

## **Framing and tone-of-voice of disaster media coverage: The aftermath of the Enschede fireworks disaster in the Netherlands**

Margôt Kutttschreuter\*, Jan Martien Gutteling and Maureen de Hond

*Department of Psychology of Conflict, Risk & Safety, University of Twente, Enschede, Netherlands*

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In 2000 disaster struck Enschede in The Netherlands. Due to explosions at a fireworks facility 22 people were killed. This study aims to describe the developments in the media coverage of this disaster from a media amplification perspective. Media amplification was assumed to have taken place in case: (1) events in the aftermath of the disaster resulted in increased media coverage, (2) the media framed the disaster in terms of conflict and responsibility and (3) the framing was in a negative tone-of-voice regarding governmental authorities. Content analysis was performed on 3942 articles, derived from four newspapers. Three peaks in the magnitude of the coverage were distinguished. The content of the coverage during these peaks differed from the period of gradual coverage decline. During the peaks, coverage more often was framed in terms of conflict and responsibility, government was referred to more often and the tone-of-voice on government was less positive. It was concluded that the media coverage of the Enschede fireworks met the conditions of media amplification. It is discussed whether the media coverage was such that the public's risk perception might have been affected.

**Keywords:** framing; risk; tone-of-voice; disaster; media coverage; media amplification

### **Introduction**

On 13 May 2000 at 15:30 in the afternoon several explosions destroyed a fireworks plant located in a suburban area of Enschede, a city in the eastern part of the Netherlands with 150,000 inhabitants. The explosions and the subsequent fire killed 22 citizens, and wounded nearly 1000 others. Over 4000 people were made homeless, and the damages were estimated at several hundred millions of Euros. Within hours the magnitude of this event became clear and hundreds of journalists and news crews from all over the world poured into Enschede. The first footage aired on television showed the severe consequences of an industrial calamity that the country had never witnessed before in recent history; the previously lively suburban area closely resembled a war zone. The disaster had a profound impact. One year and a half year after the disaster, affected residents reported two to three times more health problems than controls (Grievink *et al.* 2007). The debate on the disaster, the lessons-to-be-learned and its implications for politicians continued for at least three years.

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\*Corresponding author. Email: [margot.kutttschreuter@utwente.nl](mailto:margot.kutttschreuter@utwente.nl)

Since 2001, in the Netherlands, there is a decline in trust in political institutions. The Enschede fireworks disaster has been identified as one of a series of shocking events that may have contributed to this decline, along with the Volendam Café fire in 2001 and the assassination of the politician Pim Fortuyn in 2002 (Hendriks 2009). An interesting question in this respect is how the media covered government in relation to the fireworks disaster, and to what extent the coverage can be characterised by elements that point to media amplification, such as framing in terms of conflict and responsibility, and negative tone-of-voice.

So far, no studies have analysed media framing and tone-of-voice in relation to man-made disasters from a media amplification perspective. The literature on disaster coverage is mostly casuistic, rather than theory driven. Empirical accounts show that the news media aggressively cover an issue for a short time, after which coverage fades as the event recedes into the past (Birkland 2004, Gortner and Pennebaker 2003). The content of the disaster coverage focuses on human interest stories of victims and survivors, and the unravelling of the disaster cause (Garner and Huff 1997, Driedger 2007), though very little attention is paid to structural causes underlying a particular disaster (Anderson 2002, McDonald and Lawrence 2004). A tendency has been observed to exaggerate the situation (Berger 2001, Tierney *et al.* 2006, Pasquare and Pozzetti 2007).

In this study we will analyse the media coverage of the Enschede fireworks disaster from the theoretical perspective of media amplification. Our main assumption is that media amplification takes place when (1) events in the aftermath of the disaster result in increased media coverage, (2) media frame the disaster in terms of conflict, responsibility or blaming of governmental organisations, and (3) framing is in a negative tone-of-voice regarding governmental authorities. In the case of the fireworks disaster, we assumed that this amplification process might have taken place over a period of several years, as resolving all the relevant issues, such as investigating the contributing factors, attributing blame, convicting those held responsible, rebuilding the residential area, etc., took several years.

### **Disaster coverage and media amplification**

The Issue-Attention Cycle (Downs 1991) is a well-known theoretical model that focuses on (disastrous) events and the characteristics of the following news media coverage. The model identifies five stages, which may vary in duration: pre-problem stage, alarmed discovery and euphoric enthusiasm, realisation of the costs of progress, decline of public interest, and the post problem stage. An issue is assumed to rest in the pre-problem stage until a key event triggers public attention. In this model, the concept of media amplification is used to focus on changes in the magnitude and intensity of news media reporting. Amplification by journalists is characterised by a complex process that is described in terms of identification, reaction and gradual decline or renewal. Incidents are related to other events by the introduction of a specific theme. As this process continues, the magnitude of the problem appears to increase (spiral of amplification). Reactions to this publicity can cause either escalation or de-escalation. According to the model, the attention to an issue over time does not decline monotonously, but shows peaks and troughs. The content of the coverage also shifts. At first, coverage is event-related; at later stages coverage focuses on the (governmental) initiatives to resolve the issue. Eventually, when relatively few new incidents or reactions are reported, the attention for the

event will fade or a new attention cycle is created (Downs 1991). Developments in the aftermath of an event may also give rise to a media attention cycle regarding the issue or problem. Based on the issue-attention cycle one might thus expect that media amplification is not only visible in the quantitative coverage of the disaster, but also in the content of the coverage, such as the use of specific frames and tone-of-voice.

