

LAKE TOURISM AND GLOBAL CLIMATE CHANGE: AN INTEGRATIVE APPROACH BASED ON FINNISH AND HUNGARIAN CASE-STUDIES

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Abstract: Lakes are an essential element of some of the world's most popular tourism destinations. One of the most relevant resources of lake and coastal tourism, in general, is climate. Due to the climate change, the characteristics of tourism market may be rearranged to a significant degree. In this paper, the authors intend to discuss the topic from an aspect that has been in a focal point to a limited degree, i.e. to forecast the possible effects of global climate change in Hungarian and Finnish lakes. We can be certain that in case the impacts of the climate change have an influence on tourism, such will be effect mainly coastal and mountain areas. Consequently, we must prepare for the prevention of such problems in tourism destinations at riversides and lakes.

Keywords: lake tourism, climate change, sustainable development, lake management, environmental impacts

1. INTRODUCTION – RESEARCH INTO LAKE TOURISM

Lakes are an essential element of some of the world's most popular tourism destinations (Hall & Härkönen, 2006). This is supported, on the one hand by the fact, that prior to this year's 4th International Lake Tourism Conference in Thunder Bay Canada, three other major international conferences (Savonlinna, Finland 2003, and Thousand Islands Lake, Hangzhou, China 2005, Gyöngyös Hungary 2007) were held in this topic in the recent years. One of the important issues in the conferences was limnology, which has become a multifaceted branch of science; accordingly interests by the experts of tourism are increasingly attracted towards touristic utilization of lakes. In addition, a network co-ordinated by Finnish experts has also been established (www.laketourism.org).

One of the most relevant resources of lake and coastal tourism, in general, is climate. Due to the climate change, the characteristics of tourism market may be rearranged to a significant degree. In this

paper, the authors intend to discuss the topic from an aspect that has been in a focal point to a limited degree, i.e. to forecast the possible effects of global climate change in Hungarian and Finnish lakes. Being aware of such effects can make a contribution to the sustainable land-use and to the development of terms necessary for management under the altered circumstances.

2. BACKGROUND – CLIMATE CHANGE AND LAKES

During the past decade climate change has emerged as one of the major topics in tourism development. It was in the 1990s when the significant numbers of researchers began to show their interests in climate change and its impacts on tourism (see e.g. Scott et al., 2005; Tervo 2008; Saarinen & Tervo, 2006). In the context of lake tourism climate is one of the most relevant resources of tourism and its change may result in a significant redeployment of the tourism market features (e.g. Jones et al., 2005 cited by Hall & Härkönen, 2006). As an impact of the

climate change, alterations of the conditions for lake shore recreation as well as that of human comfort are expected to occur. As the growing demands for recreation are likely to be fulfilled by a lesser number of lakes (and their environment) in the future that, resulting in an increasing crowdedness, will lead to a decline in recreation experiences and a less attractive 'lake image'.

As a consequence to the numerous environmental impacts of lake tourism as well as climate change scenarios, the range of regional variations and the geographical distribution of lakes, the direct and indirect impacts of the climate change on lake tourism cannot be described by a single scenario. The topic of prevention or adaptation to the impacts expected brings up the necessity of lacustral resources' intensive preservation and strict protection.

CLIME project implemented e.g. in Finland and Hungary developed methods and models that can be used to manage lakes and catchments under future as well as current climatic conditions. Regional climate scenarios, and existing catchment and lake models were used to address issues that are central to the implementation of the Water Framework Directive (<http://clime.tkk.fi>). As a result, the project showed that the climatic change will significantly affect the status of northern lakes.

In Hungary the impacts of climate change in tourism are very important. The Hungarian Government asked some experts to evaluate these impacts and make feasibility study of the strategy needed (Szlávik, 2010).

In Finland, the impacts of climate change on tourism have received few attentions. Finland's National Strategy for Adaptation to Climate Change adopted in 2005 overviewed the issue at a general level (Marttila et al., 2005). Climate change and its reflections have also taken into notion in national Branch Utility Report (2009) of Tourism published by Ministry of Employment and the Economy. In the context of tourism research, Saarinen & Tervo (2006) and Tervo (2008) are focused on climate change in Finnish nature-based tourism (Climate 2006). Particularly from the view point of lake tourism and climate change research has not yet been done.

2.1. Characteristics of the geographical distribution of lakes from the point of view of tourism and accessibility

The number of lakes on Earth is surely of the order of million. Their total extent is only 2.5 million sq. km, i.e. only 2.5% of the surface of the Earth. In Europe Finland is the country richest in waters,

including 56000 lakes over 1 hectare and its fresh water areas cover 33000 km². Water quality is good or excellent in over 80 per cent of Finnish lakes. (Island Committee 2009). Although Hungary has less natural and artificial lakes, but the lake tourism is very important in the country (especially at Lake Balaton, Lake Velence, Lake Fertő and Lake Tisza). Lake Balaton is a freshwater lake in the Transdanubian region of Hungary. It is the largest lake in Central Europe, and one of its foremost tourist destinations. As Hungary is landlocked, it is often called the 'Hungarian Sea'. Lake Tisza, also known as Kisköre Reservoir, is the largest artificial lake in Hungary. As part of the ongoing Tisza River flood control project, it was built in 1973. Its filling was finished in the 1978, resulting a 127km² lake. The lake is 27km in length, with an average depth of 1.3 m and a maximum depth of 17m; it contains 43 km² of small islands.

Though the majority of fresh water is stored in lakes, as a whole we must say that lakes of our planet indicate a great decrease regarding both their extent and the mass of water stored by them. Today's physical processes lead to the cessation of certain types of lakes that can be compensated by the construction of artificial lakes (reservoirs) only to a certain extent.

The connection between zonality of geographical distribution of lakes and tourism can reveal interesting facts.

The zone with the highest lake density on Earth – the region covered by ice during the Pleistocene –, i.e. Canada, Finland, is not considered as an area of high priority from the point of view of the 4S-model, used for coastal tourism (Sun, Sea, Sand, Sex – Michalkó, 2004). In the other zone of the Earth rich in lakes, most of the lakes in the semi-desert, semi-arid environment are periodic (sometimes only episodic), their shape, size and localization change very often as well as they are saline and have no outflow to seas. From the aspect of water and heat balance, the utilisation of these lakes for the purpose of tourism is limited or impossible.

Regarding the vertical arrangement of lakes, also some interesting conclusions can be drawn. Lakes situated outside mountain regions are well-accessible, but the case of lakes at areas with diversified topography is not so simple. In the wide regions of high mountains in the temperate zones, the foregrounds of mountains, where the former ice-cover surpassed the rim of mountains, are rich in lakes. They are also well-accessible, in contrast to low mountains which were ice-covered only to a smaller extent; the region rich in lakes in these cases is confined to the rocky-alpine area.

2.2. The principles of sustainable utilisation of lakes

In the case of tourism development connected to lakes, recreation and with regard to the protection of natural and cultural values of lakes and their surroundings, one has to count keep the factors listed below (after the recommendations of Thousand-Lake Island Consensus 2005) into consideration:

a. The functions and protection of lakes:

- Lakes are important and complex resources of mankind: they are indispensable in work and in life; their water serve as a source of drinking-water, as well as they play a relevant role in flood control, irrigation, electricity production, transport, agriculture and tourism.

- Lacustral ecosystems, in general, are relatively vulnerable, thus they are regarded to be non-renewable natural resources. By today, a significant percentage of the lakes of the world have become polluted to a certain extent, reaching an amount of water which could satisfy the drinking-water needs of 1 billion people.

- Lakes are one of the important sources of tourism and free-time activities: they function as leisure, entertainment and spare time environment, place.

