# Media content analysis of the Fukushima accident in two Belgian newspapers

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*Nuclear Science and Technology Studies (NST)*

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# 1.    Introduction

In case of a nuclear accident, the media play a major role in communicating with the public. It is therefore crucial to know what messages are the media delivering in a nuclear emergency and how do they frame the event. Analysing the media reporting on the Fukushima nuclear accident can benefit nuclear emergency management in two major aspects. On the one hand, such analysis shows how to deliver risk messages effectively through the media and on the other hand, it brings insights into the information that has to be communicated by the emergency managers to the mass media.

The media analysis of the nuclear accident in Fukushima reported here was done by means of discourse and content analysis. The coding method followed explicit rules of coding and enabled large quantities of data to be categorized.

The newspapers included in the analysis were the Belgian newspapers "*Le Soir"* (French language) and "*De Standaard"* (Dutch language). The media news were obtained from press clippings by "Media data base at University Antwerp - MEDIARGUS " for the period between 11th of March to 11th of May, 2011.

## 1.1. Role of the media during a nuclear accident

The nuclear accident in Japan has predictably induced enormous media coverage. In general, mass media play a dominant role at all levels of communication on nuclear emergency issues. They are the prominent information channel for the general public, being used for communication by different stakeholders and acting as the ''watchdog'' of society. They monitor the nuclear emergency management and the subsequent remediation process. Media form a link between the emergency actors and the risk perception among the population. However, media also have to fulfil the economic aspects of publishing or broadcasting, with ''bad news is good news'' being a well-known phenomenon in journalism.

The research and the agenda setting theory [1] support also the suposition that what the media report about the hazard influences public perception and even behavior in relation to that hazard.

 In order to evaluate the risk communication in the two months after the accident in Fukushima, the content analysis of media coverage of the Fukushima nuclear accident by the mass media was performed.

## 1.2. Communicating about a nuclear accident

Communication about the risks from a nuclear accident can directly influence events.

> *Poor risk communication can fan emotions, undermine public trust, create*
> *stress, and exacerbate the existing crisis. Good risk communication can rally*
> *support, calm a nervous public, build trust, encourage cooperative behaviors,*
> *and potentially help save lives[2,p.511]*.

Risk communication is one of the cornerstones of successful emergency management. In the nuclear field, crisis communication that restricts itself to facts, but fails to account for an

individual's knowledge (or lack of it), their perception of risks, and their relative inexperience is incomplete and ineffective.

The Fukushima nuclear accident undoubtedly provided another lesson on the importance of risk communication. From the media content analysis useful lessons of particular interest for communicators in nuclear emergencies can be drawn and learned from.

**1.3. Nuclear accidents and nuclear energy in media analysis**

In the following sub-sections a theoretical overview is given of the literature studies for media analysis of nuclear topics. First, we discuss the research on media framing related to nuclear energy and second, discourse and content analysis examples related to nuclear accidents or events are given.

### 1.3.1.  Media framing examples

Framing analysis is one approach to measuring media framing of an issue. The framing of nuclear energy was investigated by Gamson and Modigliani [3] in 1989. They have applied their framing approach to an analysis of television news broadcasts and news magazines. Examples of frames developed are "*Underdeveloped nations can especially benefit from peaceful uses of nuclear energy*" or "*Nuclear power is necessary for maintaining economic growth and our way of life*". These frames were described as "media packages" by Gamson and Modigliani. In their study, the coders looked for these specific categories instead of making a more global determination based on the package. With this approach, they were able to achieve an acceptable level of agreement in coding of 80%.

The media package described the keywords and common language defining the frame, which helped the coders to identify a particular frame. The text of the media package was made up of paraphrased material and direct quotes from a number of sources. For instance, in developing a media package for a frame that describes nuclear power in terms of progress, they took language from pamphlets and other writings by advocates of nuclear power. They argued that this kind of package "offers a number of different condensing symbols that suggest the core frame and positions in shorthand, making it possible to display the package as a whole with a deft metaphor, catchphrase, of other symbolic device" [3, p. 3]

### 1.3.2.  Discourse and content analysis examples

A content analysis of written media in Italy after the Chernobyl accident was carried out by Cantone et al [4]. Their work analyzed the reasons for the decision to phase out nuclear energy and the communication strategies of the stakeholders that took part in the public debate on nuclear energy during the weeks following the Chernobyl accident. The quantitative and qualitative analysis of two leading Italian newspapers revealed that a variety of stakeholders, upholding different values and interests, took part in the debate. As there was no tradition of public dialogue and participation in Italy, the debate was polarized to a "yes/no choice," which eventually caused Italy to abandon the production of nuclear power for civilian use.

Another example of media analysis related to Chernobyl accident was conducted by Rowe, Frewer and Sjöberg [5]. They reported a cross-national study looking at how newspapers from Sweden and the United Kingdom characterized a variety of risks, focusing on the two months around the 10th anniversary of the Chernobyl accident. Approximately four times as many

reports about risks were found in Sweden as compared to U.K., possibly reflecting the strong safety culture in Sweden. The proportion and pattern of reports on Chernobyl were similar across countries. However, in Sweden, there was an increase in reports about other nuclear hazards after the anniversary, suggesting that generalization of media concern may have occurred. Generally, BSE was discussed using a greater number of characterizations in the U.K., while Chernobyl was reported using more characterizations in Sweden. Reports about hazards tended to be alarmist rather than reassuring, and rarely used statistics to express degrees of risk.

A further example is the analysis of media reporting after the nuclear incident in 2008 at the Krško nuclear power plant, in Slovenia. Even though this event was classified as level zero on the INES scale, the transparency policy of the Slovenian nuclear safety authorities prompted it to notify the international community. The plant was initially in an emergency state due to an unidentified leak, which in turn triggered the activation of the National Response Plan. This was the first time that the European ECURIE notification system was used outside the exercise framework. Consequently, media response was enormous and news framing varied from country to country. The analysis included more than 200 published articles from printed and spoken media in Slovenia, the neighbouring countries, other EU member states and ECURIE members. Special attention was paid to the messages communicated or omitted, the sources of information and the main focus of the media texts. The analysis revealed that even a transparent communication policy in a minor nuclear event by the affected country may still trigger high intensity media coverage, emotional reactions and heated political discussion when not accompanied by an equally transparent response in the communication by international organisations. The authors concluded that the reason lies in that the main media sources in countries with open political questions related to nuclear energy tend to end up being the politicians, rather than the resident experts.

# 2.   The Fukushima nuclear accident - general information

The Fukushima nuclear accident was the result of a series of equipment failures and nuclear meltdowns, following the 9.0 magnitude earthquake and tsunami on March 11, 2011. This accident is considered to be the second largest nuclear accident after the Chernobyl disaster, but more complex as multiple reactors were involved.

## 2.1. Causes of the accident

The nuclear power plant at Fukushima has six separate boiling water reactors managed by the Tokyo Electric Power Company (TEPCO)[14]. At the time of the earthquake, Reactor 4 had been de-fueled, while units 5 and 6 were in cold shutdown for planned maintenance. The remaining reactors shut down automatically after the earthquake, but the power cut and the plant flooding following the tsunami led to overheating of the reactors.

In the days that followed, full meltdown occurred at reactors 1, 2 and 3; hydrogen explosions destroyed the upper cladding of the buildings housing reactors 1, 3, and 4; an explosion damaged the containment of reactor 2; and multiple fires broke out at Reactor 4. Unit 1 continued to leak cooling water three months after the initial events; similar conditions were hypothesized to exist at the other two melted-down reactors in the complex.

## 2.2. Protective measures for the population

The countermeasures applied are summarized in Table 1 and Figure 1.

**Table 1  Summary of countermeasures taken by the Japanese authorities by May 2011**

| Date | Time | Countermeasure | Radius | People |
|------|------|----------------|--------|--------|
| March 11 | 14:46 | Earthquake occurred | | |
| | 19:03 | Nuclear emergency declared | | |
| | 20:50 | Evacuation around  Fukushima Daiichi | 2 km | 1900 |
| | 21:23 | Evacuation around  Fukushima Daiichi | 3 km | 6000 |
| | | Sheltering around  Fukushima Daiichi | 10 km | |
| March 12 | 5:44 | Evacuation around  Fukushima Daiichi | 10 km | 51 000 |
| | 7:45 | Evacuation around Fukushima Daini | 3 km | |
| | | Sheltering around Fukushima Daini | 10 km | |
| | 17:19 | Evacuation Fukushima Daini | 10 km | |
| | 18:25 | Evacuation around Fukushima Daiichi | 20 km | 178 000 |
| March 15 | 11:00 | Sheltering around Fukushima Daiichi | 20-30 km | |
| March 25 | | Voluntary evacuation Fukushima Daiichi | 20-30 km | |

| | Planned evacuation zone within 1 month (deliberate evacuation zone) | Red zone (Figure 1) |
| --- | --- | --- |
| April 11 | Preparation zone for evacuation in case of additional large release | Two yellow zones (Figure 1) |
| April 20 | Exclusion zone Fukushima Daiichi | 20 km |
| | Reduction of evacuation zone around F2 to be within 20 km around Fukushima Daiichi | 10 $\rightarrow$ 8 km |
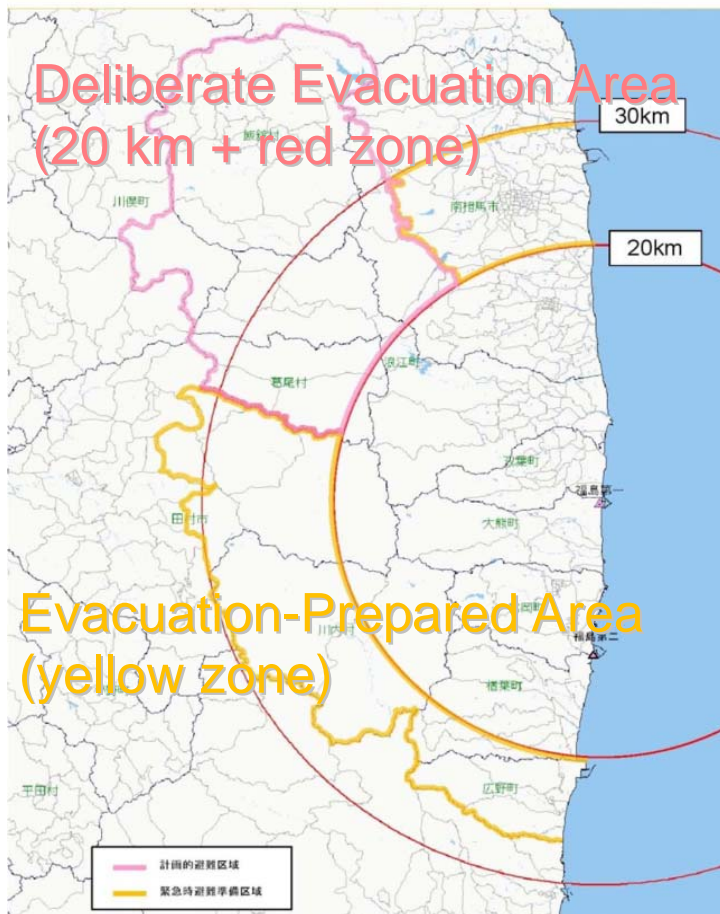


**Figure 1 Evacuation areas in up to May 2011. Source: Japanese authorities**

Measurements taken by the Japanese Ministry of Education, Culture, Sports, Science, and Technology (MEXT) in areas of Northern Japan 30–50 km from the plant showed amounts of deposited materials (cesium and iodine) way above the levels that would lead to excess of intervention levels for food products. Food grown in the affected prefectures was subject to monitoring and control and several food bans were enacted. A European directive on the control of food originating from the 13 affected prefectures was put in place on 25/03/2011.

Based on measurements of radioiodine in tap water, restrictions on the use of this water in several prefectures, including Tokyo city (23 to 24 March), were temporarily recommended. The

last restriction on tap water for infants in the Iitate village in the Fukushima prefecture was lifted on May 10.

Plutonium contamination has been detected in the soil at two sites in the plant, although further analysis revealed that the detected density are within limits from fallout generated from previous atmospheric nuclear weapons tests.

Two workers hospitalized after heavy contamination on 25 March had been exposed to doses estimated to be about 2-3 Sv at their ankles when standing in contaminated water in Unit 3.

Radiation levels varied widely over time and location. The deposition of radioactive material was not homogeneous, with higher concentrations in some locations due to wind and rain.

Leakage of radioactive material in the sea occurred repeatedly and resulted in increased radioactivity levels. Sea water was also used as a last resort to cool down the nuclear reactors at Fukushima, which resulted in a high amount of contaminated waste water.

The accident induced a broad international reaction. On 27 May 2011, the G-8 members met to discuss more regular and intense safety checks for nuclear power plants, the so-called "stress tests". Due to the accident, the attitude towards nuclear energy changed in many countries. For instance, the Fukushima disaster prompted Switzerland and Germany to announce their complete withdrawal from further use of nuclear power by 2034 and 2022, respectively.

After the Fukushima nuclear accident, the debate on nuclear energy became again a political process, "*with stakeholders who may feel threatened by radiation exposure or who may value certain benefits that involve radiation exposure to themselves or others*"[6,p.505]. It is argued that most people "*belong to both groups to a variable extent*" and that political solutions are required.

# 3.    Methodology

### 3.1. Media analysis

Content analysis, discourse analysis and framing analysis are a few among the media analysis methods. Although academic use of these text analysis methods has increased in scientific articles, the definitions of different text analysis methods are mixed.

Several books and articles exist to instruct in the methods of content analysis [7, 8], discourse analysis [9] and framing analysis [10].

In the literature there is a great deal of disagreement regarding the definition of "content analysis" and "discourse analysis", respectively; the two methods have many overlaps.

In general, the discourse analysis is a more qualitative method, while content analysis denotes a purely quantitative method. However, from several studies in the literature reporting either content analysis or discourse analysis [11] we can observe that both methods:

- quantify some aspects of text;

- reflect on the identities and motivations of the authors;

- can be used to examine either the stability or the flux in the discourse around an issue;

- can be performed with computer assistance or entirely manually.

Framing analysis is also used as a scientific method in media research. Framing analysis is a purely qualitative method and explains how the story is presented and how do journalists cover a news story from one angle rather than another.

### 3.2. Sampling of the articles

For each of the two newspapers selected for the analysis reported here, *De Standaard* and *Le Soir*, we were interested in the stories related to the Fukushima nuclear accident. The papers were coded for every day that the publication was issued (*De Standaard* and *Le Soir* do not have a Sunday edition).

The articles coded were either directly or indirectly related to the Fukushima nuclear accident and they were published in "*Le Soir*" (French language) and "*De Standaard*" (Dutch language)  in Belgium. The target time period was from 11th of March, 2011, till the 11th of May, 2011, including these two dates . This time sampling of two months was focused on the "critical discourse moments" [12], which make the culture of a nuclear issue visible in mass media.

The selected newspapers are highest quality newspapers in Belgium and thus usually taken as subject of scientific research in the field of communication and political discourse at the University of Antwerp.

The media news were obtained from press clippings by the Media data base at University Antwerp – "Mediargus". The press folders were collected by the following keywords: "Fukushima" and "nucléaire*"; or "Fukushima" and "kern*". For the articles in French, the keywords used were: "Fukushima" and "nucléaire*"; or "Fukushima" and "atomique*"

Articles that were not related to the accident in Fukushima NPP were excluded from the analysis.

### 3.3. The coding of the articles

Every article was coded by two independent coders for each language group. In case of disagreement, the master-coder decided the final code based on a discussion. The original files containg the coding from the two coders were preserved, and the final (consensual) coding was stored in a separate file.

The inter-coder reliability was calculated by Krippendorf's alpha and reported in Table 3 in annex. In order to achieve high inter-coder reliability, each coder received a training on content-analysis before she/he started the coding.

Once the articles were selected according to the rules described in section 2.1, each article was assigned a number of codes for the following nine categories of data: a) meta data, b) type of article, c) narrative codes, d) issue codes, c) tendency of article, d) sources of information, e) primary or secondary importance, f) focus of the article, and g) numeracy.

When coding the articles, it is critical that the coders should rely only on what was written in the articles, and should not draw on their prior experiences and emotional responses to the stories since relying on one's personal background is likely to raise a threat to the validity of the data.

The code book included in the annex discusses the various categories of codes that were assigned and how the different terms and concepts were defined.

# 4.    A nuclear accident is a topic closely reported in the media

> The data base consists of 260 articles published in two Belgian newspapers.

First, 378 articles were downloaded by Mediargus; 224 articles contained the word combination "Fukushima" and "nucleair*"; or "Fukushima" and "kern* in *De Standaard* and 154 articles contained the word combination "Fukushima" and "nucléaire*"; or "Fukushima" and "atomique*" in *Le Soir*.

Next, articles that were not related to the accident in Fukushima NPP were identified and excluded. Among the downloaded articles, eight articles were not related to the investigated topic in *De Standaard* and 14 articles in *Le Soir.* These articles were not included in the research. An example of such an article was one using the Fukushima nuclear reactor as a metaphor to describe a football player.

Doubled articles were also excluded from the research. 73 articles were identified in *De Standaard* as doubled articles; these came out as a result of both combinations of words "Fukushima" and "nucleair*"; and "Fukushima" and "kern*".  In *Le Soir* 23 articles were doubled, i.e. obtained using both combination of words "Fukushima" and "nucléaire*"; and  "Fukushima" and "atomique*".

The final database consisted of 260 articles for coding: 143  articles published in *De Standard* and 117 articles in *Le Soir*.

## 5.      The nuclear accident as a main concern of an article

> Was the entire article related to the Fukushima nuclear accident and its consequences or was the accident reported in a limited part of the article, while the rest of the article referred to a completely other issue?
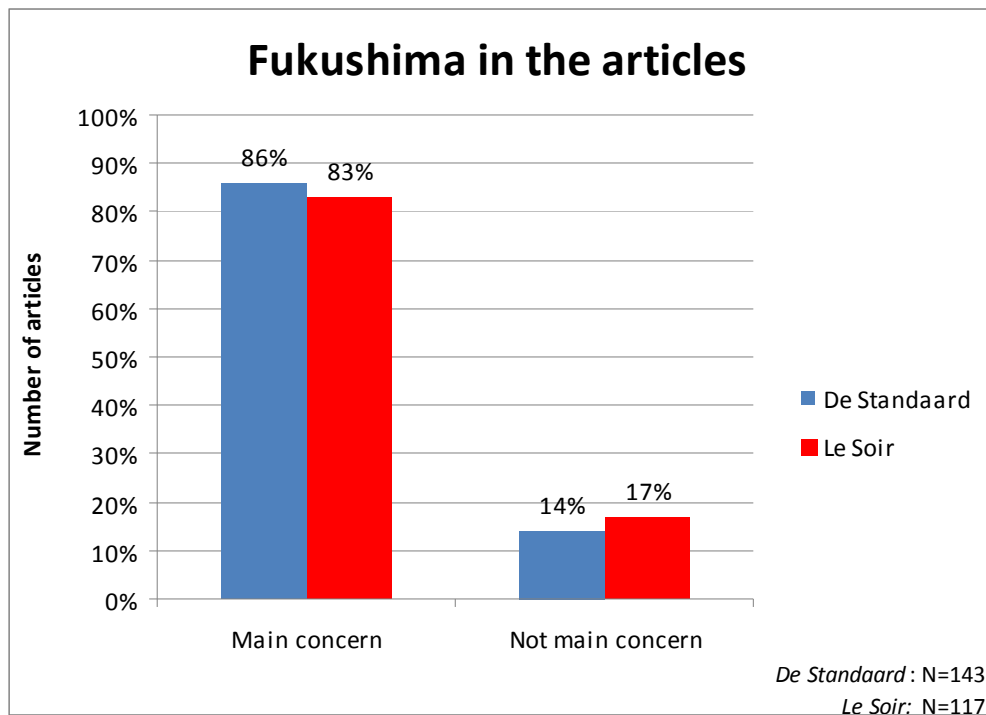


**Figure 2: Fukushima as a main concern in the articles**

From Figure 2 we can see that 85% of the articles published in the press were completely related to the Fukushima nuclear accident.

15% of the articles only mentioned the Fukushima nuclear accident, but they didn't discuss. An example from this category was an article mentioning the cancelation of sport events in Japan, which was followed by a discussion related to a particular sport. Another example was the related to Khadafi mentioning that the focus of media attention is more orientated towards Fukushima, while the article discussed the events in Libya. For such articles, the coders coded for the rest of the research coding only the paragraph or sentence related to Fukushima, instead of the entire article.

# 6.    Country of concern

Was the article's main concern a domestic issue (Belgian), an issue of the EU, and issue related to Japan or another country, or was the topic discussed of international concern?

In this section we analysed the country of concern in the articles related to nuclear accident.

As could be expected in the first two months after the accident, the majority of the articles were related to Japan. More than half of the articles were primarily or exclusively concerned with the event in Japan and the development of the situation at the nuclear power plant.

The second largest category or articles had as main concern an international or global dimension. "Global" was used to code articles that concerned topics that were general and because of their universal character were important for everyone. For instance, an article that discussed the future of nuclear energy in general, without being specifically linked to any national context, was coded as an article of global interest. Figure 3 shows that quite some articles were related to Belgian concerns as well. 15% of the articles discussed consequences and developments concerning the situation in Belgium.
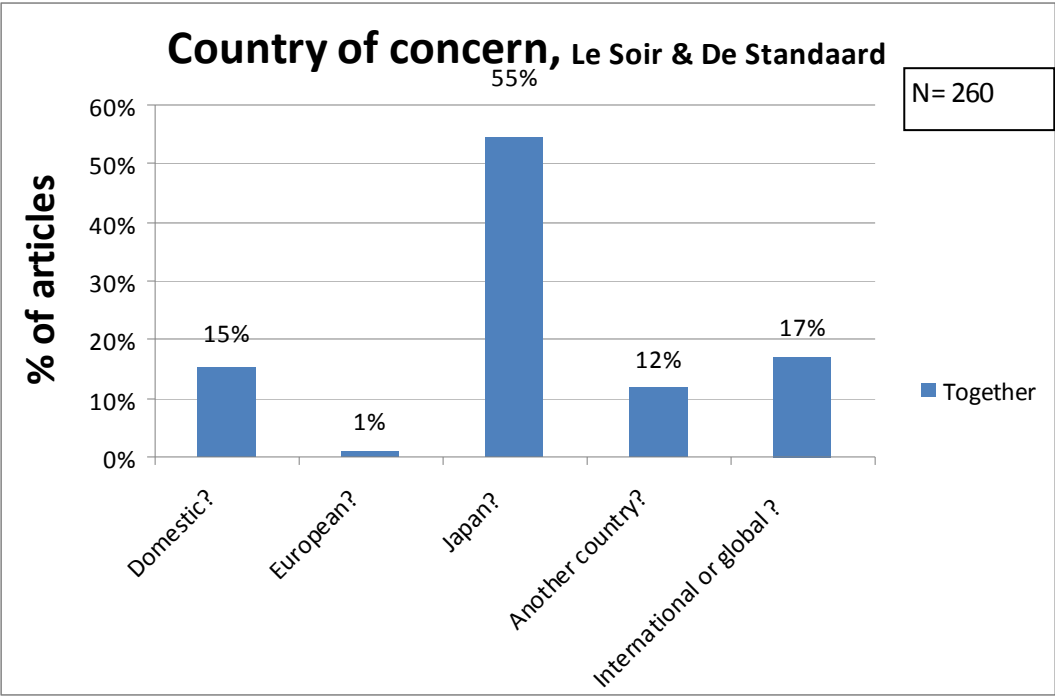


**Figure 3: Country of concern in the media articles**

Figure 4 shows that there were just small differences between the two newspapers, except for the fact that *De Standaard* focused more on international or global concerns and Le Soir on domestic ones.
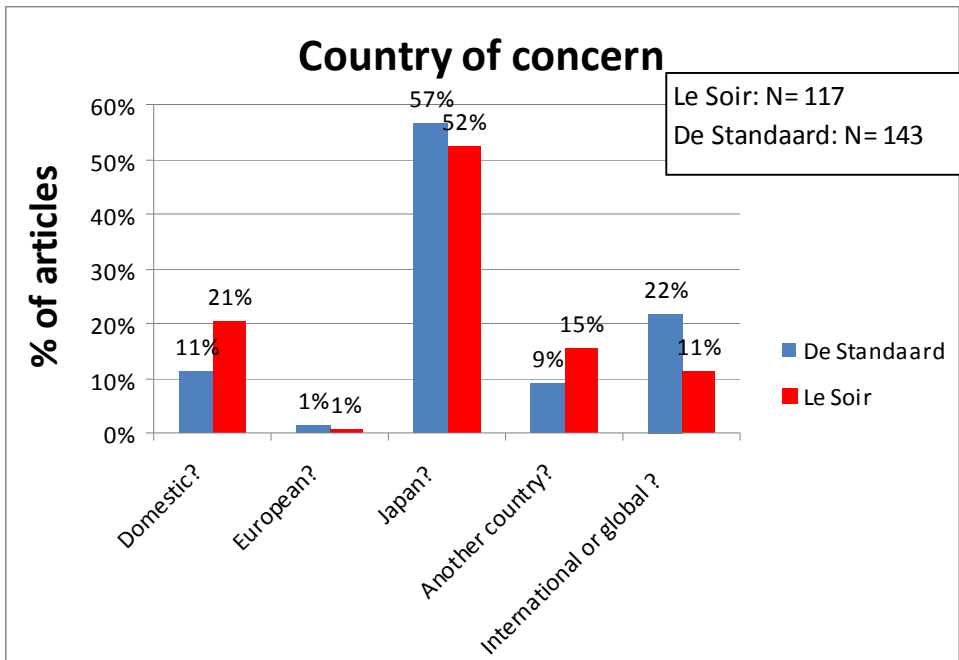
**Figure 4: Country of concern separately for *Le Soir* and *De Standaard***

Figure 5 presents the evolution of this issue over time. Overall, the majority of the articles focused on Japan. The week 7 is the only exception during these 2 months. In this week the concern was mainly related to 'another country', Ukraine, or 'International/Global', addressing general issues of importance for everyone. This week was the 25th anniversary of the nuclear accident in Chernobyl.
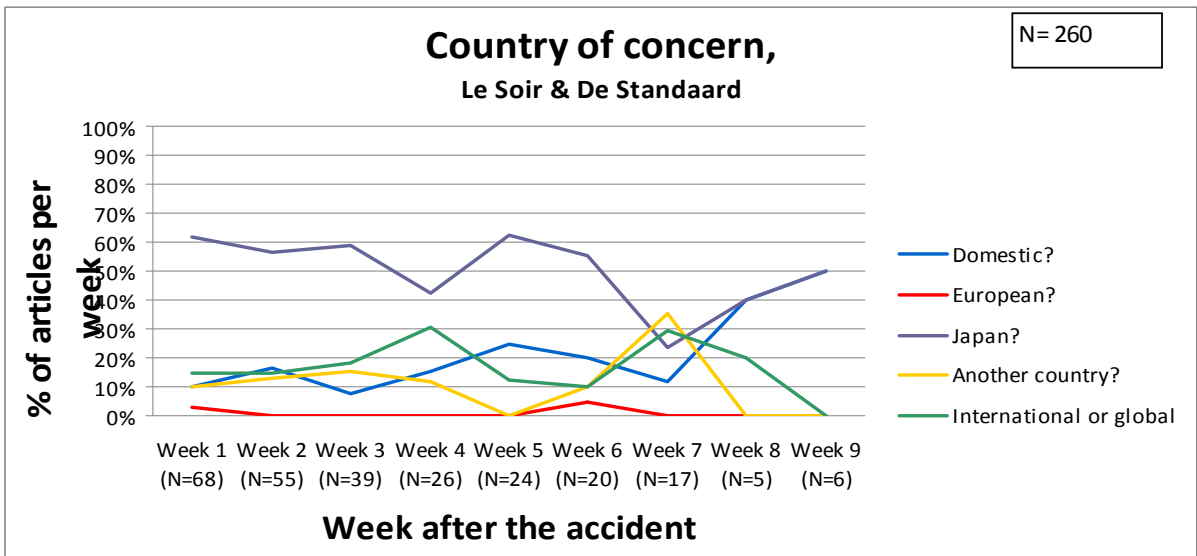


**Figure 5: Country of concern per week**

# 7.     Newsworthiness of a nuclear accident

> The nuclear accident attracted a lot of media attention in the first weeks; afterwards the attention monotonously decreased.

To identify the statistical signature of the Fukushima nuclear accident in the media, the outburst of attention and the rate of attention decay were analyzed. The goal was to identify the Fukushima nuclear accident as a topic in the media agenda and to determine how long was the Fukushima nuclear accident part of the media agenda.

For media the newsworthy information is an extraordinary event, new or unusual information, conflict, drama, tragedy, presence of elite or celebrities, a situation (event) that can be personalized and an event which evokes emotional response [13]. However, media also have to fulfill the economic aspects of publishing or broadcasting, with the "bad news is good news" slogan being a well-known phenomenon in journalism.

The journalists not only report about the reality, but they also influence it. Gamson and Modigliani [3] point out that journalists have an active role in reporting about an event (crisis). Political and public salience of issues is partly driven by media coverage of these issues. When media increase their attention to a given issue, the political elites jump on the bandwagon as well, by stating their opinion, asking parliamentary questions about the issue, tabling law proposals, or issuing executive orders [1, 14].

Previous research showed that media coverage is affected by strong inter-media agenda-setting mechanisms leading to parallel increases and decreases in the attention of various media to the same issue (Vliegenthart and Walgrave, 2008). Media outlets (e.g. first pages) generally follow the same track (e.g. presenting an event as a crisis) and let their attention for the issue in a similar manner (Vasterman, 2005; Wolfsfeld and Sheafer, 2006).