### **Framing**

Framing theory states that it is not only the magnitude of coverage that counts, but also the content of the coverage. Framing as a process (frame-setting) means making aspects of an issue more salient through different modes of presentation (Scheufele 1999). In covering a disaster, the media system (journalists and editors) decide on how to frame the event. Journalists create a central theme for the story and emphasise specific elements of the event (Birkland 1997). This central theme may relate to the definition of the problem, its causes, its treatment or its moral evaluation (Entman 1993, Trumbo 1996). In this process, journalists supply a context and interpretation of social problems and themes (Barnhurst and Mutz 1997).

The frames used result from the interaction between journalists, public and stakeholders (Birkland 1997, Scheufele 1999, Edy and Meirick 2007, Zhou and Moy 2007). The mass media set the frames of reference that readers or viewers use to interpret and discuss events. However, the media are also responsive to the public's points of view and the interests of other stakeholders. The mass media cover those issues that are relevant to the social-cultural and political context of its populace (Dove and Khan 1995, Cunningham 2005, Sonnett *et al.* 2006), while the latter focuses its attention on the issues covered by the media (Newig 2004). As such, frames are culturally embedded and change very little or gradually over time (Van Gorp 2007).

Media research shows that journalists use only a handful of non-specific frames to report news events (Semetko and Valkenburg 2000). Stories may be framed in terms of conflict, responsibility, economic consequences, human interest, and ethical and moral considerations (see the Method section for an operationalisation of these frames). The identification of systemic faults or the blaming of negligent actors (government, companies) are important ingredients in the framing process (De Vries 2004). Research shows that human interest, conflict and responsibility or blame are used often in disaster coverage (Brunken 2006, Driedger 2007), with human interest frame dropping significantly after the first three weeks (Brunken 2006).

### **Tone-of-voice**

The content of news coverage is also characterised by the tone-of-voice. Studies indicate that the tone-of-voice in the first days after an accident/disaster is rich in emotional content, but grows distanced and intellectualised as time goes by (Gortner and Pennebaker 2003). Media differ in their tone-of-voice between different levels of government. After Hurricane Katrina, for instance, federal and local agencies were portrayed in different ways (Brunken 2006, Littlefield and Quenette 2007). The tone-of-voice regarding government response was moderately neutral with federal government covered more positively, and local government covered more negatively (Brunken 2006). It may or may not change in the aftermath of a disaster (Brunken

2006, Littlefield and Quenette 2007). Given the results of the disaster fact-finding research after the Enschede disaster (Commissie Onderzoek Vuurwerkramp 2001) and the mild verdict on the board of the fireworks company giving all blame of the disaster to the failing of the local and national governmental organisations, it is likely to assume that the tone-of-voice regarding both local and national governments would become more negative over time.

In the Netherlands, the government (1) is primarily responsible for the safety policy of storage, transportation and manufacturing of fireworks and for that reason is seen as co-responsible for the occurrence of the fireworks disaster, as well as the public communication on this policy, (2) is coordinator and executioner of post disaster crisis intervention and disaster relief efforts, and (3) is responsible for the prosecution of criminal activities (Commissie Onderzoek Vuurwerkramp 2001). Given this dominant role of governmental authorities in disaster prevention and recuperation, and specifically in the Dutch context, government is the most relevant actor to refer to in the case of tone-of-voice.

### **Research questions**

Our study set out to investigate to what extent media amplification has taken place in the case of the Enschede fireworks disaster. Media amplification was assumed to have taken place in case: (1) events in the aftermath of the disaster resulted in increased media coverage, (2) the media framed the disaster in terms of conflict and responsibility, and (3) the framing was in a negative tone-of-voice regarding governmental authorities. This means that we, first, expect to see peaks in the amount of coverage over time, which can be attributed to key events in the aftermath of the disaster. Second, we expect that, in periods with coverage peaks, the media more often make use of the conflict and responsibility frames, pay more attention to governmental organisations and make use of a more negative tone-of-voice.

The question arose whether this process would take place in local and national newspapers alike, or whether differences would be observable in the framing, tone-of-voice or longevity of the interest in publishing stories about this disaster between local newspapers on the one hand and national newspapers on the other. Although the physical, material and human disruption of the disaster were most noticeable in the local community, the political shockwaves affected the whole country (Lulofs *et al.* 2005). Based on results by Anderson and Marhadour (2007), one could imagine more human interest frames or economical consequences frames in the local press and more responsibility and conflict frames in the national press, which is more oriented at national political processes. After all, newspapers might be expected to focus on the interests in and personal relevance for their readership, which are probably different for the readership of local and national newspapers. This would imply differences in frame use or differences in tone-of-voice regarding local or national authorities.

Based on the existing empirical studies, we formulated the following specific hypotheses relating to the frame use and tone-of-voice on governmental organisations, and the differences therein between local and national newspapers, and between specific high-coverage-periods in time:

*H1 The responsibility frame and the conflict frame will be used more often than the other frames.*

- H2 Local newspapers will use the human-interest frame and the economic-consequences frame more often than national newspapers.*
- H3 National newspapers report more often with responsibility and conflict frames than local newspapers (cf. the findings of Anderson and Marhadour 2007).*
- H4 The responsibility frame and the conflict frame will be used more often in the periods with a higher coverage of governmental activities (publication of the Commissie Onderzoek Vuurwerkramp 2001; verdict on the board of the fireworks company).*
- H5 The human-interest frame is used more frequently in the period directly after the disaster than in later periods (cf. the findings reported by Brunken 2006).*
- H6 The economic-consequences frame is used more frequently in later periods than directly after the disaster.*
- H7 The tone-of-voice regarding governmental organisations is negative.*
- H8 The tone-of-voice is more negative in periods that governmental actions are reported (publication of the Commissie Onderzoek Vuurwerkramp 2001; verdict on the board of the fireworks company).*

