

3 THE IMPACT OF WEATHER-RELATED HAZARDS ON RISK ASSESSMENT STRATEGIES FOR OPEN-AIR EVENTS IN CENTRAL EUROPE

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Abstract

This research project addresses the most common weather-related hazards such as thunderstorms and heat, which can have dangerous consequences. It provides an insight into the audience and production managers' perception of weather hazards and the problems faced by the latter. Interviews were conducted and questionnaires issued to try to gain a better understanding of the topic and the problems faced by both production managers and the audience. The findings of this limited investigation show that the common approach of "post-disaster improvisation" has to be changed to "pre-disaster planning". Both production managers and the audience felt that knowledge of the risks of severe weather was necessary to affect behaviour; for the audience this would change their behaviour and for the production manager it would assist in making plans to deal with the risks. Both groups also felt that information and communication are key factors for everyone who has to deal with the impact of severe weather. The research shows that weather-related impacts often result from organisational, structural, or communication failures between both sides of the event - production and audience.

Introduction

The research project deals with the impact of weather-related hazards on risk assessments for open-air events in Central Europe. It seeks to discover what type of hazards arise from severe weather at open-air events, how the audience reacts to these hazards and what the implications are for an event's risk assessment.

For the purpose of this paper the definition of severe weather given by the World Meteorological Organization (WMO) will be used:

"Dangerous meteorological (...) phenomenon, of varying duration, with risk of causing major damage, serious social disruption and loss of human life, requiring measures for minimizing loss, mitigation and avoidance, and requiring detailed information (...) to be distributed as soon as possible to the public and responsible authorities." (WMO, 2004)

Considering weather-related incidents in Central Europe during the summer seasons 2006 – 2009 and following a definition of risk as a combination of severity and probability, the first question addressed in this paper is which kind of weather phenomena can be assessed as a hazard for open-air festivals. Secondly, are the production management and festival audiences willing and able to react to these hazards.

As a production manager of an open-air festival, weather is a topic of essential interest. Having also worked at an event where two people died by a lighting strike, improving the understanding of the impacts of extreme weather became a driving force for this study.

The weather factor

Impacts of weather-related hazards need to be seen as risks that can be managed and not as unavoidable 'Acts of God' as some promoters refer to it, especially after deadly incidents. Of course there will always be situations that no one is able to predict or assess – but there are other situations, so called weather related incidents, which actually result from improperly built structures or a lack of planning and organisation. Denying this means losing the chance to learn and prevent similar situations from happening.

The knowledge of incidents related to the impacts of severe or extreme weather has increased during the last few years. This may be a result of climate change worsening weather conditions in Central Europe and/or improved media coverage. This can be evidenced by not only searching for key words like "severe / extreme weather" or "thunderstorm" in combination with "festival" or "event" at the homepage of the video portal youtube (www.youtube.de) but also when looking at newspapers and magazine articles, which are for example collected in the European Severe Weather database, available from (www.essl.org/ESWD/).

Conferences dealing with production safety or crowd safety¹ feature the topic on their agendas and insurance companies are starting to offer special insurance covering "weather as life threatening danger", "Insurance against loss in sales due to enduring rain" for example².

The reason this research is important is that the weather phenomenon is not yet properly reflected in published literature and guidance. During the last few years a considerable amount of literature has been published giving very detailed and specific guidance on many aspects of crowd management, crowd safety and health & safety for the event industry. In contrast there is only general and limited guidance on the factor of "weather". Kemp (2004) points out that both an increase of heat or rainfall could cause problems (p 14), Tarlow (2002) enumerates some points about reducing the risk of electrical storms (p 162) and the HSE Event Safety Guide (1999) finds "weather, e.g. excessive heat /cold/rain" (p 32 : 193) on the list for an event risk assessment. In all publications, weather seems to be a universal factor which has to be considered within a risk assessment for an event however the coverage of this topic is not sufficient. It is reduced to abstract warnings and general statements that weather can have problematic or even dangerous impacts on an event (HSE Event Safety Guide 1999; Tarlow, 2002). In 2007 Kemp published the outcomes of a series of health & safety seminars by the European Festival Organisation YOUROPE and found "climate issues" and related topics (pp 180 – 187) were some of the key factors with which festival organisers have to deal. Even in a new publication regarding the *Management of crowd safety at outdoor street/special events* by Kemp, Moore and Mellor (2010) where "weather was identified as an aspect of significance for outdoor events" (p IX) very little guidance is given in the checklist.