In the graphs below the media attention to the nuclear accident is presented first separately for the two newspapers – since newspapers can have a different editorial policy – then for both newspapers together.
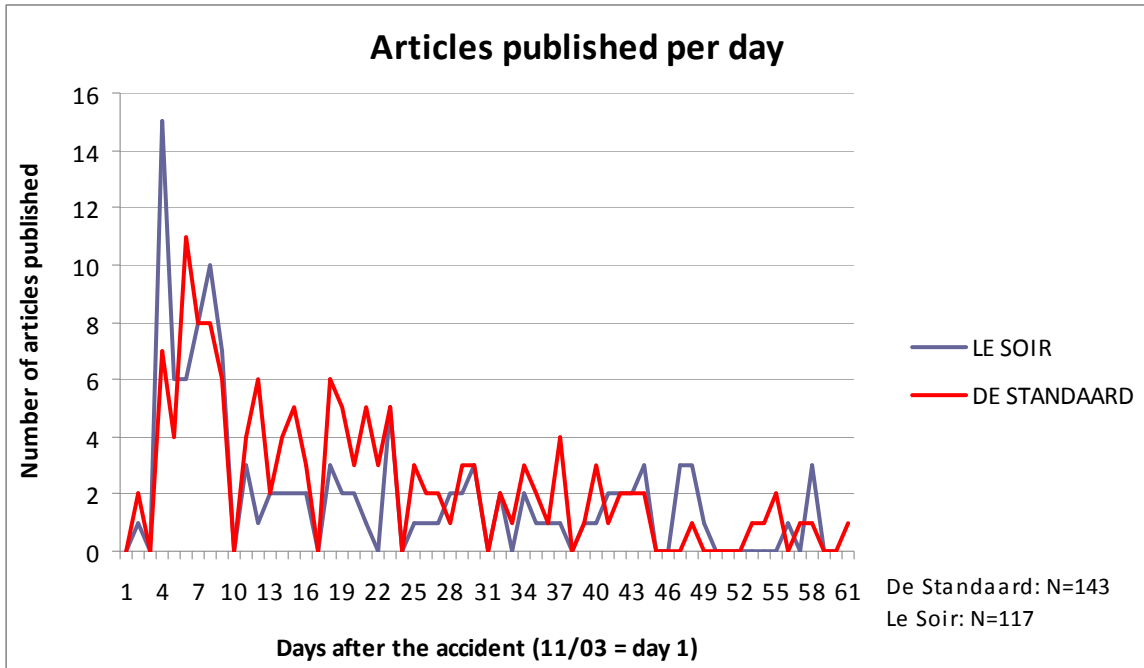
**Figure 6: Number of articles published in De Standaard and Le Soir per day after the accident**

Figure 6 shows that in general newspapers were somehow synchronized; still the differences are obvious. *De Standaard* published more articles related to the Fukushima nuclear accident than *Le Soir* except at the day 4. The rate of attention decay is obvious in both newspapers.
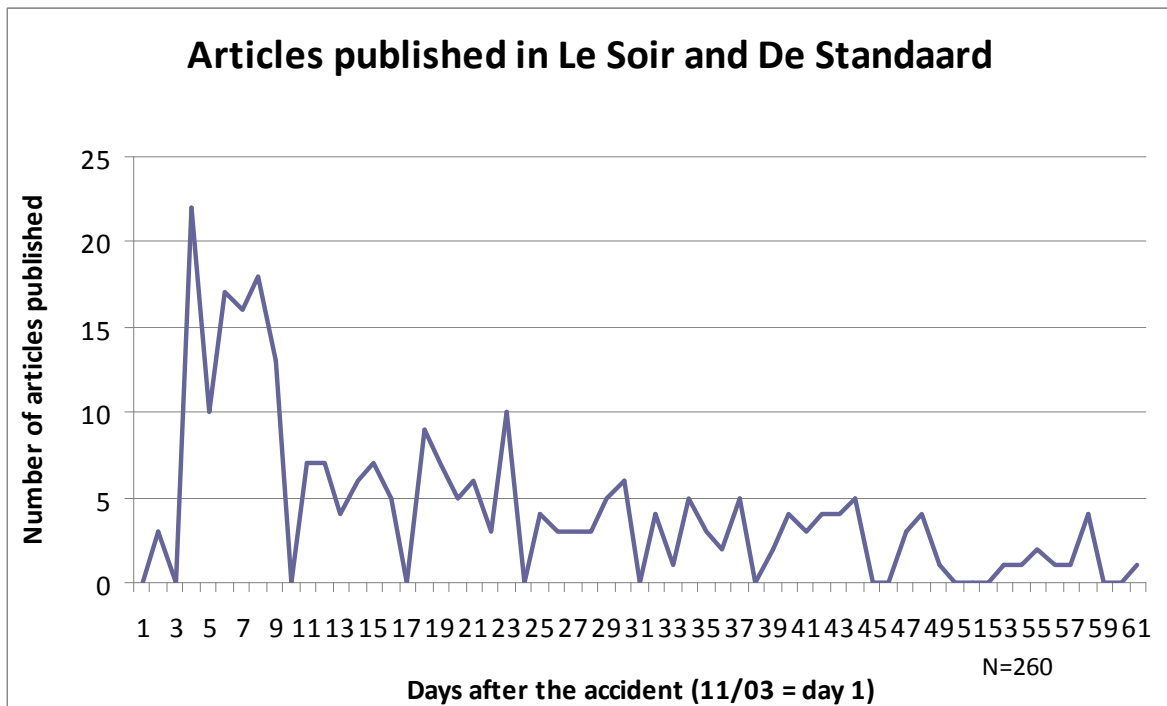


**Figure 7: Articles published in *Le Soir* and *De Standaard* per day**

The frequency of the published articles in the press was highest in the fourth day after the accident (see Figure 7). The drops to frequency zero correspond to Sundays, when neither *Le Soir*, nor *De Standaard* is published. The same drop occurred in the Easter Monday (the 46th day).

**Number of articles published per week**



N=260
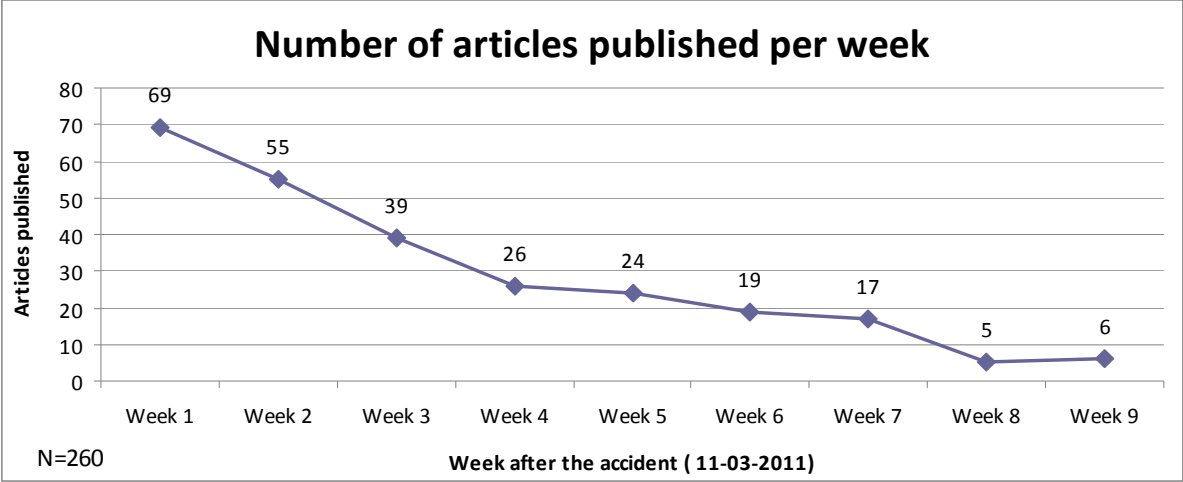
**Figure 8: Number of articles published per week in *De Standard* and *Le Soir***

To exclude the drops in media attention on Sundays and public holidays the frequency of published articles was calculated per week. Figure 8 clearly shows the explosion of media attention in the first week: the two newspapers published in total 69 articles, with 55 articles related to accident following in the second week. The rate of attention decayed to 6 articles in the ninth week after the accident in Fukushima.

# 8. Type of articles: subjective or objective

> News and features prevail in the reporting about nuclear accident. However, in the first week every fourth article is a subjective opinion.

Next, we analyzed the types of the article published after Fukushima nuclear accident.

The subjective types of the articles considered were the following: editorials, columns, letters and interview. Such articles were usually written by one person, presenting the author's opinion related to the nuclear accident.

Objective articles presented different views and facts about the nuclear accident. The journalist's or author's opinion was not presented in such articles. News and features were considered as objective types of media articles.

When there was doubt whether the article was subjective or objective the category 'other' or 'mixed' was selected.

The question in this part of the analysis was if the media stick to the facts and objective information in case of a nuclear accident or they publish mostly subjective opinions related to the nuclear accident.
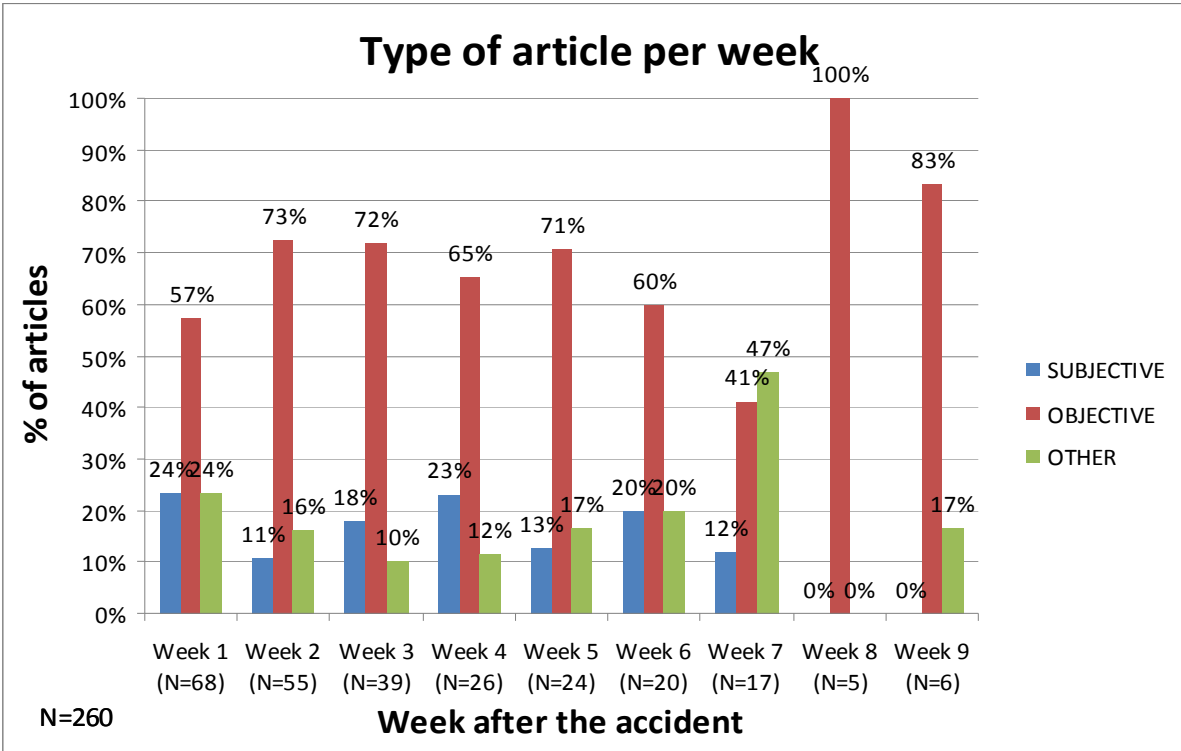


**Figure 9: Type of the article per week in both newspapers**

Figure 9 shows that the majority of articles related to the nuclear accident were objective of type. 41% up to 100% of the articles related to the accident and published in the weeks following the accident were news or features. Most of media texts were concise reports of a news item, usually few short paragraphs which stuck to the factual information or a summary of an event, e.g. information about an explosion at a nuclear reactor. Media also looked in-depth at what was going on behind the news. They tended to include a detailed description and the analysis of the nuclear accident and its consequences. They accompanied the information by an interview or quotes from various emergency actors, local population and victims. They published full-page articles, with photos and sometimes illustrations reporting from the field with all possible information sources included.

In the first seven weeks after the nuclear accident newspapers published from 12% to 24% subjective types of the articles per week. Most subjective articles were published in the first week, when every fourth article was either editorial, column, letter or an interview. The authors of this type of article published their viewpoint, which implied a critical analysis of the news item (subjective opinion supported by facts). The nuclear accident was often framed in its broader context, for instance the context of international information exchange in case of emergency, nuclear safety, energy needs or international (political) discussion on nuclear energy. The newspapers published also letters to the editor or newspaper, written by an individual from the general public or representing an organization, for instance Greenpeace.

The type of articles published in the seventh week after the accident is significantly different than in all other weeks. The highest frequency was of 'other' and 'mixed' articles (47%), followed by subjective ones (41%).

# 9. Presence of field reporting in nuclear emergency

> Almost every fourth newspaper article related to the accident was written in Japan.

In this part of the research we looked where were the journalists stationed when reporting about the nuclear accident and if nuclear emergency actors should take into account that the journalists will try to report also from the areas where protective actions were implemented (e.g. evacuation).

In the past nuclear emergency events the presence of the journalists in the emergency cone was significant and as news readers we were able to read the features from e.g. Chernobyl published in daily press. An interesting and noteworthy example is also the unusual event at the Slovenian NPP Krško (2008), where the ECURIE system was activated in European Union for the first time after the Chernobyl accident. "*The day after the event  approximately 50 media vans appeared in front of the NPP* " in order to report from the potentially affected area [15].

The lessons from the Fukushima accident show that emergency managers should be aware of the media pressure during the emergency.

The place of reporting was identified in our analysis by the place (city) published at the beginning of the article. For instance, when "Tokyo", "Fukushima" or another place in Japan (the dateline) is mentioned at the beginning of an article published during the days following the nuclear accident in the Fukushima nuclear power plant, we know that the reporter was reporting from the field, and that he is sent there for only a short period, not permanently. It is very prestigious for a newspaper to be able to say that they have a reporter abroad, in the area where the news is being made, and to be able to deliver personally gathered information and testimonies. When the dateline was not explicitly mentioned in the body of the article, we assumed that the report had been written in-office, this means in the newspaper's headquarters in Belgium.

In Figure 10 and Figure 11, showing the dateline of the articles, we can notice that the majority of the articles, around 76%, were written in the news redaction. Nevertheless, almost one fifth of all the articles were written by a reporter who was located in Japan at the moment of reporting. There is a notable difference between the numbers of field reports that were published in *De Standaard* compared to *Le Soir* (Figure 10). The frequency of articles written by a journalist located in Japan, be it in Tokyo or the danger zone around the nuclear power plant itself, is considerably larger in *De Standaard* than in *Le Soir*.
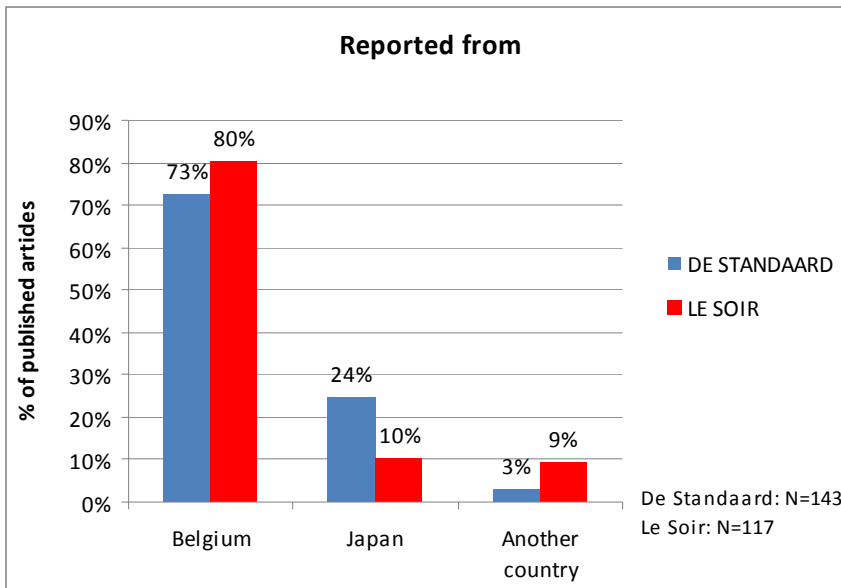
**Figure 10: Presence of the field reporting in *De Standaard* and *Le Soir***
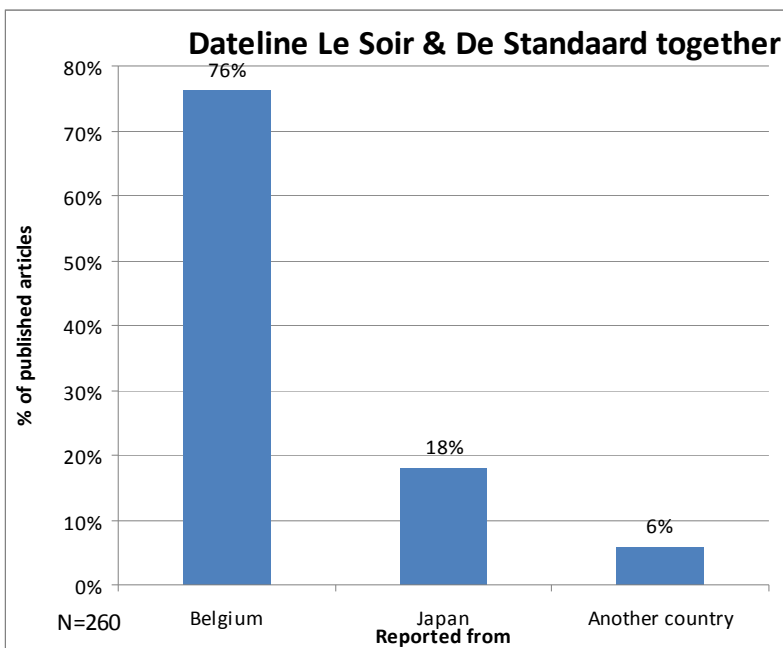


**Figure 11: Presence of the field reporting in the two newspapers together**

When the dateline is another country, different from Japan, it is mostly the case that the report originated from journalists that are operating from abroad on a permanent basis of correspondence. Reporting from journalists in Austria, concerning the IAEA, which has its headquarters in Vienna, is a good example of this category of articles with a dateline in another country.

# 10. The inter-media dependency

Long term media reporting about nuclear emergency depends on the press agencies.

We investigated whether or not the article was entirely or partially taken from a press agency or it was written by the journalist from *De Standaard* or *Le Soir* him/herself. Press agencies such as AP, AFP or Reuters are very important sources of information for journalists for factual news reports. This is both because of the easy accessibility of information, as well as its reliability when it comes to facts and figures. In this section we explored how did the media report: did they send their journalist to report about the nuclear accident and its consequences or did they refer to the net of press agencies worldwide?
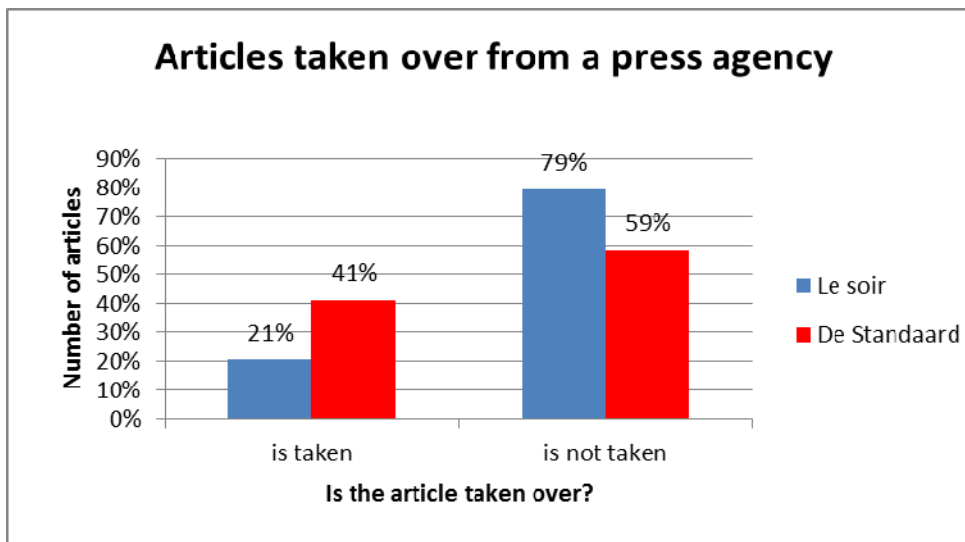


**Figure 12: Frequencies of articles taken over from press agencies**

Figure 13 illustrates the relative frequencies of articles taken over from various press agencies by the journalists of the two Belgian newspapers. In total, when calculated in a cumulative way, 32% of all articles in our sample, both newspapers taken together, were derived from press agencies. That shows that two thirds of all articles are written by the journalists of the newspaper itself or by correspondents on a freelance basis. If we analyze this variable more in detail and compare the practice of the two newspapers, it can be concluded that *De Standaard* publishes a lot more articles produced by press agencies than *Le Soir*.

Next, we did an analysis over time, to highlight how this 'dependency on press agencies' evolves when time goes by and a topic disappears from the news agenda or simply becomes less interesting.

**% published articles taken from a press agency per week**

Y-axis: % of articles that are taken over (0% – 70%)

X-axis: Week after the accident ( 11-03-2011 )

Data points: Week 1: 29%, Week 2: 29%, Week 3: 33%, Week 4: 31%, Week 5: 33%, Week 6: 40%, Week 7: 24%, Week 8: 60%, Week 9: 50%

N published articles =260
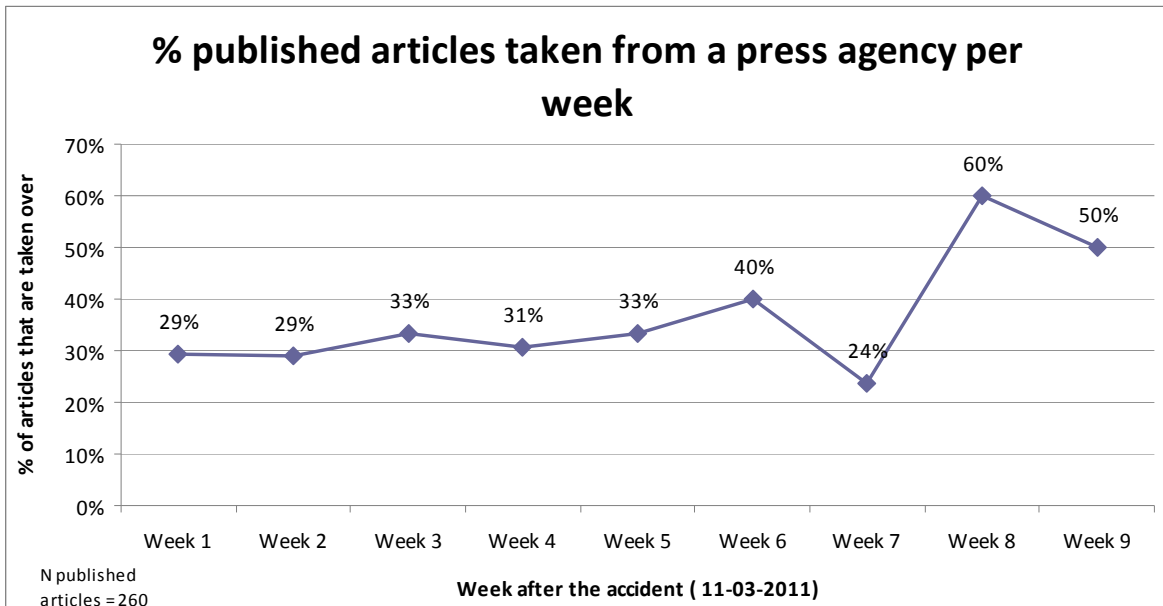
**Figure 13: Frequency of articles taken from press agencies for the two newspapers (cumulated) and per week.**

Figure 13 shows a remarkable development. In the beginning, around 30% of all articles are taken from news or press agencies. Later on, at the end of the time period analyzed, this number increases to 60 or 50 percent.

One exception is week 7 – of the 25th anniversary of Chernobyl-, in which more articles concerning this 'celebration' were written by journalists of the newspaper itself or the correspondents abroad, than were taken from news agencies. In this same period there is also an increase in the percentage of articles addressing the emergency management phase 'Recovery and Evaluation' (see Figure 15). In week 7, newspapers took the time to write field reports or subjective features including more than just news and factual information, because of which they had to rely on their own journalists and not on press agencies.

# 11. The nuclear emergency management phase covered by the media

> The emergency management phase most covered by the media in the first weeks after the accident is crisis response; long term consequences are hardly addressed.

Nuclear emergency management is nowadays often presented as a cycle consisting of risk assessment, emergency planning and in the case of an accident: response, recovery and evaluation, as presented in Figure 14 below. In this part of the research we focused on the media attention (i.e. the number of articles) on the different parts of the emergency management cycle.
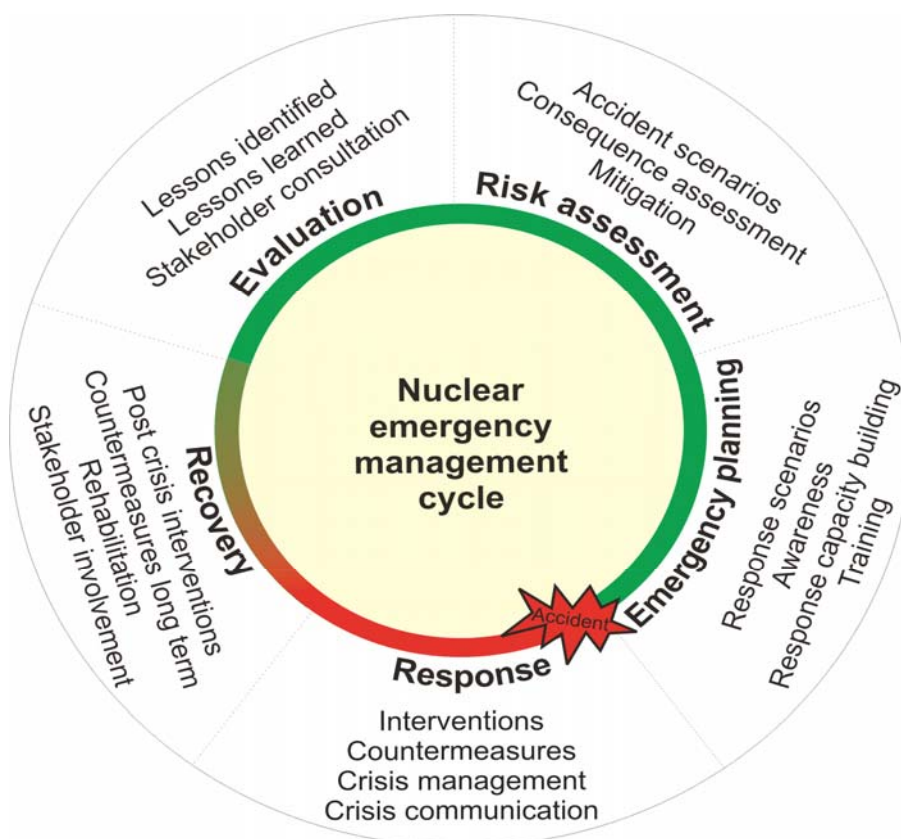


**Figure 14: Nuclear emergency management cycle adopted from [16]**

This variable was included to identify which of these phases of the so-called cycle of emergency management was mainly addressed by the published articles during the first two months after the nuclear accident in Japan. The results were compared over time, e.g. per week, which allowed to follow the evolution of the media reporting.

'Preparedness' was seen as a collection of topics addressing emergency planning. In the recent debate surrounding nuclear energy and the safety of nuclear power plants certain issues are very much present; such as issues are the stress tests on nuclear installations and the pre-distribution of iodine tablets.

'Crisis Response', which comprises the bulk of the articles, is more related to immediate happenings, actions and decisions in the aftermath of the accident. Examples include communication about the INES-scale, food restrictions, costs, number of people being affected and evacuated, as well as on-site actions undertaken at the nuclear power plant, e.g. in order to regain control over the situation.

The last phase, 'Recovery and Evaluation' is more related to long term recovery actions and evaluations like waste management or the general evaluation of the future of nuclear energy after this disaster. This also long term societal, political and economic effects in general.
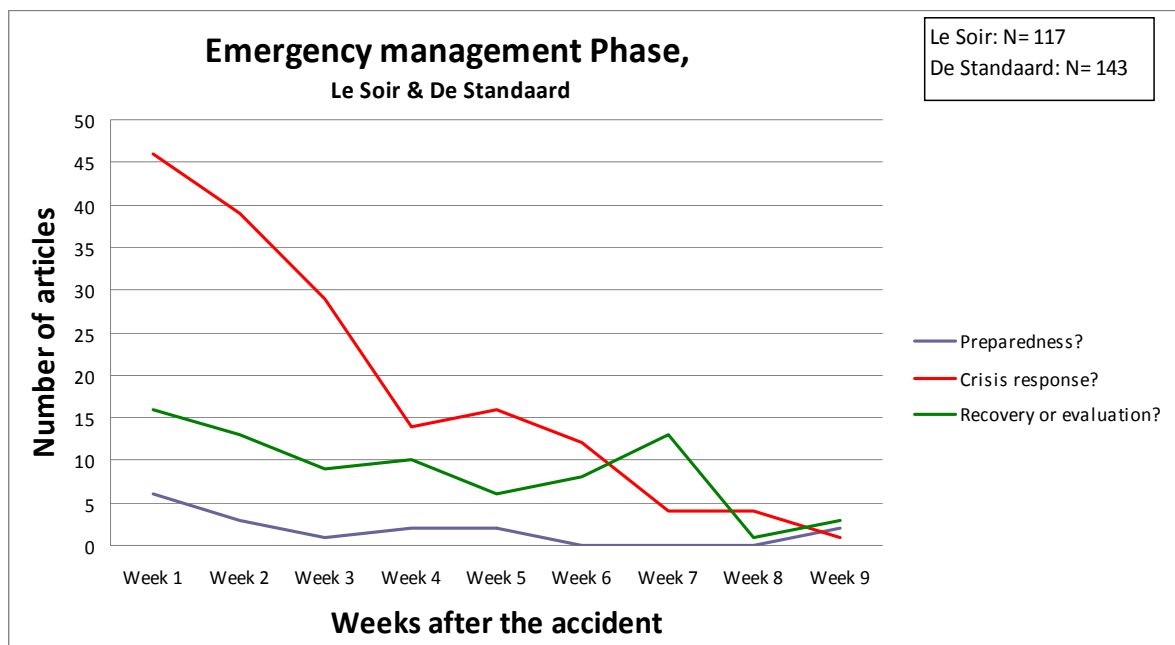


**Figure 15: Emergency management phase addressed in the articles per week**

Figure 15 shows, as might be expected, that in the beginning of the nuclear accident articles that address 'Crisis Response' make out the majority. This trend continues up until the 6th week after the accident. In the first weeks we also see the highest number of articles that discuss 'Preparedness', but this is because we also included articles that reported on the probability of an earthquake and tsunami as severe as the one who hit Japan on the 11th of March and whether the nuclear power plants are able to resist these forces of nature. These articles, addressing the natural disaster rather than the (then still possible) nuclear disaster, disappeared quite soon when the situation developed. In the 7th week, in which the international community "celebrated" the 25th anniversary of the nuclear accident in Chernobyl (1986) we see that the articles addressing the recovery and evaluation issues peak above the 'Crisis Response' articles for the first time. Many articles during that period reported about the current situation in Ukraine, mentioning Fukushima and comparing the two accidents at the same time.

## 12.     Importance of the nuclear accident for the article

> The nuclear accident in Fukushima as such was of secondary importance in the articles. The consequences of the accident were more reported upon in the media, than the accident itself.

In this part of the analysis, the importance of the accident in Fukushima in the article was identified. The accident itself could be of primary or secondary importance. Determining whether the accident was of primary or secondary importance in an article, helps highlighting whether the media agenda has developed from the reporting about the accident to some other agenda.