## **Method**

### ***Selection of the articles***

It may take months or years for a disaster-stricken society to come to a certain 'closure' and to return to a situation in which the aftermath of the disastrous events is no longer on everybody's mind on a daily basis. For that reason, we have chosen for a temporal and chronological approach to the analysis of the news media coverage of the events after 13 May 2000. A content analysis of four Dutch newspapers was performed over a three year period after the disaster. Sampled were the only local newspaper in the disaster area (*TcTubantia*, circulation in 2000 138,000), and the three newspapers with the highest circulation on the national level (circulation in 2000: *Telegraaf*, 782,000; *AD*<sup>1</sup>, 353,000; *Volkskrant*, 343,000; Cebuco 2006; NOM-TNS NIPO 2006). For these newspapers, all articles were selected from electronic databases that were published in the three years after the disaster. The articles in the national newspapers were selected from the trustworthy Lexisnexis-database; for *TcTubantia* the publisher's database was used. For all newspapers, the selection took place in an identical manner. Selection criteria were the occurrence of keywords as 'vuurwerkramp' (fireworks disaster) or 'Fireworks' (S.E. Fireworks is the name of the company that owned the facility). A pilot-study indicated that these keywords returned the largest number of hits in the electronic databases.

### ***Sample characteristics***

Searching the electronic databases over the three year period with our keywords returned a total of 4928 articles. After exclusion of announcements of radio and television programs, and the exclusion of articles in which the disaster was mentioned but was not part of the storyline of the article<sup>2</sup>, 3942 articles remained as our corpus of analysis (that is 986 articles or 20% were excluded). It appeared that national newspapers ran significantly more articles in which the disaster was not part of the storyline (*Telegraaf*, 24% excluded; *Volkskrant*, 26% excluded) than the other newspapers (*AD*, 17% excluded; *TcTubantia*, 19% excluded). The local newspaper

from the disaster area published considerably more articles than the other newspapers (*TcTubantia*,  $n = 2686$ ; *AD*,  $n = 651$ ; *Volkskrant*,  $n = 419$ ; *Telegraaf*,  $n = 186$ ).

All newspapers published relatively many articles in the first month after the disaster. In this first month 772 articles were run (*TcTubantia*, 457; *AD*, 186; *Volkskrant*, 90; *Telegraaf*, 39). After three years this number was still approximately 30 articles per month. Additional statistical analysis indicated that the development of the decline can be best described by an inverse function (see Figure 1)<sup>3</sup>. The decline of articles over the whole three year period was however non-monotonous. In two distinct periods, statistically meaningful fluctuations in the number of observed articles occurred. In these two high coverage periods discussions took place regarding the role of local and national government in the disaster. Based on this finding it was decided to analyse the corpus based on a division in four groups (based on the timeline). The groups are:

- Period I: Articles published in the first four weeks after the disaster (15 May–10 June 2000).
- Period II: Articles published 19 February–12 May 2001. In this period, in which more articles were published than expected based on the inverse function, the fact-finding report is published (Commissie Onderzoek Vuurwerkram 2001).
- Period III: Articles published 18 February–13 April 2002. In this period, in which more articles were published than expected by the inverse function, the criminal procedures against the owners of S.E. Fireworks were finalised, raising the question of the role of the government in the disaster.
- Period IV: Remaining articles.

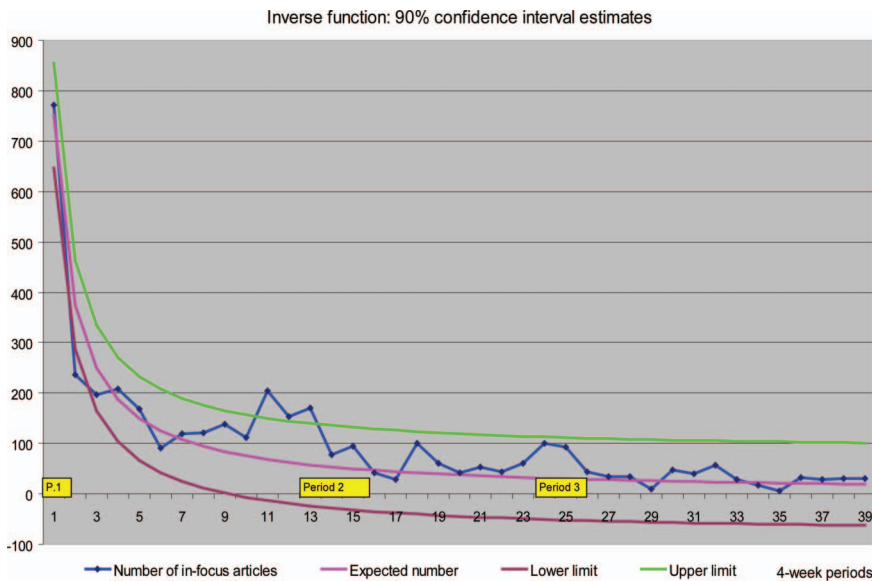


Figure 1. Expected number of articles based on the inverse function per four-week-period, with 90% confidence interval, related to the number of observed articles per period.

### Coding

The 3942 articles were coded by several coders<sup>4</sup> based on a trained coding instruction. The coders coded whether each of the frames was present or absent in the article, whether actions by a local or national governmental organisation were mentioned, and the articles' tone-of-voice regarding these governmental organisation. The reliability of the coding was checked at regular intervals.

