"THE SKY FELL DOWN" PERCEPTIONS AND IMPLICATIONS OF EXTREME WEATHER EVENTS FOR HUNGARIAN TOURISM

T. Rátz and K. Szalai

Department of Tourism, Kodolányi János University College, Hungary

tratz@uranos.kodolanyi.hu

ABSTRACT Extreme weather events include droughts, floods and associated landslides, storms, cyclones and tornadoes, ocean and coastal surges, heat waves and cold snaps. As it is assumed by scientists that global climate change leads to an increase in the frequency of extreme events, it is becoming more important to understand how tourist demand is affected by extreme weather phenomena and how tourist destinations and tourist enterprises are able to react to such events. The paper presents some of the findings of a questionnaire survey carried out in 2007 that aims to investigate the short- and medium term implications of a tragic storm of 20th August 2006 for Hungarians' travel decision making and travel behaviour. In addition, the vulnerability of Hungarian tourism to extreme weather phenomena and the industry's ability to cope with such events are assessed.

Among weather- and climate-related sources, the most common ones proved to be significant (personal experience, television/radio), in spite of the fact that one can reach more detailed and up-to-date information on the internet. The importance of providing commonly understood weather forecasts (especially warnings) has to be highlighted. Since awareness has an exceedingly important role in tourism due to the unpredictability of natural events, the development of a more effective advance warning and disaster management system is required in Hungary.

KEY WORDS*: Extreme weather, tourist behaviour, Hungary*

INTRODUCTION

On 20th August 2006 – St Stephen's Day and a national holiday in Hungary –, a violent storm hit Budapest, the capital of the country, that killed four people and injured about 300, as huge crowds watched the celebratory fireworks display. Winds of up to 100 km/h (62 mph) tore down trees, smashed cars and windows and ripped off roof tiles, and torrential rain poured down on more than one million onlookers gathered along the banks of the Danube. Boats collided on the river and several people fell overboard. Although the possibility of a heavy storm was emphasised in the Hungarian Meteorological Service's advance forecasts and

warnings, the strength and exact movement of the storm could only be predicted 1-2 hours before the beginning of the fireworks display.

Extreme weather is weather that lies outside a locale's normal range of weather intensity. It is, by definition, infrequent or rare, and is also potentially destructive (Francis and Hengeveld, 1998). Obviously, the concept of what constitutes an extreme varies from place to place, since it is the given area's climatic characteristics that define the extremity of certain weather conditions. Although summer storms occur regularly in Hungary – in most cases less violent than the one discussed in this study –, the chance that such a storm hits a highly populated area is quite low. However, as global climate change seems to generate an increase in extreme weather events (Francis and Hengeveld, 1998), and most of the potential damaging consequences relating to climate change are associated with extremes – the number of heat waves, floods, or severe storms, for example –, it is important to understand what impact global warming may have on their occurrence. In addition, it is also vital for the tourism industry to recognise the impacts of such events on tourist attitudes and behaviour, and the need to prepare for the occurrence of extreme weather conditions. Owing to the fact that scientists soon realized the significant influence of special weather events on tourism, several related studies have been published in the past few years. In the Mediterranean for instance, the number of heat waves increased and caused deaths among tourists (Katsouyanni, 1988, Conte et al., 2000, Perry 2001). In conjunction with drops in precipitation, forests became more vulnerable to fire in this region, and, subsequently, the number of forest fires rose lately (Pinol et al., 1998, Perry, 2001). The tourism industry soon reacted to the weather changes by inspiring related research work and by adopting measures that allow resorts to adapt to these changes (e.g. campaigns to raise awareness among tourists, providing them with more information) (Gómez Martín 2005). Extreme weather events generally have ecological, socio-cultural and economic consequences – such as higher mortality rates if the mean temperatures exceed 30 °C or increasing insurance claims following thunderstorms –, but the impacts of weather extremes are not universal: it is the vulnerability of human and natural systems that determine the severity of such impacts (e.g. Diaz and Pulwarty, 1997, Pielke and Pielke, 1997).

It should also be noted that there is little consensus in the literature concerning the contribution of global climate change to extreme weather events. However, some of the recent climate models are in agreement with respect to possible future changes, such as a greater frequency of extreme warm days and lower frequency of extreme cold days associated with a warmer mean climate, increased precipitation intensity, as well as mid-continent

summer drying. On the other hand, there is little consensus about the possible future behaviour of mid-latitude storms, their intensity or frequency changes, or storm track changes (Easterling et al., 2000, Meehl et al., 2000).

METHODS

In order to explore the effects of extreme weather events on Hungarian tourists' perceptions and attitudes, a questionnaire survey with a sample size of 1000 persons was carried out in spring 2007. Due to financial limitations, quota sampling was used, based on respondents' age and gender, so the selected sample represents the Hungarian population by these two variables. Participation was limited to persons above 15 years of age, as at this age cognitive abilities are considered to be stable (e.g. Apter et al., 1998 cited by Poria et al., 2003). Descriptive characteristics of the sample's socio-demographic distribution are summarised in Table 1. The qualification of the respondents refers to diverse socio-economic circumstances.

