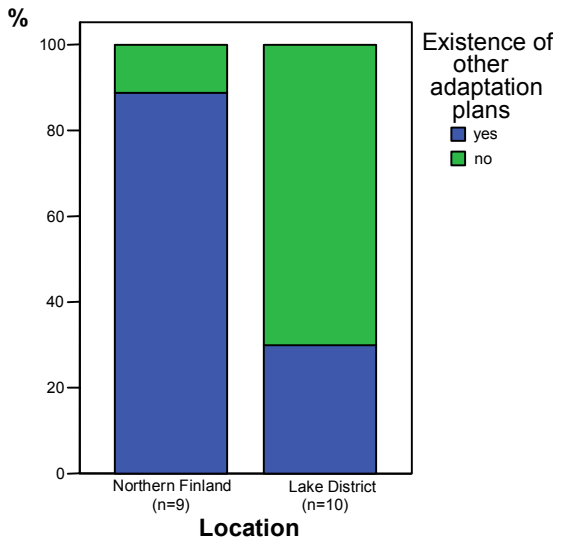

Figure 6 Existence of adaptation plans to cope with climatic variation in Northern Finland and in the Lake District.

Even believers in climate change among the respondents were very unsure and cautious when it came to expressing their personal views about the issue. This reluctance to comment on the matter may be due to the fear of losing customers and diminishing their reputation as reliable tourism operators, for example, by admitting that warming actually has an influence on the length of the operational season. König (1998) noted in Australia that the representatives of the ski industry had antagonistic attitudes towards the climate change and media reporting of it. This was because of the fear of possible negative economic impacts of such reports. It is possible that entrepreneurs in Finland share this attitude towards the media. Respondents did acknowledge that the media has an important role in promoting resorts and contributing to tourists' decision making, even though they did not consider their role to be a serious threat at the moment. This kind of attitude might also underlie their attitude towards climate change; admitting its existence and the permanent impacts it has might weaken Finland's tourism status and affect tourists' decision-making. A statement of one of the interviewees reflected this attitude: "It'll have negative effects if this kind of snowless season starts to be more the rule than the exception during the periods when tourists come here, and if their negative experiences are passed on to others. If these effects are perceived as consequences of the climate change, then it can be supposed that this implies a more permanent development, which of course will have negative impacts."

The strongest argument against climate change was natural interannual variability. Entrepreneurs have noticed that climate has always varied and the latest warming trend does not so far provide any statistical proof of long term warming. Following this argument, the slight change that has occurred recently does not imply the trend will continue for the following decades. Some operators have even noticed that in some parts of Finland the winters have recently been longer than before. The underlying reasons for climate change were also questioned.

Neither the respondents' location nor their educational level seemed to have a major effect on opinions concerning the existence and impacts of climate change (Figure 7a,b). Nevertheless, it is notable that the individuals who had the most critical views against climate change were also those who had done studies on the subject. Conversely, the respondents who had used

their own observations as the primary source of information were those most likely to believe in the existence of climate change (Figure 7c). In the bigger firms, personal opinions on the subject were not so decisive, and the interviewees tended to represent their firm's conception of the issue. In the smaller firms, personal opinions may have had more effect on the guidelines adopted by the company.

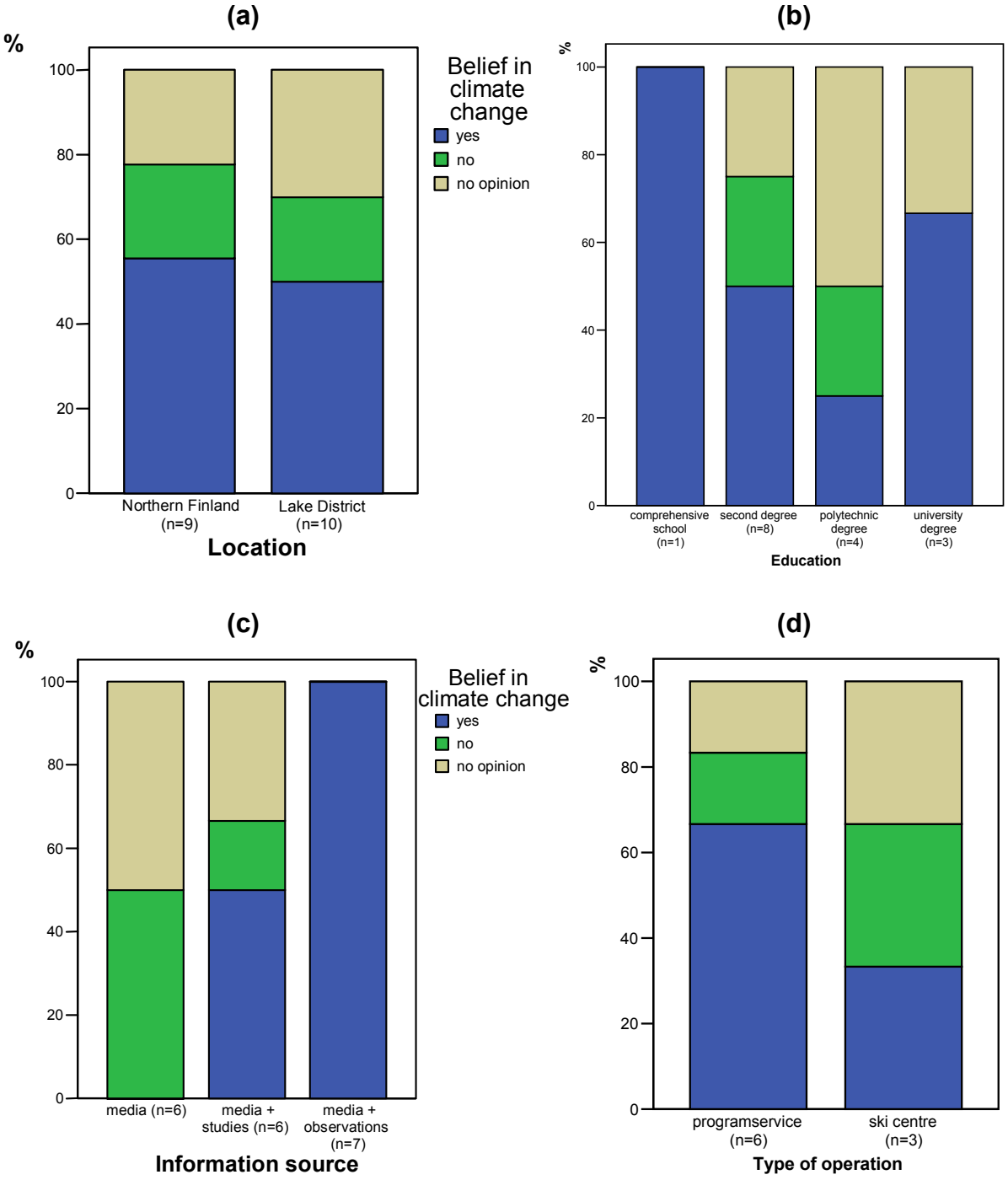

Figure 7 Belief in climate change according to (a) location of the enterprise, (b) educational level of the interviewee, (c) source of information, and (d) operational type (in Northern Finland).

In Northern Finland, it was also notable that safari firms and operators offering other tourism activities had stronger attitudes towards climate change than skiing tourism operators. Figure 7d shows that only one third of the interviewed skiing centre entrepreneurs believed that climate change is inevitable and even he was not sure about it. However, besides the small size of the sample, these results may be also be sensitive to location, because in general operators near Rovaniemi were more often worried about permanent changes in the climate than those operating elsewhere in Northern Finland.

Even though the general knowledge and level of awareness among respondents concerning climate change were rather good, and that many interviewees had already faced unusual climatic conditions that could be linked with a changing climate, their belief in climate change as a potential threat to their operations was still very low. Half of the interviewees believed that climate change is a reality, but only two of the nineteen interviewees had an adaptation plan that was consciously linked to climate change. These plans consist of investments in the construction of snow-making installations and in facilities to utilise a longer (summer) season. The rest of the interviewees, especially in Northern Finland, had adaptation plans for normal climatic variability that has always existed, and even though their plans included strategies such as investing in snowmaking capacity, they refused to call them plans to face a changing climate. Instead, plans were preferably legitimised as being designed to face the trend of growing demand, to satisfy the need to lengthen the season and diversify the supply to gain more profits, to strengthen the enterprise's economic situation and to address marketing issues.

Entrepreneurs were able to rationalise why they had not, or why they were not even considering plans for adaptation measures to face projected climate change. According to them, the most important reason was the slowness of the change: a tourism operator hardly ever plans his future more than five years in advance; in some cases, one year's forethought is sufficient. Since the National Adaptation Strategy report (MMM, 2005) states that up to 2010 it is unlikely to be possible to separate the impacts of climate change from those of natural interannual climatic variability, the attitude of tourism enterprises appears to have some justification. If their plans for the future only cover the following five years, projected climate change does not so far pose a threat. Entrepreneurs would rather wait for more definite research results and act then, according to the research data. Although the tourism business is sometimes risky, the enterprisers are not willing to rush into implementing uncertain actions if they do not know if the climate in the future is going to be warmer, colder, or unstable, or how it will affect their operational seasons.

The interviewees also stated that one cannot possibly adapt to a changing climate beforehand though they acknowledged that in some cases the versatility of activities can ease any adaptation that is required, i.e. if one or two of the offered activities become impossible, the losses can be replaced by other activities. The size of the company also affects their ability to adapt. In a smaller enterprise the investments made are so small that they pay themselves back in one or two years, so the operators are able to react at very short notice without great economic losses. "It would be a waste of resources if small companies puzzled an awful lot over these issues before they occurred, or before they themselves noticed some visible changes. And just like in our firm, it may be quite easy to make changes, when we haven't really built any ski lifts or that kind of permanent infrastructure."

The non-existence of adaptation plans may also be due to misguided insight into the seriousness and acuteness of climate change. Mistrust in the media as a reliable information

source may also affect the acquisition of information. Entrepreneurs argued that it is hard to conceptualise the issue because it has been hyped up to such an extent and that they have become weary of the whole affair. This feeling of overload caused them to reject more information on the subject, especially when they felt that the information from the media is not aimed at any special group. For example, the scenarios presented in the news only provide general information about changes worldwide or nationally in Finland. They are not localised scenarios. Most of the interviewees stated that their knowledge about the subject was at sufficiently high level, and if they needed to gain more information, they would know where to search for it. However, if there were some sort of ultimate truth about the consequences of climate change, the disclosure of it would be desirable. Some of the respondents, especially in Northern Finland, also felt that information specially designed for the tourism industry would be useful for their operations and planning processes if it was distributed directly to tourism enterprises.

The lack of adaptation strategies does not mean that the tourism sector could not handle a changing climate. As the interviewees noted, they have been struggling with climatic variability and extreme weather events with moderate success during the existence of their operations. Since they are used to acclimatising their operations at short notice to changing conditions, they are entitled to feel confident at being able to handle a gradual change in climate. The contraction of the winter season into a much shorter period has been worried some entrepreneurs in Northern Finland, but even this concern did not seem to a high priority at present. In addition, the lack of adaptation plans meant that no cost estimates have been undertaken so far. It is clear that the construction and use, for example, of snowmaking installations is costly, but interviewees seemed to be unaware of how costly. If adaptation is needed in the future, it is believed to be less expensive than the loss of revenue other wise incurred, but none of the operators was eager to estimate the total costs.