By all of the above-mentioned, the topic of necessity of intensive protection or placing lacustral resources under urgent protection is proposed. They draw attention to the necessity of raising environmental awareness and the spreading of sustainable branches and practices tourism as well as can help to decrease unfavourable environmental effects to the greatest possible extent.

b. Lake tourism development:

Tourism development projects can induce economic growth; can play a major role in the promotion of social development of backward regions and in the creation of a balanced urban-rural development. Consequently, the followings must be aspired:

- Moderate tourism development should include the protection of lakes.

- Environmental advantages should be converted to economic-social benefits; thus the utilization of possibilities within tourism through the windup of pauperisation and growing incomes can become one of the poles of economic growth and can contribute to the economic development of a given region.

- The realization of the four principles (environmental protection, rational use of resources,

consistent management and sustainable utilization) of lake tourism development, the science-based planning, the follow-up of tourism development plans and the prevention of serious damages resultant from inadequate development (seen from both the side of tour organizers and lake administrators).

- The promotion of the transition of lake tourism as presenting spectacles into a free-time type attractively, the increase of market competitiveness – for these, the development of individual products suitable for local conditions.

c. Communication and co-operation:

- Lake tourism is at the beginning stage of development in many countries of the world (e.g. China) and is in continuous transition. That is why, in order to protect and touristically develop great lakes, it is necessary to discuss different changes, management and development models. One way of this can be the organisation of international institutions, alliances connected to lake tourism. These are not only great opportunities for setting up of connections, but also for the exchange of experience and the development of educational systems.

2.3. The impacts of probable climate change scenarios on lake tourism

In the recent years, there were many and multiple attempts to describe the role of climate in tourism in accordance to the scientific standards. As an example, Gallarza et al., (2002) ranked climate seventh among the 20 factors of selecting tourism destinations while Ritchie & Crouch (2005) stated that climate is one of the seven fundamental reasons in choosing a holiday destination over another.

Physical characteristics of our environment – among them, the indisputably important climatic one – influence many of our daily activities. (Holahan, 1982) By this, the attractivity of destinations and possible tourism products are highly determined (Rátz, 2006), and additionally the selection of destinations made by tourists. The first factor of the 4S model (Michalkó, 2004) – describing coastal mass tourism – is ‘Sun’ as a weather element. In the case of many destinations of this kind, seasonality appears to be the main problem of climatic specification, and is seen as crucial in tourism. On the other hand, Ritchie & Crouch (2005) argued that in future colder destinations may be beneficiaries of global warming. Their statement demonstrates that climate change will affect not only negative, but also positively depending on e.g. the geographical location.

Lakes as touristic destinations are of rather complex characteristics. Water surface is a compact, well-distinguished area of a given landscape. 'Lacustral milieu' is the objective projection of the experience of space used by tourism (Michalkó & Rátz, 2006; see also Tuohino & Pitkänen 2004; Tuohino 2006). This is in a tight connection with the development of the cultural landscape existing in organic unity with the lake itself, as personal contact with the place was a precondition of the formation of milieu. The de facto formed 'lake image' however is more, as the region, due to its popularity, is suggestive for those as well who personally never visited it, only a picture containing subjective and objective elements was formed in their mind as a result of socialization. Whereas, in general, an image can be negative, a milieu is rather a positive concept. It is a general characteristic of lakes as being popular destinations, that both have a clearly positive message. Figure 1 below shows the components and factors of this multicolouredness.

As a consequence of the above, global climate change as an external factor can fundamentally transform the supply-demand characters of international tourism market (Budai, 2003). The connection between climate change and tourism is complex. The studies published so far have tried to take this complexity into consideration, often by using rather heterogeneous approaches, although comparative studies were rarely used.

At the beginning, many claimed different opinions regarding climate change saying the effects

on tourism are of secondary importance (Perry, 2003). On the other hand, it is clear if any of the scenarios of those mentioned in the IPCC report takes place, this will influence both world economy and the sector of tourism. The IPCC report (2001) states that the impact of climate change on tourism manifests itself not only in the worsening of conditions (primary effects) and the consequent absence of tourists, but on the other hand, we must also take secondary effects like deficiency of incomes and the loss of jobs into account. Basic services (water supply) can be damaged as well, mainly in the main season. It is more difficult to the tourism industry compared to tourists can adapt to climate changes, who have more alternatives. Respectively, Hall & Härkönen (2006) argue that climate change is evidently one important element of global environmental change that has the potential to impact on many lacustrine systems and their flora and fauna, water levels, inflows etc.

Regarding the temperature at a global scale, a general rise is forecasted, but with significant regional variations in different regions of the world. In North Europe, at the higher latitudes and in the Mediterranean Region, a rise of the temperature exceeding the average is probable.

There is a much higher uncertainty and difference regarding precipitation (changes in the distribution and the sum of rainfall) among the various geographical regions.

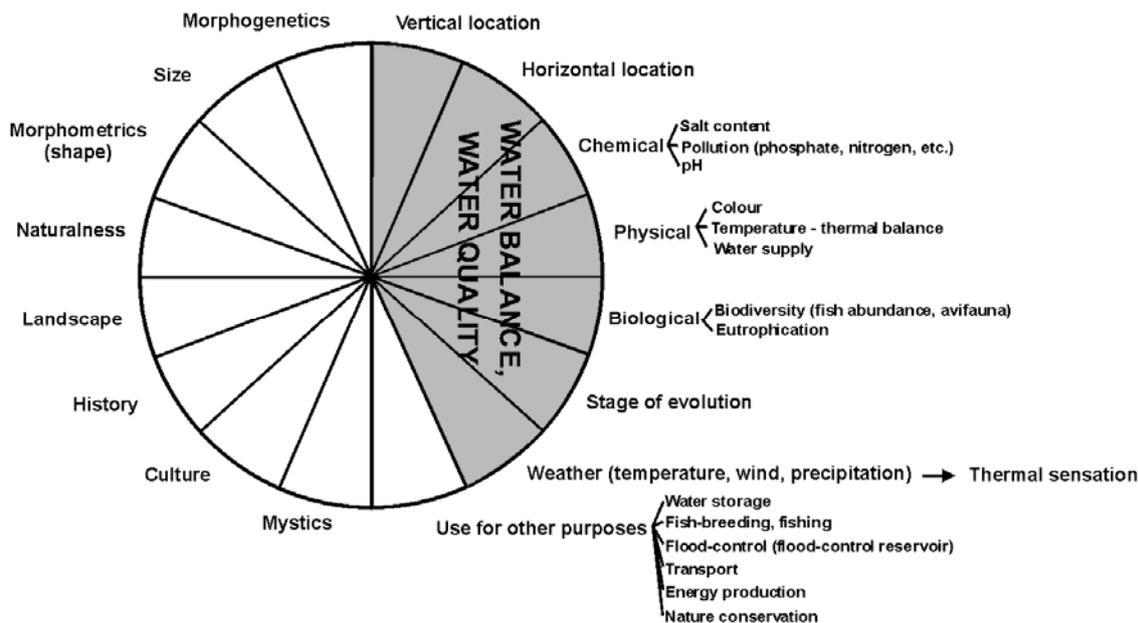


Figure 1. The types of lake attractions and the influencing factors of the tourism image and milieu (Source: Dávid & Baros 2007)

According to Tervo (2008) the most precipitation changes in Finland are expected to occur during winter months, but the magnitude of the change remains uncertain. According to her, winter precipitation is however increasing and this may run to an increasing number of snow. Changing snow and ice conditions can be considered as a most serious threat for the realization of winter activities on lakes, too.