### Frames

The articles were read and it was decided whether each of the following frames was present in the article: conflict frame (yes, no), human-interest frame (yes, no), responsibility frame (yes, no), and economic-consequences frame (yes, no). The choice of frames was based on previous work by Semetko and Valkenburg (2000) and by De Kort and d'Haenens (2005). The *conflict frame* focuses on conflicts between individuals, groups or organisations. This may reflect in the description of disclosure of conflicts of opinions, criminal procedures, criticising the other party or defending oneself against the critique of others. The interrater agreement was 87%, Cohen's Kappa = .74<sup>5</sup>. The *human-interest frame* presents the human emotional aspects of an event, issue or problem. Typical are stories describing individual victims and disaster relief workers, identified with their full name. The interrater agreement was 92%, Cohen's Kappa = .84. The *responsibility frame* presents an issue in a way that implies that some actor, e.g. government, is to a certain extent responsible for the disaster and its consequences. The interrater agreement was 86%, Cohen's Kappa = .69. The *economic-consequences frame* is present in an article when it discloses information or opinions about the financial consequences of the disaster for an individual, group, organisation or region. The interrater agreement was 94%, Cohen's Kappa = .87. There is some overlap in the use of frames. The highest intercorrelation was between the use of the conflict frame and the responsibility frame ( $r = .24$ ). The peaks on the timeline in period II and III for number of stories with a specific frame (particularly the conflict and responsibility frame) were much higher than those on the timeline for the number of all stories.

### Governmental actors

The coding scheme identified two main classes of governmental officials and organisations, local and national. A first selection of precoded actors was based on the Commissie Onderzoek Vuurwerkramp (2001) and on standard works on public administration. Local governmental officials and organisations are e.g. the municipality, the mayor and alderman, representatives of the city council, local municipal organisations, police, fire department (in the Dutch context the primary disaster relief organisation). The national government comprises members of the Royal family, the Cabinet and individual Ministers, other representatives of the national government, national governmental organisations, the office of the District Attorney, and Court<sup>6</sup>, and government appointed fact-finding committees (like the Commissie Onderzoek Vuurwerkramp). Coding was simple: local government is mentioned in the article or not, national government is mentioned or not. The interrater agreement was 86% and 92% for local and national government, respectively, Cohen's Kappa = .72 and .84, respectively.

*Tone-of-voice*

Tone-of-voice was coded based on the manifest positive or negative wording regarding the governmental actors in the article. Negative terms are ‘failure’, ‘to get away with something bad’ and ‘cheat’. Examples of positive wording are ‘praise’, ‘hats off’, ‘appreciation’. Tone-of-voice was coded separately for national or local governmental actors on five-point scales (very negative to very positive). The interrater agreement was 84%, Cohen’s Kappa = .67.

**Results**

**Media coverage and timeline of events in the three-year post-disaster period**

The first analysis tried to establish whether events in the aftermath of the disaster resulted in increased media coverage. Disaster-related events were identified and presented on a chronological event-timeline<sup>7</sup>. On this timeline, key events in the aftermath of the disaster were marked, such as governmental initiatives to improve the situation (victim support, legislation), and events in the criminal procedures against individuals or organisations that could be held responsible for their role in the disaster, and in the discussion on consequences for active politicians and authorities, and external events (see Figure 2). This figure shows that the three high-coverage periods can be linked to events in the aftermath of the disaster.

If we take a closer look at the content of the articles we observe that the coverage immediately after the disaster (period I) is characterised by articles on the death toll and other consequences (‘Searching for missing’), severe criticism of the company’s management (‘On paper innocent, in reality a bomb’), and the first critique on

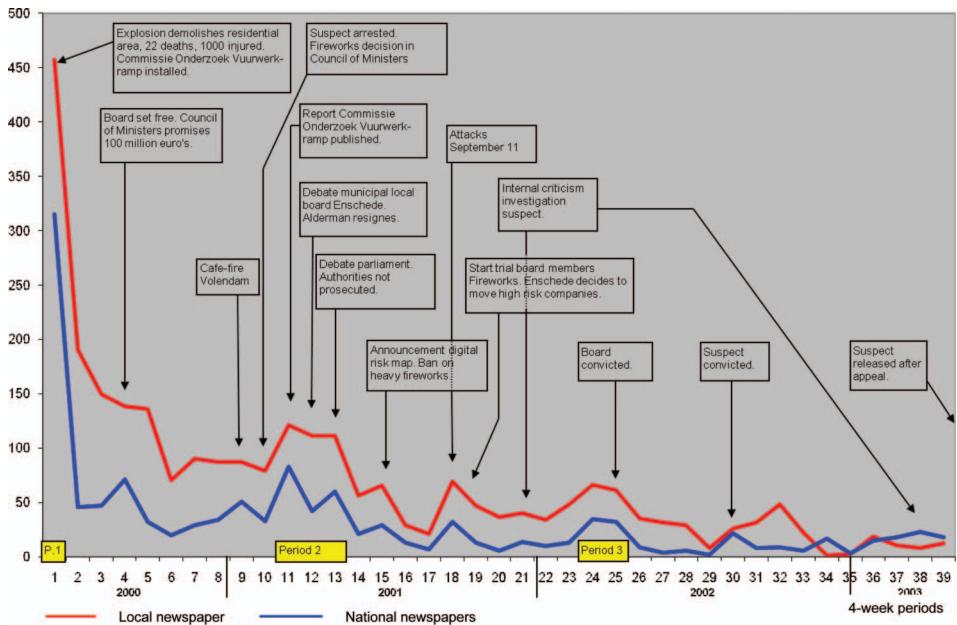


Figure 2 Timeline of the Enschede fireworks disaster: number of observed articles per 4-week-period and local versus national newspapers.



government ('Just as easy as a fishing permit the Ministry gives permits to people who claim to be experts in fireworks events'; 'Contingency plan no more than a fancy telephone list'). In this period, relief efforts start and rumours are ventilated about the events on the disaster day: arson as the cause of the disaster, illegal activities at the facility, etc.). In addition to the more serious news, the local newspaper runs many stories about the more indirect consequences of the disaster, like the cancellation of all types of events. It also starts with human interest stories of those inflicted by the disaster or witnesses. Government officials are mentioned almost immediately after the disaster took place. The national government is mentioned because of the site visit of Cabinet ministers and royalty. Soon the discussion starts whether policy makers and authorities have learned sufficiently from previous disasters, like the airplane crash in Amsterdam in 1992.