We looked for every article whether the nuclear accident was of primary or secondary importance for the content of the report. With this variable we coded whether the origin of the article was the nuclear accident in Fukushima or whether the accident was not central in the article. An article where the accident was of primary importance was written in response to the nuclear accident itself, for instance it reported about protective measures, evacuation of people, technical aspects and actions performed by the emergency workers on the plant etc. An article in which the accident in Fukushima is of secondary importance, was not focused on the accident itself, but on its consequences, for instance, it reported on the decision in Europe to conduct stress tests or the protest in Germany against nuclear power plants.
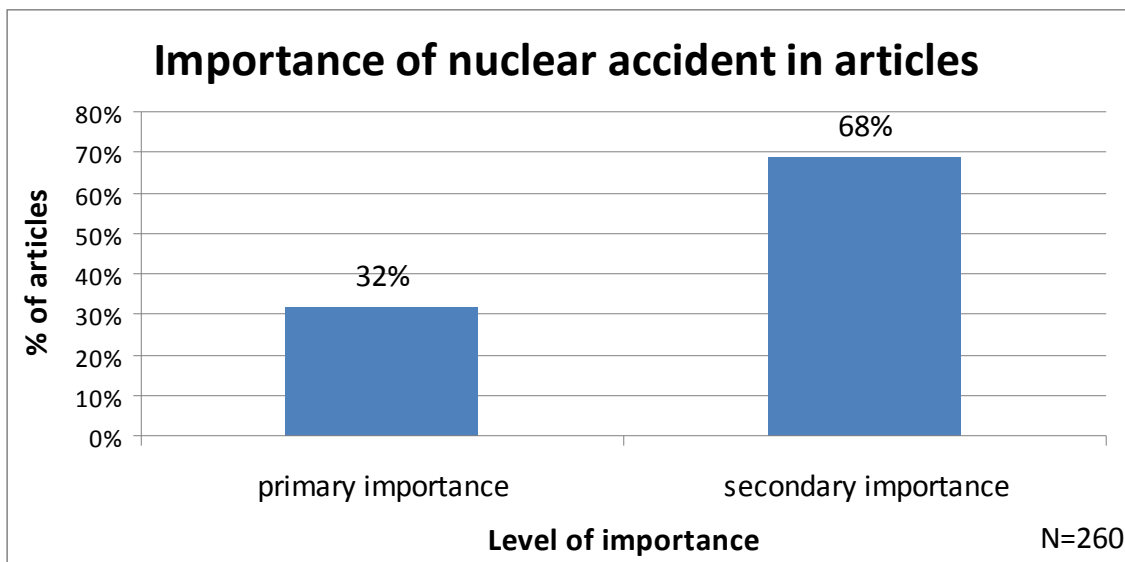


**Figure 16: Importance of the nuclear accident for media reporting**

Surprisingly, in more than two thirds of the articles containing the words Fukushima and nuclear the nuclear accident was of secondary importance. 68% of the articles were only indirectly related to the accident. For instance, they were discussing whether the accident will affect the political decisions related to the nuclear energy programs. 32% of the articles were reporting

about events directly related to the accident, for instance how many people were evacuated or what actions were taken at the NPP (see Figure 16).
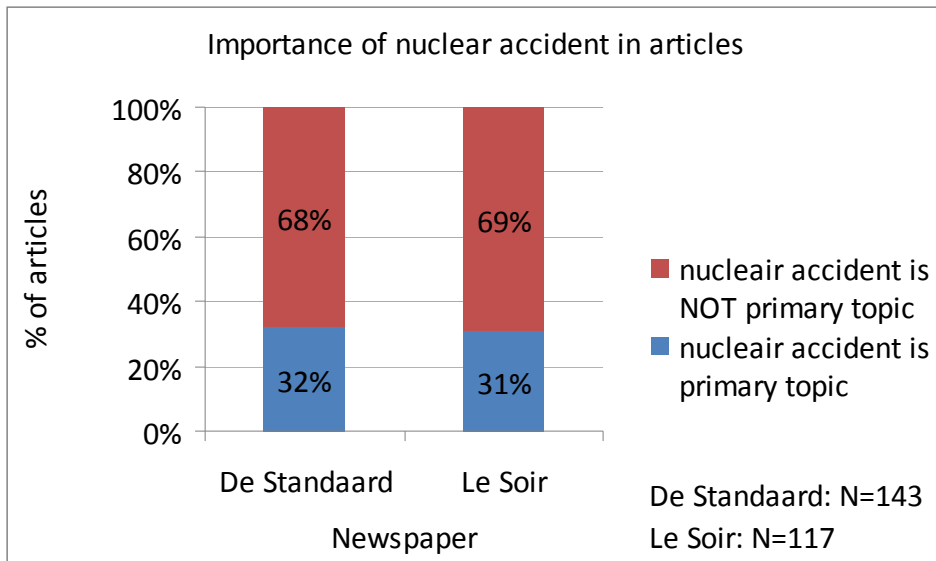


**Figure 17: Importance of the nuclear accident in the article**

Figure 17 shows that both newspapers had the same amount of articles where the nuclear accident was of primary importance. If we look at the importance of the nuclear accident over time, presented in Figure 18 we see that the nuclear accident itself is mostly of secondary importance. This also counts for the first week, because the focus was then also a lot more on the natural disaster of the tsunami and the earthquake that hit Japan. With time, the accident became less and less of primary importance.
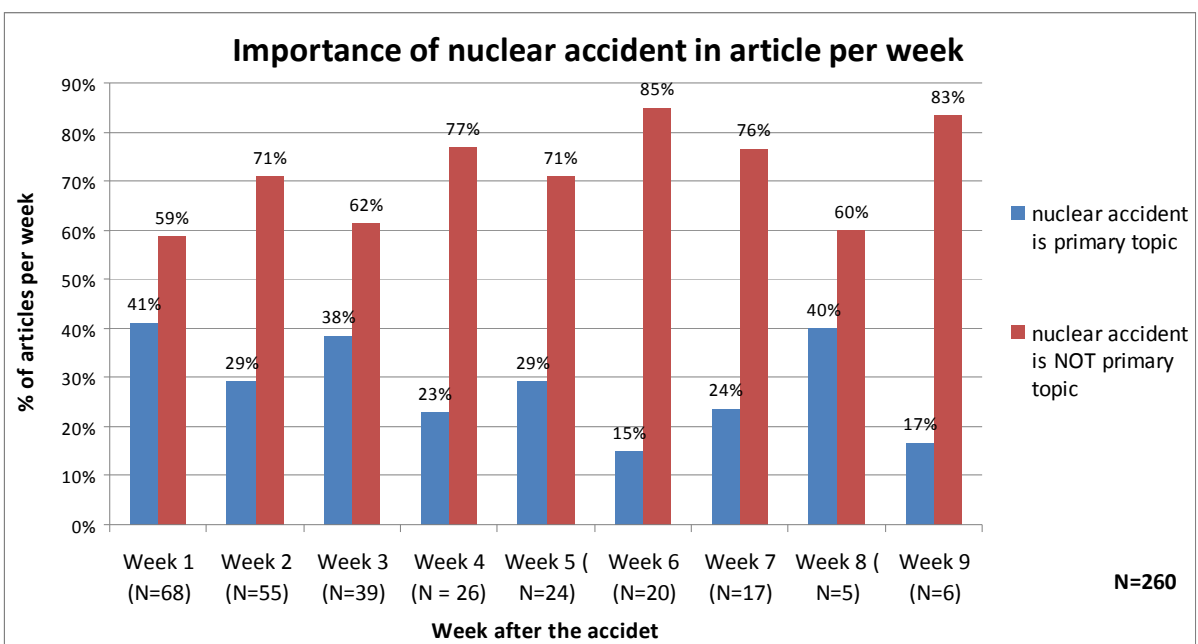
**Figure 18: Importance of the nuclear accident for the article per week**

# 13. Focus of the articles

> Media focus their attention to many topics at the time of the event, but in time they reduce their attention to few topics only. Crisis management receives the highest media attention.

The analysis of the main focus of the articles allowed identifying the main challenges of media communication in case of a nuclear accident and the focal point of the media. We investigated what media wrote about related to the nuclear accident, since the media may address an event from different perspectives. The codes used to describe the focus of the articles are summarised in the following.

The category 'Technical aspects' contained all articles that dealt with the technical aspects of the accident, e.g. technical data about the state of the reactors or the spent fuel ponds. All articles about emergency management and protective actions for people, the food chain or the environment were categorized as 'Crisis management'.

'Affected inhabitants' contained all articles that described the situation of people that were victims of the accident. 'International reaction' presented all articles that described an international reaction on the Fukushima nuclear disaster.

Articles of the 'Safety/Risk aspect' described the possibility of an accident, the probabilistic estimations of accidents in NPP's or subjects related to stress tests.

'Information exchange' contained all articles that described the problems with the information exchange.

The category 'Future of nuclear energy' contained all articles reporting about decisions or discussions of (international) governments towards the choice of nuclear energy in the future.

'Energy consumption or supply' addressed the articles about the energy consumption and/or energy supply, including discussions about the policy of electricity suppliers or operators.

The articles that discussed whether there is someone to blame for the accident or its consequences were put into category 'Blame'.

'Economic impact' contained all the articles that discussed the effects of the Fukushima accident on the (international) economy.
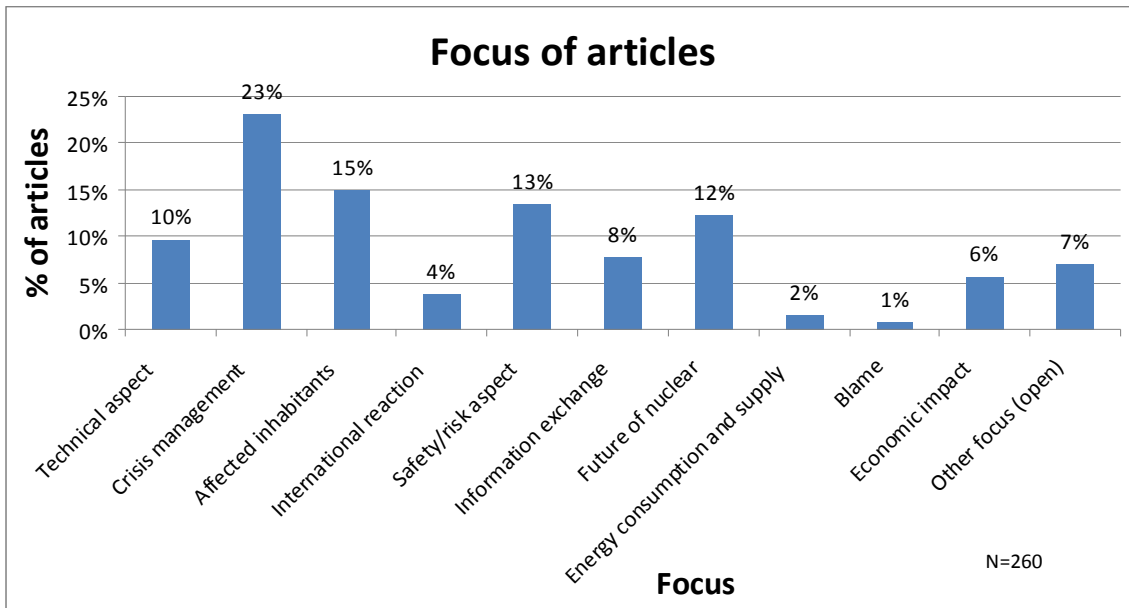
**Figure 19: Focus of articles**

If we combine the results of both newspapers we can conclude that the main focal point or the articles was the crisis management of the Fukushima nuclear accident (see Figure 19).

23% of the newspaper articles focused their attention on the emergency management and the protective actions towards people, food chain or environment. 15% of the articles described the situation of people that were victims of the nuclear accident. Interestingly, there were only a few articles that described 'Blame' 1%), 'international reaction' (4%) and 'Energy consumption and supply' (2%).

Figure 20 depicts the changes in media attention towards different subjects through time in the weeks after the accident. In the first weeks media focused on many different topics, from technical aspects, crisis management, safety risk aspects to energy consumption and supply. Eight weeks after, the media focused their attention to a limited number of topics. In the ninth week after the accident half of the articles focused on the future of nuclear energy, 33% on safety and risk aspects and 17% on crisis management.
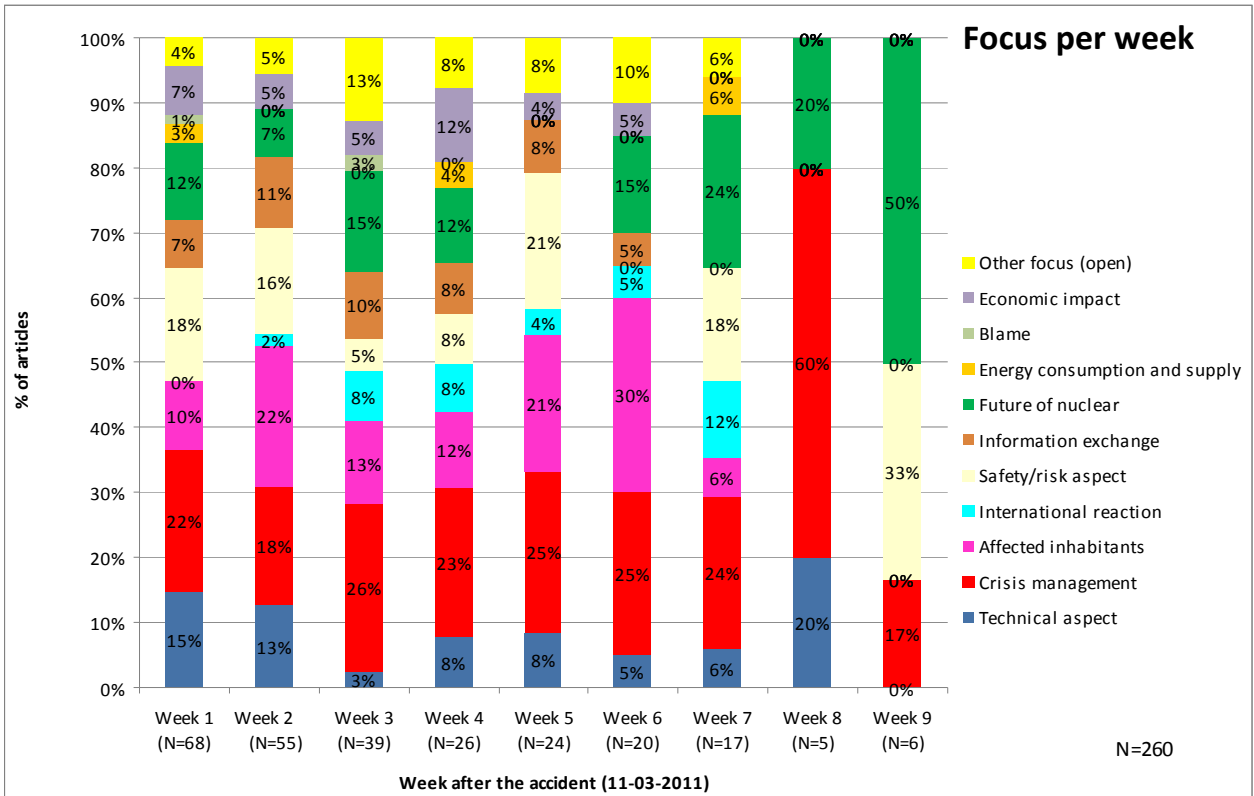
**Figure 20: Diversity of focuses per week**

The focus of the articles published in the two different newspapers was similar. Both newspapers had 'Crisis management' as their focal topic. 21% of the articles in *De Standaard* and 26% of articles in *Le Soir* were attentive towards this topic. *Le Soir* published significantly more articles with safety/risk aspect as a focal point of the article than *De Standaard*. The latter newspaper published more articles about the economic impact of the Fukushima accident, affected inhabitants and about the technical aspects of the nuclear industry.
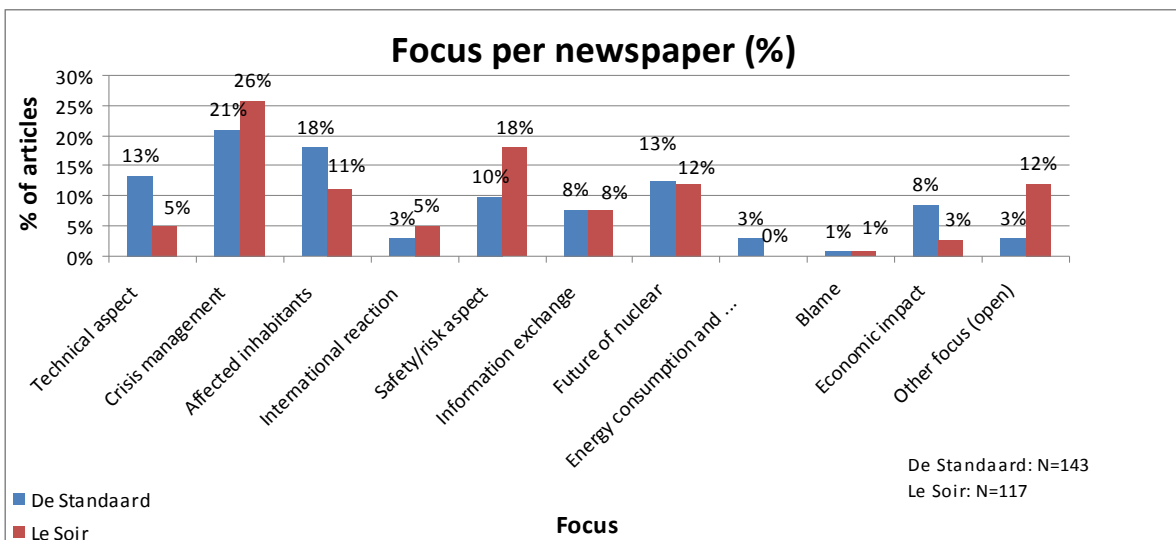


**Figure 21: Main focus per newspaper**

# 14. Major topic and content of the article

> Environmental contamination was the most reported topic, followed by emergency management issues. The topic of future of nuclear energy was also highly present in the media.

In order to identify the media content related to the nuclear accident, the analysis of the media texts was performed on two levels.

The first level was the identification of the major topic in each article. The major topic of the article was usually discussed in the first two paragraphs of the article and/or the title of the article. We looked if the major topic is related to energy, health, food, nuclear technology, radiation effects, protective actions, tsunami or earthquake, nuclear waste, etc. If the article dealt with two or more topics, but one was clearly dominant, the article was classified according to the dominant topic.

A second level of analysis was the in-depth analysis of the article content related to the major topic. The possible contents in the major topics were the following:

- **Energy:** energy supply (e.g. shortage); future of nuclear energy (overview of the nuclear issues in the past and the present - influencing the future of nuclear); energy production; climate change; waste (integrated in a broader debate about nuclear energy); another issue related to energy.

- **Health:** cancer; next generations; other diseases than cancer; psychological consequences; another issue related to health.

- **Protective actions related to food (related to radiation)**: drinking water; farming products; sea food, including fish; food import /export; restrictions on food products (consumption, producing, etc.); food control; another issue related to food.

- **Nuclear technologies:** technical aspects of reactors Japan; technical aspects other reactors (outside Japan); stress tests for nuclear installations; new types of nuclear reactors (Gen III or IV mentioned by name); other nuclear technology (e.g. research reactor, use of nuclear technology).

- **Accident effects other than health & food:** contamination of the land; contamination of the sea; contamination of inhabited area (e.g. houses, playground); contamination of goods from Japan (e.g. products, clothes, luggage); other effects e.g. radioactivity, material damage, disturbance of daily life (schools, transport) and compensation; radioactivity in the air (cloud); economic impact.

- **Other protective actions (not food):** decontamination; monitoring the environment; evacuation of people; sheltering of people; iodine tablets (stable iodine); measurement of contamination of people (internal or external).

- **Tsunami or earthquake:** consequences; probability; specifics (general things).

- **Nuclear/radioactive waste (the word "waste" specifically mentioned):** management of Fukushima waste (other than sea water); management of nuclear waste (general):

sitting, storage (interim/temporary), disposal (permanent), spent fuel; amount (expressed with the measurement unit, e.g. m³, liters, etc.)

➢ **Emergency management issues:** public information (e.g. information system, informing public, INES scale, censorship …); emergency workers + actions: directly involved at the plant  (Fukushima 50, kamikaze …), actions on the plant (cooling, extinguishing the fire, explosions; other emergency actors (e. g. military, fire brigade, police, civil protections, volunteers… ) + actions on the plant (cooling, extinguishing the fire, explosions.

➢ **Doubt category:** In case there were serious doubts about which main topic to assign, the doubt variable was chosen.

Table 2 presents the frequencies of the identified topics and the article's content. Note that for each article only one major topic could be assigned, with one or more (sub)contents inside of the major topic.

**Table 2: Major topic and content of the article**

| Major topic | Number of articles in major topic* | % of all articles in major topic | Content within the topic | Number of articles with this content in the topic |
|---|---|---|---|---|
| **Energy** | 43 | 17% | energy supply | 10 |
| | | | future of nuclear energy | 40 |
| | | | energy production | 15 |
| | | | climate change | 4 |
| | | | waste | 4 |
| | | | about another issue related to energy | 8 |
| **Health** | 12 | 5% | cancer | 4 |
| | | | next generations | 2 |
| | | | other diseases than cancer | 6 |
| | | | psychological consequences | 5 |
| | | | about another issue related to health | 7 |
| **Protective actions related to food** | 11 | 4% | drinking water | 4 |
| | | | farming products | 2 |
| | | | sea food | 3 |
| | | | food import /export | 5 |
| | | | restrictions on food products | 3 |
| | | | food control | 4 |
| | | | another issue related to food | 2 |
| **Nuclear technologies** | 21 | 8% | technical aspects of reactors in Japan | 18 |
| | | | technical aspects other reactors (outside Japan) | 6 |
| | | | stress tests for nuclear installations | 4 |
| | | | new types of nuclear reactors | 0 |
| | | | other nuclear technology | 0 |
| **Accident effects other than health & food** | 63 | 24% | contamination of the land | 13 |
| | | | contamination of the sea | 11 |
| | | | contamination of inhabited area | 14 |
| | | | contamination of goods from Japan | 7 |

| Major topic | Number of articles in major topic* | % of all articles in major topic | Content within the topic | Number of articles with this content in the topic |
|---|---|---|---|---|
| | | | other effects, material damage, disturbance of daily life (schools, transport) and compensation | 30 |
| | | | radioactivity in air (cloud) | 9 |
| | | | economic impact | 12 |
| Other protective actions (not food) | 14 | 5% | decontamination | 1 |
| | | | monitoring the environment | 4 |
| | | | evacuation of people | 11 |
| | | | sheltering of people | 3 |
| | | | iodine tablets (stable iodine) | 3 |
| | | | measurement of contamination of people (internal or external) | 2 |
| Tsunami or earthquake | 20 | 8% | consequences | 19 |
| | | | probability | 3 |
| | | | specifics (general things) | 2 |
| Nuclear/radioactive waste | 5 | 2% | management of Fukushima waste (other than sea water), | 3 |
| | | | management of nuclear waste (general) | 3 |
| | | | amount | 1 |
| Emergency management issues | 56 | 22% | public information | 32 |
| | | | emergency workers + actions: direct involved at the plant | 17 |
| | | | other emergency actors | 14 |

*15 articles (6%) were identified as belonging to the "doubt" category.


The *accident affects other than food and health* was the most reported topic related to the nuclear accident in the media. Every fourth article was mainly addressing this topic. The *emergency management issues* were also extensively covered in the media. 22% of the articles addressed the public information and the emergency actors or their actions. The third most covered topic in the media was the *energy* (17%). About 8% of articles were dedicated to the topics *tsunami and earthquake* and *nuclear technology*. The topics *other protective actions* and

*health* were reported in 5% of the articles and the least reported topic was nuclear/radioactive waste, covered in 2% of the articles.
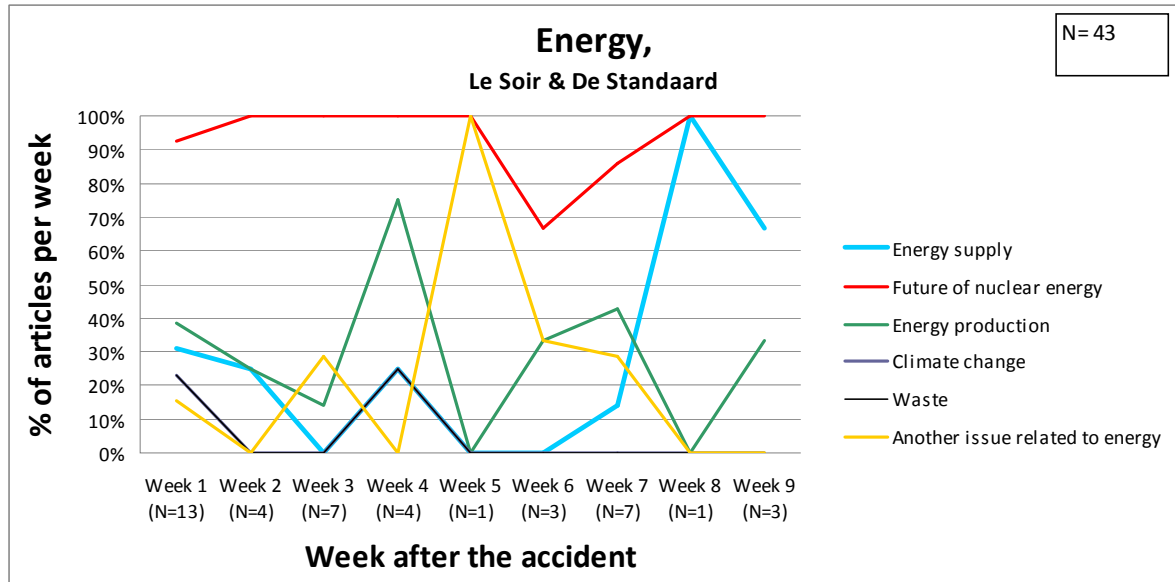


**Figure 22: Content of the articles related to energy**

In the two months after the nuclear accident in Fukushima, 43 articles having energy as the main topic were published in the two newspapers. Most of these articles addressed the future of nuclear energy. Almost every article in this category gave an overview of the nuclear issues in the past and the present that can influence the future of nuclear.

The future of nuclear energy was the main content in the articles related to nuclear in almost all weeks of our analysis. The energy supply and energy production were also important topics in the articles related to energy. Especially in the later weeks, the energy supply became an important topic in the articles. The least reported content was nuclear waste integrated in a broader debate about nuclear energy (see Figure 22).
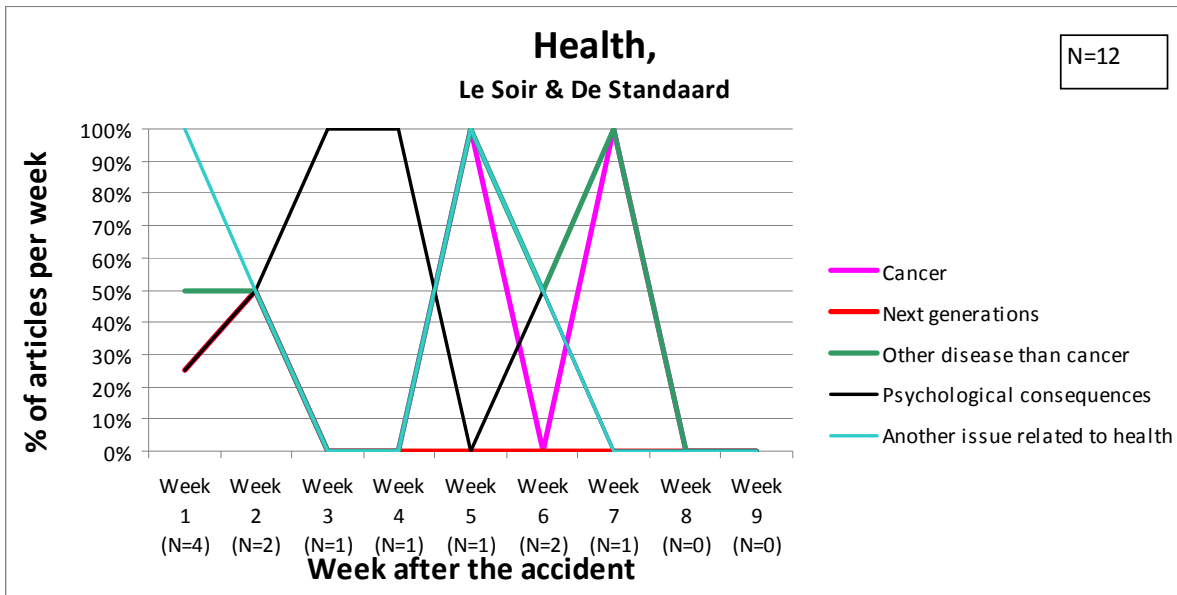
**Figure 23: Content of the articles related to health**

There were 12 articles mainly related to health issues published in the two months reporting about the nuclear accident. It is interesting that the psychological consequences of the accident were revealed as an important topic in the media agenda. In first five weeks every article related to health issues also discussed the psychological consequences. The cancer was discussed in the fifth week and in the seventh week – this was in the period of the Chernobyl anniversary (see Figure 23).
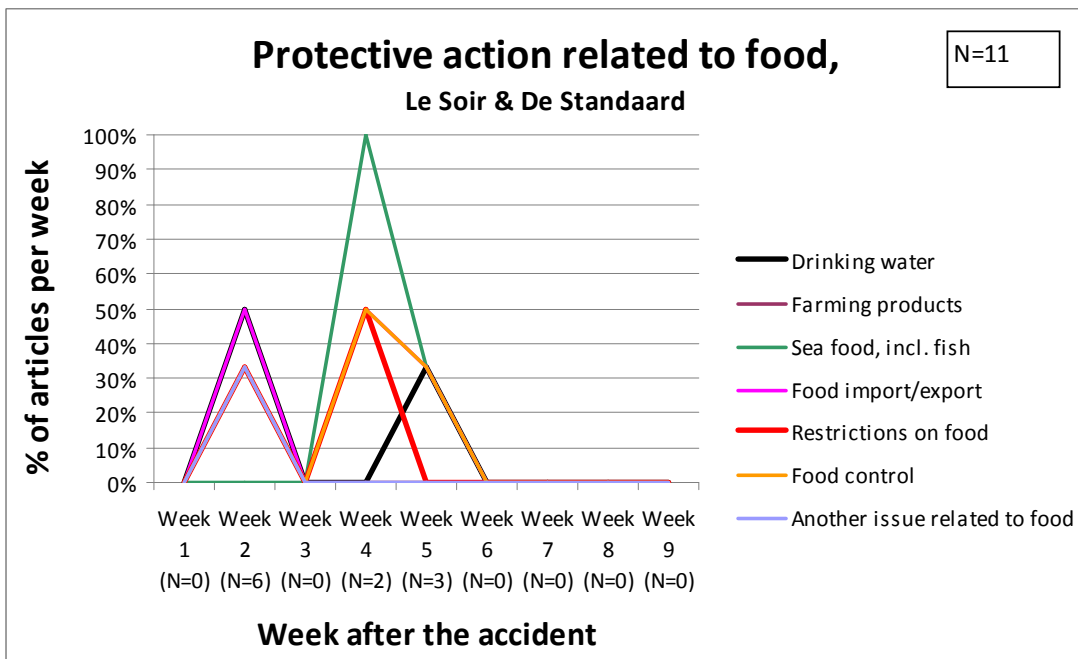


**Figure 24: Content of the articles related to protective actions related to food**

The protective actions for the food chain applied after the Fukushima nuclear accident were not among the heavily reported topics in media. From Figure 24 we can see that the sea food was in this category the most discussed topic in the fourth and fifth week after the accident. In the first week, the food import and export was the main content of the articles. It is interesting that six weeks after the accident, the media didn't discuss the protective actions related to food any more (see Figure 24).
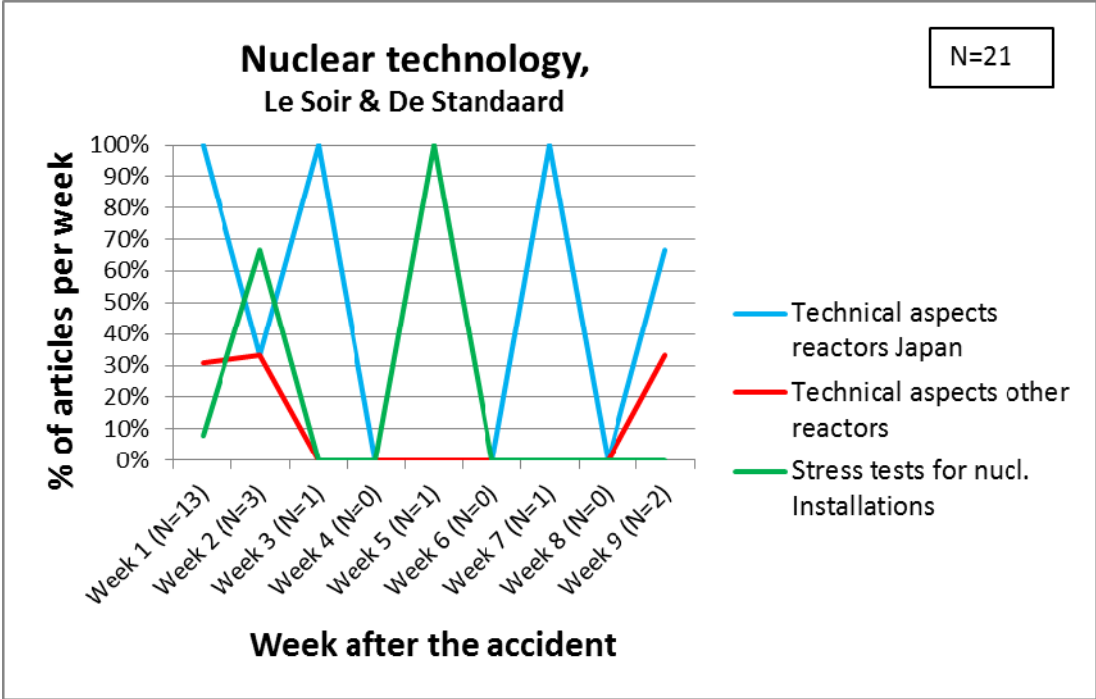