Mitigation measures for climate change (i.e. reducing greenhouse gas emissions) were not very common among tourism enterprises. Only two of the interviewees mentioned measures to mitigate climate change. These included the use of environmentally-friendly gasoline and updating their devices whenever possible. Other companies also favour environmentally-friendly functions as well, since consideration of environmental issues is, among other things, important for their reputation, especially in the international field.

2.6. Co-operation between the private and public sectors

Tourism operators, particularly in Northern Finland work in close co-operation with other tourism operators in many fields; for example, the Lumipooli-plan that aims in the construction of snowmaking facilities to benefit local tourism operators in Rovaniemi area, is realised in co-ordination with municipality and other establishments. In the Lake District, the enterprises are more independent, which some of the interviewees found to be handicap for the area's tourism. Entrepreneurs did not consider cooperation on climate change to be a pressing current issue, but if the impacts of changing climate started to become serious, new forms of teamwork would be required. One third of the entrepreneurs in Northern Finland believed that they could manage on their own and that cooperation would handle other issues than climate change. The rest of the operators in Northern Finland thought that tourism operators needed to develop more links, not only with other tourism operators but also with local communities, cities and educational institutes. Cooperation was required in financial issues, the construction of snowmaking and similar installations, development of products, strengthening of summer tourism and promotion of Finland as a land of snow.

In the Lake District, the operators regarded cooperation on climatic issues with suspicion. Half of the interviewees did not believe that teamwork could help the adaptation process. Promotion of Finnish summer abroad and improving the information channels were considered the most important forms of cooperation in the Lake District.

According to respondents, the function of the public sector (cities, government etc.) in their adaptation process is not very important. They stated that entrepreneurship should be an enterprise-led action in which the involvement of the public sector is not necessary. The enterprise should be able to fulfil not just its financial needs but all other needs as well, through its operations. This attitude may possibly change at some point, if the impacts of the climate change start to show and hinder the operations of the tourism sector. Interviewees from both regions agreed that the primary role of the public sector should be as an information source and informant. Other important functions include financing research, producing data and mitigating climate change by legislation. If the tourism sector needs to make comprehensive changes in order to stay viable, financial aid and other support measures might also be required. The public sector should also assist the operators by using zoning that benefits the tourism industry, especially where there are disputes between tourism and other types of land use.

2.7. Research needs

The impact of climate change on the Finnish tourism industry is not known. The vulnerability of different types of tourism to changes in climatic conditions depends on the type of tourism, the location of the enterprise and the capability of tourism enterprises to adapt. According to earlier findings, winter tourism may face difficulties from a changing climate that could lead to stagnation of the industry. Summer tourism seems to be in a better position concerning climate change, with a lengthening of the season helping to flatten the high season and lure more tourists. Adaptation may be necessary, though, if precipitation increases, extreme weather events such as storms and flooding become more frequent or severe, and warming-induced eutrophication of waters increase. Nevertheless, it is important to note that the impacts of climate change in other parts of the world may also influence the tourism sector in Finland, and no definitive statements about the future of tourism in Finland can be made until more research on the impacts here and elsewhere is carried out.

The tourism sector's adaptation capability depends, among other things, on entrepreneurs' attitudes to expected changes, their financial situation and the behaviour of tourists. If tourists decide to travel somewhere else, no amount of adaptation can help the tourism sector face a changing climate. It is therefore important to note that maintaining the land of snow -image is essential, especially to operators whose main customer groups come from abroad.

In the short run, the future of nature-based tourism in Finland appears to be good, since the impacts of climate change do not appear likely to have significant effects on tourism for another ten years or so. In view of this, the present lack of adaptation planning does not yet present a critical threat; there is time to develop methods and substitute products to alleviate the problems that climate change might cause. Projected warming may shorten the snow season rather fast, and the winter tourism operators are already now taking action to secure that the winter season begins on time. If future warming postpones the start of the season so that the period around Christmas and New Year become unfeasible, the results may damage the tourism sector severely, particularly in southern Lapland. In Rovaniemi, for example, the enterprises are facing difficulties at present because of recent warm Decembers. This has been the situation for some time, but the entrepreneurs are worried that they will be forced to

compress the very short and backbreaking season into an even shorter period. In addition, the area's accommodation capacity is not necessarily able to handle a more concentrated season; already nowadays at Christmas time, hotels and other accommodations are fully booked and tourism operators are working around the clock.

The influence of climatic factors on winter tourism activities depends on the type of the activity, which means that vulnerability of different activities to climate change varies a lot. Skiing (or alpine skiing) has been in the spotlight in previous winter tourism research made in Australia, Switzerland , Scotland and North America (see Balazik, 2001; Bürki, 2000; König, 1998; Scott et al., 2002) and has been found to be very vulnerable to climate change. Nevertheless, in their assessment of vulnerability of different winter tourism types to climate change in North America Scott et el. (2002) have noticed that alpine skiing may in fact be more adaptable and less in danger than the other types of snow based activities such as cross-country skiing, snowmobiling and ice-fishing. With this in mind, it is possible that operators organising different snow-based activities need more support in adaptation than the skiing operators, who have been using snow-making and other facilities to lengthen and improve the quality of the season for a longer period and are familiar with them.

All the above-mentioned adaptation methods do not necessary suit all operators; costs may be too high for smaller enterprises, artificial snow does not match with the "natural" image of reindeer or husky safaris, animal-based operations or heavy infrastructure may restrict the relocation of enterprises' activities, or technological settings may not fulfil the requirements needed to adapt the methods in practice. Resources are needed to develop alternative activities and the most vulnerable enterprises may need a lot of support, both financial and informational. The attractiveness of these new, alternative activities should also be researched; what kinds of activities are likely to attract foreign tourists that nowadays travel to Finland to see snow, or tourists travelling to Lake District to enjoy the clear waters?

Even though the tourism operators do not yet consider climate change to be a pressing problem, it is important to gather more data and produce estimates concerning the impacts climate change might have on the tourism sector. The results of such research could be useful for organising educational information meetings for operators and determining the needs for state or other subsidies and patterns for potential co-operation, which may ease the adaptation process. In addition, it is more important to promote Finland's snow reliability and the warm Finnish summer for foreign markets, if the ski seasons in the Alps become increasingly snow-deficient and if destinations in southern Europe become too hot for summer visitors. The promotion of the Finnish winter may help both to generate new and to maintain the existing tourist markets as long as the image of snow tourism as a declining phenomenon can be avoided. It is essential to emphasize the importance of maintaining the current snowy image of Finland, and prevent the proliferation of negative experiences. In addition, the warm summer image may bring to Finland more tourists who previously visited the southern parts of Europe and now start to become interested in summer holidays in the northern parts of Europe.

Mitigation measures may also influence the future of tourism if, for example, airlines are forced to raise prices because of tightening emissions taxation. This could affect tourists' mode of travel, by increasing short distance travel at the expense of long distance travel. High taxation of air travel may have an effect on the number of charter groups arriving to Lapland, since charters are the main source of income for many safari or other programme service firms.

Climate change-induced alterations in tourist behaviour may change the world's tourism patterns as well. In order to develop adaptation strategies it is essential to know, how tourists' decision-making concerning the choice of destinations and tourist activities may differ from decision-making of today. Some research has already been done on the changing tourism patterns of the world, but so far Finland has been absent from the research field. For example, approaches that have been adopted by Bürki (2000), Maddison (2001) and Hamilton et al. (2005) to define potential changes in tourist behaviour may be suitable for estimating the attractiveness of Finland as a tourist destination under a changing climate. It is notable, though, that these kinds of methods are mainly suited for rough estimates or indicators of possible tourist flows, not exact definitions.

When it comes to estimating the future of Finland's tourism sector, it is essential to define the tourism enterprises most under threat and their potential to adapt to climate change. Research elsewhere has showed that winter tourism is one of the most vulnerable types of tourism. Concerning this and the fact that winters in Finland are projected to warm more than summers, it may be justified to concentrate more research in winter tourism. Water-related and other outdoor summer activities are under threat if the warming causes a decline in water quality or if the frequency of extreme weather events such as storms increases (see Ruosteenoja et al. 2005 for more information on projected climate changes and Silander et al., 2005 for its implications for water quality).

It is also important to note that impacts on tourism somewhere in the country may influence tourism everywhere in the country. For example, if the skiing destinations in southern Finland are not be able to continue their operations, the amount of skiers in southern Finland may decrease which affects the amount of skiing tourists travelling to Lapland where ski centres still operate. Among others, Bürki et al. (2005) state that small skiing centres near cities are important due to their role as producers of new generations of skiers, and their extinction might reduce the total amount of skiers remarkably. Beginners are seldom ready to head for far away destinations if they have not practised their skills first at destinations suitable for novices as well. Since the opportunities in Finland to start skiing are also good in the bigger centres, the loss of southern Finland's smaller centres may contribute more to the loss of the possibility to familiarize oneself to skiing. Long distance to nearest skiing centre reduces the number of visits per year, which may alienate skiers from their current hobbies.

The cost of adaptation strategies may become rather high for certain types of tourism operators under a changing climate, which is a factor already awakening concern among entrepreneurs. Interviewees were concerned where money to cover the expected costs would come from, since it would not be feasible for tourists to pay in higher prices. Not all costs can be directly included in prices, even though tourists may be willing to pay more if they acknowledge that higher prices guarantee the activities that otherwise could no longer be offered. Thus, communication with tourists about climate change and its impacts on tourism activities, as well as tourism's contribution to climate change may be crucial at some stage. Based on the pilot study the specific future research needs are:

- the vulnerability of different types of tourism activities.
- wider survey based knowledge on the awareness and perceptions of climate change and its impacts on tourism in Finland and the level of adaptation strategies in the industry.

- the potential effects the climate change might have in certain regions and the possible transition of tourists and tourism industry to new regions especially in European context based on the different climate change scenarios.
- tourists awareness of the effects of climate change and their perceptions of the future conditions.
- the evaluation of potential adaptation mechanisms and strategies and their financial costs including e.g. insurance requirements.

2.8. Concluding remarks

In general, entrepreneurs seemed to be aware of climate change. However, there was a lack of precise knowledge about the effects that climate change will have on the tourism sector. Tourism entrepreneurs were somewhat sceptical about the effects climate change might have on their operations. There were unsure impressions among interviewees concerning tourists heading further north or about lengthening of the summer season and shortening of the winter season, but no exact conception of these effects. This might be because half of the interviewees did not believe that climate change as a phenomenon really exists. Aside from this, opinions concerning the impact of climate change differed; most of the interviewees believed that projected changes would not have any impact on the tourism sector. In light of these ideas, entrepreneurs appeared to be unwilling to search for more accurate or tourism-specific information. Furthermore, there was almost no adaptation plans at all among enterprises. Instead, entrepreneurs have been adapting to the "normal" short-term climatic variability rather successfully, and they considered themselves very capable of adjusting to climatic changes, even at short notice, if needed. The future of the tourism industry in Finland was regarded optimistically, and climate change was seen only a minor threat, if a threat at all, among other topics that might have an effect on the industry.