As a result of the above-mentioned, great regional differences and geographical distribution of lakes, the influence of climate change on lake tourism cannot be described by a single scenario. Basically, they have to be conceptualised to the given geographical regions taking the local conditions of individual lakes into account as well.

The attractiveness of a tourist destination includes the physical characters (physical endowments), the range of activities (branch of tourism), and the perceived picture by visitors as well as the complexity of these (Fig. 2).

A majority of tourist products are connected to special climatic conditions, consequently under the changing conditions, the popularity of certain products can decrease.

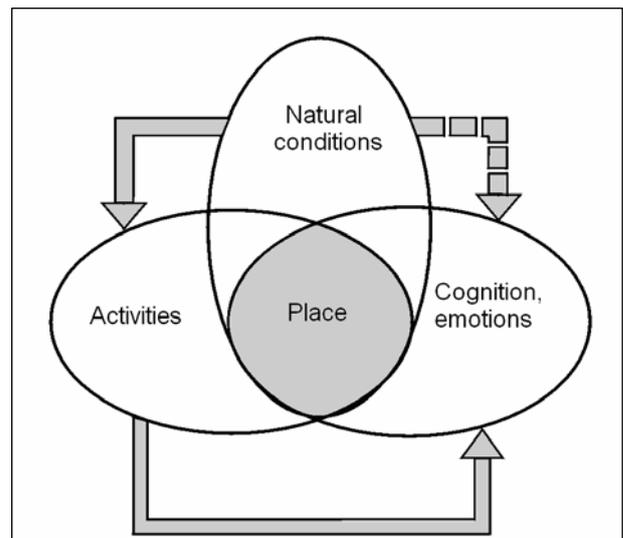


Figure 2. Main factors of selecting tourist destinations (Source: Baros& Dávid 2007).

The maintenance of the product's quality challenges tourism industry, whereas in extreme cases, the system of climatic conditions can cease to exist (Rátz, 2006). This can especially be the case for outdoor tourist activities based on climate and natural attractions, such as lake tourism.

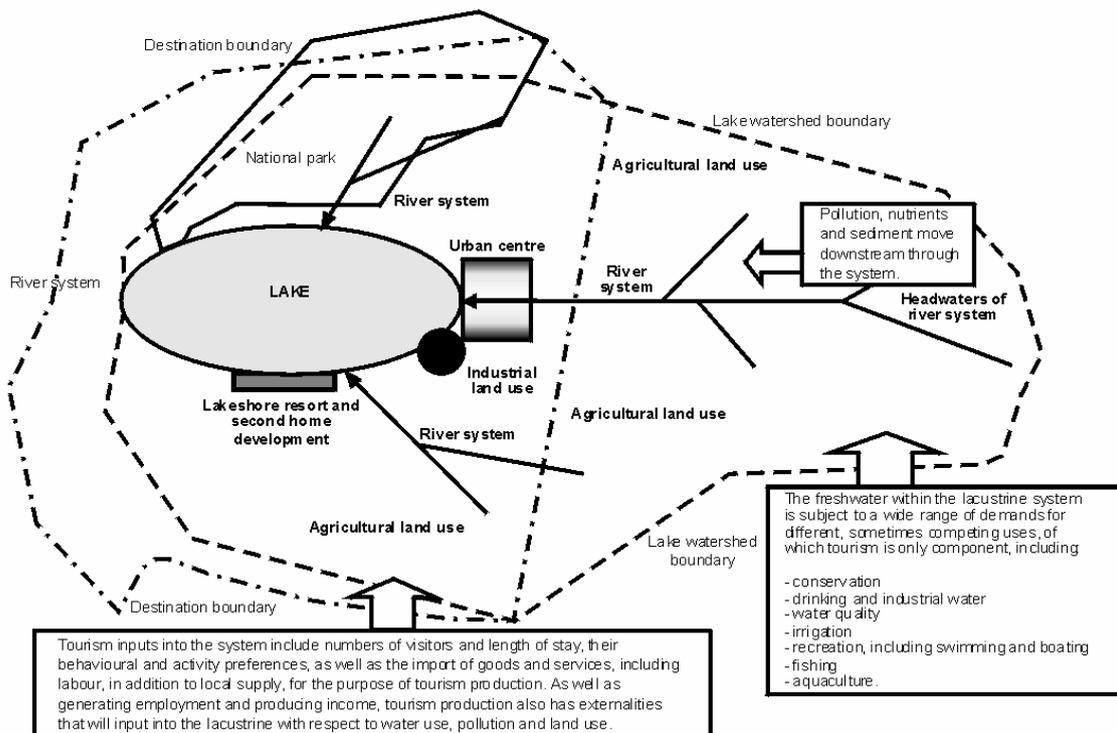


Figure 3. The lacustrine system (Source: Hall & Härkönen, 2006)

It should be noticed that due to the complexity of lacustrial systems, their condition is dependent upon the factors affecting both the lake itself and its surroundings. Consequences of the spatial expansion of urban areas, land-use – deforestation, agriculture, the getting of industrial and communal sewage flowing into watercourses supplying lakes – can cause basic environmental changes. These may be present in broad regions of the catchment area and even far from the direct users of the lake (Fig. 3).

Important indicators of the climate change can be the occurrences of extreme weather events of growing incidence and the alteration of human comfort (an air temperature– relative humidity index). Terjung-scale (Fig. 4), e.g. the increase of the ratio of the days with serious heat-stress. Basically, the tightening of the domains of temperature and air-humidity suitable for sports and recreation activities and the worsening of conditions suitable for them are expected. E.g. in parallel with the changing circumstances of coastal recreation, the positive resistance-increasing effects on the human body during bathing can also decrease (Rákóczi et al., 2002).

In Europe, the more and more frequent heat waves will have an impact on mainly the coastal tourism of the Mediterranean (Zaninovič, 2004). As a result of the higher air and water temperatures, an increasing discomfort-feeling is probable; consequently tourists will tend to seek other

destinations. In general, destinations at lower geographical latitudes seem to be more vulnerable to these changes.

Beyond the changes in human-comfort, it is important to claim that as lake tourism is dependent on climate, it is affected by the modification of some climatic parameters to a great extent. Alterations of the wind conditions make water sports unviable; the decreasing amount of precipitation can modify the water level and water quality of lakes in an unfavourable way. Lakes are among particularly susceptible destinations, their ecosystems are often vulnerable. In connection of the impacts of climate change on lakes and their water, 6 main environmental problems and the acceleration of processes are mentioned (Jorgensen, & Matsui 1997):

- Decrease of water level as a consequence of the more water utilisation (e.g. Aral Lake),
- Because of the increasing outflow/water output, lake-fill accelerates (Dongtinghu Lake, China),
- Acidisation of water due to acid rain (Biwa Lake, Japan),
- Pollution of the water as a result of toxic pollutants,
- Eutrophication due to the higher nutrient inputs as well as in other cases
- Collapse of water ecosystems.