¹ IPM – International Production Meeting, London, March 11th & 12th / Yourope's 9th Health & Safety Seminar, Groningen, January 14 and 15

² Available from <http://www.erpam.com> [accessed 04.05.2010]

Risk Assessments and resulting crowd management plans for open air festivals will not be adequate without a deeper look at the consequences which can arise from the impacts of extreme weather.

Among professionals working in the field of crowd safety there is increasing concern that the number of weather-related incidents will rise, not only due to changing climate but also due to the increasing number of open-air events of all kinds throughout Europe and the World.

Method

Both qualitative and quantitative methods were used to gather primary research data. Secondary research was also undertaken to provide background information especially on meteorology and audience behaviour.

Problems and limitations of the research

During the early part of the investigation two problems arose: Firstly, while carrying out pilot interviews and questionnaires with the chosen target group “promoter”, it soon became obvious that this group wouldn’t offer helpful answers and information. The reasons for this were that the promoters referred to their production managers as being the experts on site and only gave very vague answers especially when it came to negative experiences. Secondly, information about the number of people being injured due to weather related incidents was unreliable. This was due to the fact that statistical information about deaths could easily be researched in the media, whereas the number injuries could only be given by the promoters. Even where the numbers were known it could not be stated clearly if an injury was weather related or not.

Research sample

It was initially decided that data would be collected from individuals who were members of the European festival organisation YOUROPE. Due to the creditability of this organisation it was felt the data would be more reliable than using other sources.

The quantitative data was collected by means of a questionnaire from the audience by publishing a link on different festival online platforms (forums, facebook groups) and making it possible for everyone to respond (respondent-completion) online.

The quantitative data collected by means of a questionnaire, completed by production managers, was a purposive sample - respondents had to have experience as production managers of open-air festivals in the time period 2006-2009.

The qualitative data collected from both groups via interviews was a purposive sample - experience with open-air festivals in the time period 2006-2009.

Data collection

Interviews

According to Silverman, interviews seek to find out how individuals “perceive things” (2010, p.190). This was an important factor for interviewing both production managers and members of the audience because it was crucial to gather information about their perceptions of weather as a hazard.

Data collection took the form of in-depth interviews with seven people working or who have previously worked as production managers for open-air events and with twelve people having experience as visitors of open-air festivals. Two pilot interviews were carried out for each target group.

Interviews were held in English and German and took between one and two hours. A checklist ensured that the same questions were asked for all interviews. They were recorded digitally, translated and transcribed in word format. The anonymity of all interviewees was maintained.

Questionnaires

Data collection took the form of questionnaires provided online to members of the audience and individuals working or who have previously worked as production managers for open-air events. Pilot questionnaires were carried out with members of both target groups - both resulted in minor changes in the structures of the questionnaires. Questionnaires were provided through "SurveyMonkey" (available from <http://www.surveymonkey.com>) in German and in English.

The link for the *audience*, with a short introduction, was posted in different festival forums and in festival groups on the social network platform Facebook (available from <http://www.facebook.com>). The initial sample of the audience was 342 people. The link for *Production Managers* was sent to them personally but with the possibility to forward to others. The initial sample of production managers was 21.

Not all respondents answered all questions, some of the questions allowed multiple answers, the percentage was calculated based on the number of completed answers to the question (n). Both questionnaires were developed to collect self-reported data and consisted of a combination of closed and open questions. All online questionnaires were answered anonymously.