The Finnish tourism industry needs accurate scenarios of climate change and more data on its potential impacts on the tourism sector. To gain information, more effort needs to be invested into research on the subject in cooperation with the tourism operators and other experts on tourism. Operators need to be informed about the projections of climate change and their predicted effects on tourism, and to be encouraged already to begin to develop adaptation plans. At an international scale, it is important to promote Finland's winter tourism and warming summers so as to avoid a loss of foreign tourists through inaccurate images of the Finnish winter and summer climate. Winter or snow tourism especially is in danger, if an image of a snow-deficient Finnish winter were to spread to the most important market areas in Europe, leading to a loss of customers. The shortening of the winter season around Christmas and the New Year may be fatal to winter tourism operators if technical installations or the development of optional activities do not support continued operations during these financially crucial seasons.

3. Adaptation to climate change for outdoor recreation in Finland

[Neuvonen, Pouta, Sievänen]

3.1. Introduction

Participation in outdoor activities is one of the most common ways to spend leisure time among Finnish people. Changing climate may have profound effects on outdoor recreation opportunities. As a consequence, also the recreational behaviour of Finnish people will be affected. As recreationists are in direct interaction with natural environment, they need to make new choices of activities or modify the way of practicing the old ones, or their choices of recreation settings differ because of changed climatic conditions. People will face the need to adapt their ways to recreate in nature to changing conditions and changing recreation opportunities in future.

Adaptation to climate change concerns providers of recreation services as well. This is recognized on governmental level. The report Finland's National Strategy for Adaptation to Climate Change (MMM, 2005) pays attention to the possible increasing demand for close-to home recreation opportunities, particularly concerning summer activities.

In this section, we mainly focus on the changes in participation in recreational activities. We present scenarios of recreation participation based on FINADAPT climate scenarios of Sustainability (B1) and Retrenchment (A2) and socioeconomic scenarios. When building the scenarios, we use recreation participation models based on the data of the national inventory of outdoor recreation (LVVI). In these participation scenarios we focus on those activities, which we found to be the most sensitive to changes in weather conditions. These activities are winter activities, which are dependent on natural snow cover (cross-country skiing, downhill skiing and snowmobiling), and also summer activities which are related to warm temperature and sunshine conditions (swimming in natural waters).

The recreation participation scenarios give us a vision how current patterns of recreation behaviour follow changes in climate, demography and socio-economic development (short run adaptation – Figure 8). Beyond these model-based scenarios, we discuss what permanent changes in recreation behaviour patterns might occur in changing conditions (long run adaptation). We identify various ways how people may try to adapt their participation in recreational activities: a) by travelling to more distant locations, b) by shifting to activities which are less sensitive to weather conditions, and c) by investing on new types of recreation equipments with high-tech solutions in changed climate conditions.

Anticipatory planned adaptation is needed by public sector providing recreation opportunities. Particularly, municipalities in southern Finland face these challenges of adaptation. In our report, we try to develop some ideas or to make some suggestions how public sector recreation agencies may need to change the provision of services in both the short and long run.

In the following we first introduce some previous research done on outdoor recreation and climate change. Secondly, we present our scenario method and its information basis. Then we produce four different scenarios for outdoor recreation activities. We discuss the opportunities for long run adaptation by individuals and by the public recreation sector. Furthermore, we identify research needs for each topic.

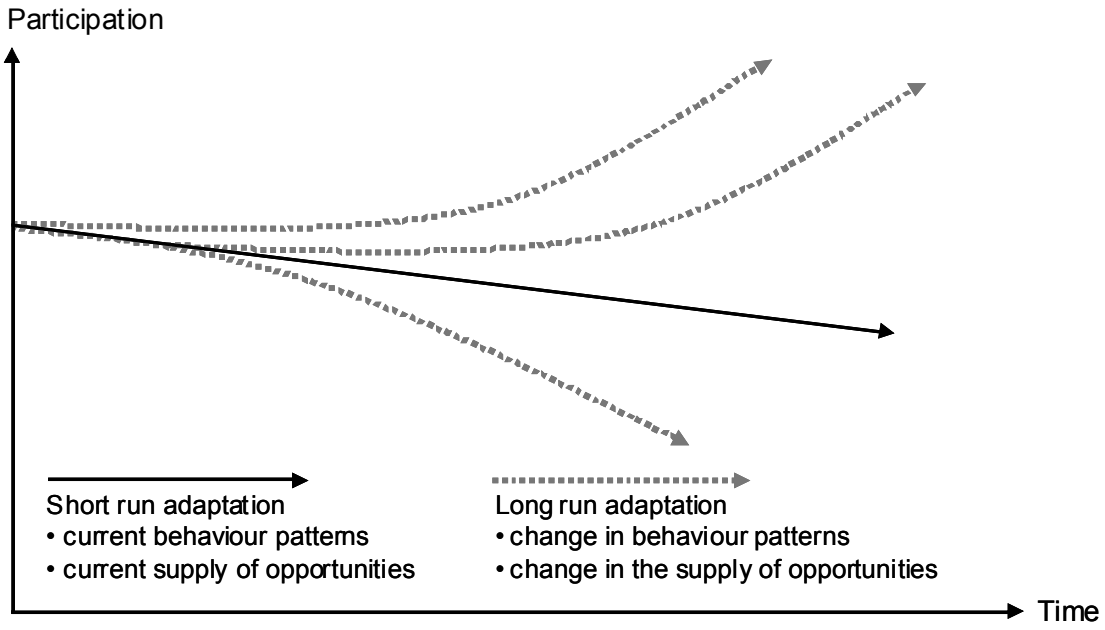

Figure 8 Short run and long run adaptation by individuals and by the public recreation sector[3]

3.2. Previous research

Outdoor recreation trends analysed by Cordell et al. (1999) show remarkable changes in participation rates and occasions for almost all outdoor activities during recent decades. Participation in general is expected to increase or keep stable in future when socioeconomic trends are considered (Bowker et all. 1999). Beside socioeconomic changes, such as the ageing of the population, and increasing income and educational status,changes in the recreation environment may affect the nature and duration of participation. In Finland, current outdoor recreation behaviour, including participation in outdoor recreation activities, was recently measured by the national outdoor recreation inventory (LVVI) study (Sievänen, 2001), but unfortunately we do not have trends over past behaviour based on actual measurements. Some indications of possible future development are discussed in a report produced by the "Forest sector and forum for the future project" (Koivula & Saastamoinen 2005, Sievänen 2005). Based on an expert survey, participation in most outdoor activities was assumed to grow during the next ten years. The experts expect snowboarding, visits to nature centres, bird watching and Nordic walking to be the fastest growing activities. Picking berries and mushrooms, and hunting are assumed to be declining activities. Climate change assumptions were not addressed specifically in this expert prognosis, and the issue has not been studied in detail before the present FINADAPT project in Finland. Nevertheless, current knowledge of recreational behaviour is also needed as a starting point from which to assess possible future changes in relation to climate change.

International research on climate change and outdoor recreation started in the 1980's. McBoylen et al. (1986) studied recreation and climate change issues in their Canadian case.

[3] The short run and long run are here defined according to the flexibility available to decision makers. The **short run** is a period of time in which the quantity of at least one input is fixed and the quantities of other inputs can be varied. The **long run** is a period of time in which the quantities of all inputs can be varied (e.g., Pekkarinen & Sutela 2002). There is no fixed time that can be marked on the calendar to separate the short run from the long run. The short run and long run distinction varies from one industry to another. With respect to outdoor recreation, in the long run the types of resources required for household participation that may be subject to change include time, skills, equipment and habits.

Ewert (1991) described a useful framework for the manifold relationship between climate and recreation, and looked at demographic, environmental, and aesthetic dimensions that are likely to affect on outdoor recreation. He also discussed the major options of adaptation. This start was followed by studies using empirical data and modelling to look at the consequences, e. g. changes in recreation behaviour caused by possible climate change. Loomis and Crespi (1999) forecasted the number of visits and number of recreation days for several outdoor activities, and related economic values to projections of temperature warming increasing precipitation up to 2060 in USA. They found that there are some activities, such as camping, hiking, picnicking, kayaking, rafting and beach recreation, which will either have a neutral response to climate change or benefit, but that winter activities such as downhill and cross-country skiing will decline under a changing climate.

Skiing has found to be one of the most sensitive outdoor activities for changing climate, and many studies have looked at the effects of climate warming on skiing conditions and further for participation in skiing (Harrison et al., 2001, Fukushima et al., 2002). In Japan, a rise in air temperature by 3°C is estimated to decrease the number of skiers by 30 % in almost all ski areas (Fukushima et al., 2002). Few other outdoor activities have been the subject of specialised climate change studies. For example, Ahn et al. (2000) studied the economic and welfare loss of trout anglers due to a warming climate.

The expected changes in visitation in national parks and tourist destination have been another line of research. (Breiling & Charamza, 1999; Krämer, 2005, Moen & Fredman, 2005; Scott, 2005b). Demand for ski tourism or visits to recreation areas in which skiing is the major attraction, are the most vulnerable to climate change. Naturally the location of the area is a key factor determining how visits are affected. In the Alps, a warming of temperature by 2°C was estimated not to affect skiing conditions at altitudes above about 2000 m, but the changed conditions would have impacts on ski areas at lower altitudes (Breiling & Charamza, 1999). This implies the loss (closure) of low altitude ski resorts (often close to cities), with access to suitable resorts becoming more difficult and costly for skiers, and a loss in numbers of 1-day (local) skiers. Nevertheless, ski tourism may survive economically because of other users (long-distance visitors) and other types of uses (other than snow-dependent activities) (Breiling & Charamza, 1999).

Irland et al. (2001) have made a review of socioeconomic impacts of climate change on outdoor recreation in USA, and have also discussed the possible adaptation policies. Their main conclusion concerning the ski industry was also that the location is crucial: ski areas in marginal climates can be seriously affected but the effect in colder regions is less clear. In many cases, snowmaking is a key adaptive mechanism. Regional variation is detrimental, and average changes on a national level may mean little.

In the following we present a scenario analysis of possible future trends in Finnish outdoor recreation with and without a changing climate. This enables us to expand the discussion of possible adaptation measures in recreation to cope with climate change.

3.3. Scenarios and assumptions

3.3.1. Observed and scenario-based climate data

The climate variables that are important to explain recreation behaviour and were used in developing recreation scenarios were mean air temperature, snow depth and number of hot

days (maximum temperature > 25ºC) (Table 3). In our study snow depth reflects skiing opportunities together with air temperature (compare Fukushima et al., 2002). We used either annual-scenarios or scenarios for the period December to February (DJF). Changes in mean surface air temperature follow the FINADAPT-scenarios Sustainability (B1) and Retrenchment (A2) (Carter et al., 2005, Ruosteenoja et al., 2005). Long-term DJF warming of 4.3ºC (B1) and 6.5ºC (A2) is projected for the period 2071-2100 relative to 1971-2000. Snow depth is predicted to decrease by 48% at Sodankylä and by 78% at Helsinki-Vantaa over the same period for the A2 scenario. Changes in snow depth are predicted to be highest between September and November and between March and May. The change in number of hot days was used in scenarios of future swimming activity.

Table 3 Types and sources of observational climate data and climate and population scenarios. DJF and JJA are the means for December, January, February, and June, July, August, respectively.