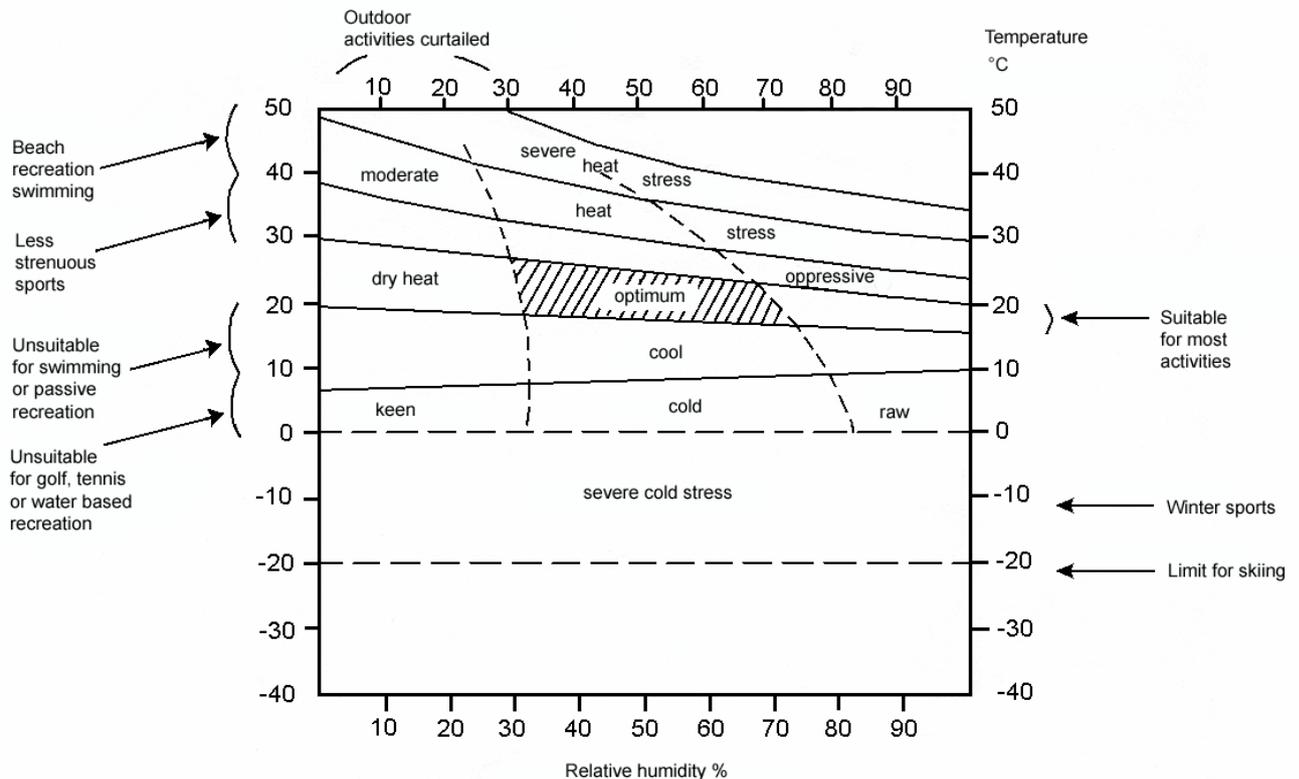


Figure 4. Temperature and relative humidity conditions for human comfort (Source: Terjung, 1966)

The recognition and management of these phenomena are important, as lakes have no natural self-cleaning mechanisms; many of them are particularly susceptible to water pollution caused by tourism (Boniface & Cooper, 2001). At a certain degree, these processes become irreversible.

In addition to these, we have to take problems occurring at coastal zones (mainly in the case of shallow lakes) into account.

Human perception of the changes in the natural environment and comfort-feeling is dependent upon the motivation and experience of travelling.

Changes can lead to a merely new situation at certain destinations regarding not only the possible range of activities there (Table 1), but it must also be interpreted in a broader sense. Due to the changing climatic circumstances, other natural conditions of a given region can undergo a significant shift. Such are the environmental burden capacity and sensibility as they can cause problems especially when the main attractions of lake tourism, i.e. the lake or its surroundings are susceptible as well. Changes can take place regarding social groups interested in tourism and their interests, too.

According to Coppock & Duffield (1975), to the successful study of outdoor recreation, a synthesis of two conflicting factors is required. Of them, one is recreation's social relevance, or the part of leisure-time spent by individuals with outdoor recreation (and tourism), whereas the other is the natural resources required for that recreation activity. Thus, it is the necessity of finding the connection between human needs for recreation and resources, facilities and opportunities required to meet them was recognised. In this case, it means the designation of measures necessary to promote the moderation of impacts and to implement sustainable tourism. Efforts must be made to expedite adaptation to the impacts of climate change as well as by the actors of tourism industry to achieve a sustainable tourism. It is required due to the recent impacts of climate change on the tourism industry.

At the first stage of decision-making (perception and the processing of information), information is filtered and compared to former information inputs by the receiver. Here, the interest of customers (tourists) can still be kindled by hard work. At the end of subsequent processes, a psychological disposition regarding the relationship towards purchase acts is developed (Moutinho, 1987). Tourists' decisions are dependent upon the factors listed below:

- the perceived image,
- information gained from the promotion materials of the given touristic destination,

- previous experiences,
- the formed image about potential destinations,
- travel bureaux,
- advice,
- social interaction.

On the one hand, the decision is made as a matter of sentiment – emotions can be influenced, for example through perception. On the other hand, individuals (customers) can be seen as a unit of decision-making, receiving and processing information as well as, based on these, making decision. In addition to this, in the consciousness of customers, there is still excitement regarding anything new and the final goal: to satisfy their own needs.

Nowadays demands of tourists undergo continuous changes. In general, one may say that consumption reaches beyond the process of buying products for the pure satisfaction of basic physiologic needs. Among the different requirements written by Maslow, A. (1954), satisfaction of the physiologic needs – situated at the bottom of hierarchy – is more influenced by regional conditions undergoing climatic changes. To a smaller extent, the matter of personal security, endangered by the growing frequency of storms, floods etc. in certain areas can also be listed here.

Changing climatic conditions as well as the more and more unfavourable comfort conditions will obviously not meet the continuously changing and, in some cases, increasingly special demands of tourists.

Therefore, this factor can become a barrier in recreation and leisure, consequently the popularity of a given destination can be lost. 4 basic factors from the aspect of recreation are listed by Patmore (1983) as follows:

- seasonality,
- biologic and social barriers,
- money and mobility,
- resources and fashion.

It is clear, that for outdoor recreation activities, changes in seasonality are of decisive importance. Variations of the length of days, temperature and precipitation conditions are important regarding not only different activities, but in respect of the peak season as well. Alteration of the resources can contribute to the decrease in the number of visitors in a certain area. Climate change will influence vulnerable areas also being popular destinations today and thus are among the destinations of mass tourism. The relocation of these to areas with low maintenance capacity (e.g. high mountains) may be accompanied by an increase of the impacts of overloadedness to a greater extent.

Table 1. Classification of the of lake tourism activities (*Tikkanen, I. 2003 modified by Tuohino 2011*),

Resource elements of a lake	Activities	Services offered
Animals	Lacustrial fauna, stock of fish	Wildlife watching routes
Beach	Beach ball games Beach fish cooking Camping Spending time near the shore Sunbathing on the beach	Beach volleyball ground Camping places Kiosk Outdoor cooking places Showers
Birds and reeds or wetlands	Bird watching/Studying birds Catching water fowl	Bird watching tower Walking routes
Fish	Angling with hook and line Draught lure fishing Fish trap fishing Fishing competition Fishing trips Fishing with baited hook, harpoon Fishing with gill net, purse sein Fly-fishing Harvesting of crayfish Ice fishing Outing fishing Pike catching Seining Spinning lure fishing Spinning rod or trolling gear	Boat cruising Boat rent Cultural events Fish harbour Fishing competitions Fishing ground or spot Fishing permission Guided fishing Lodging Rowing services
History	Historical event	Cafe, restaurant Art gallery Historical place Fishing permission Lodging Fishing equipment shop
Ice	Ice breaker cruising	Events Lodging Trails Restaurants, break places Ice-breaker Snowmobiling rent , Snowmobiling routes Trails
	Ice rally racing	
	Trip-skating	
	Long-distance ice skating	
	Skiing	
Snowmobiling Kick sledging		
Lake national park	Multiple activities	Boat harbour Guidance Natural tourism Place for going on shore Signed routes Waste and firewood services
Scenery	Looking at the scenery	Walking routes
Water	Boating trips	Boat harbour Boat renting Boat restaurants Boating route Boating trips Canoeing and kayaking oute Harbour services for boats Rowing events
	Canoeing	
	Ferryboat cruising	
	Inland waters cruising	
	Jet-boating	
	Power-boat racing	
	Rowing	
	Rowing competition	
	Sailing	
	Ship cruising	
	Steam boat cruising	
	Water skiing	
	Windsurfing	
Water and beach	Diving	Dressing room WC
	Snorkeling	
	Swimming classes	
	Swimming for fitness	
	Swimming for pleasure Wellbeing	
Water and fish	Managing fish habitats	
Water and ice	Winter swimming	Registered winter swimming places Sauna Coffee shop