Data analysis

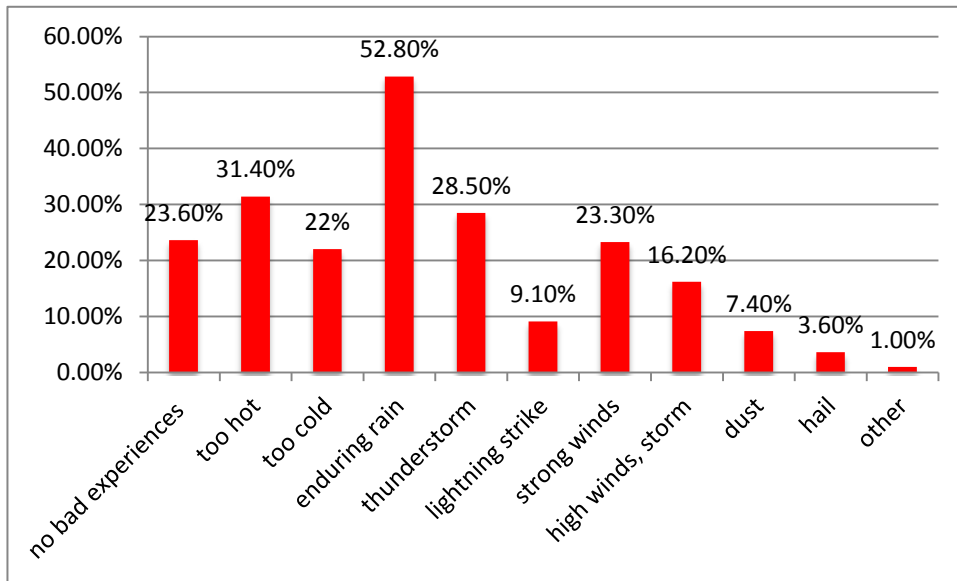
The closed questions of the questionnaires were analysed with tools provided by "SurveyMonkey". Open questions from the questionnaires and interviews were analysed manually. Though very time-consuming this provided an in-depth familiarity with the data which helped when evaluating the findings. A data collection sheet was designed to categorise answers to open questions.

Primary Research was supplemented by an analysis of relevant secondary sources, i.e. documents referring to meteorology, crowd management and crowd safety.

Findings

A large proportion, 78% of the audience³ and 86% of the production managers⁴ who were interviewed or who answered the questionnaires had experienced adverse weather of different kinds.

³ n=354



Audience: questionnaire: Did you ever experienced severe weather while visiting open-air festival? n=342

Knowledge & Perception

During the interviews with both groups it soon became obvious that the planning for weather related impacts was based on personal experience. 75% of the audience⁵ and 86% of the production managers⁶ answered that “own experience” was their main source of knowledge that would influence their behaviour.

This was supplemented by quantitative research of those who had experiences. 57% of production managers who had incidents with structures or people related to severe weather and 58%⁷ of the audience who had the experience of feeling unsafe due to bad weather, have changed their perception of the topic after the incident.

Relying on their experiences, 67% of the audience⁸ considered themselves adequately prepared, and 58%⁹ think that weather is not a dangerous hazard. In contrast only 18% of the production managers¹⁰ felt adequately prepared and 86%¹¹ assessed weather as a dangerous hazard for open air festivals. This is to a degree supported by meteorological literature - according to the WHO Regional Office for Europe

“extreme weather events will continue to pose additional challenges (...) in terms of risk management and the reliability of infrastructure (...) and others. Every effort should therefore be made (...) to put in place **evidence based** interventions and where necessary precautionary measures to limit

⁴ n=28

⁵ n=12

⁶ n=7

⁷ n=302

⁸ n=285

⁹ n=285

¹⁰ n=28

¹¹ n=28

the impacts on the environment.” (Cited in Kirch, et al, 2005 : p XVIII; emphasis added)

However personal experiences alone are not sufficient evidence, further information is needed. Menne (2005) points out that there is still no common understanding about what measures are needed and no comprehensive European data base. He states:

“With better information, the emphasis in disaster management could shift from post-disaster improvisation to pre-disaster planning.” (Kirch et al, 2005 : p XXXVI).