**Figure 25: Content of the articles related to nuclear technology**

In the 21 articled in which the main topic was nuclear technologies, we can notice that a technical discussion took place in the first two weeks, where reactors from Japan were compared with other reactors and stress tests were mentioned already in the second week. In the later weeks there is mostly one article with nuclear technology as the main content.
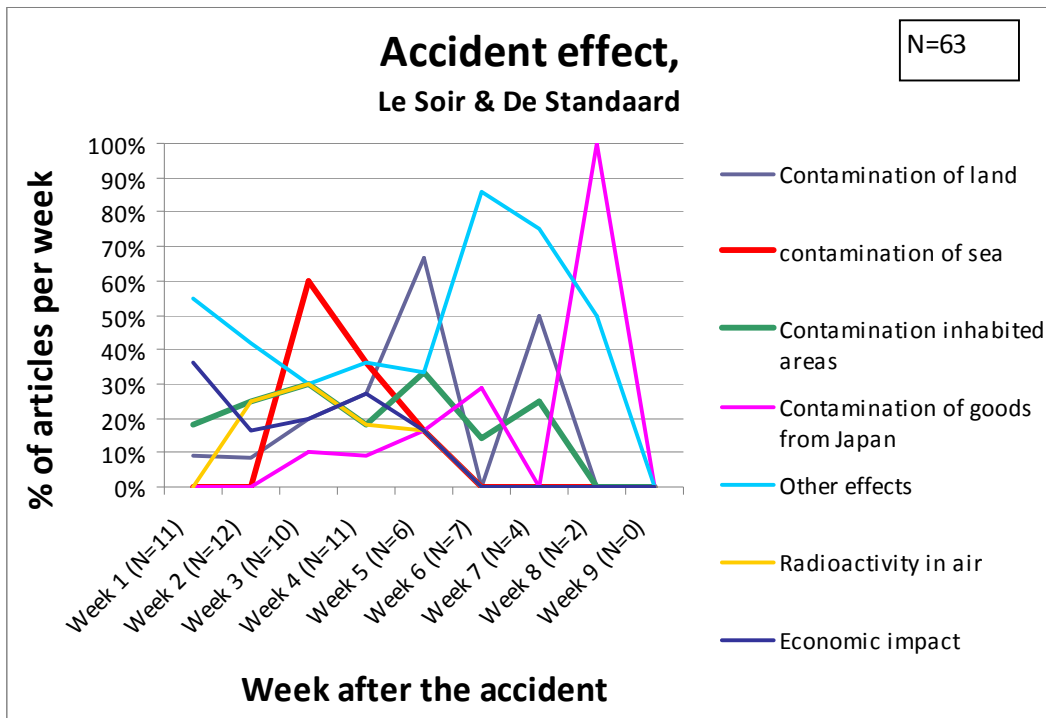
**Figure 26: Content of the articles related to accident effects**

As expected, accident effects were the most often content in the media articles. The articles discussed diverse related issues, from the economic impact to the contamination of the sea or of goods from Japan. Contamination of inhabited areas is also revealed as a newsworthy topic in media throughout the entire period of our analysis (see Figure 26). The economic impact was discussed in the first weeks, but decreased in media attention later on.
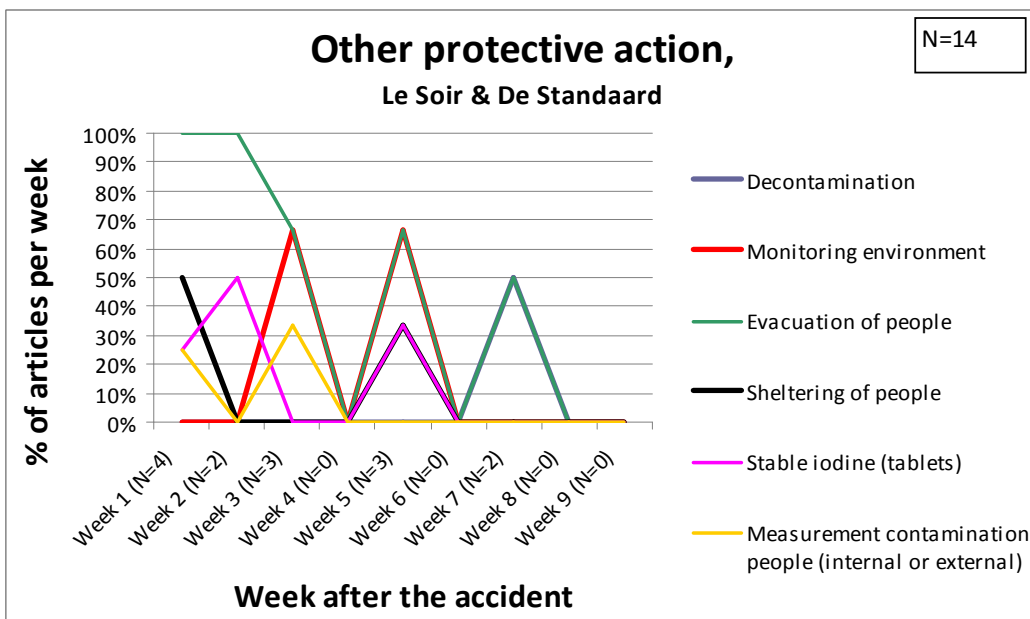


**Figure 27: Content of the articles related to other than food protective actions**

In the first week the most discussed topic in the articles related to other protective actions than actions for the food chain was the sheltering of people. This content changed to evacuation of people and to intake of stable iodine in the second week. In the third week, the evacuation of the people was still newsworthy, as well the monitoring of the environment. In general the content of the media news was related to evacuation of the people through all the period, which appeared every second week in the media agenda (see Figure 27).
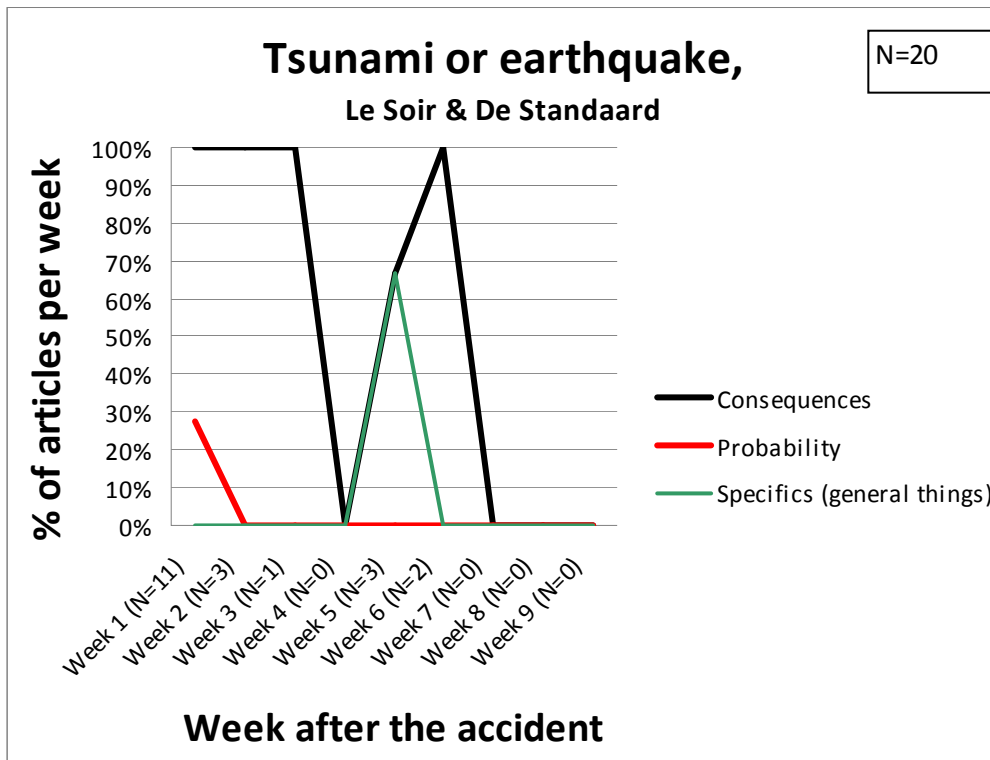


**Figure 28: Content of the articles related to tsunami or earthquake**

Although the nuclear accident was a result of tsunami and earthquake, the media published only 8% of the articles within the topic. In the first month every article discussing the tsunami or earthquake addressed the consequences. In the sixth week after the accident, the content of articles in this category became more descriptive in order to explain the specifics and the general things related to tsunami and earthquake. It is noteworthy that probabilities of tsunami or earthquake were addressed only in the first week after the accident; later on these aspects did not appear in the media content (see Figure 28).
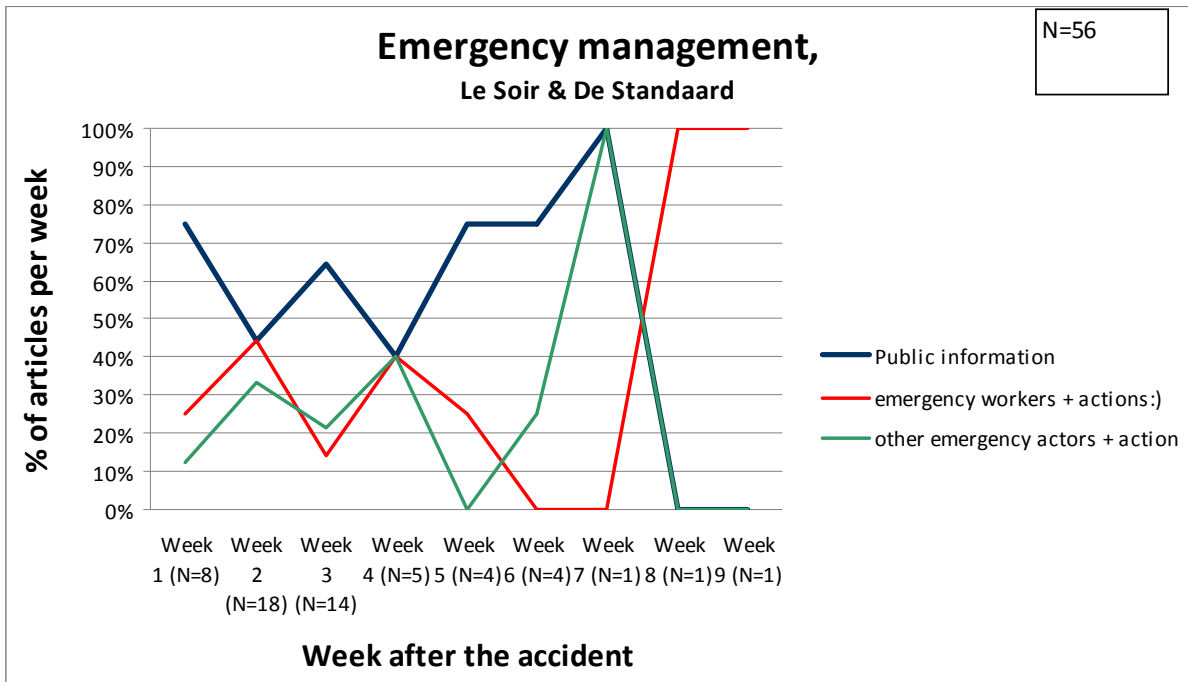
**Figure 29: Content of the articles related to emergency management**

Emergency management was revealed as one of the most important topics in media reporting. Most of the articles in this category discussed the public information. Public information appeared as a content of most articles related to emergency management in the first seven weeks after the accident. The articles reported about the information system, about how was the population informed, the level of the event on the INES scale and the censorship of public information (see Figure 29).

# 15. Conflict or disagreement in the media articles

Conflicts and disagreements were often reported in the media articles related to the nuclear accident. The most conflicting topic was public information.

In order to identify the existence of conflicts we investigated whether the media reported about conflicts or disagreements related to nuclear emergency. Conflict stories involve a conflict between people/groups/parties/countries. Such stories contained an explicit mention of the fact that there was disagreement about the issue (e.g. nuclear energy, emergency management, monitoring). This disagreement was expressed in words (e.g. contradictory positions or claims) or in deeds (e.g. protest, stigmatisation).
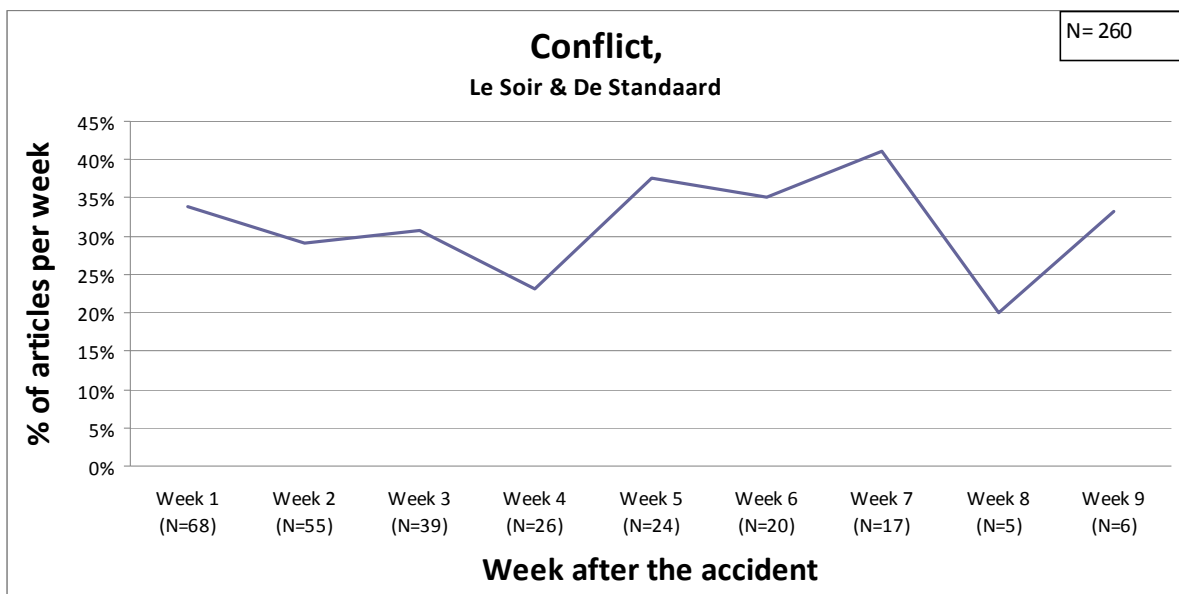


**Figure 30: Conflict or disagreement per week for both newspapers (cumulated).**

The results presented in Figure 30 show that the amount of articles reporting on conflict issues has an erratic course: it fluctuated in the weeks after the accident between 20% and 41%. At some points there were more articles expressing the conflict than at others. One remarkable peak occurs in week 7, again the same week in which the accident in Chernobyl was remembered all over the world. More than 40% of the articles published in this week contained a conflict or disagreement.
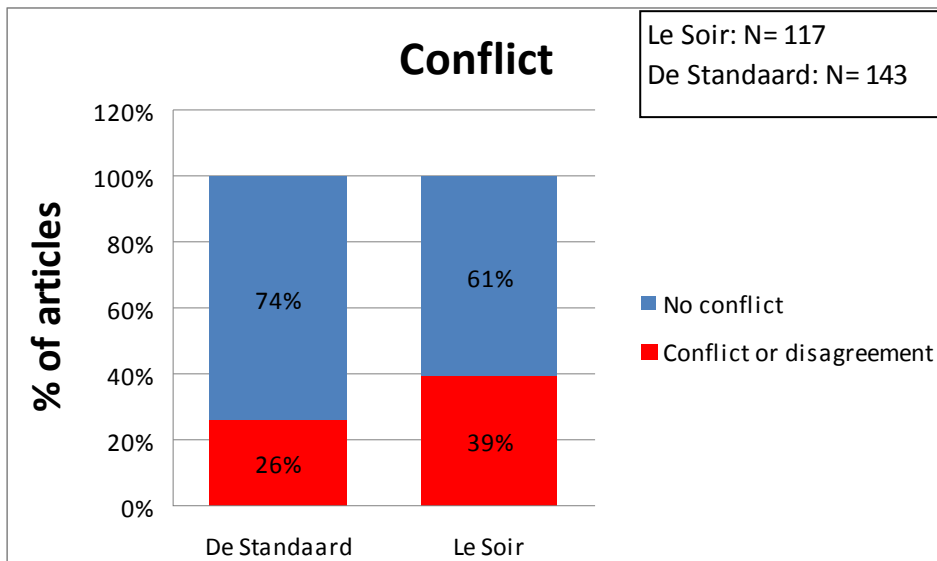
**Figure 31: Conflict in *Le Soir* and conflict in *De Standaard***

In Figure 31 we see the overall relative frequencies of articles reporting "conflict" or "no conflict" for both newspapers, compared. The differences are remarkable, in the sense that *De Standaard* published 13% less articles that indicated a conflict or disagreement between two or more parties.

### 15.1. Conflict per main issue of the articles

The most conflicting issue in the newspapers articles addressed the energy. The articles with the highest rate of conflicts (56%) were discussing energy supply (e.g. shortage), the future of nuclear energy, the energy production, the climate change or the waste (integrated in a broader debate about nuclear energy). Conflict was also present in the articles related to emergency management, 41% of the articles discussing the emergency management, reported about a conflict.

During the long crisis at the Fukushima plants, many conflicting issues in emergency management were pointed out by the international community:

a) The INES grading of the accident. Japanese officials initially assessed the accident as Level 4 on the International nuclear event scale (INES) despite the views of other international agencies and experts that it should be higher. The level was successively raised to 5 and eventually to 7, the maximum scale value.

b) Risk communication. The Japanese government and TEPCO have been criticized for poor communication with the public.

c) The cleanup efforts. The Japanese authorities have been criticized for "improvised" cleanup efforts. Experts have said that a workforce in the hundreds or even thousands would take years or decades to clean up the area. On 20 March, the Chief Cabinet Secretary Yukio Edano announced that the plant would be decommissioned once the crisis was over.
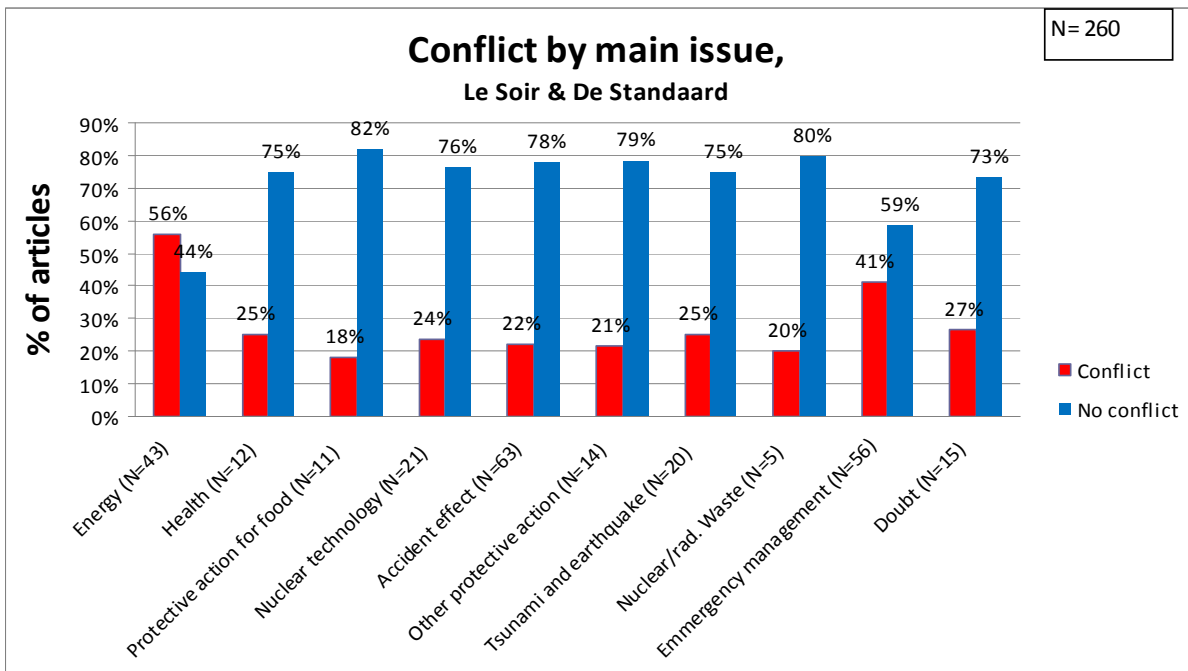
**Figure 32: Conflict per issues of the media texts**

Figure 32 gives an overview of the level of conflict per issue reported in media texts, for all articles taken together. Figure 33 and Figure 34 illustrate the conflict per issues reported, separately in *De Standaard* and *Le Soir,* respectively. These figures show that *Le Soir* reported about a conflict more often than *De Standaard*. The articles in *Le Soir* that were reporting the conflict addressed the following issues: energy, health and emergency management. It is interesting that the articles discussing waste didn't report about any conflict.
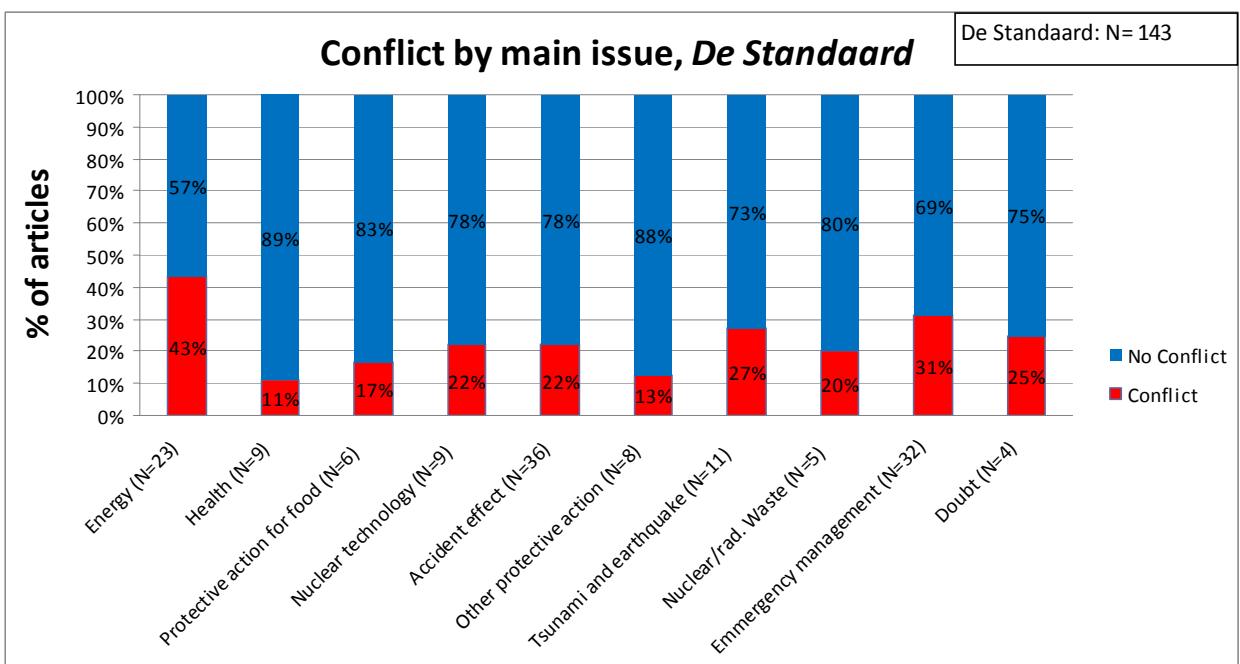


**Figure 33: Conflict per issues of the media texts in *De Standaard***
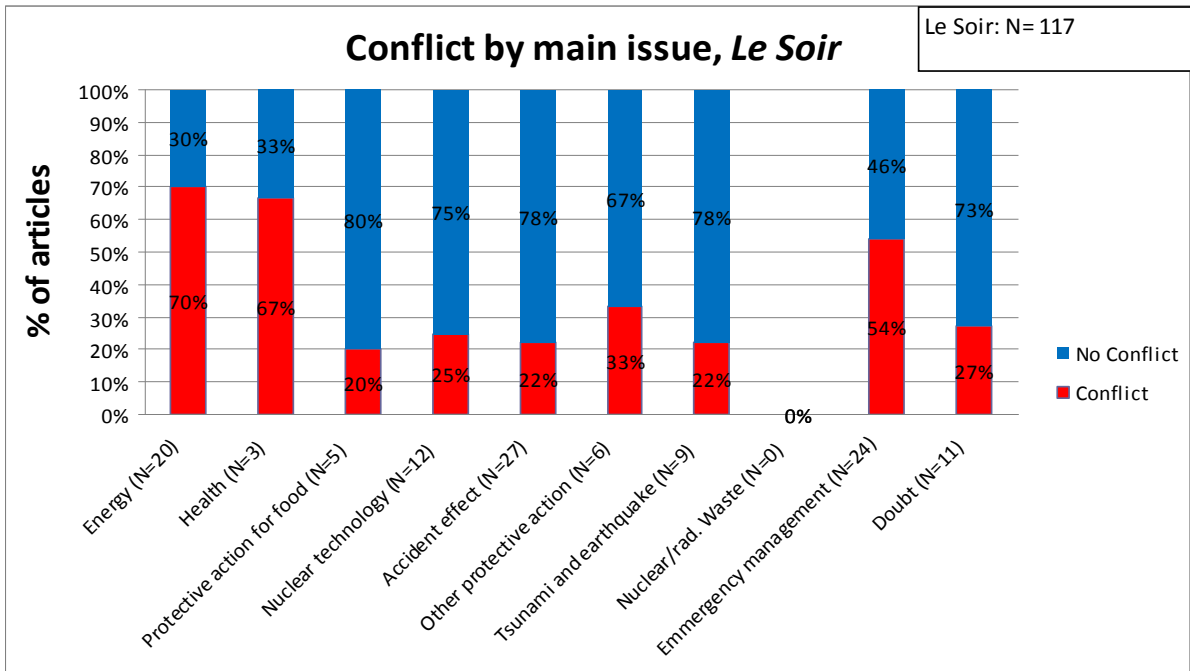
**Figure 34: Conflict per issues for the media texts in *Le Soir***

In order to identify the most conflicting topic related to emergency management reported in the newspapers we analysed separately the existence of conflicts associated with public information, emergency workers and other emergency actors.
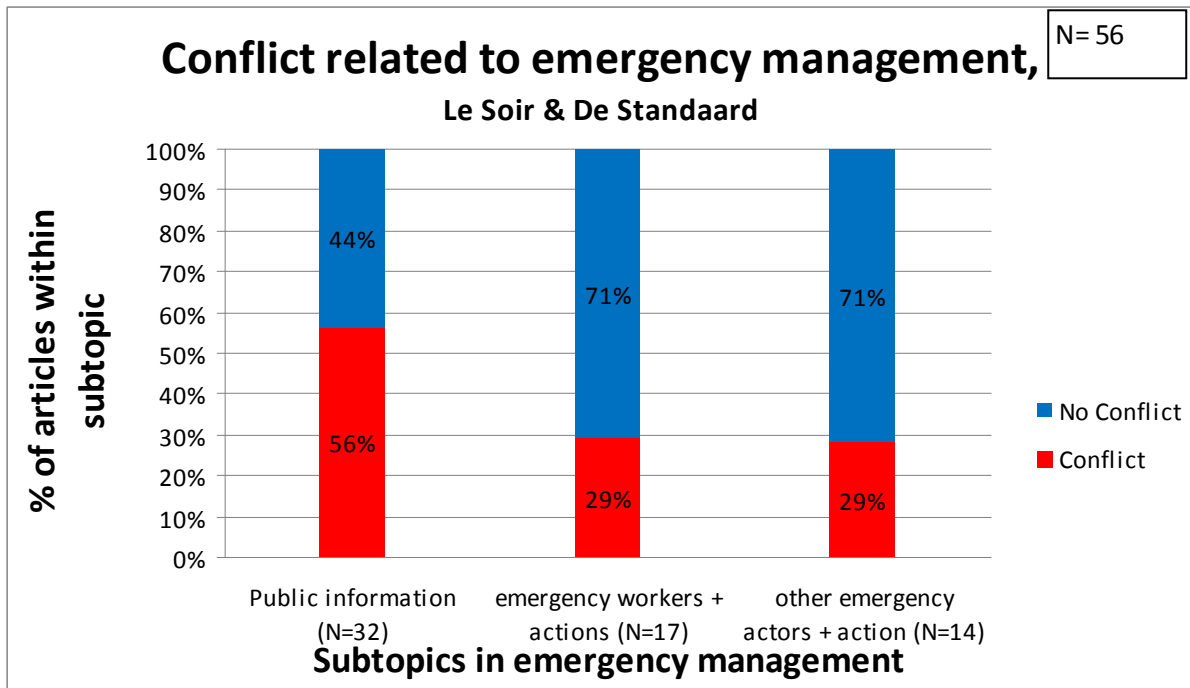


**Figure 35: Conflict related to emergency management**

From the frequency of the articles within the main issue related to emergency management we can see that the most reported and conflicting topic was public information. The articles in this category were reporting about the information system used in the management of Fukushima accident, how public was informed, the conflict related to the emergency level on INES scale, the censorship and the transparency. More than half of the articles (56%) discussing the public information reported about the conflict (see Figure 35).

One third of the articles discussing the emergency workers and their actions also mentioned a conflict. These articles reported about the workers directly involved in the emergency actions at the plant (usually named the "Fukushima 50" or kamikaze) or about the on-site actions (cooling, extinguishing the fire, explosions …). Although other emergency actors and actions didn't receive such an attention in the media, the level of conflict reported was also in this topic high. 29% of the articles in this category reported about a conflict.
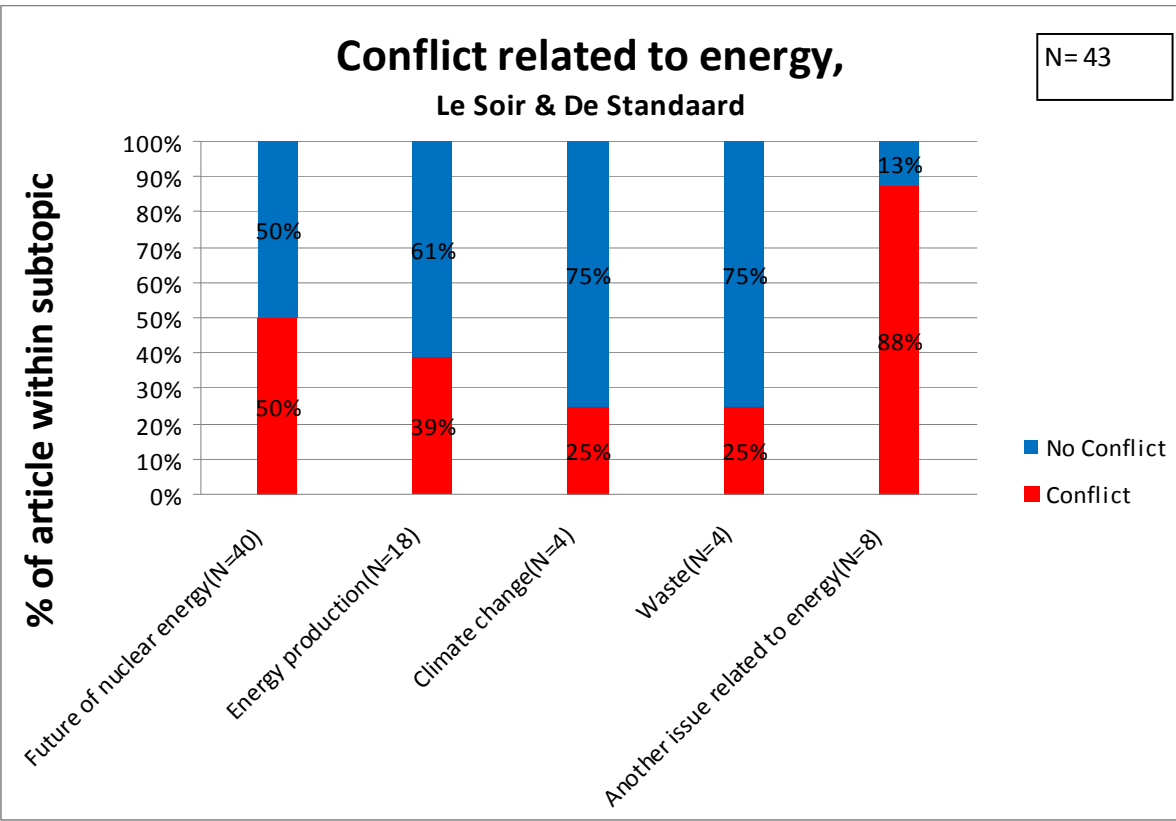


**Figure 36: Conflict related to energy**

From the Figure 36 we can see that almost every article related to energy addressed the future of nuclear energy: out of the 43 articles discussing energy, 40 articles were related to the future of nuclear energy. Half of the articles related to the future of nuclear energy reported about a conflict of disagreement. The topic "energy production" was also revealed also as a disputable one: 39% of the articles discussing the energy production reported about a conflict or disagreement between people, groups, parties or countries.