The altering comfort-feeling, the more frequent heat waves and the more frequent occurrence of extreme weather phenomenon etc. thus can highly modify the natural endowments of a preferred tourist destination. Consequently the range of activities to be carried out and are based on the attractivities of the given area can be narrowed. At coastal areas, in parallel with the greater warming of the water surface, the importance of succeeding coastal winds can decrease. Warming water itself can not provide shelter from greater summer heat waves either. With the cease of daytime cool winds, coastal climate will become less endurable. According to a study carried out on the image of Lake Balaton, in selecting among the coastal destinations, pleasant sunny weather is the most important factor (Magyar Turizmus Zrt./M.Á.S.T. 2006).

The utilisation of lakes for the purpose of tourism holds many conflicts (e.g. access to the recreation resources and the worsening of environmental conditions, and as a result, meeting the water-demands of the surrounding settlements). Such conflict can be observed between individual users in connection with the access to the lessening resources.

As a result of the climate change, it is likely that

fewer lakes (and their surrounding) will meet future recreation demands. This will consequently lead to crowdedness, which will result in the decreasing amount of available space, as well as obstruction and, finally, the deterioration of the recreation experience (Fig. 5). By introducing recreation yield (the number of boats multiplied by the amount of sailing), the load capacity (as well as its change) of a lake can be indicated (Hagget, 2006) as shown by the diagrams below. During the last decades, some examples of such impacts (worsening of the water quality, accumulation of waste, building-up along the coasts) of crowdedness have been seen in some of the lakes (Lake Balaton, Lake Velencei) in Hungary.

This and the image of the area represented by the media can discourage tourists to an extent, which might retard the development of local economy. (Dávid, & Baros, 2006). The cognition of these environmental effects (storage, organisation, reconstruction and image recall of such phenomena – Holahan, 1982) can have a great influence on people’s environmental attitude and feelings towards the given environment. The direct experience of the changing conditions is one of the strongest shaping factors of approach (Fazio, 1995).

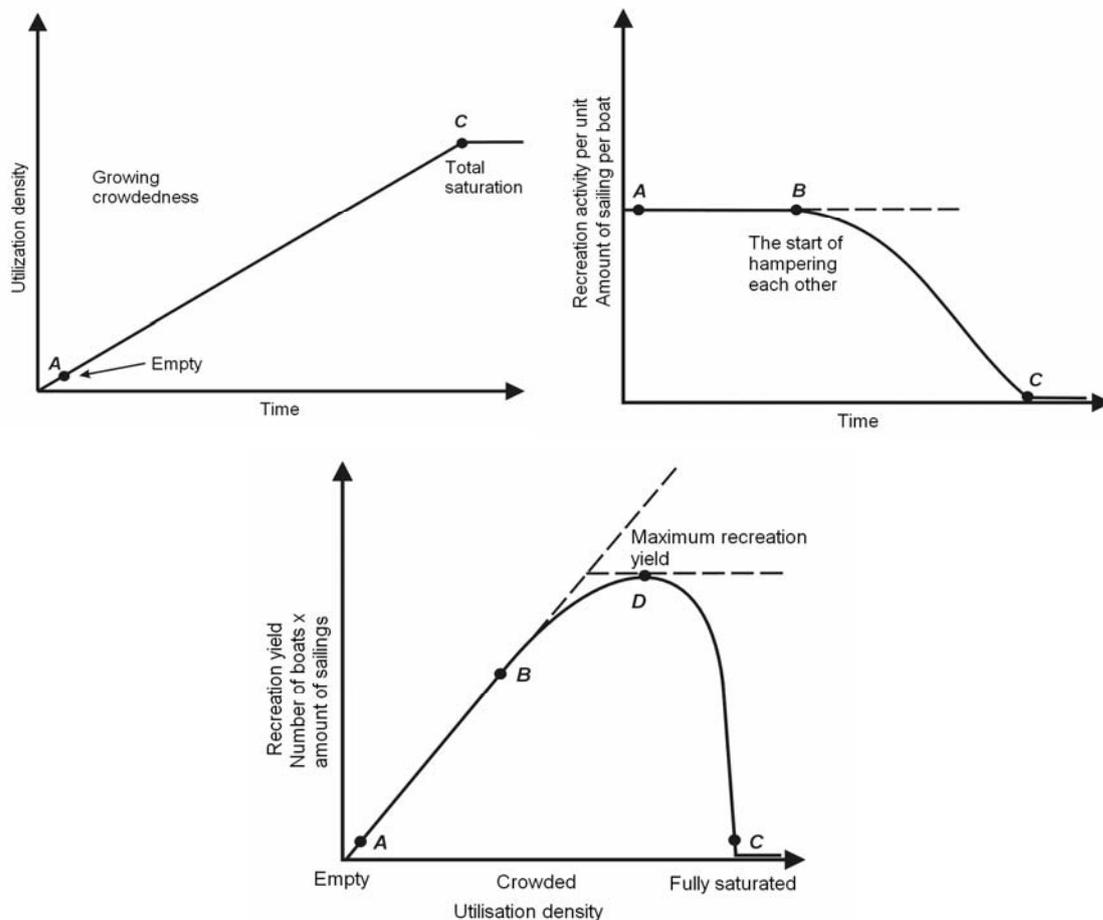


Figure 5. The process of resource utilisation and crowdedness in case of lakes (Source: Hagget, 2006)

Decline in the tourism capacity and the future competitiveness of the given destination are determined by – in addition to its seasonal orientation and the scale of effect appearing there – the speed and the extent of adjustment to continuous changes (Dávid & Baros, 2006).

This – as already mentioned – is especially important in regions, which will be among the most endangered or the most popular destinations and as in such places more crowdedness will accompany with higher environmental burden. Therefore in such areas the goal of sustainable tourism will be to offer alternative branches of tourism which can decrease environmental damages resultant from crowdedness. The main characteristics of branches which can be suitable alternatives of mass tourism are as follows (Valentine, 1993):

- tourists behave in a different way compared to those involved in mass tourism,
- they have different attitude towards the given resource,
- small-scale (a limited number of visitors) is characteristic,
- local community has bigger say in the supervision and in guiding of tourism.

Based on these, products can be introduced such as alternative, eco-, green- and sustainable etc.

tourism. An important step of developing sustainable tourism is the restructuration of the demand-system of tourists, which has to be taken into consideration in the stage of planning. Especially, as lakes represent great value for the society (Fadali & Shaw, 1998). One of the reasons for this is the interdependence (drinking water, fish-stock, water-plant-stock, touristic utilisation) of the society on lakes.

In order to mitigate the environmental impacts caused by the effects of climate change and the resultant transformed human activities as well as to adjust to changes, it is necessary to shape attitudes in decision-making and in the related sectoral policies.