Between February and May 2001 (period II) the coverage is dominated by events that followed the publication of the Commissie Onderzoek Vuurwerkcramp (2001). This Committee reported the disaster fact-finding research and its implications regarding responsibilities and needed policy change ('Oosting spares no one. Fireworks disaster: mistake after mistake made by municipality, state and S.E. Fireworks')<sup>8</sup>. Once this report was available, a prolonged public discussion developed on the consequences that the disaster should have for those who were to blame, such as politicians and governmental organisations.

Between February and April 2002 (period III) the coverage focused on the trial of the management of the disastrous fireworks company (under the current law governmental officials could not be prosecuted). The directors of S.E. Fireworks are convicted for illegal trading in fireworks and violation of environmental laws, but they are acquitted for wrongful death. Their penalty is widely perceived as much too low, which is a frustrating experience for many disaster victims ('Enschede in shock after mild verdict former directors').

### ***Magnitude of coverage and media framing in local versus national newspapers***

The second amplification aspect referred to the use of specific frames. In the articles the responsibility frame is used most frequently (64% of all articles uses this frame), followed by the conflict frame (52%), the human-interest frame (36%) and the economic consequences frames (31%). Table 1 presents the results of the analysis of frame use (conflict, responsibility, human interest and economic consequences) per period (I immediately after the disaster; II Commissie Onderzoek Vuurwerkcramp report published; III court verdict owners' company; IV all articles minus those in period I, II and III) in the local or national newspaper (*TcTubantia* versus *Volkskrant*, *Telegraaf*, *AD*)<sup>9</sup>. Multivariate analysis indicates main effects for newspaper ( $F(4,3931) = 43.8, p < .001$ ) and period ( $F(12,11799) = 26.7, p < .001$ ) as well as a significant interaction between period and newspaper ( $F(12,11799) = 4.7, p < .001$ ). Univariately, the analysis indicates a significant effect for newspaper with the frames of economic consequences ( $F(1,3934) = 97.8, p < .001$ ), of human interest ( $F(1,3934) = 89.2, p < .001$ ) and of conflict ( $F(1,3934) = 7.6, p < .01$ ), but not of responsibility ( $F < 1.0$ ). The local newspaper runs more stories with the human interest frame and the economic consequences frame than the national newspapers. This supports hypothesis 2. The national newspapers published more stories with a conflict frame. This partly supports hypothesis 3. The average score for frame use indicate that the conflict frame and

Table 1. Frame use in local or national press, per period, and post hoc comparisons.

Frames	Newspaper	Period I		Period II		Period III		Period IV		Post hoc comparisons of frame use per period (Boniferroni per newspaper)										
		Immediately after disaster	Report COV* published	Verdict factory owners	All minus periods I, II and III	Total periods	I vs II	I vs III	I vs IV	II vs III	II vs IV	III vs IV								
N	Local	N = 457	N = 343	N = 127	N = 1759	N = 2686														
	National	N = 315	N = 185	N = 67	N = 689	N = 1256														
Conflict	Local	0.37	0.60	0.75	0.49	0.50														
	National	0.30	0.78	0.81	0.58	0.55														
Responsibility	Local	0.48	0.76	0.71	0.68	0.66														
	National	0.43	0.82	0.75	0.60	0.60														
Human interest	Local	0.54	0.41	0.24	0.43	0.43***														
	National	0.20	0.19	0.16	0.19	0.19***														
Economic consequences	Local	0.36	0.32	0.31	0.41	0.38***														
	National	0.09	0.12	0.12	0.20	0.16***														

Frame use varies from 0 (frame not used) to 1 (frame used in every article).

\*COV: Commissie Onderzoek Vuurwerkkramp.

\*\*\*Difference between local and national newspapers in frame use significant at  $p < .001$ .

#Significant post-hoc differences between periods ( $p < .05$ ).

responsibility frame are used more frequently than human interest and economic consequences frame (related samples *t*-tests, local and national newspapers, all relevant contrasts:  $p < .01$ ), thus supporting hypothesis 1.

Univariately, the analysis indicates a significant effect of period on all frames (conflict  $F(3,3934) = 72.9$ ,  $p < .001$ ; responsibility  $F(3,3934) = 55.3$ ,  $p < .001$ ; economic consequences  $F(3,3934) = 8.7$ ,  $p < .001$ ; human interest ( $F(3,3934) = 7.1$ ,  $p < .001$ )). Post hoc comparisons of frame use per period shows that the conflict frame is used significantly more often in periods II and III than in both other periods. This confirms hypothesis 4. The publication of the fact finding report (Commissie Onderzoek Vuurwerkcramp 2001) and the prosecution of the board of the fireworks company did result in a higher use of the conflict frame than we observed directly after the disaster (period I) and on average in the three year coverage (period IV). Similar results can be observed regarding the use of the responsibility frame, also supporting hypothesis 4. The post hoc analysis further indicated that hypothesis 5, regarding the higher level of use of the human interest frame immediately after the disaster, is supported for the local newspaper only. In the first month after the disaster the use of this frame in the local newspaper is higher than in other periods of disaster coverage. The findings regarding the use of the economic consequences frame partly support hypothesis 6: in the local as well as the national newspapers there are hardly any differences. If differences occur, they point to the use of the economic consequences frame to be higher in period IV.