# 16. Orientation of the articles towards nuclear energy

> The orientation of the articles about the nuclear accident towards nuclear energy was mostly neutral.

In this chapter we will address the question whether the framing of nuclear energy in the articles related to nuclear accident was positive, negative or balanced. First we address the public debate and the policy towards nuclear energy in Belgium before the accident in Fukushima. Next, we give a short overview of the public attitude towards nuclear energy and finally, we present the analysis of the media articles with respect to the orientation towards nuclear energy.

## 16.1. The public debate and policy about nuclear energy in Belgium before the accident

The public debate related to nuclear energy and the arguments pro- and contra- existed in Belgium before the nuclear accident in Fukushima. Belgium has 7 reactors in operation, producing 55% to 65% of the national electricity needs. In the year 2000, a government appointed commission reported that nuclear energy was important to Belgium and recommended further development.

However, the January 2003 Act ruled out the building of new nuclear power plants and limited the operating life of the plants to 40 years. With a 40-year operating life, the first plant would have to be closed in 2014 and the last plant in 2025.

In 2007, the Belgian Commission on Energy stated that the use of nuclear energy is imperative to meet the $CO_2$ requirements and to maintain economic stability. Furthermore, the commission believed that energy prices would double without the use of nuclear energy. The commission finally recommended that the operating life of the seven nuclear reactors should be extended. Because of the political situation in Belgium, the reassessment of the phase-out law was postponed.

The Belgian government decided to support the construction of a new nuclear experimental facility called MYRRHA in 2010. MYRRHA is a flexible fast spectrum research reactor conceived as an accelerator driven system (ADS), able to operate in sub-critical and critical modes. At the time of the nuclear accident in Fukushima, the MYRRHA facility was in licensing phase and the project was expecting the promised financial support from government for the continuation of the research.

Independently of the nuclear accident at Fukushima, the Belgian Ministry of Interior carried out a previously planned information campaign on nuclear emergencies with preventive distribution of iodine tablets. This campaign started with a press conference on March 14, three days after the accident.

## 16.2. The public attitude towards nuclear energy in Belgium

The public attitude towards nuclear energy in Belgium was in the years before Fukushima nuclear accident more and more positive. A large-scale survey in 2009 [17] highlighted a more positive attitude towards nuclear energy in comparison with 2002 and 2006. Results of this public opinion survey showed that 19.5% of the respondents disagreed or strongly disagreed

with the statement "*The reduction of the number of nuclear power plants in Europe is a good cause*", compared to 21% in 2006 and 12% in 2002. The percentage of respondents agreeing with this statement dropped from 66% in 2002 to 51% in 2006, and this figure remained stable in 2009 (49%). 45% of the respondents agreed in 2009 that "*keeping nuclear power plants open secures energy supply*" (compared to 22% who disagree), while nearly 55% agreed that "*the benefits of nuclear energy outweigh the disadvantages*". When asked directly if they were "*in favour or not*" of nuclear energy, the opinions were balanced between pro and against. Only 12% of the respondents expressed a strong opinion, equally divided between strong support (6%) and strong opposition (6%); 44% of the respondents were neither in favor nor opposed or they didn't have an opinion, while 24% were moderately in favor of nuclear energy against 19% who were moderately opposed to it. The results from other public opinion surveys show similar results in increasing public support to nuclear energy. [18, 19]

To conclude, in the years before the nuclear accident at the NPP Fukushima the public attitude towards nuclear energy in Belgium was becoming increasingly positive, in the context of the so-called "nuclear renaissance".

## 16.3. Orientation of articles towards nuclear energy

The variable concerning the orientation of the article towards nuclear energy explores the way of journalistic reporting about nuclear energy and the arguments used. It is a subjective intention of the author or newspaper policy to expose the arguments in favour of nuclear energy or not. The articles that presented an opinion towards nuclear energy were categorised as 'positive', 'negative' or 'balanced'. To classify a media text as balanced implies that the both pro and contra arguments and statements concerning the nuclear energy in the article were equally presented, without a preference for one. Therefore the article was coded as a balanced article. The other two options, being respectively pro and contra nuclear energy, were not balanced, but biased towards one orientation.
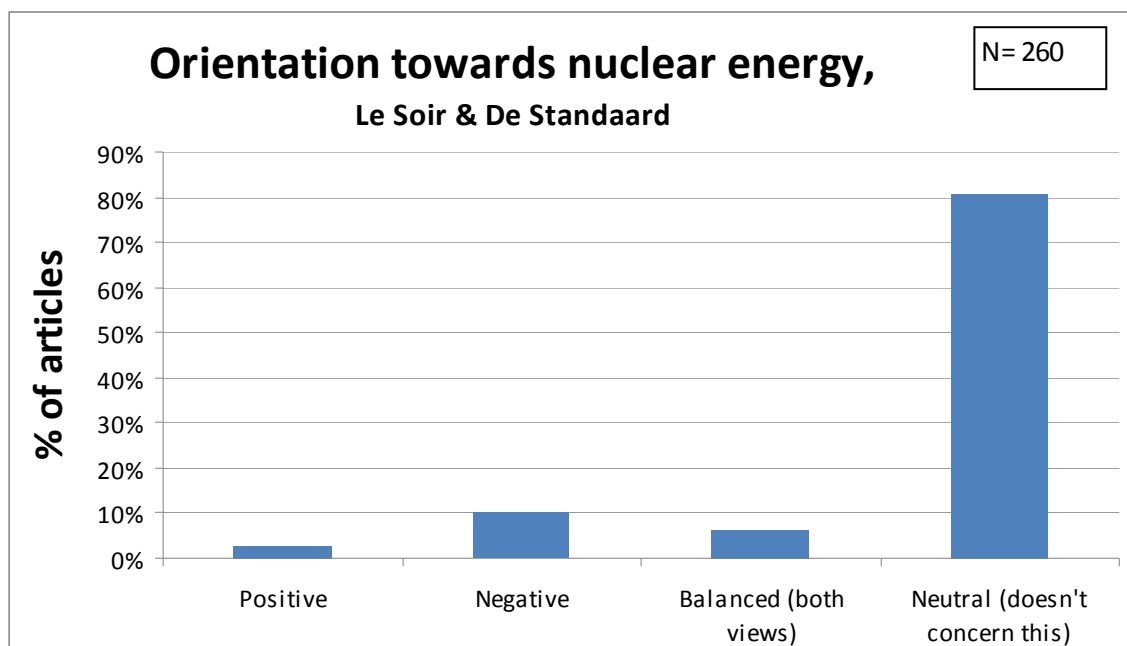


**Figure 37: Orientation towards nuclear energy**

The results of media analysis show that the overall orientation of the published articles towards nuclear energy was neutral (see Figure 37). This means that most articles did not really address the topic of 'good or bad' and that they did not express an opinion about nuclear energy.

Figure 37 shows that 81% of all articles did not express a certain orientation towards nuclear energy. This means that the other 19% contained some normative evaluation of nuclear energy, being 'positive', 'negative' or 'balanced'. Although the differences are fairly small between these subcategories, most articles containing some evaluation, were negatively orientated towards the topic (negative orientation: 10 %; positive orientation: 3%; balanced: 6% - percentages compared to the total number of articles in our sample).
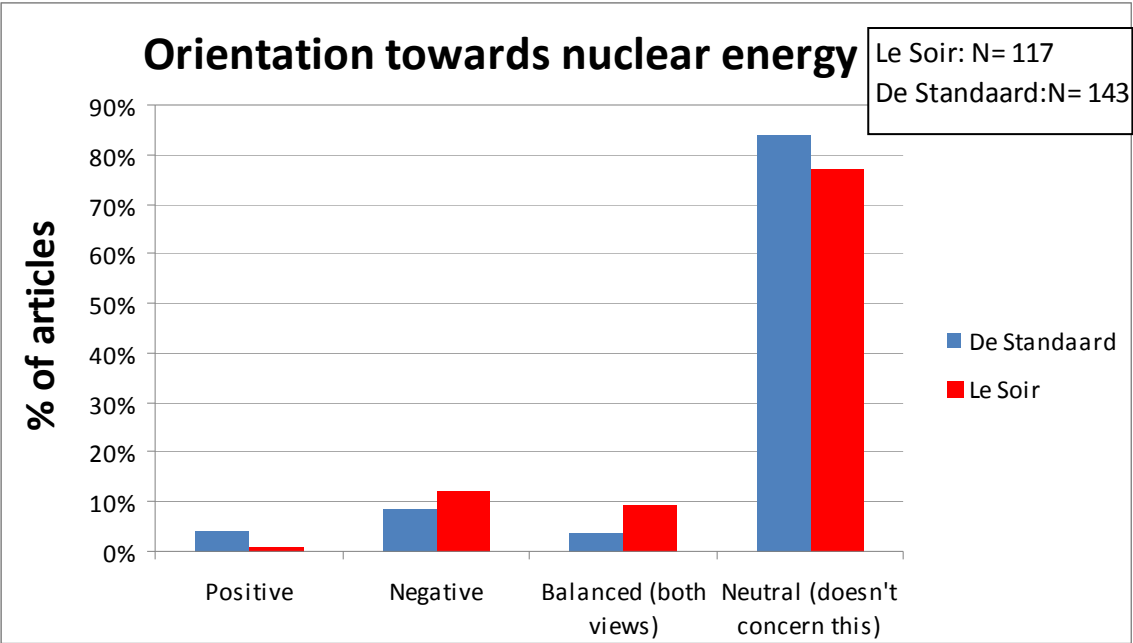


**Figure 38: Normative orientation towards nuclear energy in both newspapers (compared).**

Differences between the newspapers *Le Soir* and *De Standaard* are also very small (see Figure 38). *Le Soir* had more normatively orientated articles than *De Standaard* and at the same time less positive articles with pro-nuclear orientations. Overall *De Standaard* had more room for a positive evaluation than *Le Soir*, but as to be expected after a nuclear accident at the INES level 7, most normative articles are negatively orientated towards nuclear energy in both newspapers.
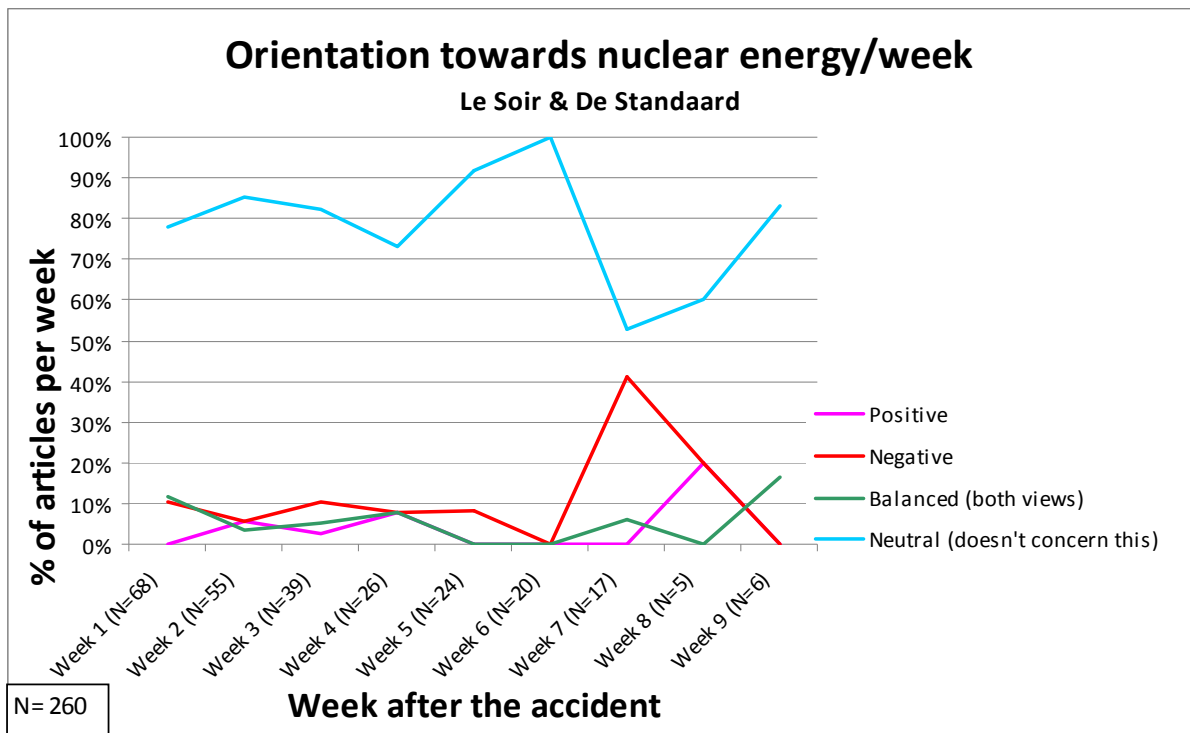
**Figure 39: Orientation of the article towards nuclear energy per week**

The comparison of the orientation of the articles towards nuclear energy in the weeks after the nuclear accident gives an indication that negatively orientated articles are not only due to the accident in Fukushima. During the period of analysis, the world 'celebrated' the 25th anniversary of the accident in Chernobyl (1986), still the worst nuclear accident in history. In this period we observed a significant increase of articles negatively orientated towards nuclear energy and a significant decrease in the percentage of neutral articles.

## 16.4.  Orientation towards nuclear energy in the discussion about the future

When the issue code of the article was 'Future of nuclear' we found that there were relatively more articles that expressed an opinion about nuclear energy and its role in modern society. Therefore we chose to analyze this in depth.
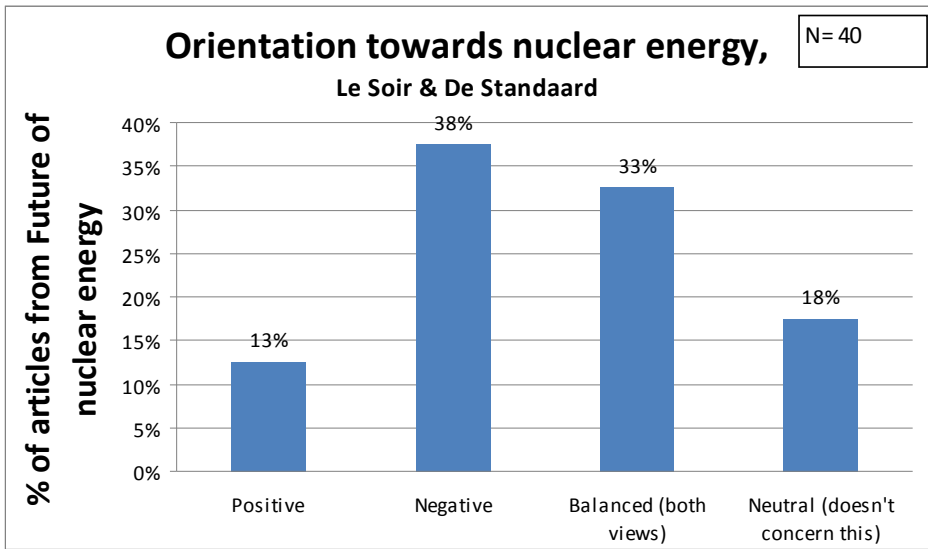
**Figure 40: Orientation towards nuclear energy in the articles addressing the future of nuclear energy**

Figure 40 shows that 82% of the articles containing the issue of the future of nuclear energy had a normative orientation towards nuclear energy. Most remarkable, but not unexpected, is that the majority of these articles were negatively orientated towards nuclear. One third though remained balanced, keeping the equilibrium between both sides of the continuum. Only 13% of these articles contained mostly positive arguments or claims towards nuclear energy.
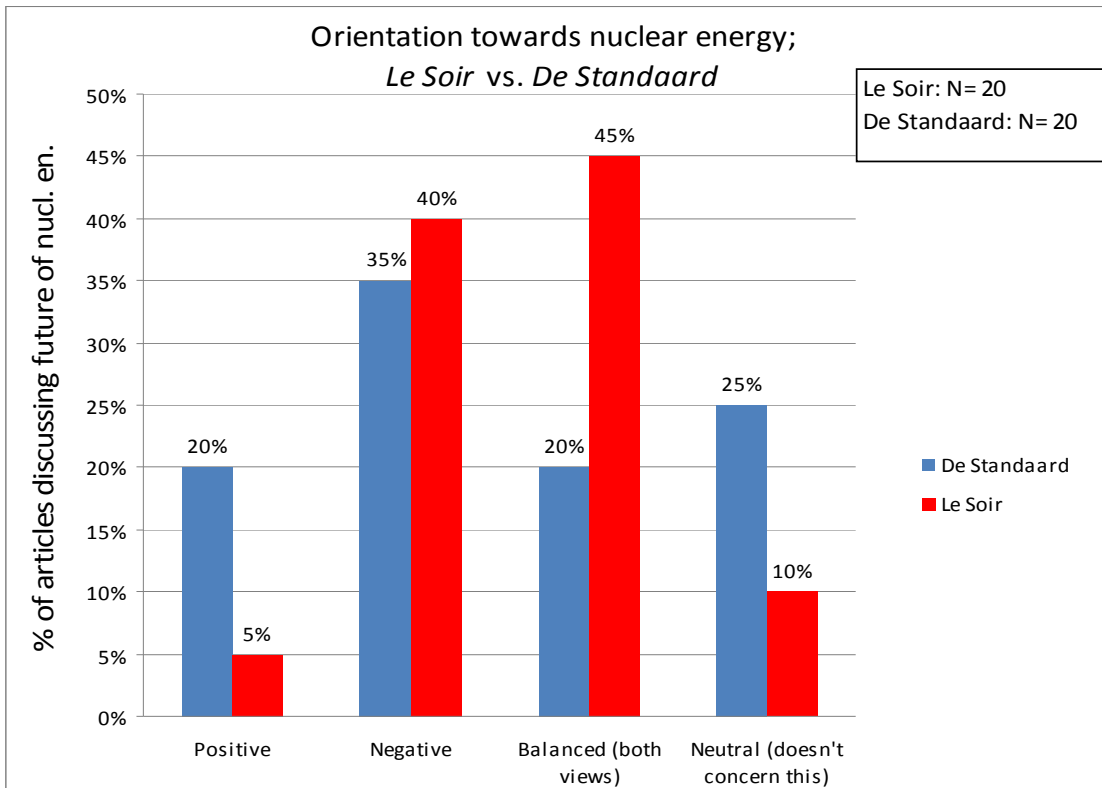


**Figure 41: Orientation towards nuclear energy in the articles addressing the future of nuclear energy**

Figure 41 gives some more information about the differences in opinions between the two newspapers analysed in this research. Both newspapers published an equal amount of articles which discussed the future of nuclear energy (N = 20). We have found that *De Standaard* has more room for a positive orientation towards nuclear energy as 20% of its normatively loaded articles related to nuclear energy contain primarily pro-nuclear arguments, as opposed to 5% in *Le Soir*. The other big difference that was remarkable is that *Le Soir* has a more balanced practice of reporting as nearly half of the total amount in this category had a balanced orientation towards the subject, as opposed to 20% in De Standaard. On the other hand, *Le Soir* had more than double the amount of articles with a normative content. Both newspapers had an almost equal amount of articles that were negatively orientated towards nuclear energy.

## 17.   Keywords

Acknowledging emotions, such as fear, anger, and helplessness is recognised as far more effective in risk communication. However, media may also insinuate the emotions by way of reporting on the nuclear event. In former research the emotional connotation of words in press reports related to nuclear events has been proven to be important. Due to the importance of emotions for risk communication the following words were analysed in the media texts: Chernobyl, panic, nuclear accident or disaster or apocalypse, distrust, danger, anger, victim (casualty), sympathy, compassion, solidarity, assistance, blame and chaos. The frequency of selected words in the media texts was counted. The synonyms of the words were included in the analysis. For example the word 'Dread' can also be expressed with synonyms as 'Fear' or 'Anxiety'. Also words with the same root, e.g. danger-dangerous-endangered, were counted in accordance with linguistic properties. The keyword, or its related synonym, had to be explicitly mentioned in the media text.
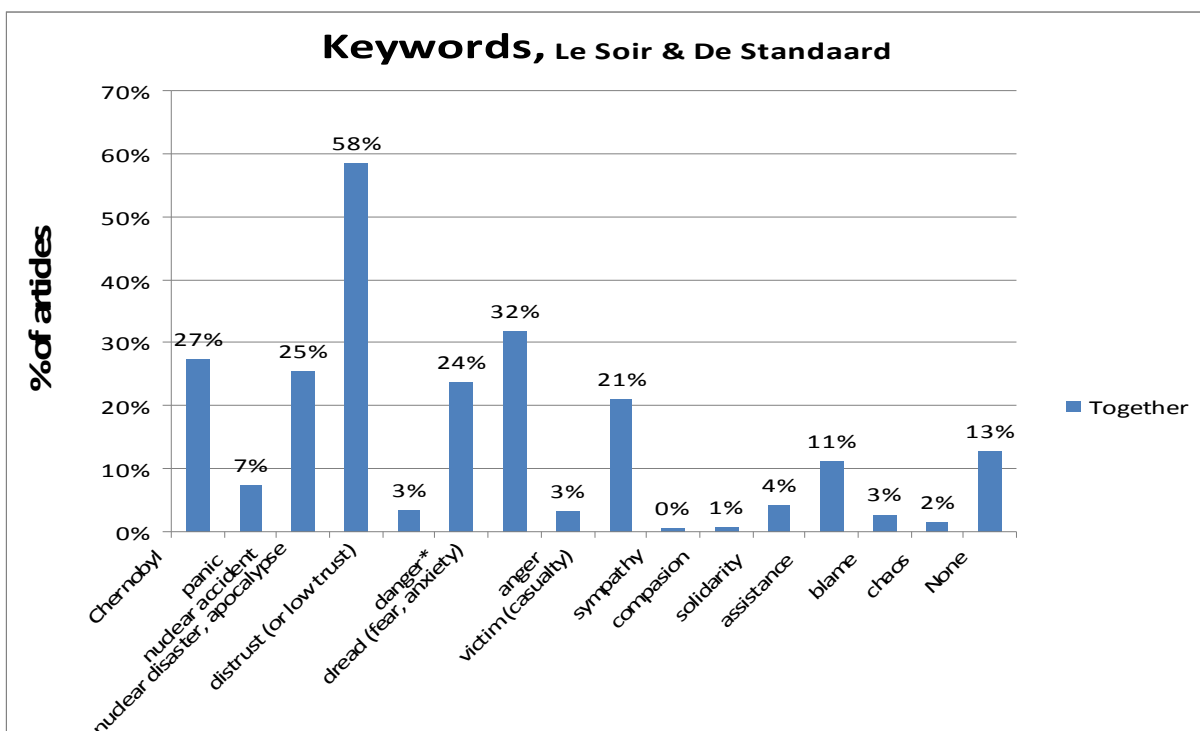


**Figure 42: Keywords used in the media texts in both newspapers (cumulated)**

In Figure 42 we can see how many times the different keywords were used in the media texts of both newspapers during the first two months after the nuclear accident. In general we can see five keywords that were used in about or more than one fourth of all articles: 'Chernobyl', 'Nuclear accident', 'Nuclear disaster', 'Danger' and 'Dread'. These keywords carry a rather negative connotation. The keywords with positive connotation, such as 'Sympathy', 'Compassion', 'Solidarity' and 'Assistance', were hardly used in the media texts.
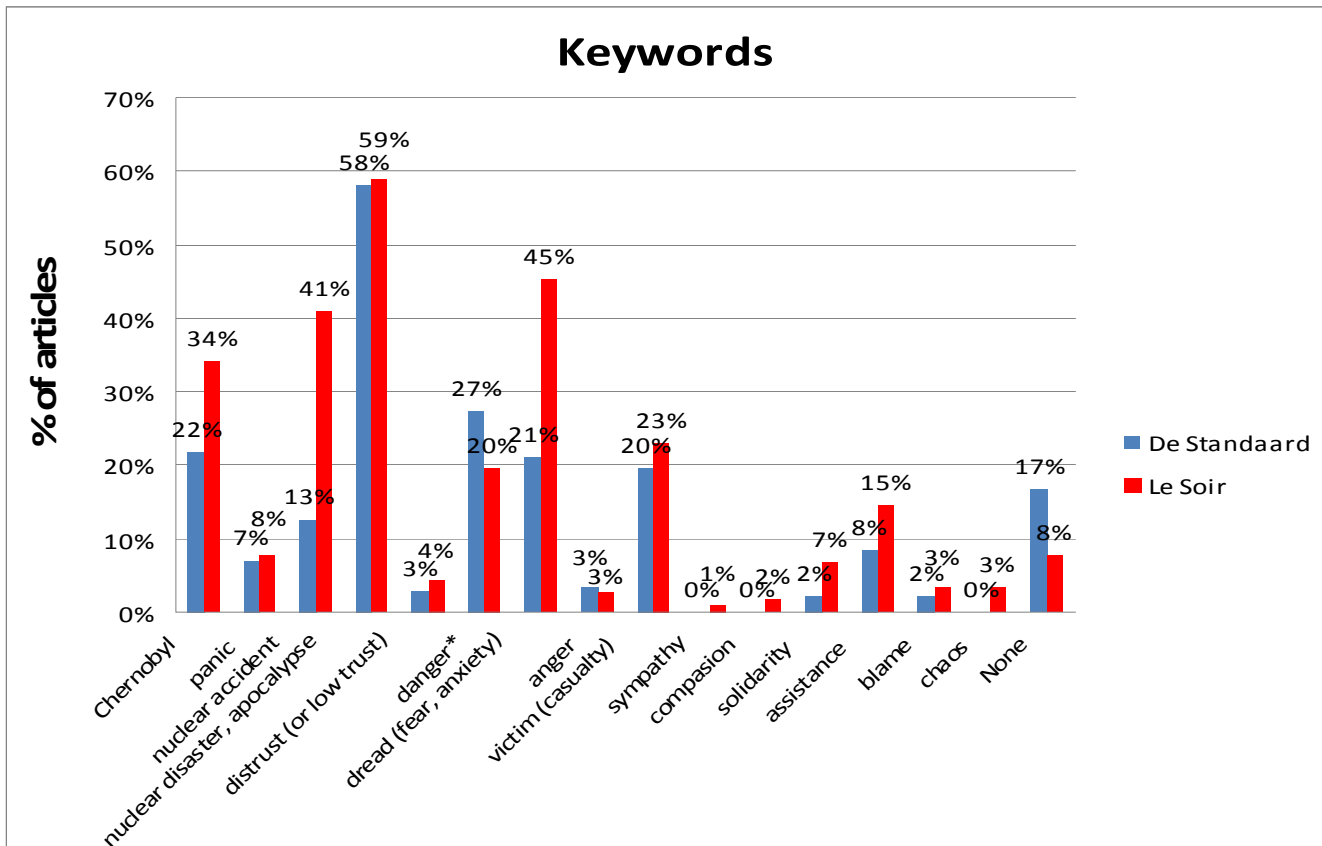
**Figure 43: Keywords used in the media discourse of both newspapers (compared).**

Figure 43 shows a comparison between the uses of the keywords in the two newspapers. Remarkably more keywords were used in *Le Soir* than in *De Standaard*. For example the word "dread" was used in *Le Soir* in 45% of the articles, while in the newspaper *De Standaard* it was used in 21% of the articles. A significant difference was identified also in the use of the word Chernobyl. The newspaper *Le Soir* has used this word in ten percent of the article more often than *De Standaard*. *De Standaard* had the most articles without any of selected keyword (17% of articles in *De Standaard* without any of selected keywords vs. 8% of such articles in *Le Soir*.)

## 17.1. The word "Chernobyl" in the articles

We explored how many times both newspapers made a reference to the nuclear accident in Chernobyl when they reported about the nuclear accident in Fukushima. In addition we analyzed on which days the newspapers made the reference to Chernobyl accident and if there was a difference in using word "Chernobyl" between the two newspapers.
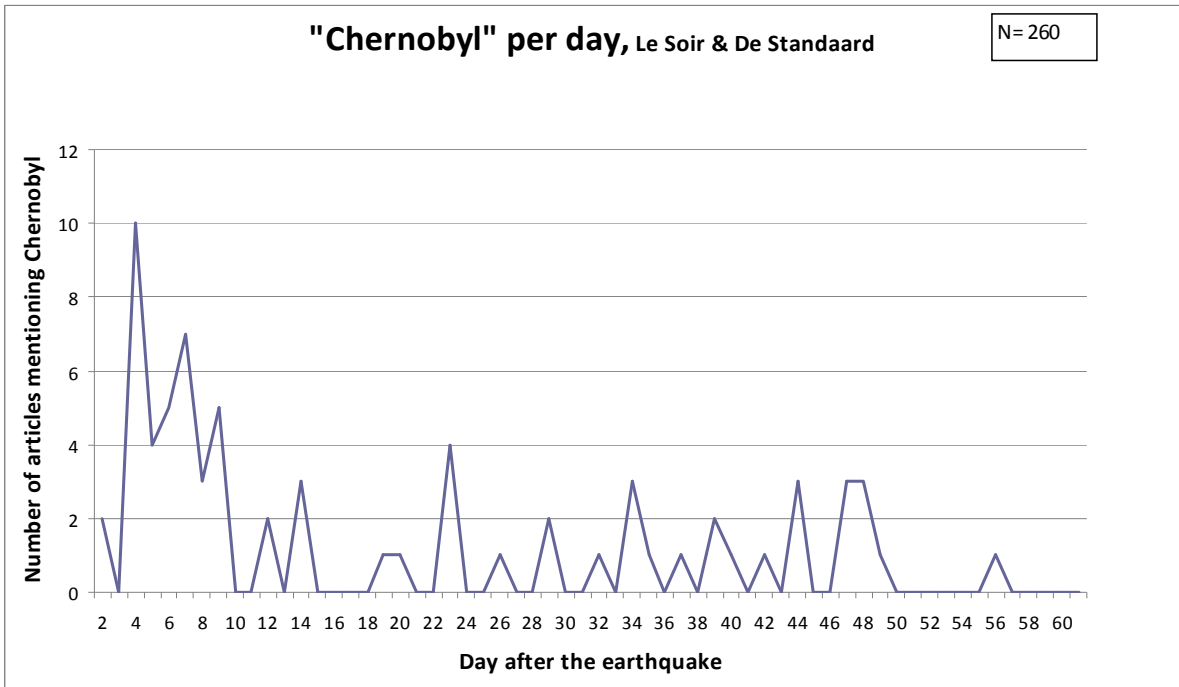
**Figure 44: Chernobyl keyword per day for both newspapers combined**

Figure 44 combines the frequencies of the word "Chernobyl" in both newspapers. We found out that although the nuclear accident in Chernobyl had completely different characteristics than the accident in Fukushima the media referred to it quite a lot. The word "Chernobyl" appeared in the articles almost every day. On the fourth day after the accident in Fukushima the reference to Chernobyl was made ten times in the articles in both newspapers (the two newspapers have no issues on Sundays).