It is the intension of tourists, people willing-to-travel and, in general, anybody to receive more and more exact information on weather. Thus, the most appropriate time and place of their travel, in accordance with their personal demands, conditions (e.g. health conditions) and the destination can be chosen. The exact knowledge and clear communication of climatic and bioclimatic conditions can contribute to the popularization of the destinations' natural conditions and can promote the work of travel organizers (Zaninovič, 2004). The question of prevention and/or adoption raises, among others, the necessity of integrated lake management (Fig. 6).

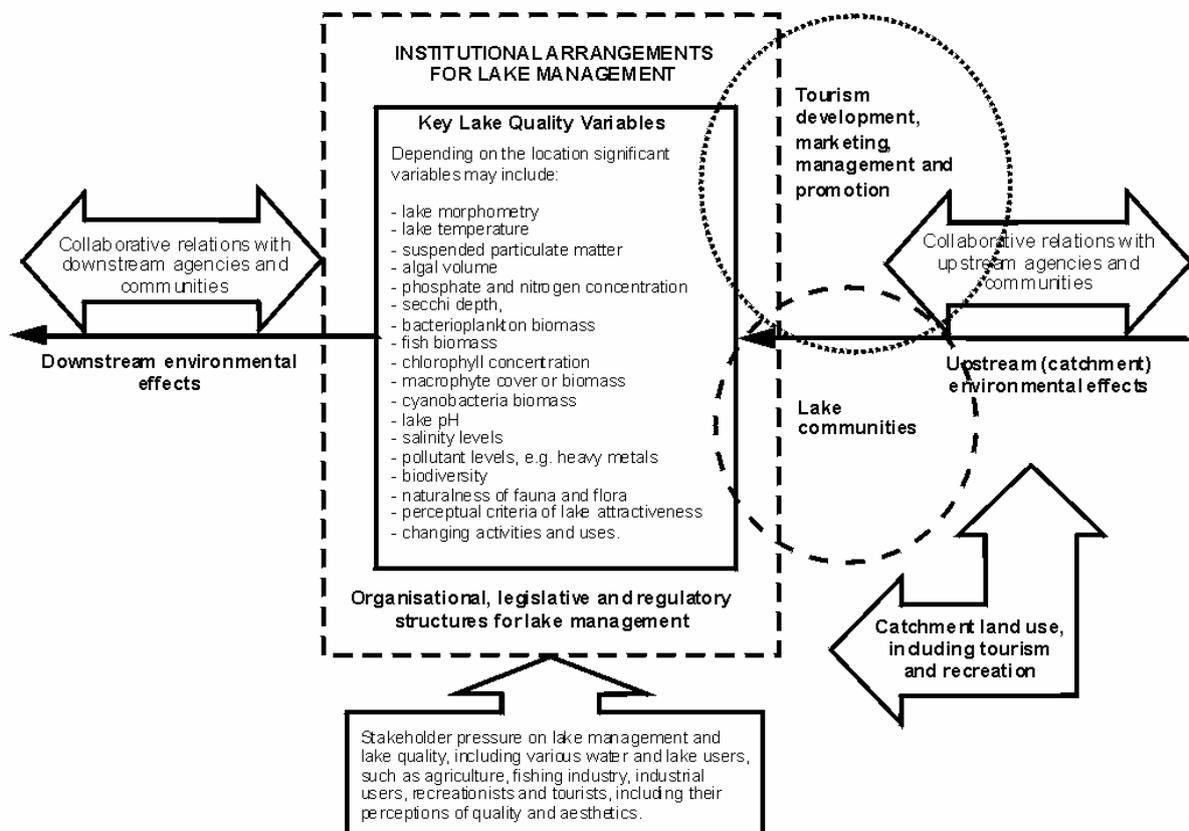


Figure 6. Elements in integrated lacustrine management (Source: Hall & Härkönen 2006)

An obstacle of its development is the fact that administrative and institutional borders and impact areas do not necessarily coincide with catchment areas. It makes difficult reaching agreements between the various agencies and organisations, or between dispositions and competences. Moreover, differences can also be observed between the borders of the destination or the promoted area and that of the lake, although the lake itself can be crucial in the promotion of tourism. It is considered to be typical that the agency responsible for the promotion of the lake is different from the one in charge of the environmental management.

Pollutions and other effects on the lacustral environment – important from the point of view of both the eutrophication and human health – as well as their perception can have harmful effects on the tourism of the region. As seen in figure 6, most of these effects are objective variants (only the aesthetic perception related to the lake and the surrounding landscape is subjective). They are of great importance, since being tools of measuring the changes in the state of the environmental and the subsequent alterations in water-quality, biodiversity and in the capacity of lake utilisation and advance tackling the relevant problems. However, it is claimed by many studies that the transformation of scientific results into political actions is rather cumbersome, unless when the fundamental/essential environmental problem is widely perceived by the inhabitants/society (Thomas, 2004).

2.4. Case study in Hungary

2.4.1. Prognoses for Hungary

Károssy & Puskás (2004) intended to reveal the potential impacts of global warming in the Carpathian Basin. The authors used the general description and frequency data of Péczely's (1983) catalogue of macro-synoptic weather types developed for the area of the Carpathian Basin containing the daily data for the last 123 years. In order to this, the 13 different macro-synoptic weather types were classified into two groups. In them, the optimal (anticyclonic situation-group) and the unfavourable (cyclonal situation-group) weather types for tourism were included, respectively. They were examined by basic statistical methods.

According to the results, it can be concluded that the impacts of global warming in the Carpathian Basin regarding the frequencies of anticyclonic days (preferred by tourism) during the summer months are not apparent or can not yet be manifested. Thus, in Hungary, the favourable, optimal macro-synoptic weather conditions provide favourable conditions for tourism both in yearly and monthly relations.

The country is not listed among the most vulnerable areas in any of the scenarios published, moreover, according to some authors; the growing of tourism to some degree is expected. The pleasant climate of our lakes (mainly the Balaton and Lake Tisza) and spas can make a great contribution to this. (Rátz, 2006).

2.4.2. The role of the weather/climate and the water-quality/ water quantity at the Lake Tisza

In this chapter, the main results of a questionnaire survey carried out in 2005 aiming to explore the practises of tourists at Lake Tisza and the River Tisza are introduced. During the survey, 1360 questionnaires were filled out; 61% of the respondents were females whereas 39% were males. Regarding their age structure, the majority of pollees were 19-25 (58%) and 31-40 (16%) years old. 9-9% of people were in the 26-30 and 41-50 age groups, while the share of other categories is under 3%. As seen in the figure, Lake Tisza is the most popular tourism destination along the River Tisza. 63% of holidays made by the River Tisza are aimed to Lake Tisza and the surrounding areas (Fig.7).

Of the questions, here are highlighted where the quantity and quality of water were both clearly important in the answers. Regarding the range of activities, according to the evaluation of the responds received, no significant difference between the riverside beaches and riverside catering were observed. They were proved to be the most popular ways of amusement and entertainment (260-323 pollees). Under pleasant and clear water conditions, spending free-time with swimming at beaches or in swimming pools are preferred (Fig. 8). Reduction of the water-level and the amount of water would induce radical changes. It should be noted, however, that in the case of Lake Tisza, the water involved is mostly of special interflow; consequently the adequate water-supply from the River Tisza is regarded as safe.

Another relevant factor can be the research of impacts on fishing tourism since at Lake Tisza there is a considerable number of guests whose main motivation is this branch of tourism. Its importance is indicated by the figure below (Fig. 9).

As seen, at Lake Tisza the amount of fish caught by anglers approximates the total amount of fish caught along the total reaches of the River Tisza (without Lake Tisza). It is an important fact, despite the unfavourable environmental changes taken place in the reservoir in the past decades (e.g. worsening of the natural spawning endowments of the fish stock). In the future, both direct and indirect consequences of the global warming can prevail in this area.