Variable	Observed daily climate data	Climate scenarios
Mean air temperature Annual; DJF	Venäläinen et al. (2005)	Carter et al. (2005)
Snow depth Annual; DJF	Venäläinen et al. (2005)	Ruosteenoja et al. (2005)
Number of hot days Annual; JJA	Venäläinen et al. (2005)	Ruosteenoja et al. (2005)
	Demographic and socio-economic scenarios	
Demographic trend	Carter et al. (2005)	
Age	MMM (2005); Tilastokeskus (2004a)	
Education, % of 15-74 years	Hanhijoki et al. (2004)	
Employed, % of 15-64 years	Carter et al. (2005)	
People living in cities over 100 000 inhabitants, %	Tilastokeskus (2004b)	
Amount of money (€/year) used in outdoor recreation	Carter et al. (2005). Growth scenario based on VATT-scenarios of aggregate national consumption (billion €) for leisure and tourism.	
Working hours/week	Työvoima 2020: Osaamisen ja täystyöllisyyden Suomi. 2003. Työministeriö (Ministry of Labour). Työpoliittisia tutkimuksia 245.	

3.3.2. Population scenarios

Table 3 summarizes the variables and population scenarios we used together with our recreation survey data of 15-74 year old Finnish population in 1999. Demographic development follows the annual population growth rates for Finland described by Carter et al. (2005). Age-variable means either mean age or proportion (%) of 15-74 year old population aged 15-34, 35-64 or 65-74 years. Education is described as proportion (%) of population having non-university tertiary or university education. Proportion of population living in municipalities of over 100,000 inhabitants is used to indicate outdoor recreation opportunities and the general living environment. We also used the percentage of the employed population (Sustainability B1), amount of money used for outdoor recreation and working time per week to describe the economic and time resources available for outdoor recreation.

3.3.3. Outdoor recreation models and scenarios

To build the scenarios we first applied national outdoor recreation survey (LVVI) data to estimate present participation of 15 - 74 year olds in the Finnish population in outdoor recreation. The data were collected between August 1998 and May 2000 and cover two winter and summer seasons (Virtanen et al., 2001). The data focus on participation in outdoor recreation activities during the most recent 12-month period. Second, in constructing

participation models we connected observed climate data and survey responses by using information on respondent's municipality of residence[4] and time of data collection. As a result we got one data set including responses to recreation participation and weather information related to three areas and time of surveying. We used observations of temperature, snow depth and number of hot days (temperature more than +25ºC) to estimate the effect of climate on participation and frequency of participation on outdoor recreation activities. For example information of participation in skiing in year 1999 in southern Finland is related to skiing conditions in winter 1999 in southern Finland. The models for the present outdoor recreation behaviour were logistic regression (for participation in outdoor recreation activities) and negative binomial regression models (for participation times) (see Appendix 2).

Third, we built four different scenarios for outdoor recreation (Table 4). We used present day outdoor recreation estimates as a basis for changes in outdoor recreation behaviour. Other model-based projections were calibrated to this base level. We assumed that relationships between climate and socio-demographic factors affecting recreational behaviour remain stable. Then we extrapolated the models outside the present-day by using climatic and socioeconomic scenario values in our models. Scenarios CCB (A2) and CCB (B1) were based on climate factors only. Scenario SDB was based on socio-economic and demographic changes only. Scenario CCSDB combined both climate and demographic and socio-economic development.

Table 4 Scenarios used for modelling outdoor recreation

SCENARIO	DESCRIPTION
CCB (A2)	Climate change based scenario SRES A2
CCB (B1)	Climate change based scenario SRES B1
SDB	Socio-economic and demographic based scenario
CCSDB	Climate change, socio-economic and demographic based scenario

We produced four outdoor recreation scenarios for: participation in cross-country skiing, downhill skiing and snowboarding, snowmobiling and swimming in natural waters. Results of the LVVI-survey represent the present outdoor recreation participation (1998-2000). In scenarios the time horizons were near term (2005-2020), mid-term (2021-2050) and long term (2071-2100). To estimate the range in the total number of participants during each future period, we accounted for population growth rates in the outdoor recreation scenarios by multiplying participation percentages and prevailing population scenarios for the 15-74 years population cohort. The results were further used to calculate the range of the total number of participation times by multiplying participants (million) with participation frequencies. Scenarios of behaviour, as for population levels, socio-economic and climate projections, become very uncertain as long time periods are considered. As scenarios CCB (A2), CCB (B1), CCSDB and SDB assumed the current pattern of behaviour, they only provide part of the explanation for possible changes in future outdoor recreation behaviour.

[4]Weather data from individual meteorological stations were assumed to apply to survey responses originating from different regions, as follows: Uusimaa, Itä-Uusimaa, Kymenlaakso, Varsinais-Suomi, Satakunta, Kanta-Häme and Pohjanmaa (Helsinki Vantaa station); Etelä-Karjala, Etelä-Pohjanmaa, Keski-Pohjanmaa, Etelä-Savo, Pohjois-Savo, Keski-Suomi, Pirkanmaa, Pohjois-Karjala, Päijät-Häme and part of Pohjois-Pohjanmaa (Jyväskylä station); Lappi, Kainuu and Kuusamo, Pudasjärvi and Taivalkoski in Pohjois-Pohjanmaa (Sodankylä station).

3.4. Autonomous adaptation by individuals

3.4.1. Outdoor recreation scenarios - short run adaptation

Table 5 summarizes the four outdoor recreation scenarios for four outdoor activities. Near term scenarios indicated only minor effects on outdoor recreation. To emphasize the importance of the possible changes we found the long term scenarios, although very uncertain, still helpful to use as a basis for discussion.

Table 5 Estimated effect of climate and socio-economic factors on cross-country skiing, downhill skiing/ snowboarding, snowmobiling and swimming.

		Participation scenarios		
Activity	**present**	**near term 2005-2020**	**mid-term 2021-2050**	**long term 2070-2099**
Cross-country skiing	% of population (frequency of participation, days)			
CCB (A2)	40 (19)	38 (17)	36 (17)	30 (14)
CCB (B1)		38 (18)	37 (17)	33 (16)
SDB		39 (20)	39 (20)	40 (20)
CCSDB		39 (19)	36 (18)	32 (16)
Participants (million)	1.56	1.48 - 1.52	1.40 - 1.52	1.17 - 1.56
Participation days (million)	30	25 - 30	24 - 30	16 - 31
Downhill skiing (including snowboarding)				
CCB (A2)	16 (9.4)	16 (9.4)	16 (9.4)	16 (9.4)
CCB (B1)		16 (9.4)	16 (9.4)	16 (9.4)
SDB		14 (8.9)	12 (8.9)	12 (8.8)
CCSDB		13 (8.9)	11 (8.8)	10 (8.6)
Participants (million)	0.62	0.51 - 0.63	0.43 - 0.62	0.39 - 0.62
Participation days (million)	5.8	4.5 - 5.9	3.8 - 5.9	3.4 - 5.8
Snowmobiling				
CCB (A2)	10 (13)	9.0 (11)	8.2 (9.3)	5.9 (5.8)
CCB (B1)		9.0 (12)	8.6 (10)	7.5 (8.5)
SDB		8.5 (12)	7.7 (11)	7.2 (11)
CCSDB		8.1 (11)	7.0 (9.3)	5.3 (6.3)
Participants (million)	0.39	0.32 - 0.35	0.27 - 0.34	0.21 - 0.29
Participation days (million)	5.1	3.5 - 4.2	2.5 - 3.7	1.2 - 3.2
Swimming in natural waters				
CCB (A2)	68 (28)	69 (29)	73 (31)	82 (41)
CCB (B1)		69 (29)	71 (30)	75 (33)
SDB		66 (29)	65 (29)	65 (30)
CCSDB		67 (30)	69 (33)	76 (44)
Participants (million)	2.65	2.58 - 2.70	2.54 - 2.85	2.53 - 3.19
Participation days (million)	74	75 - 81	74 - 94	76 - 140

A decrease in mean snow depth and number of days with snow cover has direct influences on ***cross-country skiing*** opportunities especially in southern Finland. The possible consequences are, first, cross-country skiers make less skiing trips than before but do continue to ski annually. Second, some people quit skiing due to the higher costs (in time and money) of skiing. The map in Figure 9 shows how the current participation rate in cross-country skiing is related to average annual temperature. In contrast, the scenarios show how both the number of skiers and number of skiing occasions decrease with climate and socio-demographic change (Table 5; Figure 10a). The CCB scenarios imply both of these changes. Although socio-demographic change balances some of the decline (SDB scenario), the combination of these

factors (CCSDB scenario) shows a remarkable (4%) decrease in participation in the mid term, and a slight decrease in participation times.

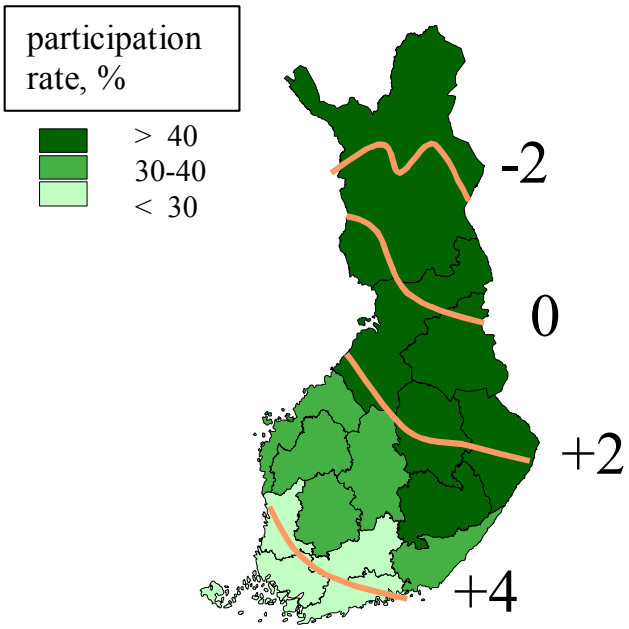

Figure 9 Current participation in cross country skiing and annual average temperatures.

Participation in ***downhill skiing*** *(including snowboarding)* appeared to be less sensitive to changes in climatic conditions (Table 5; Figure 10b). However, in the SDB scenario the participation rate and number of trips showed a decreasing trend. Today, downhill skiing is much more popular among the younger generation compared to an older generation most of whom never learned the skills. In the SDB-scenario we were not able to account for the effect of a cohort of young active skiers who most probably are willing to continue their skiing activity in the future. This means that in future a larger proportion of older people is likely to be interested in downhill skiing compared to today. If this effect had been accounted for in the scenarios, the decrease of participation rate would have been more modest.

Declines in rates and days of participation are also estimated for ***snowmobiling*** (Table 5; Figure 10c). Both CCB-scenarios and SDB-scenarios show decrease in participation rate and days. However, the cohort effect not built in to the model would again have cushioned the decrease.

Swimming in natural waters is an activity which is expected to benefit from a warming climate (Table 5; Figure 10d). When the swimming season is longer, people interested in swimming will continue to participate, with more young people starting swimming and older people continuing to participate their swimming activity to a later age. However, the increase in participation associated with the CCB-scenarios is balanced by a decline that would be expected when socioeconomic and demographic factors, particularly age structure, are included in the scenario. Swimming behaviour is also associated with the water quality, and if algal blooms become more common in higher temperatures, the increase in swimming participation under CCB scenarios may be checked. The effect of algal blooms is expected to affect swimming behaviour especially along the coast of the Gulf of Finland. Unfortunately, no studies have yet been conducted of the effect of water quality on water recreation.