General weather related problems

Both production managers and audience were asked what problems have they had with severe weather. The production managers naturally have a long list, the audience on the other hand have had fewer problems – a contrasting result to the findings discussed above.

General problems named by more than 35% of production managers:

- no tested emergency plans
- no emergency plans for staff (leading to dangerous situations for staff working under severe weather circumstances)
- communication problems with other companies working on site etc
- not enough shelter / no places of safety
- behaviour of the audience
- communication problems with the audience
 - technical – for example at night / on campsites
 - perception and ignorance
- not enough budget to realise proper measures
- lack of knowledge
- no support / understanding from promoter

General problems named by more than 35% of audience members:

- no places of safety / no shelter
- no adequate clothing (even when checking forecasts)
- no warnings from promoter
- “no problems – it’s a festival and weather is weather”

Weather-related hazards

The WMO considers the weather to be severe or extreme in the following events: Thunderstorms and the phenomena that accompany them, heavy rain, strong wind/ wind gusts, hail, lightning, flash floods, and extreme temperature.

Production managers and audience concurred with some of these categories; they perceived the weather to be most dangerous at an open-air festival, if there is high winds, thunderstorms, enduring rain, and hail.

Considering the definition of risk as the probability that an adverse event will occur and including the consequences of that event, Ebi (2005, cited in Kirch et al, 2005, pp 47-56) calls for different strategies for high probability events with low consequences and for low probability events with high consequences.

However the assessment of “enduring rain” as a dangerous event shows, that especially for the audience, both categories seem to be important. One of the interviewees suggests the following explanation,

“It’s not really dangerous due to injuries, but you’ll get so frustrated and f**ked off when it won’t stop raining the whole day. You’re freezing and you know that you get a cold when you’re at home. It’s more dangerous for your personal morale”

This perception cannot be neglected by production managers or crowd managers because organising 30,000 people in a state of low morale can easily turn out to be a problem when it comes to a situation where the co-operation of the audience is needed.

Thunderstorm

Looking at the festival seasons 2006 – 2009, thunderstorms were wide spread over Europe. But as thunderstorms are complex phenomena with multiple accompanying variables (heavy rain, lightning, strong wind gusts), a closer look is needed.

The main reasons for assessing thunderstorms as dangerous were given in the interviews:

- fast development / no preparation time
- local wind gusts / collapsing structures
- lightning strikes / “because they are dangerous for everything”
- can lead to a panic (fear of lightning strikes)

Lightning strikes

According to UCAR (University Corporation for Atmospheric Research), lightning strikes kill more people than any other kind of bad weather. But because lightning usually kills people one at a time, it tends to be underrated as a hazard¹².

Only 21% of the audience¹³ assessed lightning strikes as dangerous – mainly because no one had any relevant experiences:

“I’d be more likely to win the lottery”

“there are so many structures around – why should it hit me?”

But this perception misses an important factor which makes lightning strikes dangerous: more people are killed by a high-voltage current reaching out from a lightning bolt than by being struck directly¹⁴.

This is considered more of a hazard by production managers, especially by those who work on green fields and who had to think about natural hazards such as trees. Interviewees had experiences of people seeking shelter under trees – although in one case messages were given to the audience not to do that.

High winds

Looking at the incidents 2006 - 2009, high winds were the cause of fatalities in some of them, for example

¹² <http://www.ucar.edu/communications/factsheets/Lightning.html> [accessed 23.04.2010]

¹³ n=336

¹⁴ (<http://www.ucar.edu/communications/factsheets/Lightning.html> [accessed at 23.04.2010])

- Canada, Big Valley Jamboree Festival : stage collapse (one death)
- Slovakia, Pohoda Festival : tent collapse (two deaths)
- Germany, Southside 2007 : tent collapse (one death)

High Winds are assessed as the most dangerous weather phenomenon by production managers, even if structures are built properly, according to building regulations and standards, local wind gusts can have a disastrous impact, not only on big but also on small structures.