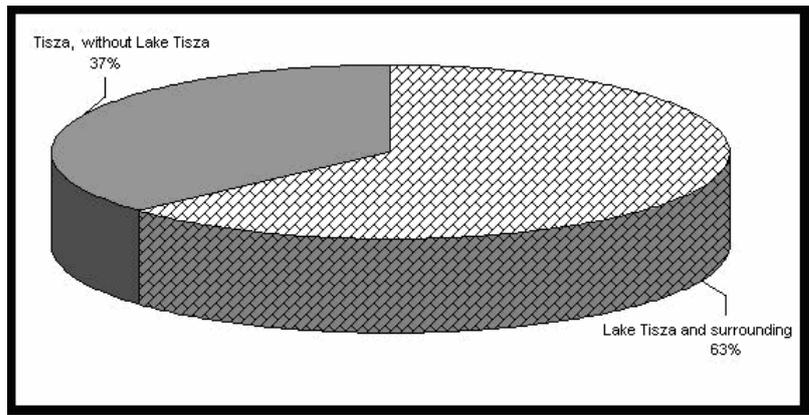


Figure 7. Popularity of the River Tisza and Lake Tisza (Source: Aquaprofit Rt. 2005)

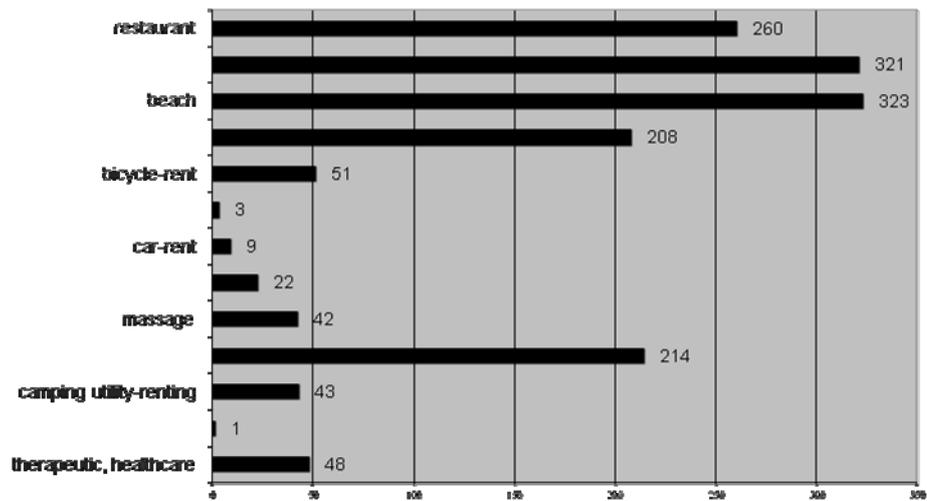


Figure 8. Main activities of the tourists at the River Tisza and Lake Tisza (Source: Aquaprofit Rt. 2005)

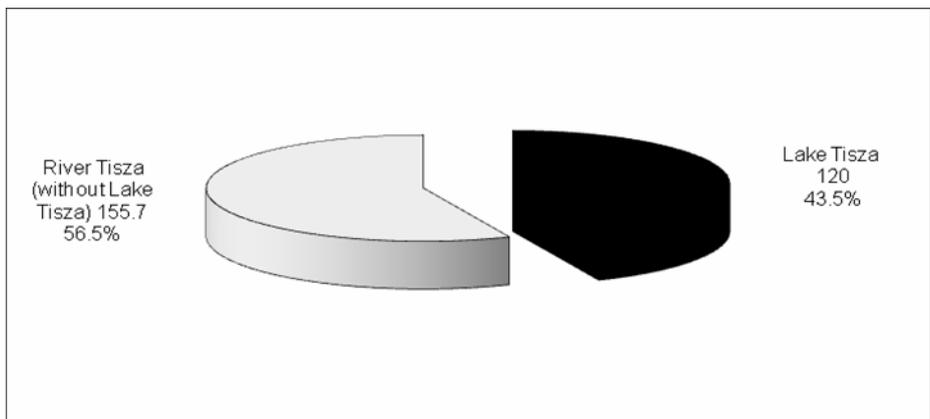


Figure 9. The role of the River Tisza and Lake Tisza in fishing tourism by the amount of fish caught by anglers in the Hungarian section of the river and in Lake Tisza in 2006 (in tonnes) (Source: National Federation of Hungarian Anglers, 2006)

2.5. Case study in Finland

2.5.1. Prognoses for Finland

Branch Utility Report 2009 states that climate change is both a challenge and a possibility for Finnish tourism. This statement is based on the viewpoint that

Finland's northern location is a great benefit while sun seeking tourism in southern countries is decreasing. On the other hand, report states that environmental issues are important for Finnish tourism businesses and climate change and its reflections have to take into account while doing business in future.

The report of Marttila et al. (2005) says that major impacts to Finnish summer tourism are mainly positive; longer, sunnier and warmer season and warmer waters. Noted negative effects were mainly related to increasing algae growth e.g. in shallow lake waters. In winter time, opportunities for snow-related activities were seen declining especially in southern part of Finland.

Hemmi (2005), Saarinen & Tervo (2006), Tervo (2008), Warwick & Pienitz (2006) and Tervo & Saarinen (2006) have studied the climate change in the context of Finnish tourism and recreation. Reports of Saarinen and Tervo have mostly focused on tourism in Lapland. Their reports are also including some aspects of lake tourism. In general lake tourism research connected to climate change is rare in Finland. Behind this may the assumption that this kind of research is not relevant as Finnish lakes are basically in good condition. The research done is mainly focused on lakes' biological and hydrological issues. Thus currently the reflections of climate change for Finnish tourism business are mainly based on general forecasting (Tervo & Saarinen, 2006) and climate change reports connected to lake tourism context.

Finnish lakes differ from Hungarian lakes in character. In Finland, it may be difficult to define where the lake starts and where it ends. The most interesting is Great Saimaa, which can be viewed as either one lake or a group of a hundred lakes. Great Saimaa is one lake in a sense that the water level is almost constant all the way from Lappeenranta to Joensuu. However, according to the ice, temperature and flow conditions, the many pools of Saimaa could also be considered separate lakes. Like Saimaa, many other pools in the Lake District form chains extending over hundreds of kilometers. These are broken up by short rivers or narrow passages where the water level can drop by several meters. Finnish Lakeland is fragmented. Finnish lakes are mostly formed during the Ice Age and shaped by the land uplift (see Fig. 10). (Island Committee, 2009).

According to Island Committee (2009) water quality in Finnish lakes is good or excellent in over 80 percent of lakes. This means that the condition of these lakes can practically be regarded as almost natural. Although many shallow lakes are eutrophic and they require attention. In Finland, there has also been almost 1 000 rehabilitation projects in recent decades. Also significant investments in the removal of nutrients from urban and industrial wastewaters have been done. (Island Committee, 2009).

2.5.2. The role of the weather/climate and the water-quality/water quantity at Lake Saimaa

Compared to Hungarian Lake Tisza, In Finland

similar kind of visitor research in lakes has not been done. Tisza Lake is a compact tourism destination compared to e.g. Lake Saimaa and thus much easier destination for visitor research as fragmented Saimaa region. Also common statistical information of Lake Saimaa is missing, as information focused on special lake is lacking from above mentioned reason.