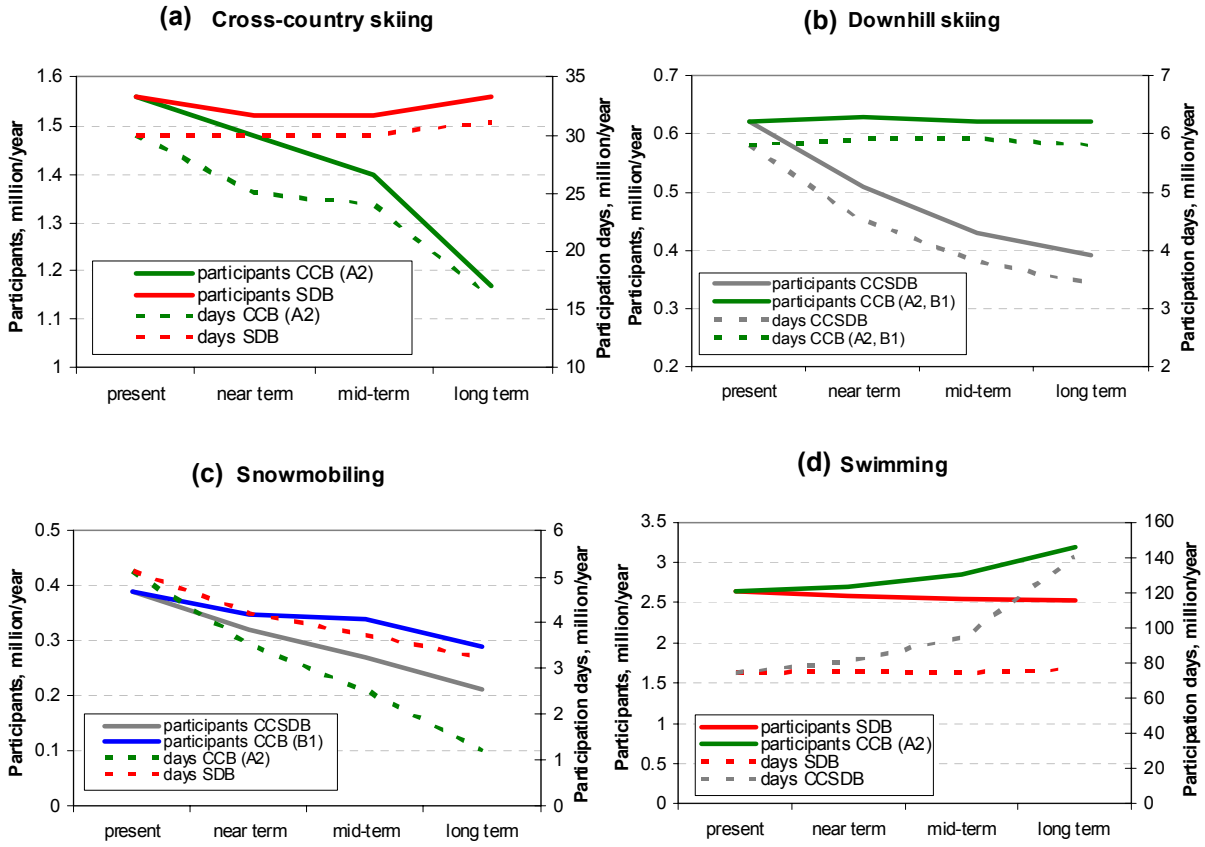

Figure 10 Present day and projected participation and participation frequency among 15-74 year-olds in the Finnish population for: (a) cross-country skiing, (b) downhill skiing, (c) snowmobiling and (d) swimming in natural waters. Scenarios are described in Table 4)

3.4.2. Changes in behaviour pattern - long run adaptation by individuals

Our scenarios were based on data that capture current behaviour patterns, and thus are not applicable to situations where this pattern has changed. The longer the time period considered, the more probable it is that people will react by some other means than simply shifting the times of participation. This long run adaptation can happen by travelling to more distant locations, by choosing activities that are less sensitive to weather conditions, or by investing on new types of recreation equipment using high-tech solutions under changed climate conditions.

As an example of these possible changes in behaviour, we next consider possible adaptation in cross-country skiing behaviour. According to the LVVI data, ski resorts today attract daily visitors (i.e. on visits that do not include an overnight stay) mainly within a 50 km radius. The mean distance between a cross-country skiing location and permanent residence is 20 km. However, 12.5% of respondents reported a distance of less than 1 km. If the supply of skiing opportunities close-to-home, particularly in southern Finland, decreases considerably, we can also expect a shift in demand to more distant locations. When the distance to a skiing resort increases, it will most probably have the strongest effect on skiers who have the lowest flexibility in their disposable income for leisure activities. Moreover, those skiers who are able to stand the increased costs of skiing will need to adapt their participation in skiing within the constraints of their disposable leisure time. This may mean less day trips to skiing areas, but one or more trips of longer duration in order to minimize the time cost of travelling. It may also mean a willingness to invest in more permanent accommodation opportunities at

ski resorts. On the other hand, skiing conditions close-to-home may mean more skiing on wet snow, which may demand new types of skis, sticks, shoes and clothing compared to those of today. Another line of adaptation, maybe more planned adaptation, is that people in southern Finland may also look for new activities to replace skiing. Various forms of ice-skating may become more popular as an alternative to skiing. Even activities, which are not snow-dependent, may compensate snow activities. Nordic walking is a probable substitute for skiing close to home in Southern Finland.

3.4.3. Research needs of autonomous adaptation

Related to autonomous adaptation several research needs can be identified:

- Inventories on a regular basis are necessary to follow outdoor recreation trends.
- Although we know how people adapt with the current recreation behaviour pattern, we do not know how the pattern will change. There is a need for contingent behaviour studies using survey methods (see Richardson & Loomis, 2004).
- The scenarios in this article were built for national level analysis. However, the regional differences in adaptation will be large. Continuation of this study at a regional level is necessary.
- Indirect effects of climate change (changes in wildlife populations, fish populations and the composition of vegetation, berry or mushroom crops) affect the recreationists' decisions about the frequency and duration of future participation.
- Changes in water quality, in part due to a changing climate, will be important for water recreation and have been little researched.
- Exchange of experiences and results with other Nordic or Baltic countries, with similar environments to Finland, is also necessary.

3.5. Impacts of individual adaptation

3.5.1. Health-related impacts

Any change in recreational opportunities in close-to-home areas which make the conditions for participation in physically demanding recreation activities difficult or different may have negative impacts on people's involvement in recreation in general, and particularly in those activities which bring the most positive health and well-being impacts. Substituting outdoor activities with indoor activities may also have impacts on mental health. The natural environment has been found to being more relaxing and to offer better restorative effects compared to other environments. If difficulties in practicing outdoor recreation lead to a fall in the amount of physical activity in general, the health related impacts are obvious (STM, 2001). For example participation in cross-country skiing is recognized to be an important winter activity for Finnish people, which offers manifold physical benefits. Cross-country skiing is one of the best exercises to maintain effective muscle coordination, and to provide good aerobic exercise. For the segment of middle aged or older skiers it may be difficult to find new activities to compensate the decline in skiing activity.

3.5.2. Economic impacts

Individual adaptation may have various economic impacts. For example our scenarios show that the number of participants and participation days in skiing and snowmobiling will most probable decrease in the future without active adaptation by the recreation sector. In the short term, the lowest estimate of participation days, for example, in cross-country skiing is about 8

% under the current level. This also gives an idea of the baseline for the decrease in income of commercial skiing operators. However, changes in the behaviour pattern of skiers can balance these negative economic impacts. Adaptation by the recreation sector can also create new income opportunities whereby recreation activity is provided through commercial services instead of public opportunities based on everyman's right.

3.5.3. Cultural impacts

Some leisure activities have strong cultural images among nations. Cross-country skiing is important culturally to Fennoscandian people. In Finland, children are taught to ski on average by the age of five, and thus almost all (94 %) Finnish people have the skills to ski (Pouta & Sievänen 2001). If the skiing conditions become permanently poor, and a large portion of the younger generation do not have the chance to learn skiing skills at an early age, it may also change radically the interest in skiing, and in the long run, skiing could lose its cultural basis. It may even change how Finnish people appreciate skiing as a competitive winter sport.

3.5.4. Research needs

Health, economic and cultural impacts of individual adaptation can be considerable but are unknown. More multidisciplinary research is needed in these issues.

3.6. Adaptation by the recreation sector

3.6.1. Winter activities

Suppliers of recreational opportunities can undertake specific adaptation measures designed to anticipate or react to changes in climatic conditions. This planned adaptation may take place simultaneously with other autonomous adaptation measures adopted by individuals participating in recreational activities.

In winter, the most obvious way to adapt to a declining snow cover is to create artificial snow for traditional winter activities. Normally the conditions for natural snow require a series of days when the temperature is below zero and a sufficient amount of snowfall. Indeed, temperatures below 0ºC are important even for artificial snow making. Nowadays, artificial snow is used to lengthen the skiing season, especially on downhill ski slopes (cf. section 2) . However, it is a serious concern if the production of artificial snow for cross-country skiing or snowmobile tracks covering large areas would be required. The potential to produce artificial snow is closely related to its cost. Moreover, a snow-covered winter landscape presents a different experience than a wet, bald and dark-coloured landscape with an artificial, white ski track. It is an interesting issue to ask if people are willing to pay for cross-country skiing on artificial snow when skiing has traditionally been part of everyman's right. The most probable development would be a concentration of cross-country skiing and snowmobiling opportunities to Northern Finland. In addition, this probably implies that people may not wish to own their skies and vehicles, but rather to rent them, which presents business opportunities for the tourism industry. On the other hand, the number of people interested in snowmobiling may decrease, which will counterbalance the positive economic impact. It is problematic for the nature tourism business that high seasons related to holidays take place in April when the snow conditions are most uncertain (Figure 11).

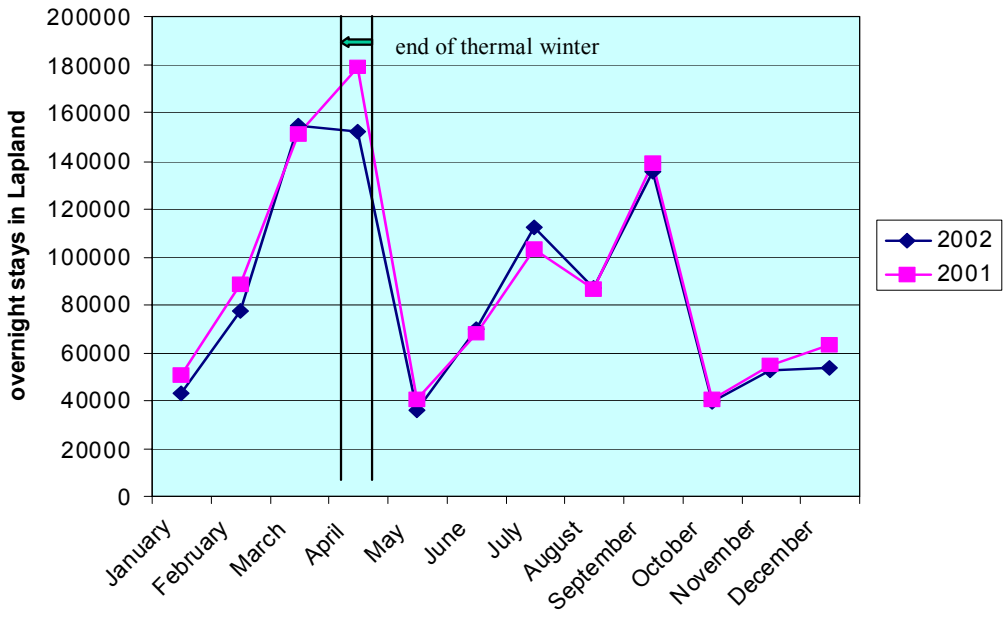

Figure 11 Overnight stays and the end of thermal winter.