#### ***Magnitude of coverage and covering local or national authorities***

The third amplification aspect relates to the covering of governmental authorities. Three quarters of the articles (75%) referred to the functioning of a level of government (2974 articles); the national government was referred to in 61% (1799 articles), the local government in 81% (2419 articles). Table 2 presents the results of the analysis of coverage of governmental authorities (local versus national) per period in the local or national newspapers. Multivariate analysis indicates main effects for newspaper ( $F(2,3933) = 64.4$ ,  $p < .001$ ) and period ( $F(6,7868) = 30.4$ ,  $p < .001$ ), as well as a significant interaction between newspaper and period ( $F(6,7868) = 6.0$ ,  $p < .001$ ). The local newspaper runs relatively more stories on the local government than the national newspapers and vice versa. In period II and III significantly more attention is paid to the role of local and national government than directly after the disaster, while the attention to local and national government in period IV lies in between. The interaction is only significant for the attention paid to the national government ( $p < .05$ ). The interaction effect indicates that the national newspaper give less attention to the national government immediately after the disaster than in later periods with the highest levels in period II and period III. The local newspaper basically shows the same pattern. Attention to the national government immediately after the disaster is lower than in later periods, but the increase in attention in period II and III is smaller.

#### ***Magnitude of coverage and tone-of-voice regarding the local and national government***

Table 3 presents the average tone-of-voice scores regarding local and national governmental authorities per period, observed in the local and the three national newspapers. Inspection of the data makes clear that the tone-of-voice was mildly

Table 2. Average coverage of local and national governments in local and national press, per period, and post hoc comparisons.

Government covered in news	Newspaper	Period I		Period II		Period III		Period IV		Post hoc comparisons of frame use per period (Bonferroni per newspaper)			
		Immediately after disaster	Report COV* published	Verdict factory owners	All minus periods I, II and III	Total periods	I vs II	I vs III	I vs IV	II vs III	II vs IV	III vs IV	
Local	Local	0.52 (n = 457)	0.69 (n = 343)	0.71 (n = 127)	0.67 (n = 1759)	0.65*** (n = 2686)	#	#	#				
	National	0.48 (n = 315)	0.64 (n = 185)	0.60 (n = 67)	0.53 (n = 689)	0.54*** (n = 1256)	#						
National	Local	0.28 (n = 457)	0.44 (n = 343)	0.65 (n = 127)	0.37 (n = 1759)	0.38*** (n = 2686)	#	#	#	#		#	
	National	0.40 (n = 315)	0.82 (n = 185)	0.81 (n = 67)	0.66 (n = 689)	0.62*** (n = 1256)	#	#	#	#		#	

Coverage ranges from 0 (government coverage in no article) to 1 (government covered in every article).

\* COV: Commissie Onderzoek Vuurwerkkramp.

\*\*\* Difference between local and national newspapers in coverage of government significant at  $p < .001$ .

# Significant post-hoc differences between periods ( $p < .05$ ).

Table 3. Average tone-of-voice regarding local and national government in local and national press, per period, and comparison between periods.

Tone-of-voice regarding government level	Newspaper	Period I		Period II		Period III		Period IV		Comparisons of tone-of-voice per period (Mann-Whitney U-test, per newspaper)			
		Immediately after disaster	Report COV* published	Verdict factory owners	All minus periods I, II and III	Total periods	I vs II	I vs III	I vs IV	II vs III	II vs IV	III vs IV	
Local government	Local	-0.15 (n = 238)	-0.38 (n = 237)	-0.52 (n = 90)	-0.17 (n = 1179)	-0.21*** (n = 1744)	#	#	#	#	#	#	
	National	-0.33 (n = 150)	-0.58 (n = 118)	-1.08 (n = 40)	-0.53 (n = 367)	-0.52*** (n = 675)	#	#	#	#	#	#	
National government	Local	-0.22 (n = 127)	-0.40 (n = 151)	-0.37 (n = 83)	-0.25 (n = 656)	-0.28*** (n = 1017)	#	#	#	#	#	#	
	National	-0.18 (n = 125)	-0.79 (n = 151)	-.91 (n = 54)	-0.43 (n = 452)	-0.49*** (n = 782)	#	#	#	#	#	#	

Tone-of-voice ranges from + 2 (very positive) to -2 (very negative).

\*COV: Commissie Onderzoek Vuurwerkkramp.

\*\*Difference between local and national newspapers in tone-of-voice on local and national government significant at  $p < .001$ .

#Significant post-hoc differences between periods ( $p < .05$ ).

negative toward local and national governments. Tone-of-voice was judged to be neutral in approximately 60–65%, negative in 30–35% and positive in 5–10% of the articles. The national newspapers covered government more negatively than the local newspaper. This is in support of hypothesis 7. Statistically, the tone-of-voice differs per period (Kruskall-Wallis H one way analysis of variance, Chi-sq is 49.7,  $df = 3$ ,  $p < .001$  and 47.1  $df = 3$ ,  $p < .001$  for the national and local government, respectively). National newspapers are most negative toward the national government in period II and III, regarding the report of the Commissie Onderzoek Vuurwerkcramp and the issue of the verdict that is seen as too mild; for the local newspaper similar results were obtained. National and local newspapers were most negative regarding the local government in period III. Least negative is government judged immediately after the disaster (period I). This is true for both local and national government and local and national newspapers. These results support hypothesis 8.

## Discussion

Disasters typically attract much media coverage for a certain period after their onset. After a while, other issues with a high newsworthiness emerge, and the media attention for the disaster fades. We analysed the media coverage of the Enschede fireworks disaster from the theoretical perspective of media amplification. For both the local and the national newspapers, at first, coverage was high. A sharp decline followed, which later levelled off to a gradual decline. Statistical analysis indicated that the development of the decline was best described by an inverse function, for both the local and national newspapers.