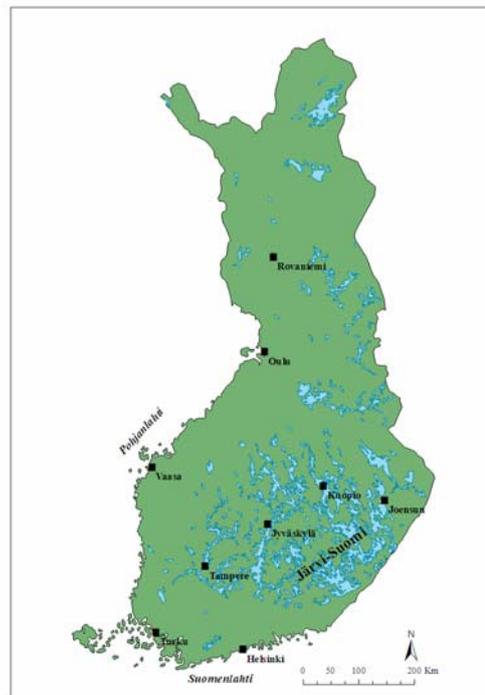


Figure 10. The Finnish Lakeland (Järvi-Suomi) is mainly located in Centre and Eastern Finland. Map by Ristolainen 2008.

The most significant changes in Finland will occur during the winters (Tervo, 2008). According to her “the predicted wintertime warming until 2040 is 1.2-5°C (compared to 0.6-1.6°C for summer). Warming will decrease the number of frost day and winter precipitation is expected to increase”. According to Tervo’s research (2008), the changing snow and ice conditions are considered the most serious threat for the realization of many activities. However, the decrease in the number of snow cover days was not so crucial among those entrepreneurs, who were involved in the research. This was based on the view that at present the business was also covered by other activities.

Among Tervo’s research target group there were two groups of which nine entrepreneurs operated in Northern Finland on snow and winter time activities, while ten entrepreneurs in Lake District were operating on water and summer activities. Their opinions about climate change and its effects to their businesses are seen on figure 11. In general, respondents are aware of effects of climate change. They were also able to identify some examples (Saarinen & Tervo, 2006).

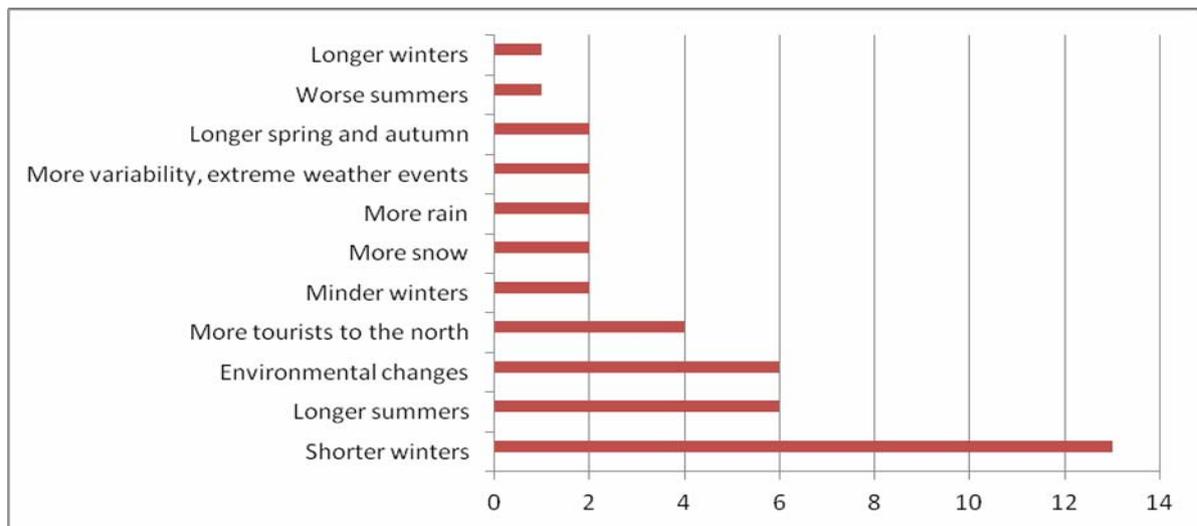


Figure 11. Impacts of climate change according to the nature-based tourism entrepreneurs. (Figure 1. Saarinen & Tervo 2006, modified by Tuohino 2011)

From the viewpoint of lakes, entrepreneurs were aware of tourists from urban southern Finland heading to northern instead of coming to Lake District as the ‘real’ winter with winter activities was seen in Northern Finland. During the summer, precipitation was considered as a negative fact as bad weather affects tourists’ willingness to participate in nature-based tourism activities. Environmental changes were not considered fatal as long as flora and fauna would not change dramatically. Saimaa Seal as a key specie of Lakeland was regarded as an important attraction among Lakeland entrepreneurs. (Saarinen & Tervo, 2006.) While Saarinen and Tervo asked about climate change’s impacts on tourism business, half of entrepreneurs in Lake District did not see real effects, while four saw positive effects and one negative. While asking if climate change is reality, half said yes, two said now and rest three did not have any opinion at all. Four entrepreneurs had already perceived climate change effects on their own businesses. Only one entrepreneur had the existing adaptation strategy towards climate change. In general, the effects of climate change were seen as more neutral in Lake District than in Northern Finland. (Saarinen & Tervo, 2006.)

To give an example, seminar on Large Lakes in Joensuu 2006 gave an overall view of the research of large lakes both in Finland and in other countries. To give another example, the results of the international CLIME project showed that the climatic change will significantly affect the status of northern lakes. One half of the approximately one hundred large lakes in Europe are located in Finland.

It was found that the impacts will be particularly marked in northern Europe where the shortening of the ice-cover period will affect the water quality and

biology of lakes. The climate change will significantly affect the transport of nutrients and the colour of water in streams from peatlands and conifer forests. On the other hand, it was presented the good quality of Finnish lakes. To summarize the Finnish case, some presumptions can be done. First, climate change may cause changes in product development processes in lake tourism businesses

There is a need for evaluation of alternative future winter activities based on ice cover and the amount of snow. In Finland the current activities are based on natural resources and there has been no need for artificial solutions. What about in future – is there a need e.g. to artificial art rinks, while winters are getting shorter and ice cover is getting weaker? Can this also be a possibility for new kind of tourism products? Or for new customer segments, too? In summer, situation is better, as the season is lengthening. Natural waters are utilized more in leisure and recreational purposes because of longer period of warmer weather. This may cause crowding and reflect to people’s behaviour somehow. Warming may also cause some problems with water quality. While thinking longer swimming periods and weaker water quality together, the question is, if open air and indoor swimming pools will be more utilized instead of natural waters.

3. CONCLUSIONS

On the basis of literature and our experiences, we may claim, that drawing reduced and precipitant conclusions would not be purposeful. In essays on the issue of climate change, often reduced conclusions are included, according to which, such future changes can be imagined as the recent climatic zones shifting towards higher geographic latitudes. In general, these conclusions must be false in many cases.

However, some presuppositions can be made. They are not intended to be forecasts but only to suppose some possibilities. For example, if the seasonal movement of the ITCZ to a northern-southern direction is intensified due to the increasing greenhouse-effect and consequently the zone of the descending air currents is shifted to the North in the summer, the summer aridity of the Mediterranean will be typical in the recently humid areas as well. (Czelnai, 2007). In Europe, mainly the Balkans and in the area of Central and Eastern European countries have already been hit by droughts. As a result of the climate change, this problem would worsen with a consequent negative influence on the water-level and the water-quality of lakes in the area.

We can be certain that in case the impacts of the climate change have an influence on tourism, such will be effect mainly coastal and mountain areas. Consequently, we must prepare for the prevention of such problems in tourism destinations at riversides and lakes, (Láng et al., 2007).

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Received at: 05. 05. 2011

Revised at: 23.09. 2011

Accepted for publication at: 07. 10. 2011

Published online at: 12. 10. 2011