All production managers interviewed offered at least one example of the consequences of high winds:

- brandings / banners on towers and fences (sometimes installed by agencies without being checked by the production team)
- material not properly stacked (eg wooden pallets)
- wet mesh (getting heavy and losing the ability to let wind pass through)
- merchandise tents, bar tents, concession stands: not properly secured by the owners

Although 40% of the audience¹⁵ thought that high winds were extremely dangerous, there also appears to be a sort of “danger-seeking” atmosphere around this phenomenon.

This is evidenced by findings on the internet portal YouTube, where videos and commentaries show a common message: THIS IS FUN:

“EPIC! What a weekend”¹⁶

“hehe that was so cool”¹⁷

“The camping was almost destroyed by the wind...but was good fun” / “the space created by the blown away tents made way for some great parties”¹⁸

Hailstorms

According to the Tornado and Storm Research Organisation (Torro)¹⁹, hailstorms, normally lasting between 2 and 15 minutes, have been the cause of costly and deadly events throughout history.

As hailstorms are relatively infrequent and not even known in some parts of Europe, only 14% of the audience²⁰ and 25% of the production managers²¹ thought that a hailstorm was dangerous. However, when considering the incidents resulting from hailstorms, they must be rated as the most dangerous weather phenomenon for open-air events because no other phenomenon is able to cause a panic like a hailstorm does. Fruin (1993) cites the example of

¹⁵ n=314

¹⁶ <http://www.youtube.com/watch?v=MyO5Z4MK-rE> [accessed 23.04.2010]

¹⁷ <http://www.youtube.com/watch?v=hlcGv-Omets&feature=related> [accessed 23.04.2010]

¹⁸ <http://www.youtube.com/watch?v=08QYNP13VbE&NR=1> [accessed 23.04.2010]

¹⁹ (available from http://www.torro.org.uk/site/hail_extremes.php [accessed at 23.04.2010])

²⁰ n=314

²¹ n=28

a sudden violent hailstorm in Katmandu in 1988, where 30,000 people tried to flee from the hailstones and more than 100 died and 700 were injured. Though these people did not die from hailstones alone, it can be assumed that rain instead of hail would not have led to such a panic.

Hailstorms also have a considerable financial impact according to one of the world's leading insurance companies Deutsche Rück in 2006 two short and very heavy local hailstorms in Southern Germany caused more than 100 injuries and 150 million Euros of damage to structures.

Enduring rain / flooding

Considering the relatively small number of injuries due to enduring rain it is not assessed to be dangerous, but can lead to an increased stress level both with audience and staff. One production manager said that it's hard to motivate staff to work safely in enduring rain:

"They rather want to finish work in a hurry and don't care about safety. The Atmosphere in general is difficult due to an increasing amount of frustration which accompanies enduring rain."

When enduring rain is accompanied by flooding the situation is dependent upon the preparedness of the promoter. As long as there is the possibility for a warm shower or a dry place to stay (as could be seen perfectly at Roskilde Festival 2007) the audience does not really complain:

"it's part of the open-air feeling"

"if you can't stand this, you should not go to an open-air festival"

"if it's too hard, I sleep in my car – so there's no problem at all"

Rain also is something that 85% of the audience is prepared for, either by bringing rain jackets and rubber boots or:

"bringing freezer bags to put around my stockings"

"bringing folding shovel to dig a ditch around my tent"

"bringing rubbish bags to be prepared to slide through the mud"

This last quote highlights an issue which was discussed by the production managers: people sliding through the mud, dancing in the mud or throwing mud at themselves; 10% of the audience think this is really fun. In these conditions campsites have all kinds of waste and other emissions on the ground that cannot be seen. Behaviour like this is extremely dangerous leading to injuries such as, cuts, bruises, electrical shock and skin irritations from such things as emissions on the ground, waste, insects or animal bites.

Heat

Heat is a less known form of severe weather. This was also expressed by one production manager who stated:

"I think the most difficult one is heat as nobody would allow you to cancel a show because of heat"

This was especially true for the festival season of 2006 as the whole of Europe was hit by an extreme heat wave.