Table 1: Respondents' characteristics (%)

Gender	**Male**			**Female**			**Total**
	49.1			50.9			100.0
Age	**15-19**	**20-34**	**35-44**	**45-59**		**60+**	**Total**
	11.1	29.6	15.5	21.1		22.6	100.0
Education	**Lower than elementary**	**Elementary school**	**Vocational Training**	**Secondary school**	**Higher vocational training**	**College/ University**	**Total***
	0.8	7.0	12.7	34.2	15.7	25.3	95.7

* Less than 100% due to no response

Due to the locality of the examined extreme weather event, Budapest and Central Hungary are overrepresented in the sample. The distribution of the respondents' permanent residence is the following: Budapest 50.2 %, Central Hungary 18.2 %, Northern Hungary 9.1 %, Southern Great Plain 6.0 %, Northern Great Plain 5.0 %, Central Transdanubia 4.1 %, Western Transdanubia 3.9 %, Southern Transdanubia 3.6 %.

The questions included in the survey focused on two main areas: the reactions of respondents following the August storm and the event's medium term impacts on their leisure behaviour on the one hand, and their perceptions of extreme weather phenomena occurring in major tourist destinations, as well as their experiences with such phenomena, on the other hand. Due to limitations in length, the present paper discusses findings related to the first group of questions.

RESULTS

Only 28.6 % of the respondents attended the celebratory fireworks display on 20th August 2006. In order to analyse the level of association between survey participants' permanent residence and their attendance of the ceremony, crosstabs statistics were used, proving an obvious correlation between the variables (χ^2=29.648, sig=0.000): those who lived in Budapest or closer to the capital city (Central Hungary, Central Transdanubia) were far more likely to take part in the celebratory fireworks display in 2006 and 2007, access and geographical distance proving to be significant factors in affecting attendance. Those respondents who did not watch the fireworks on the spot (71.1 %) generally did not do so in other years either (Tab. 2). Despite the advance warnings issued by the Hungarian Meteorological Service, only a few respondents decided to vacate the location of the event in time, and only 5 persons mentioned the weather forecast as their main reason for not attending the celebration. These findings suggest that in general terms the advance forecasts and warnings of meteorological services are not the determining factors in Hungarians' travel decision making.

Table 2: Reasons of not taking part in the celebratory fireworks display (% of respondents)

Reason	***%***
Usually do not take part	59.8
Usually take part, but not this year	16.8
Prompted to leave the spot by the weather forecast warnings before the start of the fireworks display	2.5
Other	18.4
No response	2.5

In addition, survey participants were also asked about their immediate reaction to the storm when it hit the banks of the river Danube. Among the analysed answers three were dominant. 36.4 % of the respondents managed to leave in time just before the storm hit, 23.1 % looked for shelter right away, while 26.6 % found it impossible to leave the area because of the crowdedness. The fortunate could find shelter in nearby doorways, underpasses, cars and restaurants. Surprisingly, only one survey participant took refuge in a hotel, although the riverbanks where the crowd gathered are among the capital's prime tourist districts (next day media reports praised certain hotels in the area for offering immediate help in form of blankets and hot drinks and blamed others for refusing to open their doors to the crowd). On

the basis of these facts and the high number of injured people, it can be stated that neither the organizers nor the participants believed in the storm occurrence or prepared for the worst, even though it was predicted by the meteorological services. The tragic consequences of the storm highlight the importance of providing commonly understandable warnings, since rational quantitative forecasts are not necessarily informative and threatening enough: perhaps due to the relatively rare occurrence of such intense thunderstorms in Hungary. Prior to the August 20 storm, the majority of Hungarians were not familiar with wind-speed indicators and could not properly estimate the potential damage caused by winds of 50 km/h or 100 km/h. The heated media reports following the tragedy managed to slightly increase people's awareness of the importance of listening to weather forecasts and highlighted the need to follow expert advice.

Table 3: Wind speed estimated by the respondents

Wind-speed	*Participants (%)*	*Non-participants (%)*
10 km/h	*0.6*	*0.2*
50 km/h	*4.0*	*6.2*
100 km/h	*32.6*	***44.1***
150 km/h	***42.3***	*38.9*
200 km/h	*19.4*	*8.3*
No response	*1.1*	*2.3*

Personal experiences seem to play a key role in increasing people's awareness: although the registered wind-speed did not exceed 100 km/h, those who personally experienced the storm estimated a higher level of wind strength than those who only learnt about the event from the media coverage (F=14.960, sig=0,000) (Tab. 3). Moreover, first-hand experience of the violent storm also seemed to moderately affect participants' attitudes towards weather information and warning as well as influence their leisure and travel behaviour, particularly with respect to attending open-air mass events (Tab. 4). Respondents with first-hand experience of the storm are far more likely to take weather forecasts more seriously in the future, although only a small relationship was measured between attending the 2006 fireworks display and developing a negative attitude towards taking part in open-air mass tourism programmes in the future. In addition, those who took part in 2006 proved to be more likely to attend in 2007 as well. Consequently, it can be stated that – considering this event – weather is not the most determinative factor in the decision making process of the

respondents. The decision seems to depend on factors like access (influenced by permanent residence) or the personal interest in such a ceremony.