The first condition for media amplification is assumed to be present when changes occur in the volume or content of the media coverage following events in the aftermath of the disaster. For the Enschede disaster, many peaks in the media attention were visually identified; three of these were found to deviate significantly from the expected level defined by the inverse function. These peaks seemed to represent particular issues related to the fireworks disaster: the event itself, the report of the Commissie Onderzoek Vuurwerkcramp and the prosecution of the board of the fireworks company. Apparently, in periods of gradual and ‘natural’ decline of the media’s attention for the disaster, certain events or new issues arose that led to significant increases in media attention. Such events or issues stimulated stories with a conflict or responsibility frame, rather than a human-interest frame. In the media coverage, the Enschede fireworks disaster was linked to existing (fireworks) safety problems in general. The safety culture and safety policy in fireworks facilities and a governmental policy of tolerance were identified to have contributed to the disaster. Additionally, the issue of the liability of governmental officials was debated.

The amount and content of the media coverage was thus significantly affected by events in the aftermath of the disaster. Considering that the measurement unit of the time periods was four weeks, we are talking long-lasting increase in media attention here. This might explain why other events we a priori identified as possibly being important, seemed to initiate peaks in media attention that were identified visually, but not found to be statistically significant.

In the three years of the investigation, two other catastrophic events took place. Interestingly, these events did not seem to have led to a *decrease* in media coverage of the fireworks disaster. One of the catastrophes, the 9-11 attacks in 2001, even fell in a

visually identified peak in the coverage of the fireworks disaster. Additional analysis showed that most articles during this time frame dealt with the fireworks disaster itself. Issues mostly related to developments in the criminal investigation. Only a small number of the articles also addressed the 9-11 attacks, mostly in the local paper. The other catastrophe was the Volendam Café fire (2001), which led to the death of 14 people, mostly youngsters. The coverage of this event was smaller than that directly following the fireworks disaster. Again, additional analysis showed that most articles during this time frame dealt with the fireworks disaster itself, and that only a small number of the articles also addressed Volendam Café fire. This seems to suggest that the amount of coverage of the fireworks disaster continued in its regular pace, and that the 9-11 disaster might even have initiated some extra coverage comparing it to the fireworks disasters.

Our findings are, thus, in line with the issue-attention cycle which states that (1) the media attention to an issue rises and then declines, and that (2) new developments may lead to a new cycle of media attention, in particular attention focusing on policy related issues. Our observation that changes occurred in the volume of the media coverage following events in the aftermath of the disaster corresponds with the first of the processes we hypothesise to be a part of a media amplification process.

As a second step in our assumed amplification process we identified journalistic framing as an important vehicle for describing governmental actions and policies. To study framing we looked at the differences in the *content* of the media coverage in the three distinct periods of high coverage, as opposed to periods with expected levels of coverage (that is in which the gradual decline was observed). Specifically, it was studied whether the media framed the disaster in terms of conflict, responsibility and blaming local and/or national governmental organisations. The responsibility and the conflict frame were used most frequently (in 64% and 52% of the stories, respectively), which agrees with findings by Brunken (2006) and Driedger (2007). These frames were used most often in the period in which the Commissie Onderzoek Vuurwerkkramp report was published, and the period in which the verdict on the board was issued, which supports our assumption that these frames would be used particularly in periods of renewed attention when governmental actions are highlighted.

Our assumptions regarding the use of the human interest and economic consequences frames were only partly supported. There were hardly any differences in the use of the economic consequences frame looking at the various periods. And the human-interest frame was used more often in the period directly following the disaster by the local paper only. The media coverage thus highlighted conflict and responsibility framing related to actions and policies of local and national governments. We can therefore conclude that the second condition for media amplification was met.

The third ingredient of our media amplification process is related to the tone-of-voice of the media framing regarding local and national governments. The data we collected for the Enschede fireworks disaster revealed that on average the tone-of-voice was mildly negative toward local and national governments. This tone-of-voice turned out to be only mildly negative as a result of a large number of articles in which tone-of-voice on government was neutral. The national newspapers (we analysed three national newspapers) covered government more negatively than the local newspaper. Winett and Lawrence (2005) report similar differences between local and national newspapers. We also observed that in periods of renewed

attention for governmental actions or policies, the tone-of-voice became much more negative, implying that the third condition for a media amplification process was also present.

Our study aimed at establishing whether the conditions were such that an amplification effect of the media coverage related to the Enschede disaster on the public's risk perception might be plausible. The news media are essential in the process of formation of public risk perceptions, and media amplification may lead to public concern, public debate and, under certain conditions, safety policy change (Birkland 1997, Kasperson *et al.* 2003, Murdoch *et al.* 2003, Ibitayo *et al.* 2004, Kurtz 2004, Gutteling 2005, Bakir 2006). In reconsidering the results of this study, there is support for the assumption that the conditions were such that an effect of the media coverage on the public's risk perception might have occurred. We observed that 75% of all articles on the disaster reflect governmental activities. Furthermore, we found that coverage of government was often framed in terms of responsibility and conflict, and had a mildly negative tone-of-voice. We found that further down the three year period, when new issues or events arose, the use of conflict and responsibility frames to describe governmental activities even increased, and that the tone-of-voice gradually even became more negative.