Only 21% of the production managers²² and 30% of the audience²³ assessed heat as dangerous – but with regard to crowd management plans for festivals it is a factor of paramount importance for security and the medical services. Heat can cause hypothermia, heat cramps, heat strokes, dehydration and sunburns both to audience and staff. Especially in dense crowds in front of the stage where there is no air movement which is necessary to dissipate heat, dangerous situations can arise. Additionally, the “use of drugs such as alcohol or amphetamines may predispose subjects to heat illness by changes in physiological effector mechanisms and by changes in behaviour.” (Havenith 2005, cited in Kirch et al, 2005, p.77)

As a method to cool down 18% of the audience suggested using drizzling water – a measure which all production managers agreed was ineffective.

“it only gives them the feeling of being fresh and they do not drink or even leave..... They’re still dehydrated and overheated and they should feel that they are.”

37 % of the audience thinks that the promoter should provide free drinking water on the whole festival site – a measure which is discussed among the production managers. On the one hand it is regarded as a good service and welfare measure - on the other there is a strong feeling that the audience should take care of itself and that providing free drinking water is something no one would expect anywhere else– especially as the promoter normally gets income from selling drinks. 21% of the audience suggested that providing cheap drinking water would be a good idea – a suggestion which is supported by most of the production managers as a good compromise that promoters may be able to live with.

The question of warnings

When asked what the audience expects from the promoter, ‘early warnings’ was an important factor in the audience’s expectations. 78% suggested that the promoter should give early information and 100% of the production managers thought that the audience expect warnings.

This is also supported by the literature, for example Menne (2005, cited in Kirch et al, 2005, pp 265 - 272) states that “early warning is widely accepted as a crucial component of disaster risk reduction”. Fruin (1993, p _) speaks of a “duty to warn”.

“a legal view of crowd management responsibilities requires that crowd participants be informed of foreseeable dangers associated with crowd behaviours and /or assembly facilities.”

Though there was the unquestioned opinion that warnings are necessary, problems arose around the question of when the information and warnings should be published and what kind of information should be given.

Some production managers’ responses:

“warn them too early, no one would react – and if they did react, I’d get problems with the promoter when people go home too early”

²² n=28

²³ n=314

“what shall we tell them? Go to their cars? Stay in the tents? Go home?”
Everything we say can have consequences to their health”

Some audience responses:

“I don’t know if I would react to a warning – it depends upon the program”

“Of course warnings are a good thing, but unless the promoter can offer shelter – what should we do?”

Although it might be difficult to implement, Ebi (2005, cited in Kirch et al, 2005, p.48) suggests:

“Although disasters due to adverse weather and climate events cannot be entirely prevented, primary prevention, particularly development of early warning systems, can reduce the number of adverse health outcomes that occur during or following an event. Current primary prevention activities, where they exist, are generally limited to (...) inform the public what to do (and not do) during or immediately following an event (...) an effective early warning system should both reduce vulnerability and increase preparedness”

Conclusions

The purpose of this research was to ascertain the perceptions of production managers and audiences of the most common weather hazards.

The findings show that there is a general understanding by both groups of the hazards of weather at open-air festivals but that the assessment of the hazard is strongly dependent upon the individual’s personal experience.

Among the obvious hazards are thunderstorms, with its accompanying variables (rain, wind, hail, lightning strike). In addition heat has to be considered, although at first sight this does not seem to be a dangerous hazard.

The findings also suggest that, in addition to properly built structures, communication is a key factor in both pre-disaster planning and post-disaster management. Only when everyone involved has a clear understanding of what might happen is there a chance that emergency plans – if they exist - can be realised.

It is hoped that this limited investigation will serve as a basis for future studies leading to a deeper understanding of the impact of weather-related hazards on open-air events. More research is necessary to look at the different variables of “severe weather” in detail for better preparation and planning.

In summary there is a need to have a better understanding of the impact of severe weather, improved risk assessment and therefore preparation for open-air events.

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