It will also be important for the municipalities in southern Finland to adapt to a changing climate by providing opportunities for alternative activities. Provision of good quality opportunities for (Nordic) walking is one option, but it requires solutions to the problem of slipperiness on walkways. Artificial ice rinks are currently provided as an alternative for winter sports. The provision of ice rinks may extend to new concepts and facilities such as short ice trails, which may be offered for those who do not like to play ice hockey or other activities inside an ice rink.

3.6.2. Summer activities

An increase in popularity and frequency of swimming in natural waters may cause more crowding on beaches of lakes and the sea shore. The crowding may also cause changes in people's behaviour, but it will also cause a management problem for municipalities who are the main providers of beaches and other sites for swimming. Swimming participation may be constrained, however, by algal blooms and otherwise poor water quality, particularly on the coast of the Gulf of Finland. A decrease in coastal water quality may redirect pressure towards inland waters. Overall, the longer swimming season in natural waters but reduced water quality may change the balance of use between indoor, outdoor and natural swimming sites. This calls for adaptation in municipalities.

3.6.3. Research needs

Very little is known about the awareness and possibilities to adapt among recreation providers at the municipality level. Several specific research questions can be identified:

- to study the state of awareness and readiness of municipality agencies to adapt their provision of recreation services under conditions of climate change
- to examine the need to alter current services to match changing conditions, and to replace current recreation services with alternatives
- to estimate the extra costs of rebuilding recreation infrastructure caused by climate change

3.7. Concluding remarks

In this section, we analyzed what kind of short run recreation behaviour changes are possible based on scenarios produced according to a population survey. Secondly, we discussed some of the changes that may occur in a longer perspective, when the supply of recreation services may also have been adapted to the new climatic conditions.

Cross-country skiing is one of the winter activities which seems likely to suffer the most from a warming climate in Finland. If snow conditions during the winter months are not suitable to support participation in cross-country skiing, it is expected that people will look for other options to spend their leisure time outdoors in winter time. Cross-country skiing on artificial snow is possible but the character and atmosphere of skiing may change a lot because of the very limited supply of trails. Crowding and its side effects such as wasted time in ski rental lines, risk of accidents on heavily used trails, social problems due to conflicts between people having different values and expectations of ski trails (e.g. noise pollution from music or methods of using trails) may diminish the attraction of ski trails and skiing in general.

Many water-based recreation activities may benefit from climate change because of the expected longer season. Besides swimming, boating and fishing seasons can continue for several weeks longer and possibly in better weather conditions. Negative effects of warming may also occur, due to algal blooms and otherwise poor water quality. For example, boating may lose its attraction if other side-activities such as fishing and swimming are not appealing because of poor water quality.

In general, our assumption is that the adaptation to climate change will happen gradually. The diminishing trend of participation in winter activities may change as new generations and their habits become more dominating the population. For example, people, who have learned to ski, try to continue their skiing habits as long as their disposable time and income allow. In the long term, the number of people who have no interest to participate at all is likely to increase, and overall demand for skiing opportunities will thus decrease. The same applies to snowmobiling, maybe at an even more rapid pace. Conversely, downhill skiing may be more successful at maintaining its popularity, because downhill skiers are already accustomed to travelling to ski resorts, and to paying for the services. They may be better prepared to adapt to increased costs of their leisure activity. In general, climate change can have more positive than negative impacts on participation in summer activities. Increased demand may have negative effect if the supply of services gets scarce and crowding makes the participation less attractive.

Adaptation of recreational behaviour to climate change is difficult to assess because decisions concerning participation are made by individuals who allocate their resources according to their personal values and their social environment. The physical environment is only one factor in the decision making process. Climate is important, but again only one factor in the recreation environment. People have many options available to use the environment for recreation, and to identify good ways of compensating a lost opportunity with an alternative Nevertheless, the loss of some alternative options may be a difficult process to adjust to, in terms of a long-term attachment to an activity and the loss of variety of activities. Finnish people participate actively in outdoor recreation today. On average they participate in eleven different outdoor activities in different seasons of the year. This richness of activities is valuable to our Finnish culture, and hopefully will not be lost because of climate change.

4. Conclusions and discussion

[Sievänen, Tervo, Neuvonen, Pouta, Saarinen]

Climate change is a very complex issue and it is extremely hard to distinguish its effects from other changes in society (Cordell et. al., 1999). Changes in social structure and particularly in economy are strong driving forces of recreation and travel behaviour. Also, other qualities of environment beside the climate are detrimental to people making choices of how to recreate in nature or where to travel for pleasure in leisure time. In this report, we focused on prospective changes in recreation and travel behaviour, and discussed how Finnish people may find ways to adapt to new climatic conditions, and secondly, how the nature-based tourism industry in Finland perceives the issues of climate change and how it may affect on their business.

Outdoor recreation as a whole consists of a large spectrum of activities and behaviour patterns which offers flexibility of choices in changed conditions. In this study, we focused on outdoor activities which appeared to be the most weather or climate dependent. Cross-country skiing is one of the winter activities which seem to suffer the most of the warming climate in Finland, particularly in Southern Finland. Cross-country skiing on artificial snow in Southern Finland is future option, but maybe not attractive for many. In short term, an adaptation action of skiers may be travelling longer distances to snow-secure regions and destinations, and as a consequence skiing tourism industry has chances to grow. In less snow-secure circumtances it is expected that people look for other options to spend their leisure time outdoors in winter time.

In general, our assumption is that adaptation to climate change will happen gradually. The diminishing trend of participation in winter activities may change as new generations and their habits become more dominant in the population. A number of people may lose interest in participating in snow-based activities. In general, climate change can have more positive than negative impacts on participation in summer activities. Increased demand may have a negative effect if the supply of services gets scarce and crowding makes participation less attractive.

In general, nature-based tourism entrepreneurs seem to be aware of climate change. However, there is a lack of precise knowledge about the impacts that climate change will have on the tourism sector. Tourism operators are somewhat sceptical about the effects climate change might have on their operations. There are vague impressions among interviewees concerning tourists heading further north or about lengthening of the summer season and shortening of the winter season, but no exact conception of these effects. This might be because half of the interviewees do not believe that climate change as a phenomenon really exists. Aside from this, opinions concerning the impacts of climate change differ; most of the interviewees believe that projected changes would not have any impact on the tourism sector. In light of these ideas, entrepreneurs appear to be unwilling to search for more accurate or tourism-specific information. Furthermore, there exist almost no adaptation plans at all. Instead, entrepreneurs have been adapting to the “normal” climatic variability rather successfully, and consider themselves very capable of adjusting to climatic changes, even at short notice. The future of the tourism industry in Finland is regarded optimistically, and climate change is only a minor threat, if a threat at all, among other topics that might have an effect on the industry.

The Finnish tourism industry needs accurate scenarios of climate change and more data on its potential impacts on the tourism sector. To gain information, more effort needs to be invested into research on the subject in cooperation with the tourism operators and other experts on tourism. Operators need to be informed about the projections of climate change and their predicted effects on tourism, and to be encouraged already to begin to develop adaptation plans. At an international scale, it is important to promote Finland's snow secure winter tourism in the north, and improved opportunities for summer tourism because of warming summers in the south, so as to avoid a loss of foreign tourists through inaccurate images of the Finnish winter and summer climate. Winter or snow tourism is especially in danger, if an image of a snow-deficient Finnish winter were to spread to the most important market areas in Europe, leading to a loss of customers. The shortening of the winter season around Christmas and the New Year may be fatal to winter tourism operators if technical installations or the development of optional activities do not support continued operations during these financially crucial seasons.

Adaptation to climate change in other sectors of society (cf. other studies in the FINADAPT project) may also have effects on adaptation and adaptation needs in recreation and nature-based tourism. For example, protected areas are important as recreation environment as well as a nature-based tourism destinations. Proposed increase in protected areas (Pöyry and Toivonen, 2005) may also benefit outdoor recreation and nature-based tourism. Successful adaptation in water resource management is essential for water based recreation and nature-based tourism (Silander et al., 2005). Also contrary effects of adaptation are probable; adaptation in the recreation and nature-based tourism sector will affect other sectors. For example, changes in recreation participation have health effects (Hassi and Rytkönen, 2005). Furthermore, changes in recreation and nature-based tourism patterns have consequences on the demand for transportation (Saarelainen, 2005).

Adaptation of recreational and travel behaviour to climate change is very difficult to assess. People have many alternative ways to recreate in natural environment, and so there are plenty of possibilities to compensate a lost opportunity with another. This is particularly true in the context of nature-based tourism industry and its different activities. Still, major changes of outdoor recreation habits mean a change in culture and way of life. For Nordic people outdoor life means varied opportunities of four seasons and especially winter activities.

5. Acknowledgement

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Appendix 1: Annotated study of literature on climate change and tourism

[Tervo]

The University of Zürich has been one coordinating centre for research on tourism and climate change issues. Even though the research has been conducted by different faculties, it has often been guided by Hans Elsasser, who has participated in publication of many articles on the subject. Also Bruno Abegg, Rolf Bürki and Urs König have done comprehensive research on the issue. In North America, especially the University of Waterloo Daniel Scott, Geoff McBoyle and Geoff Wall have been the most active researchers on the field.

1. Abegg, B. (1996). *Klimaänderung und Tourismus. Klimafolgenforschung am Beispiel des Wintertourismus in den Schweizer Alpen.* Hochschulverlag AG an der ETH, Zürich. 222 pp.

Abegg (1996) concentrates on the impacts of the climate change for ski tourism in the Swiss Alps. The base for the research lies on the snow-deficient winters of the late 1980s that caused notable financial losses for area's tourism sector. In the study, both climate change scenarios and data collected from the snow deficient winters are utilized to define the possible impacts of climate change on tourism in the Alps, mainly on ski centres due to changes in the snow conditions in the area. The impacts are estimated by modeling the length of the ski season and snow conditions in two areas using the ECHAMI (European Community and Hamburg atmospheric model/Large Scale Geostrophic oceanic model) and the CCC-GCMII (Canadian Climate Centre, CCC) -models to define the future weather conditions. Part of the integrated study also finds out how tourism operators react to climate change. The impacts of climate change are considered negative because of the rising snowline and the decrease of snow reliability. The enterprisers do not, however, consider their position negative; instead they have high expectations for adaptation strategies which have already been put into action in some places.

2. 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.

König's (1998) research is situated in the Australian Alps, but by the theme and the structure it is very similar to Abegg's study. The research is holistic, and approaches the issue by first defining the importance of the area's winter tourism and estimating the (mainly economical) impact of snow-deficient winters on winter tourism. In the second stage, König applies Galloway's (1988) snow-cover duration model to assess snow conditions for 2030 and 2070 on the basis of IPCC's climate change scenarios. Based on this information, future snow reliability in some of the ski centres and the future of winter tourism enterprises in the Australian Alps are estimated. Finally, surveys of skiers and tourism enterprises are carried out to estimate the potential change in demand and the perceptions and adaptation strategies of tourism enterprisers.