Results showed significant differences between the local paper and the national papers in the use of frames. The local newspaper used the human-interest frame and the economic consequences frame more often than the national newspapers. The national newspapers used the conflict frame slightly, but significantly more often than the local newspaper. These differences may be explained by considering the readership of the newspapers. The local paper focused its coverage on the relevance of the disaster for the local residents and, therefore, made use of a human-interest frame and an economic consequences frame more often than the national paper. In the perspective of the Enschede disaster human interest (regarding local victims and survivors) and economic consequences (regarding local damages and rebuilding efforts) are to be considered local issues. The national paper, on the other hand, emphasised the national relevance of the disaster in terms of needed adjustments to safety policies and the overall quality of safety and disaster management, making use of the conflict frame more often. Similar results have been reported by Anderson and Marhadour (2007).

Our investigation period amounted to three years of newspaper coverage. In doing so, the methodological repercussions of such an elaborate approach have become clear. Results showed that the media disaster coverage was not limited to a period of several weeks or months after the event (see also Ten Veen *et al.* 2009), but that significant events related to the aftermath forced us to extend the study to a period of several years. Driedger *et al.* (2009) suggest that a 10 day analysis should be sufficient to determine media presentations of risk events in situations where this risk event remains relatively constant over time, media coverage remains high for an extended period and no new salient issues emerge. This clearly does not apply to the fireworks disaster, which developed many new salient issues over a couple of years. In our study it became clear that the most interesting periods from a framing and amplification point of view, namely the period in which the report of the Committee Onderzoek Vuurwerkramp (2001) was published, and the period in which the verdict on the Board of the fireworks company was issued, occurred, respectively, approximately nine months and two years after the disaster itself. This contrasts with the confined periods of analysis in



most (e.g. Garner and Huff 1997, McDonald and Lawrence 2004, Brunken 2006, Littlefield and Quenette 2007), but not all (Driedger 2007) content analysis studies of disaster coverage.

An important reason to conduct a media analysis is to establish whether conditions for an amplification effect of the media coverage on public risk perception and risk policy making are satisfied. Such an effect on the public's risk perception is dependent on the duration of the coverage: the longer the media coverage, the more profound the effect (Kasperson *et al.* 2003). Studies analysing the media coverage over a period of several weeks are only able to establish the conditions in the short-term. If we want to study whether the conditions are right for an amplification effect on the public's risk perception and maybe policy making, a media coverage analysis over a period of years rather than weeks is necessary. The results of our study on the Enschede fireworks disaster suggested that conditions might have been right for an amplification effect on the public's risk perception; whether this is also true for other disasters remains to be demonstrated.

## Notes

1. *AD* is a nationally available newspaper with a very high circulation in Rotterdam and surroundings.
2. An example of such an article is the life-story of a retiring architect who was not involved with the rebuilding of the destroyed neighborhood in Enschede, but made a remark about it in the light of urban development.
3. Visual inspection suggested that the decline was not monotonous and that there were fluctuations. It is tempting to attribute such fluctuations to events in the aftermath of the disaster. However, some fluctuations might be random. Inspection of the confidence intervals for the estimated number of articles gives an indication about this. If the observed number of articles falls within the confidence limits, one concludes the peak is a random fluctuation. If the observed number falls outside the confidence interval, one concludes there is a genuine and significant peak in media coverage. The analysis revealed that the decline in media coverage was steep and rather stable for the local newspaper, and steep and more volatile for the national newspapers, suggesting that for the latter the external events in the aftermath of the disaster were important.
4. Coders were four students of the Faculty of Behavioural Studies who were in their third or fourth year and who were paid for their work, and a University staff member. None of them was involved in the fireworks disaster as a victim, or suffered damages.
5. Cohen's Kappa is an index that measures interrater agreement for categorical variables. In many studies (e.g. Semetko and Valkenburg 2000), the interrater reliability is determined by calculating the percentage of agreement between the raters. However, this statistic does not take into account the agreement which occurs by chance. Cohen's Kappa overcomes this. It is the proportion of agreement that is actually observed between raters, after adjusting for the proportion of agreements that take place by chance. Cohen's Kappa ranges between -1.00 and 1.00. Landis and Koch (1977) suggest the following interpretation of the coefficient: a Kappa between .00 and .20 indicates a slight agreement between the raters, a Kappa between 0.21–0.40 a fair agreement, between 0.41–0.60 a moderate agreement, between 0.61–0.80 a substantial agreement and between 0.81 and 1.00 an almost perfect agreement between the raters.
6. Strictly speaking, the courts are not part of the national government but are independent authorities as part of the *trias politica*.
7. The timeline lists both the observed number of articles (per newspaper) and disaster-related events. The three-year period has been subdivided in 39 four-week periods, which allows comparisons over similar length periods. This enabled statistical analysis and guarded against fluctuations, e.g. as a result of competing events (like the Volendam Café fire) or, maybe, media hypes (Vasterman *et al.* 2005).

8. Oosting is the name of the chair man of the independent fact-finding Commissie Onderzoek Vuurwerkramp.
9. A two-way analysis variance was carried out. The dependent variables are all dichotomous variables. Lunney (1970) showed that 'if the proportion of responses in the smaller response category is (...) equal to or greater than .2 and the number of degrees of freedom for the within cell variance is equal to 20 or more, it is permissible to use ANOVA when the dependent variable is dichotomous' (p. 267). These conditions are met. Analysing our data by means of ANOVA is therefore permitted. One of the assumptions of analysis of variance is homogeneity of variance. ANOVA is robust, however, for departures from homogeneity of variance. A rule of thumb is that the ratio of largest to smallest group standard deviation should be 2:1 or less. This is the case: the highest hi/lo ratio is 1.66. As a double check, we analysed the differences between the periods by means of non-parametric statistics. In 66 of the 72 comparisons, the conclusion was the same. In case of differences, the applied Bonferroni test was more conservative in that it showed the level of significance to be between  $p < .01$  and  $p < .05$ , whereas the Mann-Whitney U-test showed the difference to be significant at the  $< .001$  level.

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