The graph below presents the relative numbers: the percent of the word "Chernobyl" in all articles related to the Fukushima nuclear accident published in both newspapers in the weeks after the accident (see Figure 45).
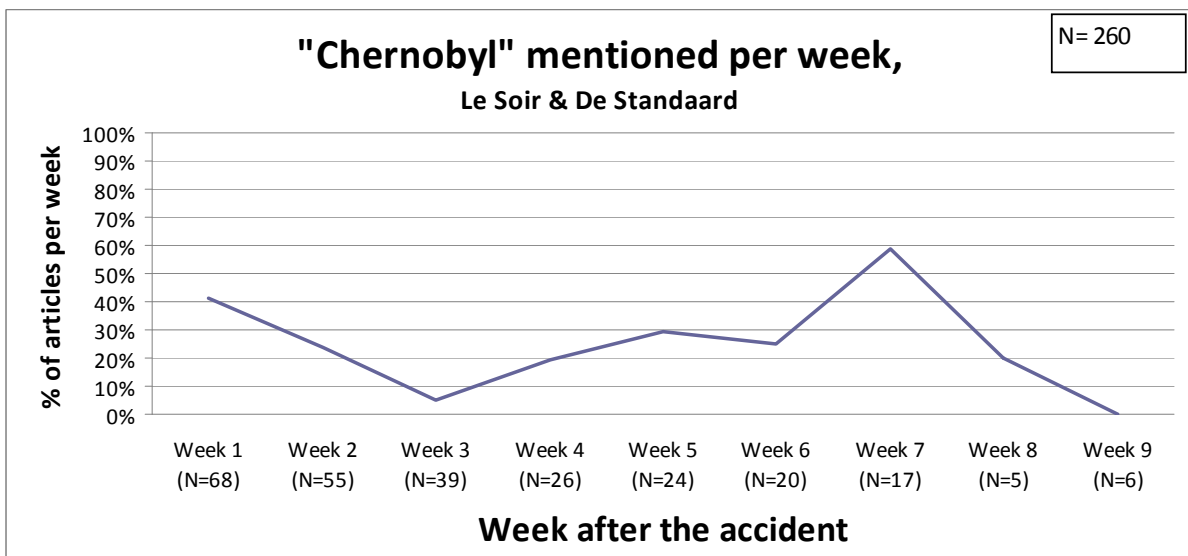
**Figure 45: Presence of "Chernobyl" keyword in the articles published, per week, both newspapers**
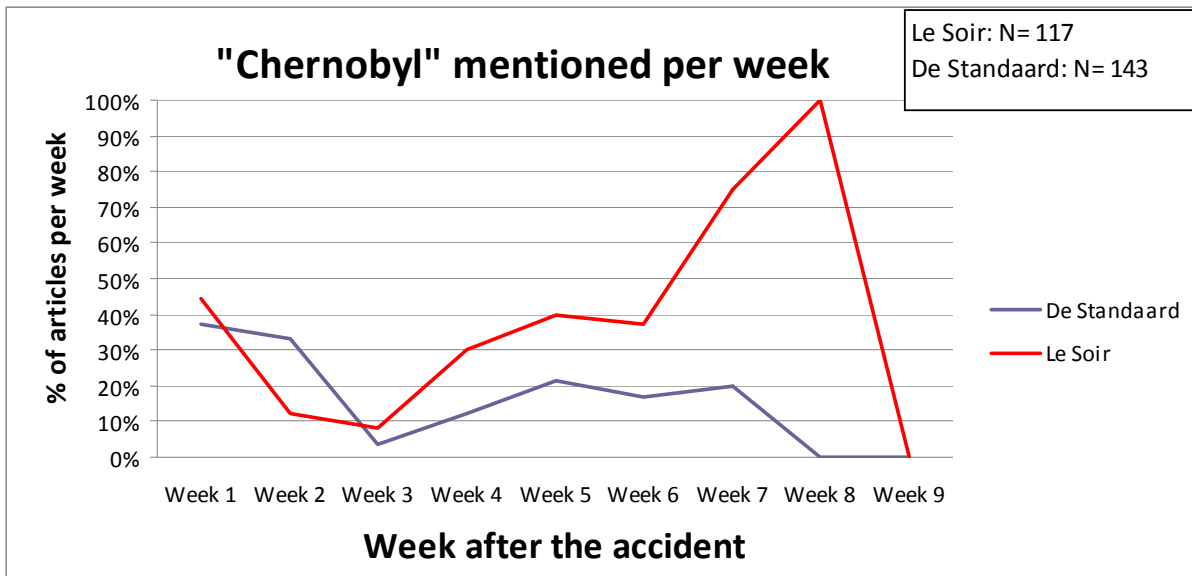


**Figure 46: Presence of "Chernobyl" keyword in the articles published, per week, separately for** *Le Soir* **and** *De Standaard*

We found out that the word "Chernobyl" was significantly more often mentioned in *Le Soir* than in *De Standaard* in two time periods (see Figure 46). The first period was directly after the accident happened, while the second period was around the 25th anniversary of the nuclear accident in Chernobyl.

## 17.2. Other emotion triggering words in the media reporting

The analysis of the words "dread", "victim" and "danger" is presented as a percentage of all the published articles in the week. In the following graphs, the first one presents the percentage of the articles using the keyword in the articles published in the week after the accident for both newspapers together, and the second graph presents the analysis for each newspaper apart.
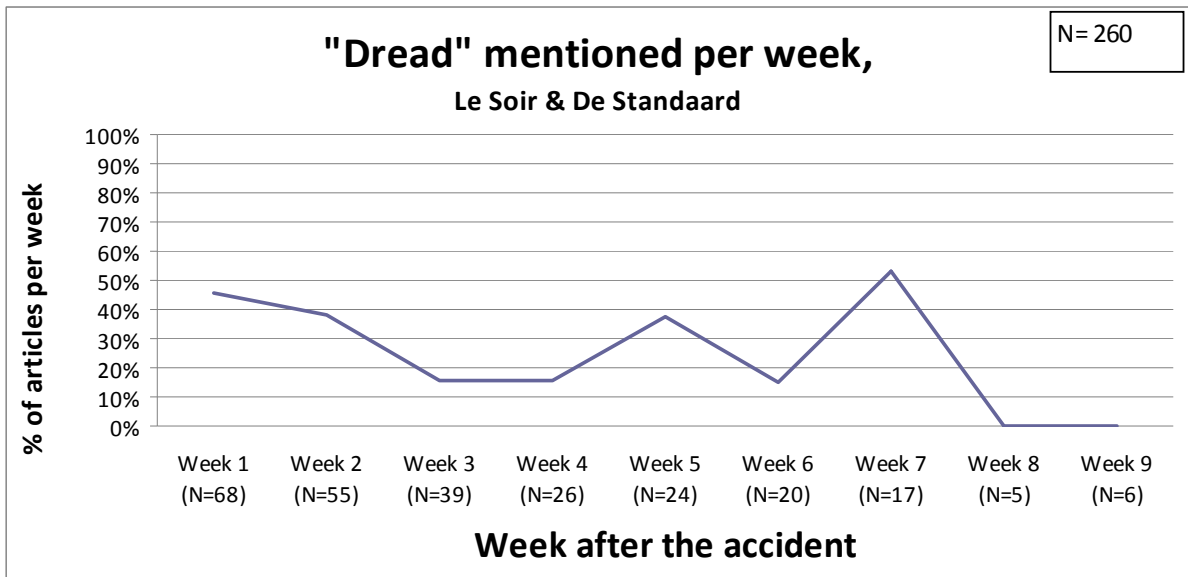
**Figure 47: "Dread" in media texts for both newspapers together**
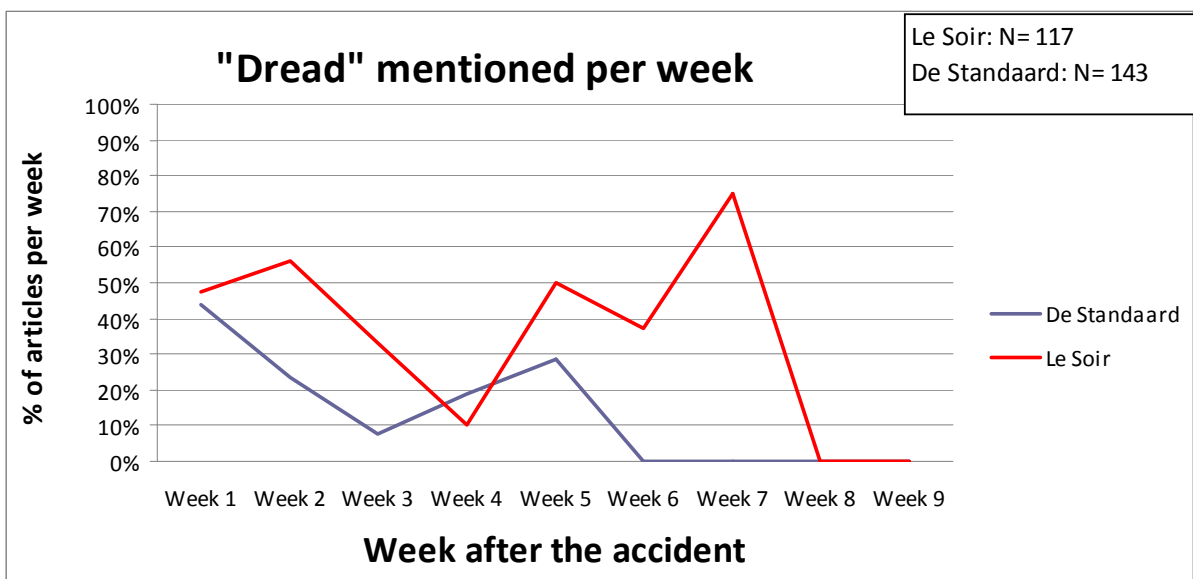


**Figure 48: "Dread" in media texts, *De Standaard* and *Le Soir* separately**

The word "Dread" was used in media articles along the entire period of eight weeks after the accident; it disappeared from the media texts in week eight and was also not used in the ninth week after the accident (see Figure 47). However, big differences in using the word "dread" were observed between the two newspapers. The newspaper *Le Soir* has used it much more often than *De Standaard* (see Figure 48*)*.

An important observation is that the word "dread" was more often used in the seventh week after the accident than in the first weeks. For example in the newspaper *Le Soir,* more than 70% of the articles published in the seventh week included the word Chernobyl, while in the first week this word was found in less than half of the articles.

From these findings we can conclude that a fear becomes more dominant in the media articles in the later periods of nuclear emergencies than in the early period. The reported fear probably reflects also the feelings accumulated from the Chernobyl accident, which was remembered in the week of using the word "dread" the most often.

**"Danger" mentioned per week, Le Soir & De Standaard**

N= 260

(Chart showing "% of articles per week" on Y-axis from 0% to 100%, X-axis showing Week 1 (N=68), Week 2 (N=55), Week 3 (N=39), Week 4 (N=26), Week 5 (N=24), Week 6 (N=20), Week 7 (N=17), Week 8 (N=5), Week 9 (N=6), labeled "Week after the accident")
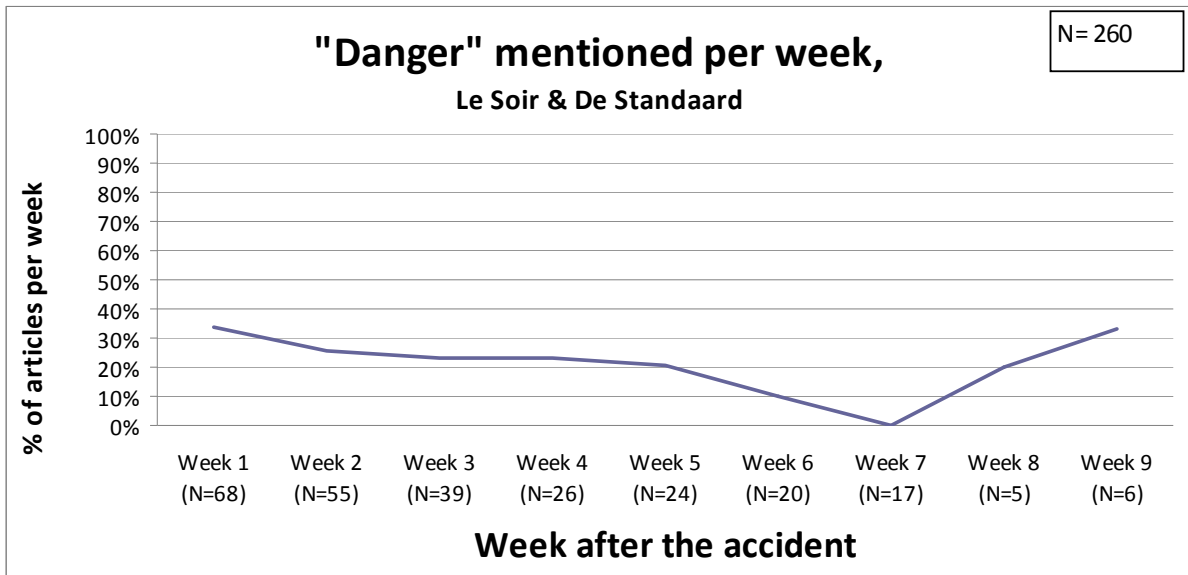
**Figure 49: "Danger" in media texts for the two newspapers together**

**"Danger" mentioned per week**

Le Soir: N= 117
De Standaard: N= 143

(Chart showing "% of articles per week" on Y-axis from 0% to 100%, X-axis showing Week 1 through Week 9, labeled "Week after the accident", with two lines: De Standaard and Le Soir)
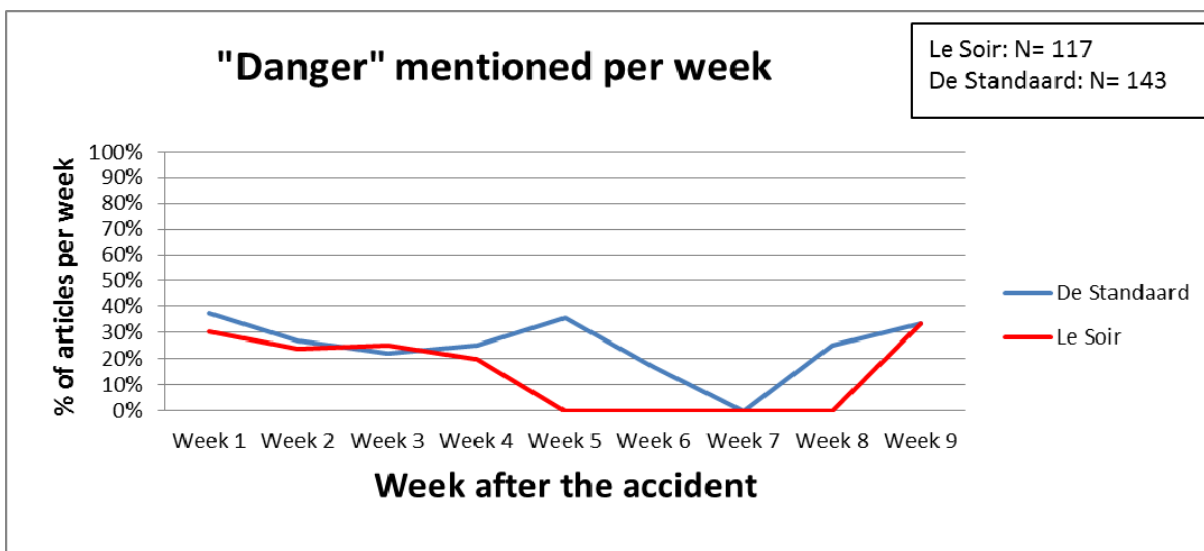
**Figure 50: "Danger" in media texts, *De Standaard* and *Le Soir* separately**

The use of the word "danger" decreased in the first weeks, but in the last weeks of our analysis it increased again. The increase in the use of the word "danger" can be especially observed in the eight and ninth week after the accident. The word "danger" was more often used in *De Standaard* than in *Le Soir*.

We analyzed further how often have media used the words "danger" or "dread" in the reporting about Fukushima nuclear accident. We found that the peaks in frequencies of using the word "dread" were associated with the lowest points of using the word "danger". In other words, when media reported about danger, they didn't use the word dread and opposite.
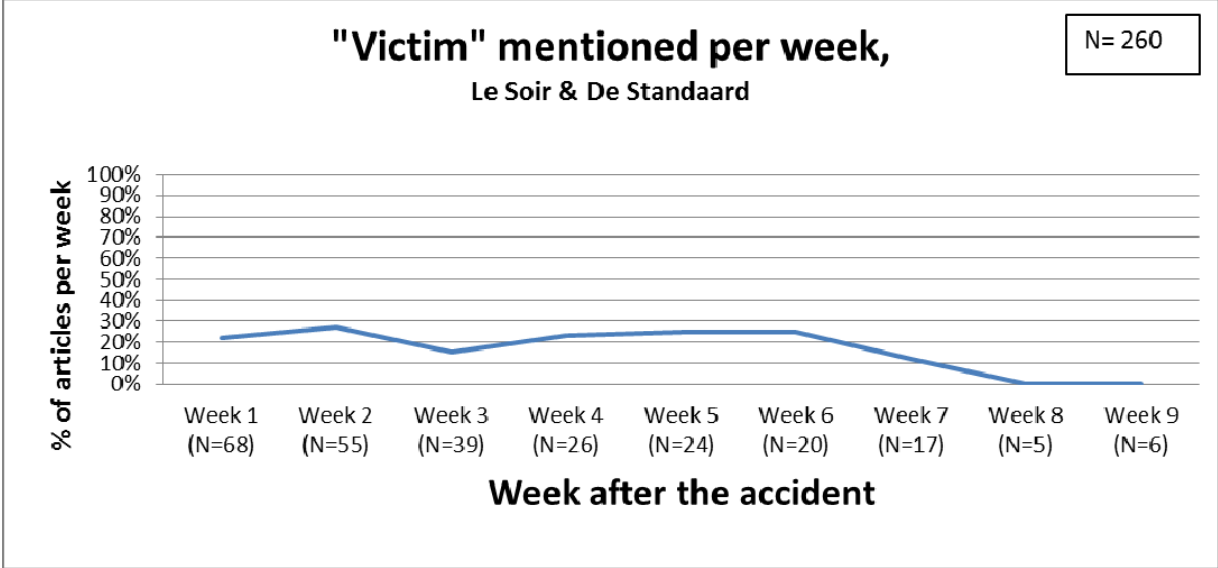


**Figure 51: "Victim" in media texts for both newspapers together**
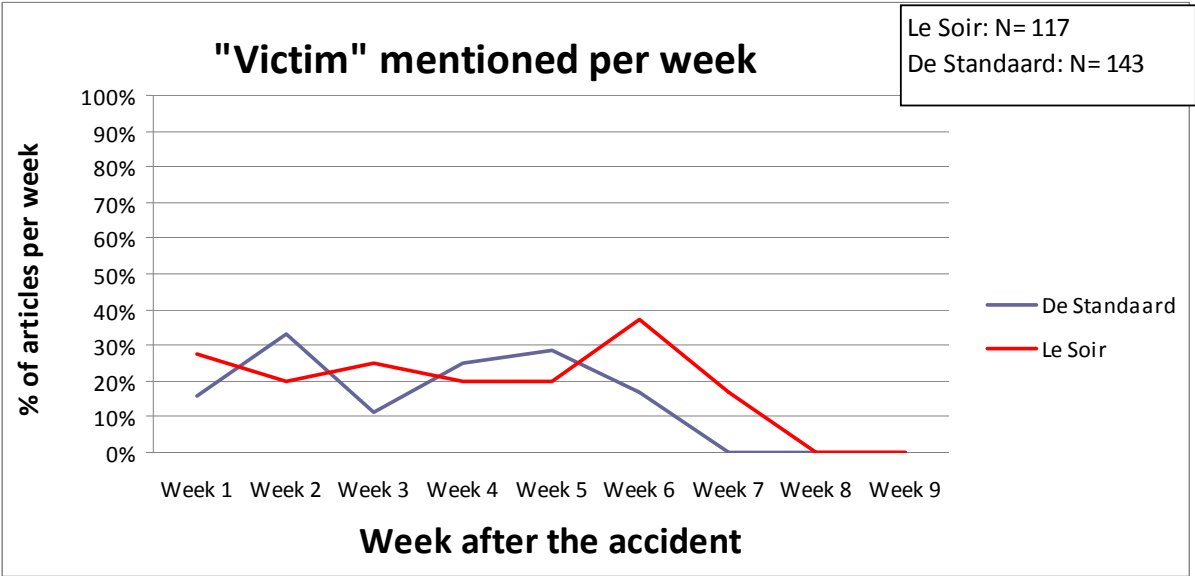


**Figure 52: "Victim" in media texts, *De Standaard* and *Le Soir* separately**

The word "victim" was in the first weeks present in every fourth article related to the Fukushima accident. In the eights week after the accident the media stopped using this word (see Figure 51). Small differences between the two newspapers were observed in using the word "victim" (see Figure 52).

## 18.      Radiation presented by units

With the analysis of measurement units reported in media articles related to Fukushima we assessed how the media reported about radiation risks by using quantitative information. Radiation related quantities can be expressed using different measurements units that might be used to explain the risk of radioactivity after a nuclear accident.

For the analysis reported here we have used a list of 18 different possible measurement units corresponding to measurement of activities, activity concentration, ground depositions or dose rates or estimates of the dose. These units were only coded if explicitly written in the article.
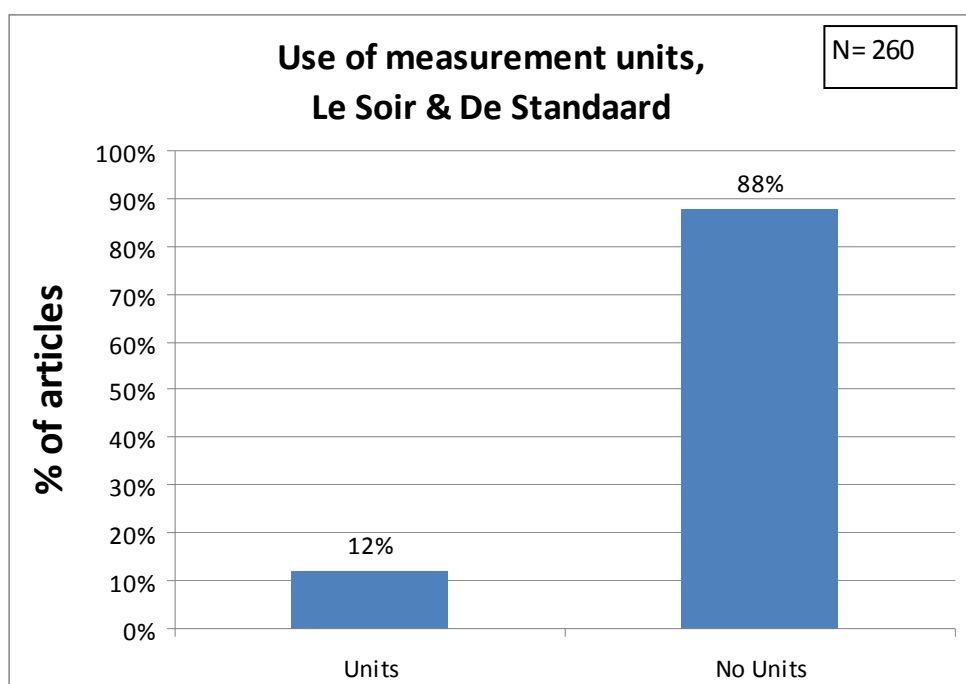


**Figure 53: Presence of specific measurement units in media articles**

Measurement units specific to radiation were not regularly reported in the media articles (see Figure 53). Only 13% of all articles in our sample contained any measurement unit related to radiation or radioactivity and 87% of articles did not contain any measurement unit.
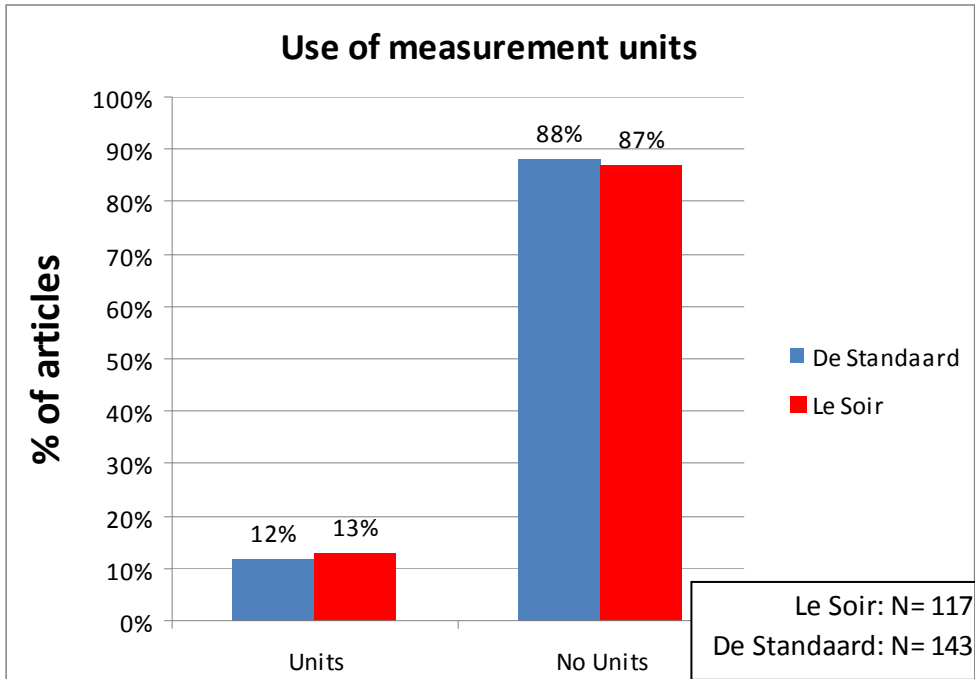
**Figure 54: Unit presence in the two newspapers**

In Figure 54 we can observe that both newspapers had 12%-13 % of the articles reporting some measurement units. There were no differences observed between the two newspapers in using quantitative data to present the radiation risks from the nuclear accident.
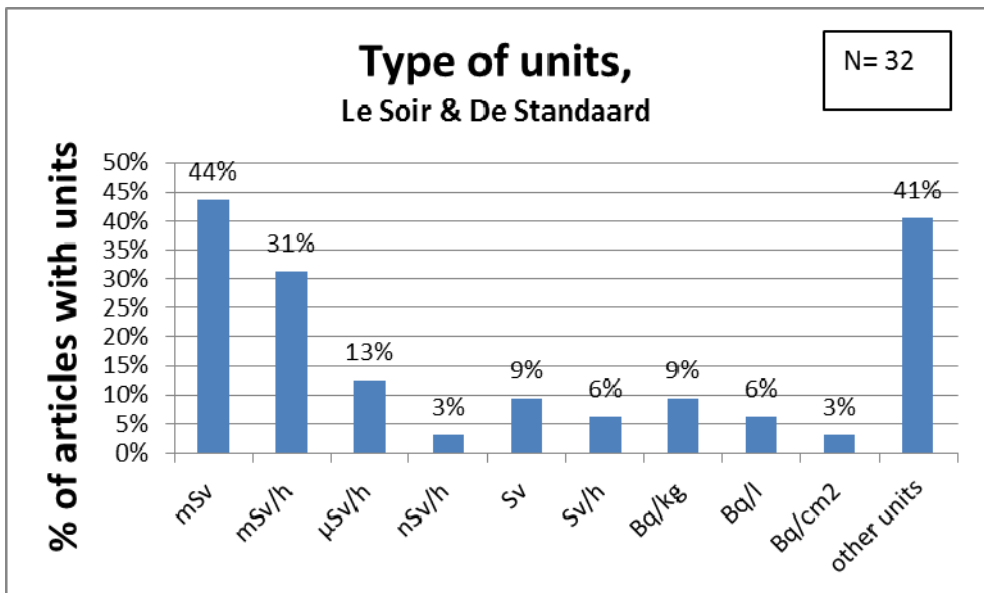


**Figure 55: Type of units reported in articles**

Figure 55 shows the results of an in-depth analysis of 32 articles that reported some measurement unit. 44% of articles used "mSv" and 41 articles have used other units, mainly the Becquerel. The less reported unit in articles related to Fukushima nuclear accident were $Bq/cm^2$ and nSv/h (which is in fact commonly used to express the background radiation level).
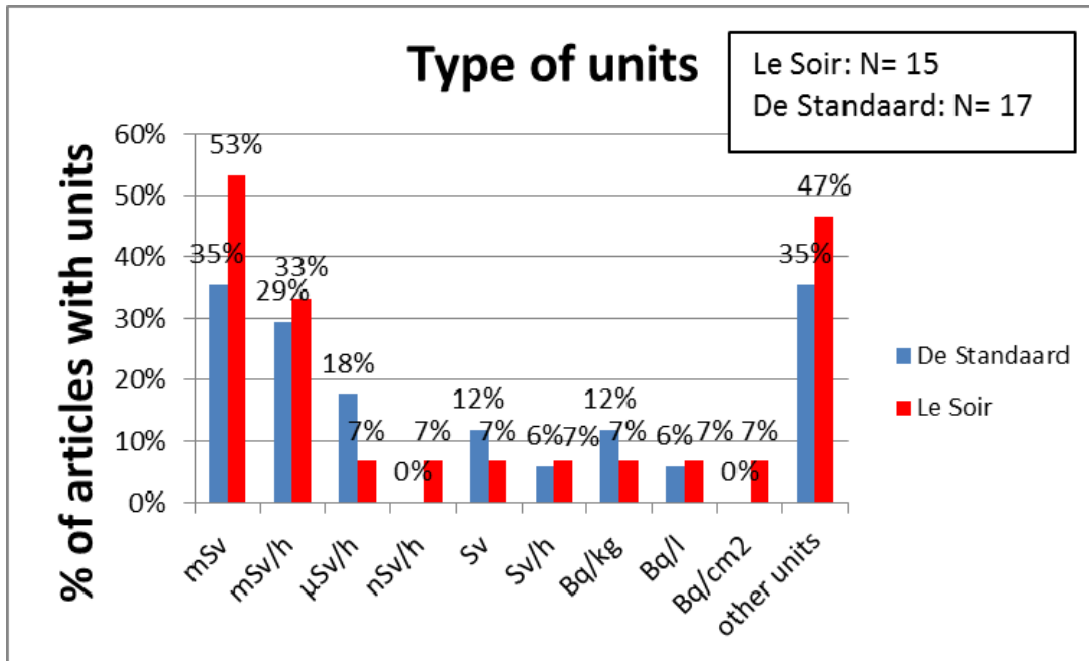
**Figure 56: Type of units in *De Standaard* and *Le Soir***

Figure 56 shows that both newspapers had a preference for nearly the same measurement units. *De Standaard* had less variation in the expression of different measurement units, seven compared to nine in *Le Soir*.
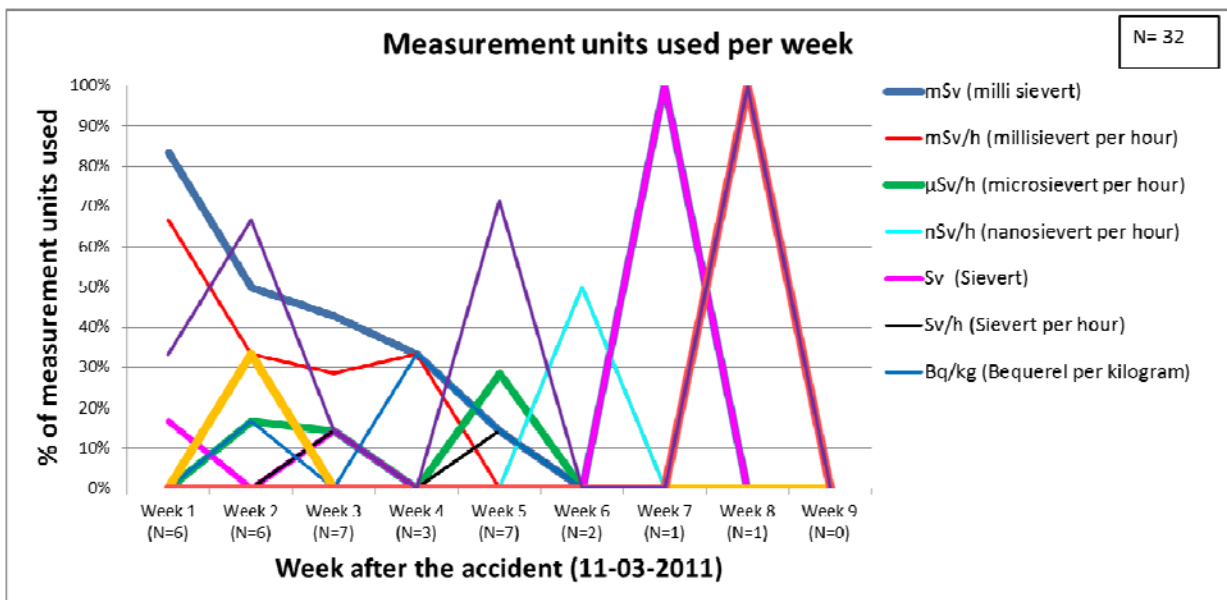


**Figure 57: Measurement units used per week**

Figure 57 shows that in the first weeks the units reported in the articles were diverse: from mSv to Sv/h. In the second month after the accident the units reported were reduced to Bq, Bq/cm2 and mSv/h. However, most of the articles (87%) didn't report any measurement units.
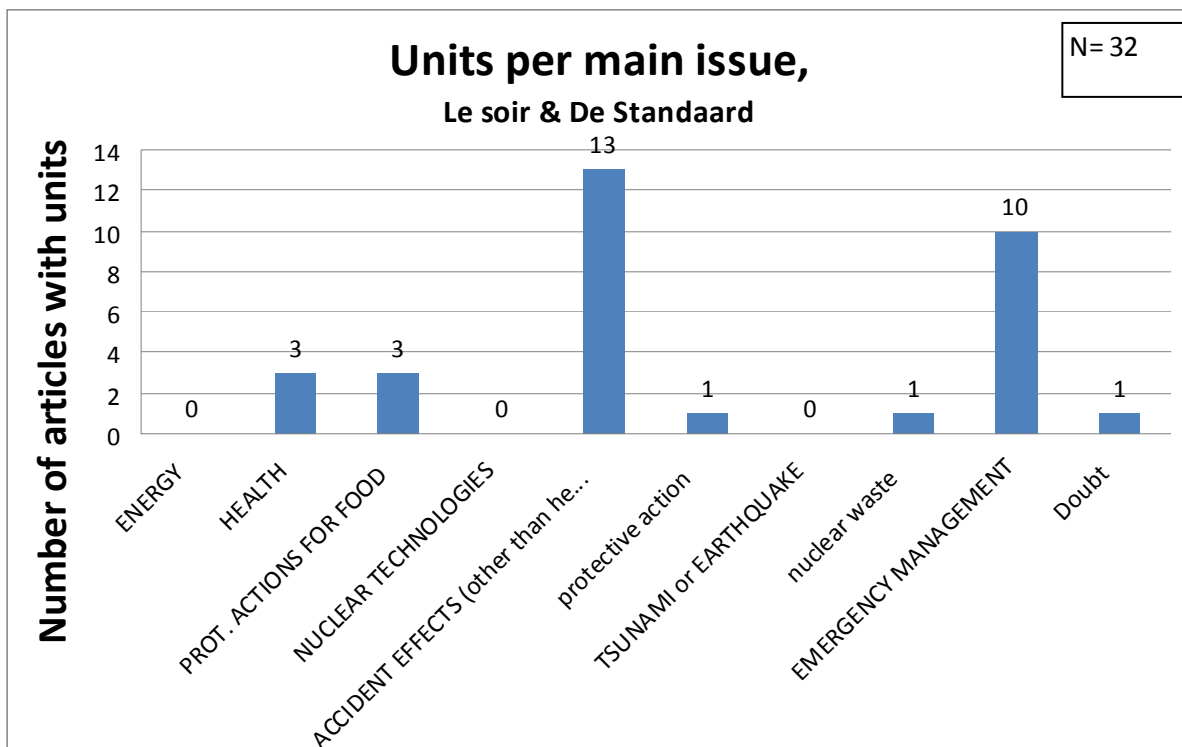
**Figure 58: Measurement units per main issue in the article**

In order to identify for what purposes were the different measurement units used, we looked at the main issue of the media text. From the Figure 58 we can see that the measurement units were mainly reported in the articles addressing the accident affects (other than health effects) and emergency management.