3. Bürki, R. (2000). *Klimaänderung und Anpassungsprozesse im Wintertourismus.* Ostschweizerischen Geographischen Gesellschaft, St. Gallen. 206 pp.

Bürki (2000) aims to establish how climate change might affect the snow reliability of ski centres, how their customers consider the issue of "climate change and tourism" and how tourists would react to changing climate conditions. Bürki also defines the consequences of

tourists' reactions to winter tourism demand and tourism enterprisers' methods to deal with the climate change; both the reactions and the possible adaptation methods. The research methods in use are modeling with ECHAM- and CCC-scenarios and survey and group interviews.

4. 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 occasional paper 18.) Department of Geography, University of Waterloo. 84 pp.

Scott et. al. (2002) focus on the impacts that winter tourism in Ontario might face due to climate change. Besides downhill skiing, cross country skiing, snow mobiling and ice fishing are also under scrutiny in this paper. The main idea is to define the vulnerability of these activities to climatic variability and the significance of these activities for the viability of activity-based tourism. Climate scenarios used in the study are created by integrating information from different climate models, and the impact of adaptation methods is also taken into account.

Winter tourism

The research that handles winter tourism is for the most part concentrated on (down hill) skiing. Mainly the research is focused on the variability in the duration of the ski season on the basis of changes in snow cover, but also on the tourism entrepreneurs' and tourists' awareness and attitude to climate change are considered. The appropriateness of adaptation strategies is also assessed in research that is often accomplished as case studies.

Balazik, M. R. (2001). The economic impact of climate change on the Mid-Atlantic region's downhill skiing industry. *Michigan Journal of Economics* 17.

Behringer, J., R. Buerki & J. Fuhrer (2000). Participatory integrated assessment of adaptation to climate change in Alpine tourism and mountain agriculture. *Integrated Assessment* 1, 331-338.

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

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Galloway, R. W. (1988). The potential impact of climate changes on Australian ski fields. *Teoksessa* Pearman, G. I. (ed.): *Greenhouse–planning for climate change*. CSIRO Australia, Melbourne, pp. 428-437.

Koenig, U. & B. Abegg (1997). Impacts of climate change on winter tourism in the Swiss Alps. *Journal of Sustainable Tourism* 5:1, 46-58.

König, U. (1994). Entwicklung and Zukunft des Gletscherskitourismus in der Schweiz. *Wirtschaftsgeographie und Raumplanung* 19.

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.

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.

Summer tourism

Research that handles summer tourism is often focused on the change of tourism potential in different areas. Climate indexes and climate change scenarios play an important role in summer tourism studies.

Scott, D., G. McBoyle & M. Schwartzentruber (2004). Climate change and the distribution of climatic resources for tourism in North America. *Climate Research* 27, 105-117.

Staple, T. & G. Wall (1996). Climate change and recreation in Nahanni National Park Reserve. *The Canadian Geographer* 40:2, 109-120.

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.

Other research

In this section literature has been collected that deals with changing tourist demand, tourism experts' estimations about the climate change issue and literature that discusses different research methods.

Abegg, B., U. König, R. Bürki & H. Elsasser (1998). Climate impact assessment in tourism. *Applied geography and development* 51, 81-93.

Becken, S. (2004). How tourists and tourism experts perceive climate change and carbon-offsetting schemes. *Journal of Sustainable Tourism* 12:4, 332-345.

Berkhout, F. & J. Hertin (2000). Socio-economic scenarios for climate impact assessment. *Global Environmental Change* 10, 165-168.

Bigano, A., A. Goria, J. Hamilton & R. S. J. Tol (2005). The effect of climate change and extreme weather events on tourism. *<http://www.feem.it/NR/rdonlyres/8506A5F5-CCCF-4A77-ACB2-C80C8952AC66/1465/3005.pdf>*

Braun, O. L., M. Lohmann, O. Maksimovic, M. Meyer, A. Merkovic, E. Messerschmidt, A. Riedel & M. Turner (1999). Potential impact of climate change effects on preferences for tourism destinations. A psychological pilot study. *Climate Research* 11, 247-254.

Carter, T. R. (1991). *The Hatch index of climatic favourability*. Unpublished script.

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Rotmans, J., M. Hulme & T. E. Downing (1994). Climate change implications for Europe: an application of the ESCAPE model. *Global Environmental Change* 4:2, 97-124.

Matzarakis A. & C. R. de Freitas (2001; eds.). Proceedings of the first international workshop on climate, tourism and recreation, 270 pp. *<http://www.mif.uni-freiburg.de/ISB/ws/papers/full_report.pdf>*

Wall, G. & C. Badke (1994). Tourism and climate change: an international perspective. *Journal of Sustainable Tourism* 2:4, 193-203.

Other literature

This section includes texts that discuss the impacts of climate change and adaptation methods at a general level, and also assessments reports and conference publications that cover the issue, often representing rather large-scale approaches to the issue.

Agnew, M. D. & D. Viner (2001). Potential impacts of climate change on international tourism. *Tourism and Hospitality Research* 3:1, 37-60.

Bultot, F., D. Gellens, B. Schädler & M. Spreafico (1994). Effects of climate change on snow accumulation and melting in the Broye catchment (Switzerland). *Climatic Change* 28, 339-363.

Bürki, R., H. Elsasser & B. Abegg (2003). Climate change – impacts on the tourism industry in mountain areas. *<http://www.world-tourism.org/sustainable/climate/pres/rolf-buerki.pdf>*
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éCLAT Research Community. Climate change and tourism, interactions between climate change and tourism. <www.e-clat.org>

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

Essex, S., M. Kent & R. Newnhamn (2004). Tourism development in Mallorca: is water supply a constraint? *Journal of Sustainable Tourism* 12:1, 4-28.

Giles, A. R. & A. H. Perry (1998). The use of a temporal analogue to investigate the possible impact of projected global warming on the UK tourist industry. *Tourism Management* 19:1, 75-80.

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Hall, C. M. & J. Higham (eds.)(2005). *Tourism, recreation and climate change.* Channel View Publications, Clevedon. 309 pp.

International Institute for Sustainable Development (1999). The effects of climate change on recreation and tourism on the prairies. A status report.
<http://www.iisd.org/publications/publication.asp?pno=423>

Jeftic, L., S. Keckes & J. C. Pernetta (eds.)(1996). *Climatic change and the Mediterranean. Volume 2*. Arnold, London. 564 pp.

Kent, M., R. Newnham & S. Essex (2002). Tourism and sustainable water supply in Mallorca: a geographical analysis. *Applied Geography* 22, 351-374.

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

Matzarakis, A., C. R. de Freitas & D. Scott (eds.) (2004): Advances in tourism climatology. *<http://www.mif.uni-freiburg.de/ISB/>*

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Mieczkowski, Z. (1985). The tourism climatic index: a method of evaluating world climates for tourism. *The Canadian Geographer* 29:3, 220-233.

Najjar, R. G., H. A. Walker, P. J. Anderson, E. J. Barron, R. J. Bord, J. R. Gibson, V. S. Kennedy, C. G. Knight, J. P. Megonigal, R. E. O´Connor, C. D. Polsky, N. P. Psuty, B. A. Richards, L. G. Sorenson, E. M. Steele & R. S. Swanson (2000). The potential impacts of climate change on the mid-Atlantic coastal region. *Climate Research* 14:2, 219-233.

Nicholls, S. (2004). Climate Change and Tourism. *Annals of Tourism Research* 31:1, 238-240.

North Atlantic Treaty Organisation (2003). Climate change and tourism: Assessment and coping strategies. Papers. *<http://www.icis.unimaas.nl/workshop/nato/papers.html>*

Parish, R. & D. C. Funnell (1998). Climate change in mountain regions: some possible consequences in the Moroccan High Atlas. *Global Environmental Change* 9, 45-58.

Pagnan, J. L. (2003). The impact of climate change on arctic tourism – a preliminary review. *<http://www.world-tourism.org/sustainable/climate/pres/jeanne-pagnan.pdf>*

Parry, M. L. (ed.)(2000). *Assessment of potential effects and adaptation for climate change in Europe: The Europe ACACIA Project*. Jackson Environment Institute, University of East Anglia, Norwich. 320 pp.

Perry, A. (2000). Impacts of climate change on tourism in the Mediterranean: Adaptive responses. FEEM Working Paper No. 35.00. <*http://ssm.com/abstract=235082*>

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Viner, D., B. Amelung & P. Martens & M. Agnew (2003). Climate Change, the Environment and Tourism: The Interactions. Final Report. European Science Foundation – LESC Exploratory Workshop. Foundazione Eni Enrico Mattei. Milan. <*www.cru.uea.ac.uk/tourism*>

Wall, G. (1998). Implications of global climate change for tourism and recreation in wetland areas. *Climatic Change* 40, 371-389.

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Appendix 2: Example of binary logistic and negative binomial regression models to estimate the effect of climate and socio-economic factors on cross-country skiing, downhill skiing/snowboarding, snowmobiling and swimming.

Participation in an activity **Dependent variable (dummy): participation = 1, no participation = 0** **Method: binary logistic regression model**			**Participation days in an activity** **Dependent variable: Frequency of participation in an activity 1-365 times/year** **Method: left truncated negative binomial regression model**		
CROSS-COUNTRY SKIING					
Variable	**Coefficient**	**P-value**	**Variable**	**Coefficient**	**P-value**
Constant	-1.002	<0.0001	Constant	2.411	<0.0001
Age 35-64 years (reference category 15-34 years)	0.4362	<0.0001	Age years	0.008770	<0.0001
Age 65+ years (reference category 15-34 years)	-0.4236	<0.0001	Living in a municipality of >100 000 inhabitants	-0.2516	<0.0001
Employed (not employed)	0.3343	<0.0001	Mean air temperature [1]	-0.01820	0.0027
Educational level vocational college or university	0.5553	<0.0001	Average snow depth 1	0.01980	<0.0001
Living in a municipality of >100 000 inhabitants	-0.3595	<0.0001			
Mean air temperature [1]	-0.0346	0.0006			
Snow depth DJF [2]	0.0148	0.00215			
N	10199		Alpha	1.231	<0.0001
Correctly classified, % (cut point at 0.5)	62.9		N	4233	
R^2 (SAS)	0.0690		Pseudo R^2	0.332	
Log-likelihood (constant)	-6793		Log-likelihood (constant)	-49576	
Log-likelihood (model)	-6431		Log-likelihood (model)	-16450	
DOWNHILL SKIING					
Variable	**Coefficient**	**P-value**	**Variable**	**Coefficient**	**P-value**
Constant	0.1818	0.1746	Constant	2.193	<0.0001
Age years	-0.06340	<0.0001	Age years	-0.006158	0.0122
Employed (not employed)	0.5317	<0.0001	Employed (not employed)	-0.1935	0.0030
Educational level vocational college or university	0.5726	<0.0001	Educational level vocational college or university	-0.2165	0.0078
Mean air temperature [1]	-0.007570	0.5863	Living in a municipality of >100 000 inhabitants	0.2250	0.0014
Snow depth [1]	0.009170	0.1142	Snow depth [1]	0.004155	0.3347
N	10552		Alpha	2.128	<0.0001
Correctly classified, % (cut point at 0.5)	83.4		N	1777	
R^2 (SAS)	0.103		Pseudo R^2	0.434	
Log-likelihood (constant)	-4676		Log-likelihood (constant)	-5562	
Log-likelihood (model)	-4103		Log-likelihood (model)	-12826	