Table 4: The impact of the tragic storm on survey participants' travel and recreation attitudes

Variable	χ^2	*df*	*sig*
Take weather forecast more seriously in the future	*12.36*	*1*	*0.000*
Refuse to take part in any open-air mass programmes in the future	*4.45*	*1*	*0.035*
Plan to attend in the celebratory fireworks display on 20th August 2007	*122.44*	*1*	*0.000*

In order to understand the role of weather-related information sources in Hungarian's leisure and travel behaviour, respondents were asked to assess the frequency of consulting a set of possible information sources such as television and radio forecasts, information provided by the travel industry or personal advice from friends and relatives. The mean values in Table 5 indicate the importance of each information source, confirming the general belief that word-of-mouth communication is the most widely used method of acquiring knowledge in everyday situations (e.g. Ellison and Fudenberg; 1995, Goldenberg, Libai and Muller; 2001).

An exploratory principal component analysis with Varimax rotation was applied to the list of information source variables, with the aim to reduce their dimensions and to identify the determinant factors. As Table 5 shows, the principal component analysis yielded a three-factor solution with the following dimensions: (1) internet-based information sources, (2) traditional information sources, (3) personal experience. The three components explain 63.44 % of variance, with the Bartlett's test of sphericity and the Kaiser-Meyer-Olkin measure of sampling adequacy showing an adequate level of factorability (Bartlett's approx. χ^2=1216.049, sig=0.000; KMO=0.761).

As Table 5 indicates, respondents' own personal experience based on previous visits to the given destination proved to be a particularly significant source of information concerning the local climate and expected weather, but even friends' and relatives advice seemed to be more trustworthy than official sources. However, it is clear that among all information sources, personal perceptions and recollections have the highest chance of reflecting extreme weather phenomena – such as heat waves, thunderstorms and temperature extremes – due to the visitor's limited length of stay at the destination and the selective memory of humans.

Table 5: Weather- and climate-related information sources used by respondents

Factor	Factor loading	Explained variance (%)	Eigenvalue	Mean*	St.dev.
F1. Internet-based sources		34.98	3.15		
Online climate/weather information	0.856			2.72	1.38
Online tourist information	0.825			3.01	1.41
Current weather forecast on internet	0.824			3.16	1.42
F2. Traditional information sources		15.84	1.43		
Climate information in guidebook	0.752			2.58	1.39
Current weather forecast on television and radio	0.508			3.69	1.23
Medium-term weather forecast	0.596			2.82	1.31
F3. Personal experience		12.62	1.14		
Personal experience of friends and relatives	0.832			3.70	1.11
Own personal experience	0.842			4.06	1.16

* On a scale 1-5, with 5=always used, 1=never used

DISCUSSION

Despite the fact that weather is a basic determinative factor in tourist experience and that extreme weather events (and natural disasters partly connected to them) have occurred more frequently in the last few years, respondents seemed to put not enough emphasis on gathering information. Traditional information sources proved to be particularly significant – primarily personal experience and television/radio –, even though personal experiences are subjective and selective, and television and radio in turn broadcast rather limited knowledge (as opposed to online information channels where the track and the position of such fronts or storms and the damages accompanying them can be observed continually).

The importance of providing commonly understood information – especially warnings – has to be emphasized. Communicating rational, quantitative forecasts proved to be insufficient; therefore, there is an obvious need to emphasise possible consequences and to educate the public about necessary precautions in the case of extreme weather events. Concerning the tourism industry, due to the increasing possibility of extreme weather conditions, it is becoming vital to raise awareness of potential threats and suggest adaptation measures such as the development of advance disaster planning and warning systems, or the modification of destinations' physical environments to withstand the elements (e.g. by taking wind directions

in consideration during the design and construction of buildings, cutting down dry or rotten trees, or providing elevated foundations on areas regularly affected by flooding).

Hungarian media and politicians learnt from the tragic event and responded more readily to potentially threatening weather incidents; although this also led to several unnecessary warnings during the last year (such overreactions were mainly explained by political reasons, as decision makers made an effort to keep clear of any responsibility in a similar tragic case). As a matter of fact, an appropriate awareness plan is still missing (see the heat wave warnings in Hungary in the last weeks of July 2007 – the role and the task of those concerned were rather ambiguous).

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