The articles addressing the accident affects were reporting on the contamination of land, contamination of the sea, contamination of inhabited areas (e.g. houses, playground), contamination of goods from Japan (e.g. products, clothes, luggage), radioactivity in the air (cloud), economic impact of the accident or other effects, such as radioactivity, material damage or disturbance of daily life (schools, transport) and compensation.
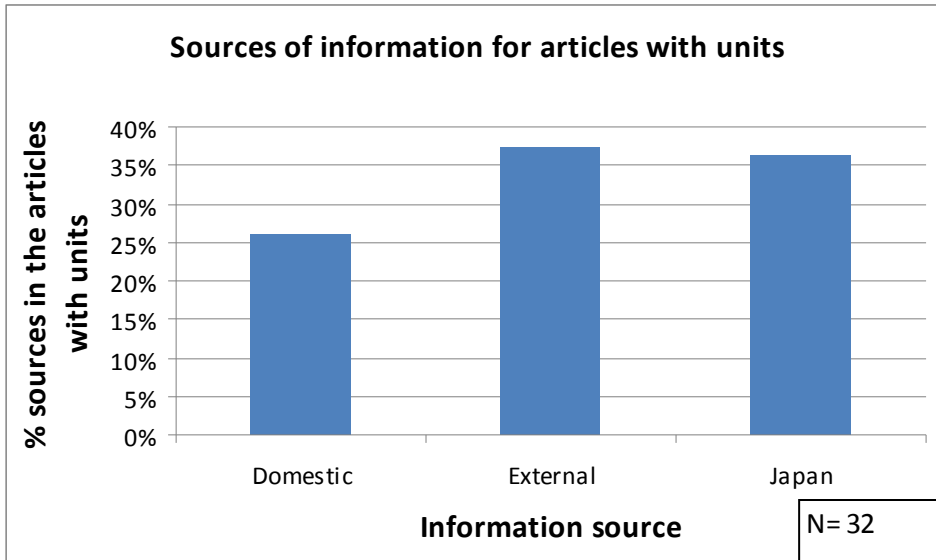
**Figure 59: Sources of information for articles with measurement units**

The Figure 59 presents the information sources for the articles that report the radiation measurement units. 35% of information sources for the articles reporting the units came from the external information sources for instance IAEA or EC and more than 30% of information sources were from Japan, for instance Japanese government or operator of NPP TEPCO. The Belgian information sources, for instance FANC, were presented by 25% of all information sources.

## 19. Risk comparisons

Making risk comparisons is a valuable approach to risk communication, because it constitutes an effective way to address public questions and concerns about risks during and after an emergency. The research shows that effective formats are needed to communicate quantitative information about radiation risks to the general population. For example, the research related to doses received from the mammography showed that quantitative information about risks and benefits may be meaningful only to patients who have some facility with basic probability and numerical concepts[20]. For the non-expert population, the technical language and jargon are major barriers to understand risks. Abstract and unfeeling language, for example reporting quantitative radiation units, often offends and confuses people[21], therefore using comparisons of the risks are advised in order to develop sound communication related to radiation risks.

However, the comparisons used in addressing risks have to be carefully selected. With risk comparisons the risk is put in a perspective, but the comparisons have to be relevant and legitimate. This is especially important for invisible or unfamiliar risks. Covello [2,p.517] pointed out that the most effective comparisons appear to be:

➢ *"comparisons of the same risk at two different times;*

➢ *comparisons with a regulatory standard (such as a public health or food safety standard);*

➢ *comparison of the risk of doing something vs. not doing something;*

➢ *comparisons of alternative solutions to the same problem and*

➢ *comparisons with the same risk as experienced in other places."*

In order to identify risk comparisons used in the media texts published after the Fukushima nuclear accident we counted the following comparisons:

➢ comparison with the risks from medical purposes,

➢ comparisons with the risks from flying,

➢ comparison with natural radiation

➢ comparison with professional (normal) exposure to radiation of workers at nuclear installations

➢ comparisons with limits or norms (words such as "limits", "norms", "maximal allowed levels").

➢ comparisons with a historic nuclear accident e.g. Chernobyl (NOT the atomic bombs at Hiroshima or Nagasaki).

➢ comparisons with something else
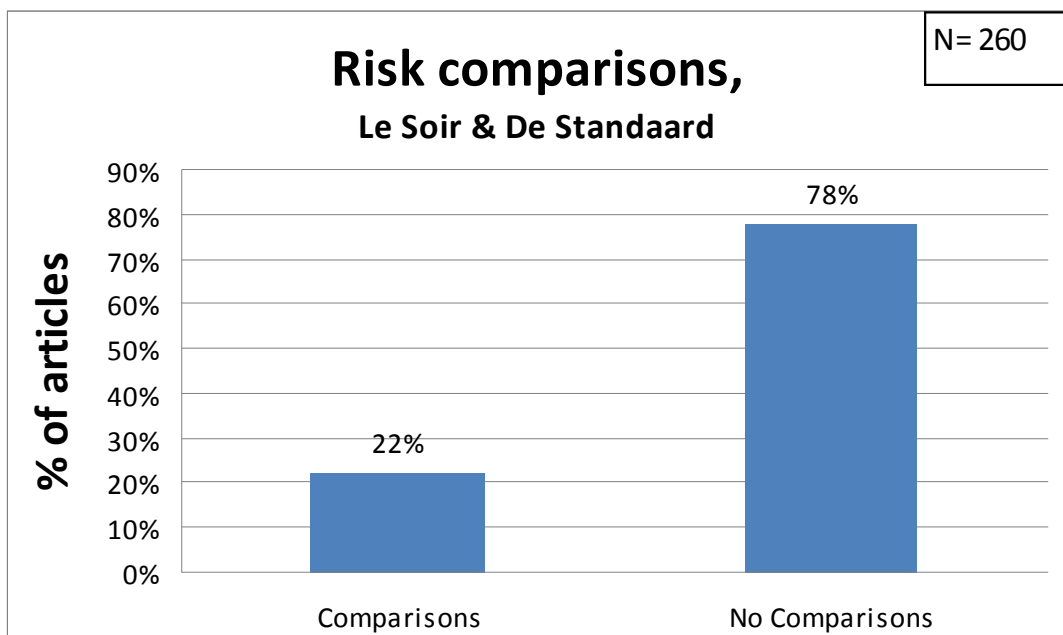
**Figure 60: Risk comparisons in media texts**

Twenty-two percent of the published articles have used at least one risk comparison (see Figure 60).

Figure 61 shows that *De Standaard* included more comparisons in its articles than *Le Soir,* which is a different results compared to the one obtained in the analysis of the measurement units used. The difference is quite significant, as almost twice as much articles from *De Standaard* contained comparisons with other radiation risks (29% in *De Standaard* vs. 15% in *Le Soir*).
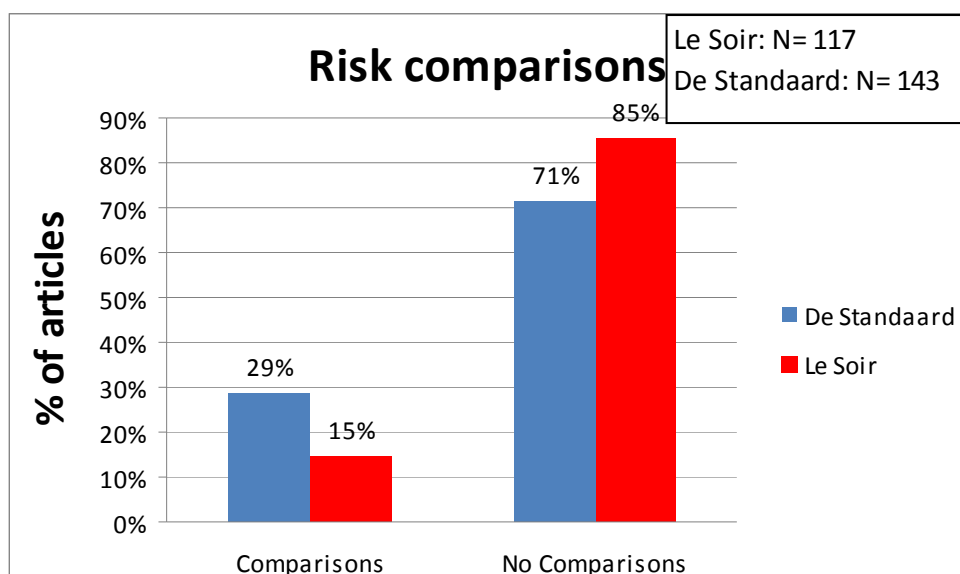


**Figure 61: Risk comparisons in *Le Soir* and *De Standaard* separately**

Five different comparisons were used in both newspapers including the comparison with the 'Natural radiation background', 'Workers exposure to radiation at a nuclear installation', 'Legal norms and limits' and 'Historical nuclear accidents' (see Figure 62). Almost half of the articles (48%) have used a comparison of the risks from the nuclear accident at Fukushima with legal norms or limits and 40% of articles with other nuclear accidents.

The comparisons with another nuclear accident were comparisons with the radiation risks from historical nuclear accidents, for instance, the nuclear accident in Chernobyl. In such cases, the media compared the risks of radioactivity and not of an accident in general. For example, the number of victims or the size of evacuation would not belong to this category. The comparison of the rating given on the INES scale – Fukushima and other accidents was included in this type of risk comparison. The radiation risks from the atomic bombs at Hiroshima or Nagasaki were not included in this category. It is interesting to note that the radiation risks from the Fukushima nuclear accident were not compared with the risks from medical exposures or from flying by plane (which are commonly used when communicating about radiations risks, see for instance http://radioactivity.mext.go.jp/en/monitoring_by_Fukushima_air_dose/2011/12/26480/index.html).
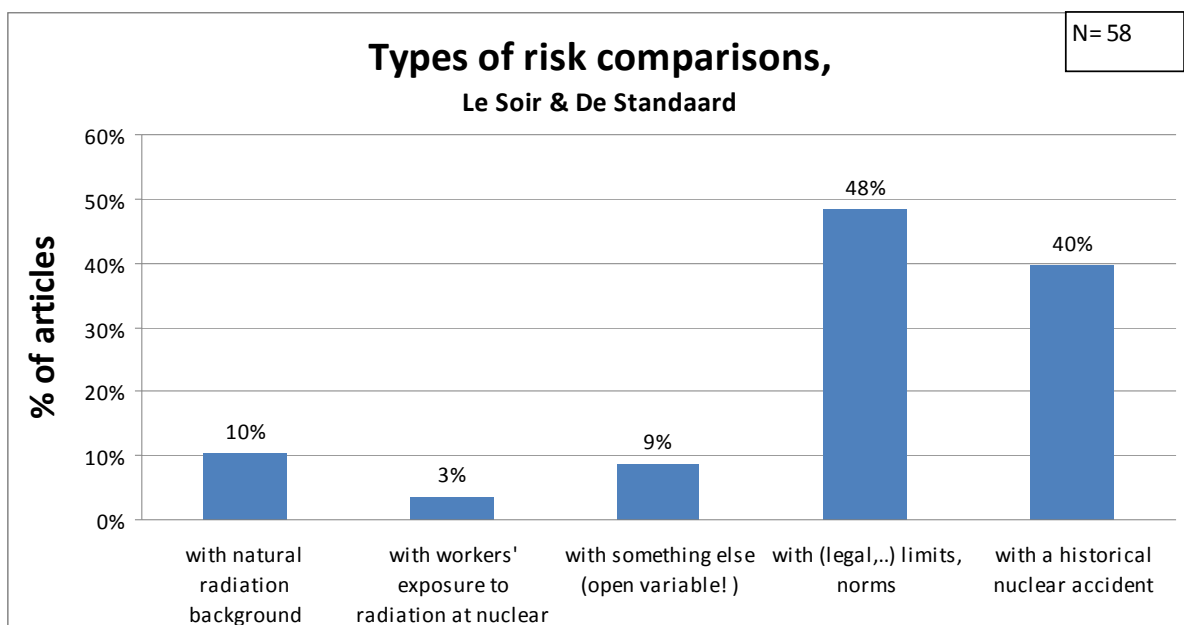


**Figure 62: Types of risk comparisons**

It is remarkable that both newspapers opt for almost the same set comparisons; the comparison with the legal norms was the most often comparison in both newspapers (see Figure 63). Comparisons with the radiation risks from medical purposes and radiation risk from flying were absent in both newspapers. There was also a category denoting a comparison with 'something else'. Here we found that in two thirds of the cases there was a comparison with the radiation from the nuclear bombs in Hiroshima and Nagasaki in 1945.
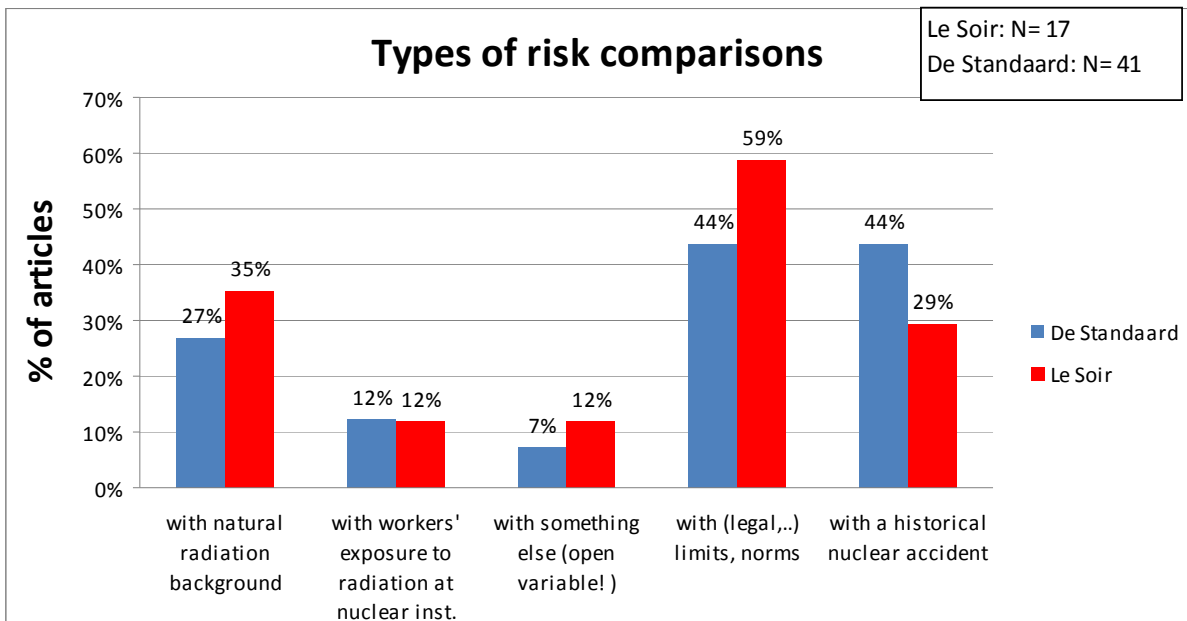
**Figure 63: Types of risk comparisons separately for both newspapers**

By comparing the two newspapers as regards the use of comparisons related to radiation risks, we could observe some differences. *De Standaard* used the comparison to Chernobyl more often than *Le Soir*, while *Le Soir* compared the risks more to norms and legal limits. One remarkable fact is that *Le Soir* was the only one of the two newspapers that compared the radiation risks from Fukushima with those from the WW2 bombings on Hiroshima and Nagasaki; *De Standaard* did not mention this at all.

# 20.    Information sources

> IAEA was recognized as one of the most important sources of information related to the accident. Among the domestic (Belgian) sources, politicians and scientists had a dominant role in disseminating and commenting the information.

As a rule of thumb, especially when reporting on crisis, reporters are expected to use multiple sources [13, 22]. With the content media analysis we explored the sources of information for published media articles related to the nuclear accident at NPP in Fukushima. The aim was to find out which sources were referred in mass media and whose information was the most quoted? By analyzing the quoted sources we will identify who gets a voice in case of a nuclear accident.

In journalism, the relationship between reporters and sources of information is one of the main concerns. Berkowitz claims in a study that "*a central point of concern for the relationship between reporters and sources is that, if the journalistic paradigm calls for turning to authoritative news sources, then those believed to possess authority will have a better chance of getting a voice in the news." [23,p.108]*

When official sources of high prestige appear in the news, the reporter-source relationship tends to legitimate the power structure of society [24]. Ericson[25] found that this occurs because the job of the journalist is to produce news content that bears the aura of factuality: the statements of credible sources can be taken as fact, certifying the news without the need to research the veracity of that "fact". In the research on media framing of public life, the scholars[26] found that in most societies, fact bearers live in the ideologically dominant mainstream, representing that mainstream's dominant ideological institutions and presenting their dominant frame. For example, "*the relationship between reporters and officials is highly controlled at Japanese Kisha[1] clubs… In the Japanese case, news becomes largely what officials say" [23,p.108]*.

The code of journalism assumes that a media article must refer to different sources of information in order to present several views and depict the event taking different aspects into consideration. We analysed the media sources for each of the following groups of countries separately:

➢ Domestic sources (in this case, Belgian sources).

➢ Japanese sources, containing all information that was given by Japanese media or people, e.g. representatives of Japanese company or parties.

➢ External sources, i.e. sources that did not came from Belgium or Japan. For example: a German newspaper or the president of the USA.

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[1] Reporter clubs in Japan
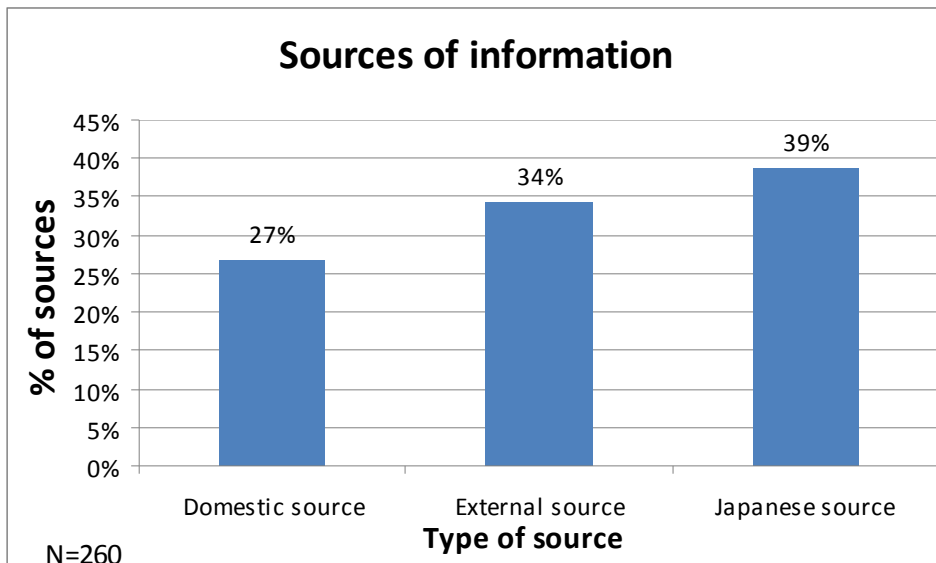
**Figure 64: Sources of information**

Figure 64 shows all the sources that were used in the two newspapers together. The graph shows that Belgian sources of information represented 27% of all sources referred to in the articles; the external sources were present in 34% of the cases, and the most referred sources in the articles related to the accident were sources from Japan (40%).
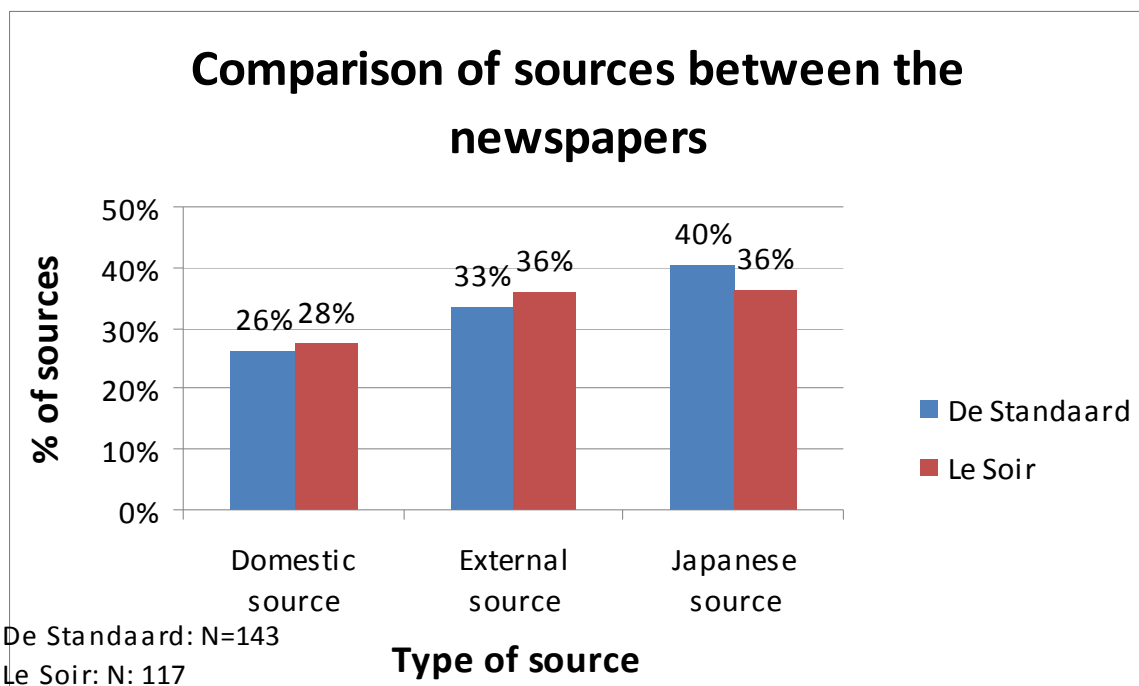


**Figure 65: Comparison of sources between the newspapers**

Figure 65 presents the comparison of the two newspapers as regards the sources quoted. In the 143 coded articles of *De Standaard* we found 67 domestic, 85 external and 103 Japanese sources. In *Le Soir* we found 53 domestic, 69 external and 70 Japanese sources in 117 coded

articles. In general, there were no significant differences noticed between the two newspapers. In both newspapers the Japanese sources were the most quoted sources in the reporting about the nuclear accident in Fukushima.
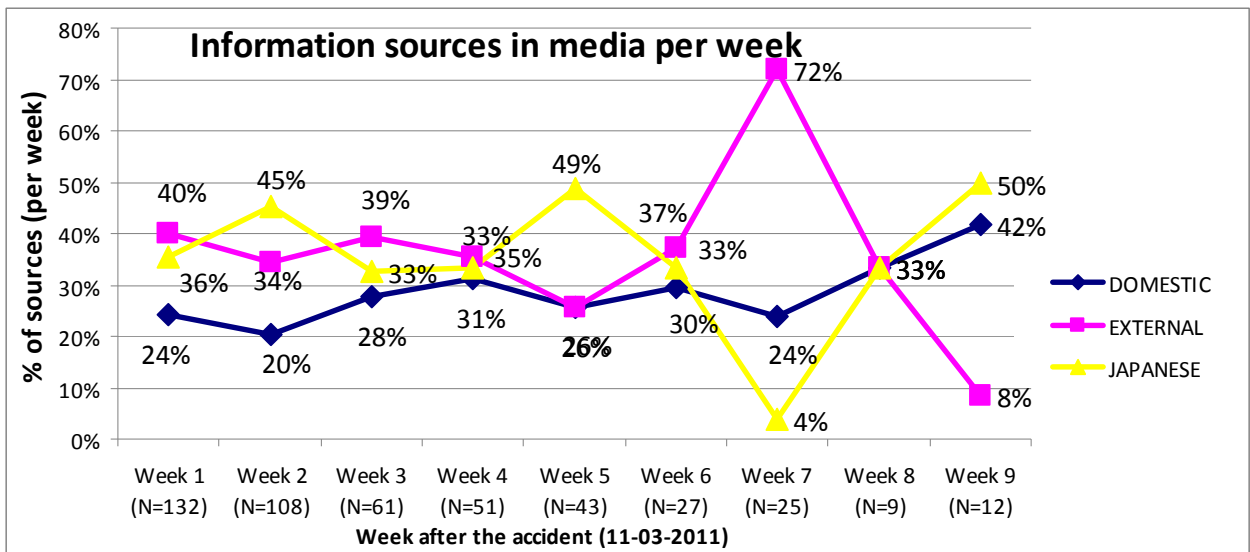


**Figure 66: Information sources in media per week**

In the first week after the accident, the most referred information sources in the media were the external sources (40%), followed by Japanese information sources (36%). The domestic (Belgian) information sources represented 24% of all sources quoted in the first week after the accident.

In general, the domestic information sources were the least quoted sources in the media in the first six weeks after the accident.

External sources became extremely quoted in the seventh week after the accident, when the presence of these sources represented 72% of all sources in the media. With the exception of the seventh week, the information sources from Japan were revealed as important and highly quoted sources.

In Figure 67 we highlighted which information sources were presented in the media per week.
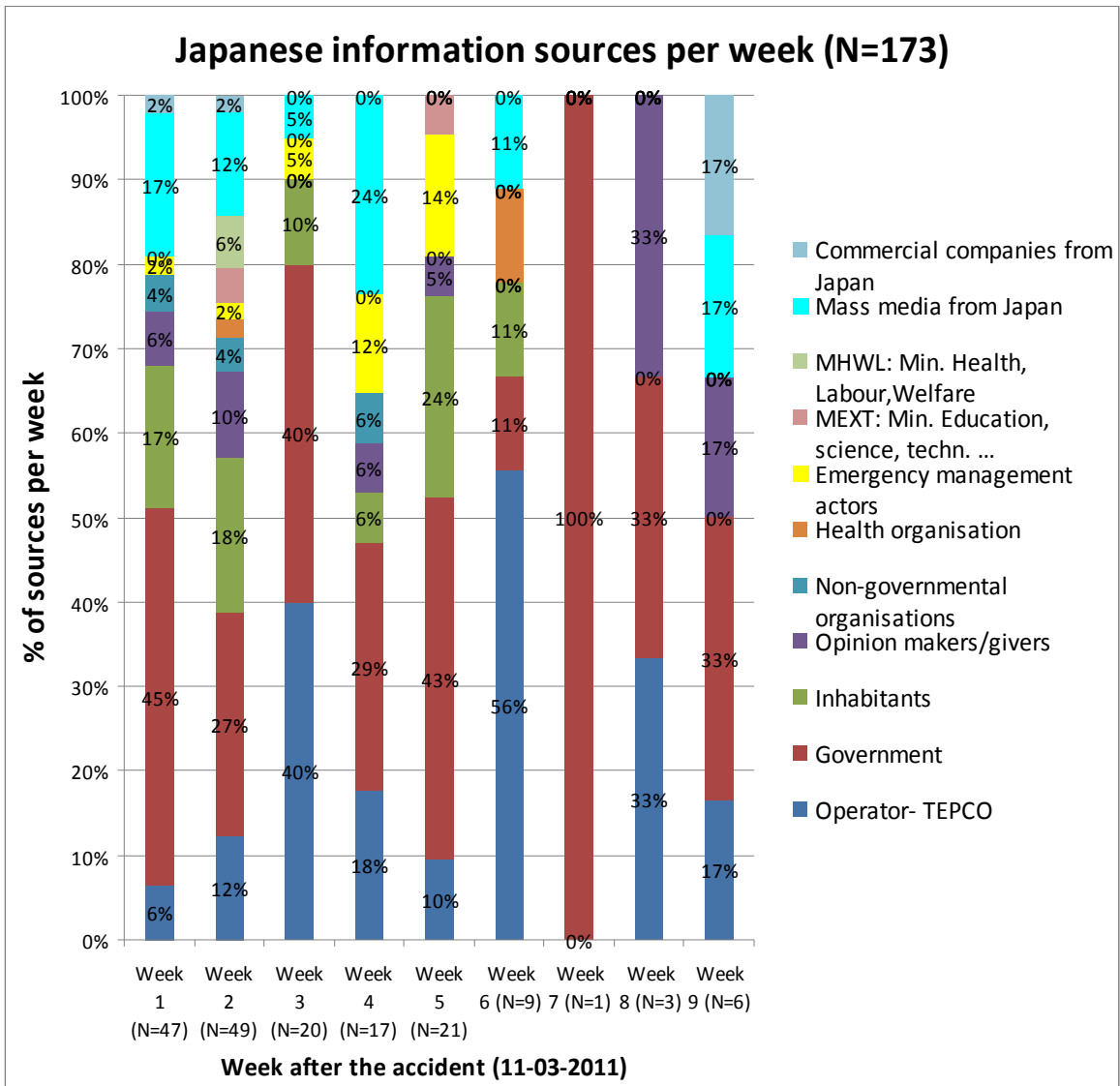
**Figure 67: Japanese information sources per week**

In the first week after the nuclear accident the most presented information source in Belgian media was the Japanese government (see Figure 67). 45% of the information sources belong to this category. Mass media from Japan were quoted in 17% of articles, and the same for the inhabitants of Japan (17%). In general, the government and the operator of the NPP were the most important information sources. The inhabitants from Japan also got a voice in the media, but only in the first six weeks, where they presented from 6% to 24% of the information sources. This category included inhabitants from the affected region, citizens of Japan, people being at the time of the accident in Japan, including personnel of embassies, e.g. families of Belgian citizens being at the time of the reporting in Japan. After the sixth week of reporting about the nuclear accident in Fukushima, the inhabitants disappeared from the media articles as an information source. Instead of inhabitants, the opinion-makers and opinion-givers got more voice in the last weeks of our analysis.