Participation in an activity **Dependent variable (dummy): participation = 1, no participation = 0** **Method: binary logistic regression model**			**Participation days in an activity** **Dependent variable: Frequency of participation in an activity 1-365 times/year** **Method: left truncated negative binomial regression model**		
SNOWMOBILING					
Variable	**Coefficient**	**P-value**	**Variable**	**Coefficient**	**P-value**
Constant	-1.732	<0.0001	Constant	2.605	<0.0001
Age years	-0.03190	<0.0001	Educational level vocational college or university	-0.5605	<0.0001
Employed (not employed)	0.3614	<0.0001	Living in a municipality of >100 000 inhabitants	-0.9538	<0.0001
Living in a municipality of >100 000 inhabitants	-0.4306	<0.0001	Mean air temperature [1]	-0.1130	<0.0001
Snow depth [3]	0.06960	<0.0001			
N	10642		Alpha	3.245	<0.0001
Correctly classified, % (cut point at 0.5)	89.4		N	1111	
R^2 (SAS)	0.0534		Pseudo R^2	0.311	
Log-likelihood (constant)	-3501		Log-likelihood (constant)	-11722	
Log-likelihood (model)	-3209		Log-likelihood (model)	-3643	
SWIMMING					
Variable	**Coefficient**	**P-value**	**Variable**	**Coefficient**	**P-value**
Constant	1.5865	<0.0001	Constant	2.841	<0.0001
Age years	-0.0346	<0.0001	Age years	0.007895	<0.0001
Employed (not employed)	0.3906	<0.0001	Employed (not employed)	-0.09201	0.0001
Educational level vocational college or university	0.4443	<0.0001	Living in a municipality of >100 000 inhabitants	-0.1208	<0.0001
Number of hot days [1]	0.0286	<0.0001	Number of hot days [1]	0.01322	<0.0001
N	10554		Alpha	1.244	<0.0001
Correctly classified, % (cut point at 0.5)	71.5		N	7163	
R^2 (SAS)	0.102		Pseudo R^2	0.245	
Log-likelihood (constant)	-6616		Log-likelihood (constant)	-125329	
Log-likelihood (model)	-6047		Log-likelihood (model)	-30699	

[1] during previous 12 months at Helsinki-Vantaa, Jyväskylä or Sodankylä depending on the respondent's community of permanent residence.

[2] during previous winter (December-February) at Helsinki-Vantaa, Jyväskylä or Sodankylä depending on the respondent's community of permanent residence.

Documentation page

Publisher	Finnish Environment Institute	Date December 2005
Author(s)	Tuija Sievänen, Kaarina Tervo, Marjo Neuvonen, Eija Pouta, Jarkko Saarinen and Arvo Peltonen4	
Title of publication	Nature-based tourism, outdoor recreation and adaptation to climate change	
Parts of publication/ other project publications		
Abstract	Adaptation of outdoor recreation and nature-based tourism concerns majority of Finns. Adaptation may take place both in demand and supply: people will adapt by changing their recreation and travel behaviour, and supply of recreational and tourism services will be adjusted to new conditions either reactively or anticipatory. In this study, the impacts of climate change on recreation sector and nature-tourism entrepreneurs' readiness to adapt and attitude towards climate change were under study. The results showed that snow-based recreation and tourism activities are the most vulnerable ones, especially in southern Finland, and that warming may benefit summer activities. However, the decrease n environmental quality and the increasing occurrence of extreme weather conditions such as storms may diminish this positive impact. Attitudes towards climate change and its impacts varied among tourism entrepreneurs. The general opinion was, however, that climate change does not so far represent a serious threat to the tourism industry. Tourism operators also feel that they are prepared to changes in climate conditions because of their readiness to react on normal weather variation already today. Lack of exact data and uncertainty concerning climate change and its effects in different areas make adaptation more difficult. In the recreation sector, participation in winter activities, especially in cross-country skiing and snowmobiling will decrease in a long run. Possibilities for summer activities become better, but socioeconomic factors such as age-structure may weaken the positive impact. Several research needs related to recreation and tourism were identified. The Finnish tourism industry seems to need more detailed and spatially informed scenarios concerning climate change and more information on its impacts on the different activities in the tourism sector. Also communication channels seem to need more attention. More information is needed to monitor changes in recreational behaviour and trends. Also, there is a need for contingent behaviour studies to project recreationists' and tourists' reactions to changing conditions.	
Keywords	climate change, tourism, outdoor recreation, nature-based tourism, tourism industry, winter tourism, summer tourism, skiing, adaptation, Finland	
Publication series and number	Finnish Environment Institute Mimeographs 341	
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Other information		

Kuvailulehti

Julkaisija	Suomen ympäristökeskus	Julkaisuaika joulukuu 2005
Tekijä(t)	Tuija Sievänen, Kaarina Tervo, Marjo Neuvonen, Eija Pouta, Jarkko Saarinen ja Arvo Peltonen4	
Julkaisun nimi	Luontomatkailun ja virkistyskäytön sopeutuminen ilmastonmuutokseen	
Julkaisun osat/ muut saman projektin tuottamat julkaisut		
Tiivistelmä	Virkistyskäytön ja luontomatkailun sopeutuminen ilmastonmuutokseen koskettaa valtaosaa suomalaisista. Sopeutumista voi tapahtua kysynnässä, jolloin kansalaiset muuttavat ulkoilu- ja matkailutottumuksiaan ja tarjonnassa, jolloin matkailu- ja virkistyspalvelujen tarjontaa muokataan uusia olosuhteita vastaavaksi. Tutkimuksessa selvitettiin ilmastonmuutoksen mahdollisia vaikutuksia sekä asenteita ja valmiuksia sopeutua muuttuviin ilmasto-oloihin sekä luontomatkailun yritystoiminnan että luonnon virkistyskäytön näkökulmista. Tulosten mukaan lumeen perustuvat matkailu- ja virkistysaktiviteetit ovat lämpenemisen takia haavoittuvimpia. Lämpeneminen voi hyödyttää kesämatkailua ja lisätä osallistumista kesän virkistysmuotoihin. Virkistysympäristön laadun heikkeneminen ja äärevien sääolosuhteiden yleistyminen voivat tasoittaa tätä vaikutusta. Matkailuyrittäjien asennoituminen ilmastonmuutokseen ja sen vaikutuksiin vaihteli suuresti. Ilmastonmuutoksen ei yleisesti katsottu muodostan matkailutoiminnalle suurta uhkaa. Säiden normaali vaihtelu on valmistanut matkailupalvelujen tarjoajia toimimaan muuttuvissa ilmasto-oloissa. Sopeutumista vaikeuttavat tiedonpuute ja epävarmuus ilmastonmuutoksen voimakkuudesta ja vaikutuksista eri alueilla. Luonnon virkistyskäyttöön ilmastonmuutos vaikuttaa voimakkaimmin talvella. Erityisesti maastohiihtoon ja moottorikelkkailuun osallistuminen tulee pitkällä aikavälillä vähenemään. Kesälajien, esimerkiksi uimisen harrastusmahdollisuudet paranevat, mutta sosioekonomisilla tekijöillä kuten ikärakenteella voi olla muutosta tasoittava vaikutus. Virkistyskäytön ja luontomatkailun tutkimustarpeissa korostuu matkailuelinkeinon tarve yksityiskohtaiseen ja aluesidonnaiseen tietoon ilmastonmuutoksen skenaarioista ja siitä, miten mahdollinen muutos vaikuttaa eri matkailumuotoihin. Tiedonvälitykseen on samoin kiinnitettävä huomiota. Virkistyskäytön ja luontomatkailun muutosten ja trendien seuraaminen vaatii systemaattista inventointitietoa, mutta myös eri ulkoilulajien harrastajille kohdistetut kyselytutkimukset ovat tärkeitä kysynnässä tapahtuvien muutosten ennakoimiseksi.	
Asiasanat	ilmastonmuutokset, matkailu, virkistyskäyttö, luontomatkailu, matkailuelinkeino, talvimatkailu, kesämatkailu, hiihtäminen, sopeutuminen, Suomi.	
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The relationship between climate change and recreation and tourism has not been under research in Finland until recently as the issue of the changing climate has become more apparent. Adaptation of outdoor recreation and nature-tourism concerns the majority of Finns. Adaptation may take place both in demand and supply: people will adapt autonomously and reactively by changing their recreation and travel behaviour, and the supply of recreational and tourism services will be adjusted to suit the new conditions.
In this study, the impacts of climate change on the recreation sector and the nature-tourism entrepreneurs' attitude towards and readiness to adapt to climate change were under study. The results showed that snow-based recreation and tourism activities are the most vulnerable ones, especially in southern Finland, and that warming may benefit summer activities. However, the decrease in environmental quality and increasing occurrence of extreme weather conditions such as storms may diminish this positive impact. So far tourism operators do not have adaptation plans for climate change, but the normal variation in weather has prepared tourism operators for changes in climate conditions. Lack of exact data and uncertainty concerning climate change and its effects in different areas make adaptation more difficult.

Muuttuvan ilmaston ja matkailun sekä luonnon virkistyskäytön suhdetta on tutkittu Suomessa vähän, mutta ilmastonmuutoksen edetessä on aiheesta tullut ajankohtainen ja tärkeä. Virkistyskäytön ja luontomatkailun sopeutuminen ilmastonmuutokseen koskettaa valtaosaa suomalaisista. Sopeutumista voi tapahtua kysynnässä, jolloin kansalaiset muuttavat ulkoilu- ja matkailutottumuksiaan uusien ilmasto-olojen mukaisiksi, ja tarjonnassa, jolloin matkailu- ja virkistyspalvelujen tarjontaa muokataan uusia olosuhteita vastaavaksi. Tutkimuksessa selvitettiin ilmastonmuutoksen mahdollisia vaikutuksia sekä asenteita ja valmiuksia sopeutua ja varautua muuttuviin ilmasto-oloihin sekä luontomatkailun yritystoiminnan että luonnon virkistyskäytön näkökulmista. Tulosten mukaan lumeen perustuvat matkailu- ja virkistysaktiviteetit ovat lämpenemisen takia haavoittuvimpia suhteessa muihin virkistys- ja matkailumuotoihin. Lämpeneminen voi hyödyttää kesämatkailua ja lisätä osallistumista kesän virkistysmuotoihin. Virkistysympäristön laadun heikkeneminen ja äärevien sääolosuhteiden kuten myrskyjen yleistyminen voivat tasoittaa tätä vaikutusta. Suunnitelmia ilmastonmuutokseen varautumiseen ei ole kehitetty. Säiden normaali vaihtelu on valmistanut matkailupalvelujen tarjoajia toimimaan muuttuvissa ilmasto-oloissa. Sopeutumista ja varautumista vaikeuttavat tiedonpuute ja epävarmuus ilmastonmuutoksen voimakkuudesta ja vaikutuksista eri alueilla.

This report is also available at the FINADAPT Web site:
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