In a later stage of emergency management (after the sixth week), the scientists, well-known personalities and politicians, whose opinion was considered important enough to be

represented separately from the official governmental opinion, shared information or opinions with the media. They represented from 17% to 33% of the information sources in this period. The operator of the NPP Fukushima, the Tokyo Electric Power Company (TEPCO) became the most important information source in sixth week after the accident, when TEPCO was quoted in 56% of the articles. The operator was highly presented in the media also in the third week, with 40% of the articles referring to it.  Mass media from Japan were also an important source of information for the Belgian press.
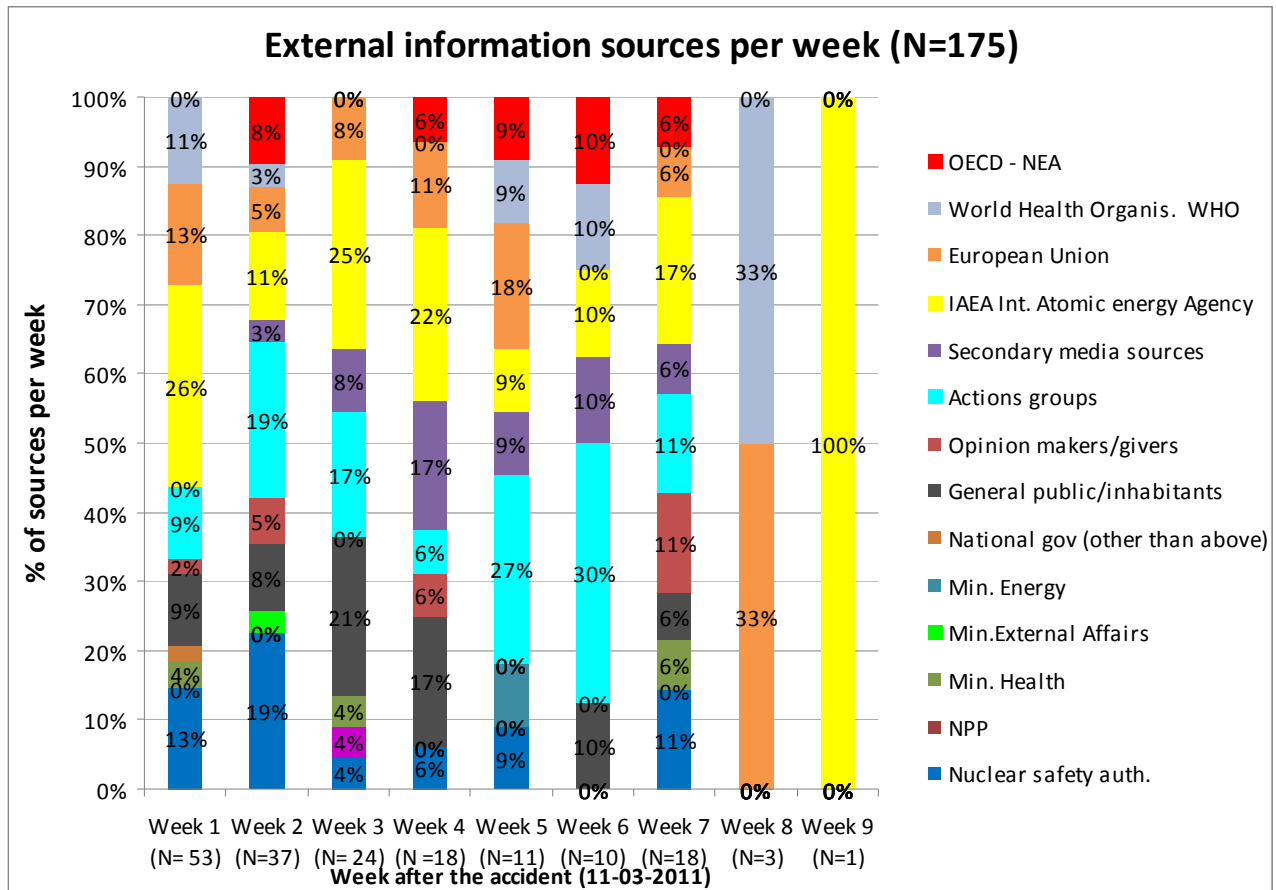


**Figure 68: External information sources in media per week**

The external information sources were revealed an important source for media in the case of a nuclear accident. External information sources are institutions or organisations quoted in the media text, other than domestic or Japanese, for instance the International Atomic Energy agency (IAEA), European Union, World Health Organisation (WHO), United Nations Food and Agricultural Organization (FAO), USA department of energy (DoE).

Figure 68 presents the external information sources in the media reporting related to the Fukushima nuclear accident. The IAEA was recognized as one of the most important information sources for the media. IAEA was especially important in the first four weeks. It provided updated information on the Fukushima accident and posted it on the public website on a regular basis. It continued to monitor the situation in and around the Fukushima Daiichi nuclear power plant. IAEA was also in close contact with Japanese authorities. The media took the information from IAEA and made it available for the general public. This was extremely

significant in the first week, where IAEA became every fourth information source quoted in the media. However, the action groups got a strong voice in the media as well. First seven weeks after the accident the action groups were constantly presented as an information source in media. 6% to 30% of information came from activists from a wide spectrum of organizations such as NGOs, citizens' representative groups or anti-nuclear groups such as Greenpeace section.
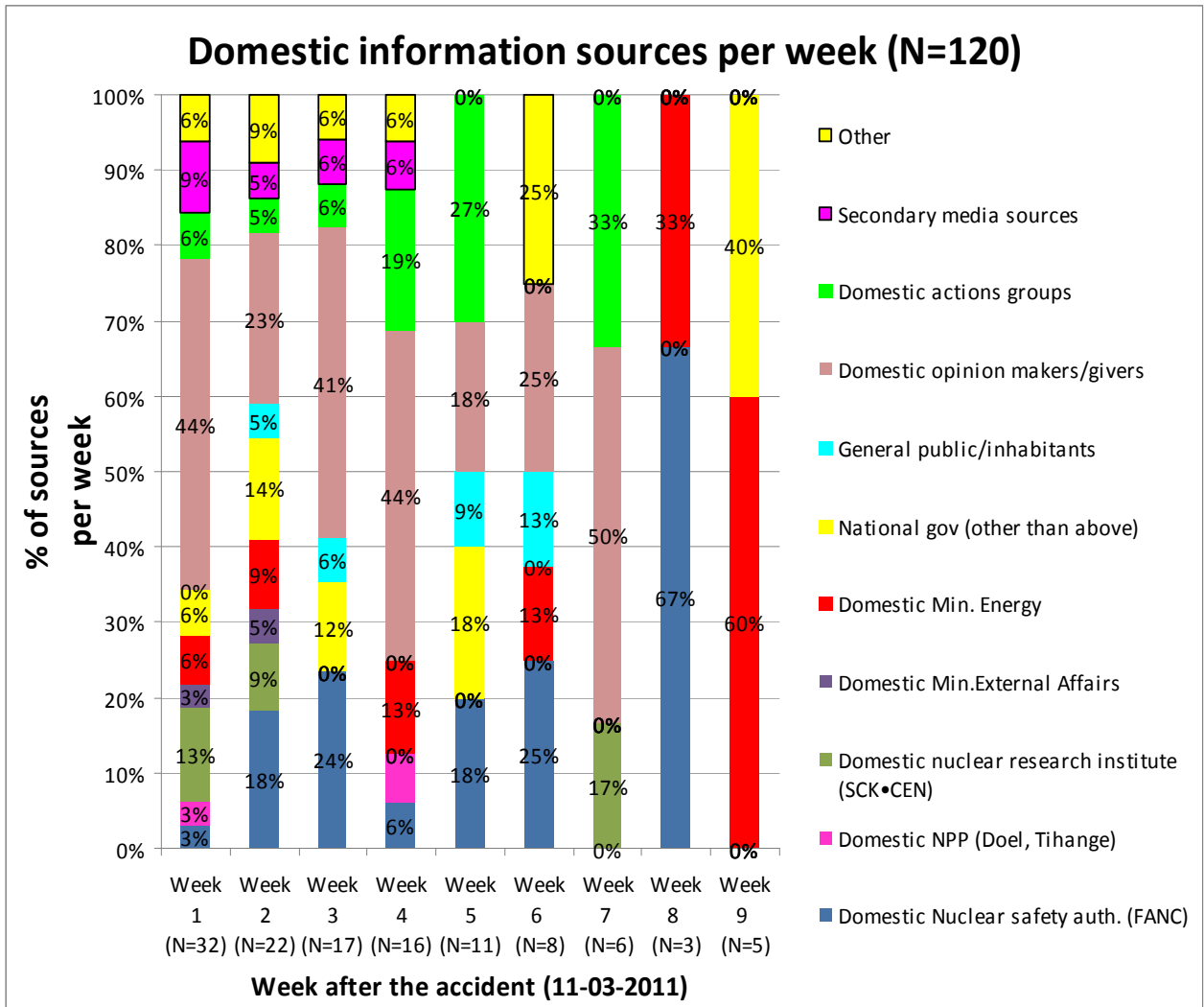


**Figure 69: Domestic (Belgian) information sources in media per week**

Among the information sources from Belgium, the opinion makers/givers got the strongest voice. The scientists, well-known personalities and politicians were the main source of information in Belgian media in the first month after the accident. They represented from 17% to 50% of information sources for media in the first four weeks.

The Belgian nuclear safety authority (FANC) became a regular source of information related to Fukushima nuclear accident from the second week on. The Belgian Ministry of Energy became important at a later stage. In the ninth week of our analysis, the Ministry of Energy represented 60% of the information sources. Also in Belgium, the action groups were constantly presented in media, but more significantly in the second month after the accident.

# 21.      Primary actor in the article

In order to identify the most important actor in the media reporting about the nuclear accident, we identified the "primary voice" in each article. The primary actor in an article is the person, organization, or institution that the article is mostly about. In order to retain consistency, the primary actor for this study was the first actor to appear in the title or the first two paragraphs of the article. If no actor appeared in the title or the first two paragraphs, there was no primary actor identified.

Figure 70 presents the primary actors in the articles. The domestic opinion givers/makers were recognized as the most frequent primary actors in the media articles (14%), followed by the Japanese government (10%) and the Japanese opinion makers/givers. In general, the articles related to the nuclear accident in Fukushima reported about a broad spectrum of actors, from inhabitants to politicians and action groups.

**Primary actors in media articles,**

Le Soir & De Standaard

N= 260
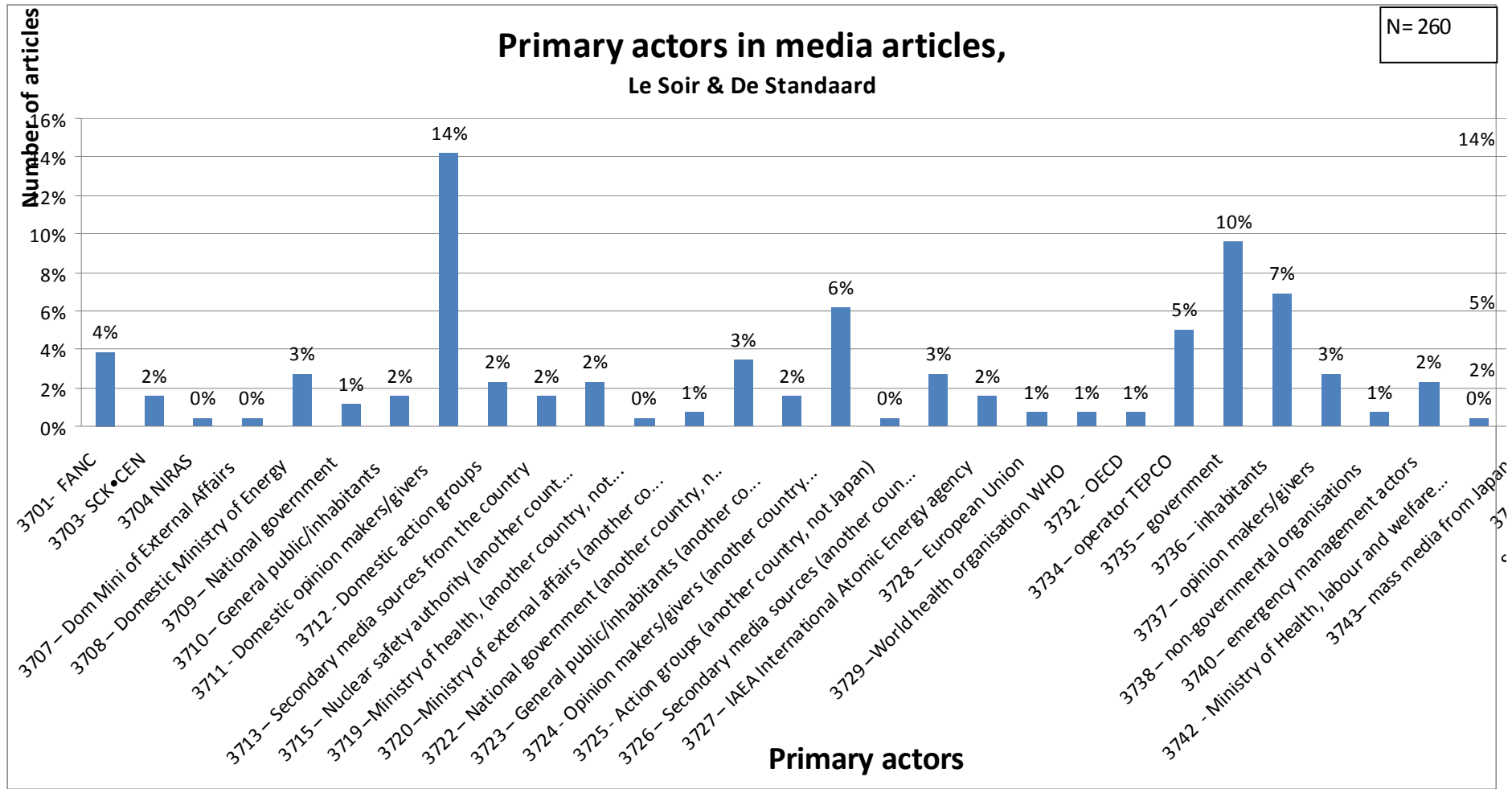
Figure 70: Summary of all primary actors discussed in articles related to the accident

## 22. SCK-CEN & MYRRHA

In order to analyze if SCK•CEN appeared in the selected media articles, the coders were asked to check whether SCK-CEN or MYRRHA were mentioned in the article and, in that case, the connotation of the article towards SCK•CEN or MYRRHA needed to be identified (neutral, negative or positive).

The analysis showed that SCK•CEN as a nuclear research institute was not linked with the nuclear accident in Fukushima in the selected media articles. In the two newspapers taken together, SCK•CEN was mentioned only eight times, seven times with neutral connotation and once with a negative one. The latter appeared in *Le Soir,* in an article related to the consequences of the accident in Chernobyl and the safety of nuclear installations.

MYRRHA was mentioned only once, in an article with a neutral connotation.
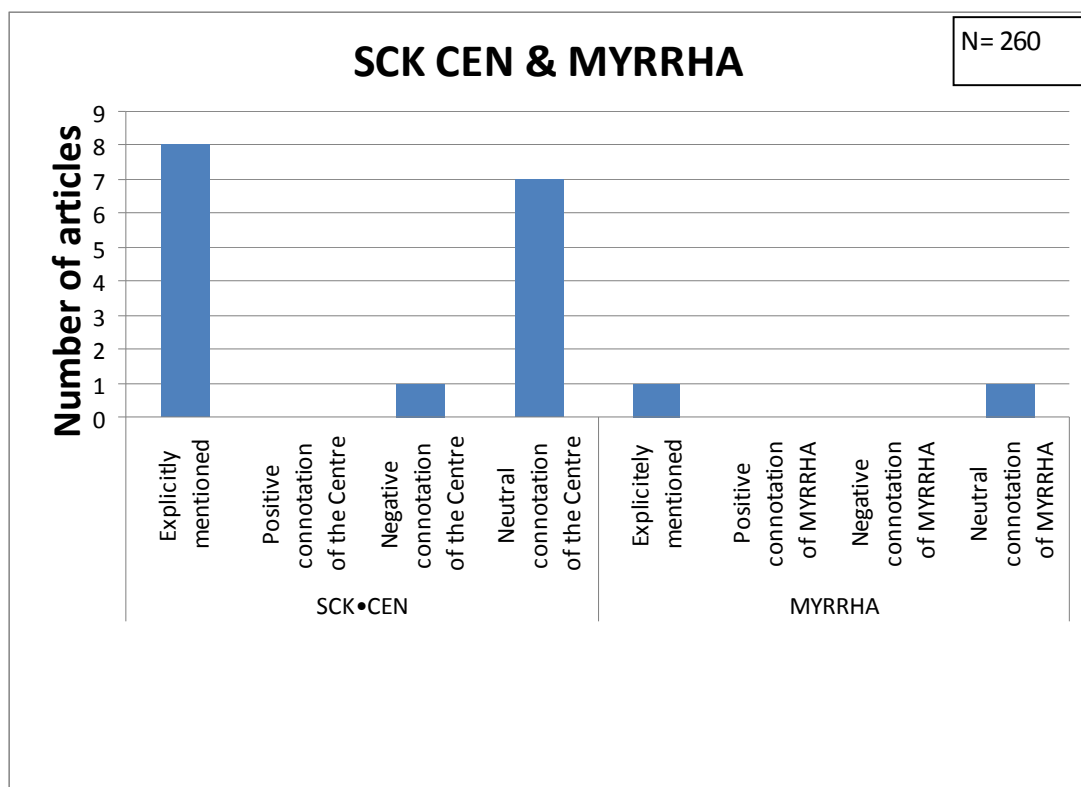


**Figure 71 SCK•CEN and MYRRHA in the media articles**
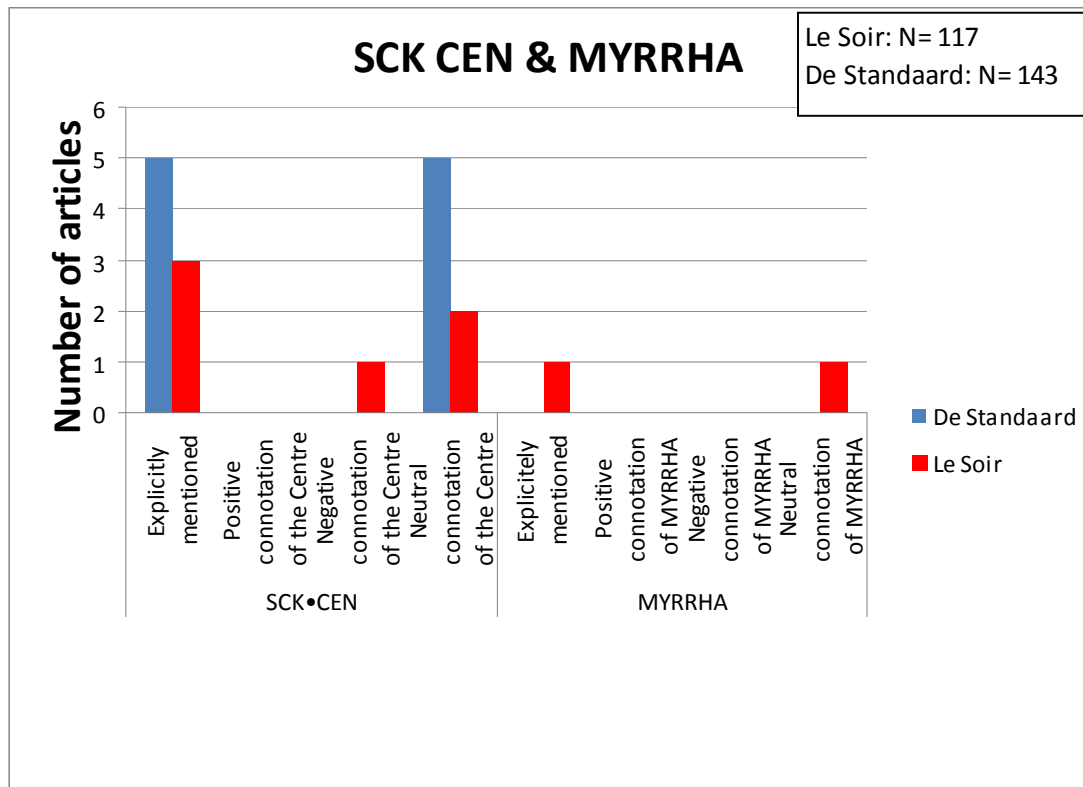
**Figure 72: SCK•CEN and MYRRHA mentioned in the media, per newspaper**

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# 23.    ANNEX  The Code book

## 23.1.  Meta Data

1)  **ID - Article ID**

2)  **Validity ( level of validity of the article)**

3)  **Title** (Transcribe literally in the original language of the article)

4)  **TitleEN** (Translation of the original title in English)

5)  **Date (Date of appearance in the newspaper)**

6)  **Source** (Name of the newspaper)

7)  **STATE** (Country of publishing**)**

8)  **PGNUM – (**Page Number)

9)  **WCOUNT -** Word Count

10)  **VISUALS –** Visuals (photo, graph, map…) (yes/no)

11)  **DATELN –** Dateline (text, e.g. "Tokyo")

12)  **TAKENFROM –** Is the article taken from a press agency or other newspaper? (yes/no)

For each article, we need some descriptive material that allows us to identify the story. Each article should be assigned a specific identification number "*ID*", consisting of 5 digits, from which the first two are the country code. All Belgian articles thus will start with 32, all Slovenian with 36 and all Italian with 39.  For instance, the first Belgian article will have the ID 32001 (Belgian article, country code 32, article 001). In Belgium, for the French articles the last 3 digits will start from 001 (e.g. 32001, 32002,..), the Dutch articles will start from 501 (32501, 32502,..).

The validity of the article has four levels: 0 is not valid at all, we will not code it. E.g. a metaphor like: "he's like the Fukushima nuclear reactor". Level 1 contains the articles that we will code and they are completely related to the Fukushima nuclear accident. Also TV guides are coded as level 1. Level 2 are articles that are doubled in our database. We keep them in our database, but we don't code them. Level 3 are articles that only mention the Fukushima nuclear accident, but they don't discuss it e.g. cancelation of sport events in Japan that are followed by the discussion related to particular sport. Another example of the article with validity 3 would be article related to Khadafi mentioning that the focus of media attention is more orientated towards

Fukushima, but the article discusses the events in Libya. **The coders code only the paragraph or sentence related to Fukushima, not entire article.**

After the validity, we shall record the original title or the article ("*title*"), the English translation of the title ("*TitleEN*"), the "*date*" of the issue, and the "*source*" of the article (the name of the newspaper). Because of the dynamic media agenda, the page number should also be mentioned.

The articles that are covered in newspapers may vary significantly in size. Some cover significant parts of a page, while others consist of fewer than 50 words and are tucked away in a corner. One way of determining the size of an article is by counting the "*words*".

The size of an article can be part of the agenda setting capabilities of the media, as newspapers can accentuate stories by making them larger and putting them front and center. Is this agenda different in different countries?

Do other aspects of format, such as visuals also matter in the importance attributed to the content of an article or an issue in a newspaper? The "*visuals*" category is a binary variable that we shall use to distinguish between articles with or without visuals. The purpose of this dummy is to distinguish between the stories in which the reporter is supported by visuals in order to have more effect and ordinary articles. If visuals are not obtainable, then mark it as such.

We are also interested in where the article was written, which is stated in the "*dateline*". Was the reporter in Japan, in the region from which he/she was reporting or was he or she writing from a different country or region? It is for example possible that the newspaper did not have a journalist on location, and because of the conditions or costs, the reporter was not able to get there. The dateline can usually be found in front of the body of the article. If there is no dateline, the site of the media house must be written, e.g. Brussels. For the type of article 'letters' you write the place of the author.

Finally, we shall record if the article was taken from a press agency (e.g. Associated Press). In this case the variable TAKENFROM will get a value 1, otherwise 0. This is useful for instance in case of a dateline 'Tokyo" to distinguish the case when the journalist himself has been at the reported location (e.g. Tokyo) or whether the reporting by another press agency (e.g. AP) has been done from Tokyo.


**<span style="color:red">From this point onward all variables are binary: Yes/No, unless otherwise specified.</span>**

### 23.2.    Type of the article


**100) Type of article**

   1001 - News

   1002 - Interview

1003 - Editorial

1004 - Column

1005 - Letter

1006 - Feature

1007 - Mixed

1008 - Other



**exactly one** of these will be coded **1**, the rest: 0

*News*: Concise report of a news item, usually just a short paragraph which sticks to factual information or a summary of an event, e.g. an information about explosion on nuclear reactor.

*Interview*: An article largely based on an interview, which can be preceded by a brief introduction and/or followed by a conclusion. Interviews often tend to represent one point-of-view i.e. that of the actor interviewed, unless two or more actors have been interviewed. There are different types of interview e.g. studio interview or long statements in article.

*Editorial*: Editor's viewpoint implies a critical analysis of the news item (subjective opinion supported by facts). The issue is often framed in its broader context. For the Fukushima nuclear accident, this can be the wider context of international information exchange in case of emergency, nuclear safety, energy needs or international (political) discussion on nuclear energy.

*Column*: A regular piece in a publication by the same author providing an opinion or different perspectives on the news item, but not labelled as editorial. A column is always written by opinion-maker.

*Letter*: A letter to the editor or newspaper, written by an individual from the general public or representing an organization. E.g. Letter from Greenpeace.

*Feature*: An in-depth look at what's going on behind the news. This type of article tends to include a detailed description and the analysis of the issue involved and is often accompanied by an interview or quotes from various actors. A feature invariably implies full-page articles, with photos and sometimes illustrations reporting from the field with all possible sources included (e.g. reportage).

***Mixed:*** An article with analysis and quotes/ small interview, a one-off article by an expert(s)/well-known personality(ies), a longer analysis article where a description or analyses is interspersed with quotes from actors referred to in the news item. This category is added to classify articles that do not fall into any of the above categories, but have a common thread running through them – quotes from actors. The size of the article can therefore vary from short (a few statements with quotes, and therefore not just a brief news where there are no quotes), to longer articles (a more detailed description with quotes from actor(s), but not long enough to fall into any of the other categories).

***Other:*** *Ot*her publications which do not belong to any of mentioned categories, e. g. comics, cartoons… In this category enter also the articles that are the text below the photo's e.g. subtitles and TV-guide related to Fukushima. Also the definitions or general explanations can be coded as other; e.g. radioactivity, fusion, iodine.

### 23.3. **Narrative codes** (four digits)

21) **DOMISSUE –** does the article concern a domestic issue, an issue of EU, Japan, another country or international?

        2101 – domestic

          2102 – European ⬅ | **exactly one** of these will be coded **1** (the most important), the rest: 0

          2103 – Japan

          2104 – Another country

          2105 - international or global

22)    **EMPHASE** - Emergency management phase

          2201 – preparedness ⬅ | **exactly one** of these will be coded **1**, the rest: 0

          2202 – response

          2203 – recovery and evaluation

The coder has to determine "**DOMISSUE**", i.e. whether the article considers:

- a domestic issue;

- a European issue (e.g. food restrictions inside the EU);

- an issue **only in** Japan (e.g. lack of trust in the Japanese government by the population). Remark: all articles will mention Japan; in order to code 2103 as 1, the article has to focus on the situation in Japan.

- an issue related to some other state or region (e.g. USA or South Korea);

- international issue broader than EU (e.g. recommendations or comments of international organisations, such as IAEA) or global issue (e.g. energy in general or future of energy worldwide).

Coders may find an indication on assigning the DOMISSUE by looking at the particular newspaper section where the article was published, e.g. domestic issues, external affairs, etc.

Example for **DOMISSUE**: if *the article clearly mentions* that this accident posed a threat to Belgium as the radiation will increase because of the nuclear accident in Japan, the value 1 should be given to the dummy variable **2101**. If the article addresses a domestic topic, but this topic is a result of e.g. international norms it has to be coded as domestic as well. For instance, if the article reports about sushi rejection in many states as well in Belgium, the coders in Belgium have to code the article as dummy variable **2101** with the value 1.

The "**EMPHASE**" aims to identify which phase of the emergency management is the article mainly addressing. Nuclear/radiological emergency management is nowadays often presented as a cycle [16] composed of preparedness for possible nuclear accidents (**2201**), response (**2202**), recovery actions and evaluation of the technical, political, economic, societal consequences of the accident (**2203**).

Example for **EMPHASE**: Preparedness: **2201** = 1 if the article concerns any aspect of emergency planning, e.g. stress tests on nuclear installations, pre-distribution of iodine tablets in Belgium, articles related to possibilities of earthquake in the countries. Response: **2202** =1 if the article concerns crisis response (e.g. cost or number of people evacuated, monitoring, information distribution e.g. INES, food restrictions), i.e. immediate actions and decisions but not the future, not long term plans etc. Recovery: **2203** = 1 for all articles related to long term recovery actions (e.g. decontamination of buildings, removing the surface layer of contaminated soil, waste management) or to societal, political, economic, or other effects (e.g. discussions of the future of nuclear energy, German decision to phase out nuclear energy, protest against nuclear energy, global costs of the accident, drop in the public opinion support of nuclear energy).

## 23.4. Issue Codes (four digits)

The coder should establish the major topic category (usually discussed in the first two paragraphs of the article and/or the title of the article): is it about energy, health, food, nuclear technology, radiation effects, protective actions, tsunami or earthquake, nuclear

waste, etc.? After that, the coder shall decide on the more specific subtopic code. Codes should be assigned at the most detailed level that is feasible. If the article deals with two or more topics, but one is clearly dominant, the article should be classified according to the dominant topic.

**23)** Energy,

2301 – energy supply (e.g. shortage)

2302 – future of nuclear energy (overview

of the nuclear issues in the past

and the present - influencing

the future of nuclear)

2303 – energy production

**Each of these may be** coded **1** or 0 (it is possible to have multiple 1's)

2304 – climate change

2305 – waste (integrated in a broader debate about nuclear energy)

2399 – about another issue related to energy

**24)** Health,

2401 – cancer

2402 – next generations

**Each of these may be** coded **1** or 0 (it is possible to have multiple 1's)

2403 – other diseases than cancer

2404 – psychological consequences

2499 – about another issue related to health

**25)** Protective actions related to food (related to radiation),

2501 – drinking water

2502 - farming products

**Each of these may be** coded **1** or 0 (it is possible to have multiple 1's)

2503 - sea food, including fish

2505 – food import /export

2506 - restrictions on food products (consumption, producing, etc)

2507 – food control

2599 – another issue related to food

**26)**   Nuclear technologies,

   2601 – technical aspects of reactors Japan

   2602 – technical aspects other reactors (outside Japan)

   2603 – stress tests for nuclear installations

   2604 – new types of nuclear reactors (Gen III or IV mentioned by name)

   2605 – other nuclear technology (e.g. research reactor, use of nuclear technology)

**27)**   Accident effects other than health & food,

   2701 – contamination of the land

   2702 – contamination of the see

   2703 – contamination of inhabited area (e.g. houses, playground)

   2704 – contamination of goods from Japan (e.g. products, clothes, luggage)

   2705 – other effects e.g. radioactivity, material damage, disturbance of daily life (schools, transport) and compensation.

   2706 – radioactivity in air (cloud)

   2707 - economic impact

> **Each of these may be** coded **1** or 0 (it is possible to have multiple 1's)

**28)**   Other protective actions (not food),

   2801 – decontamination

   2802 – monitoring the environment

   2803 – evacuation of people

   2804 – sheltering of people

   2805 – iodine tablets (stable iodine)

   2806 – measurement of contamination of people (internal or external)

> **Each of these may be** coded **1** or 0 (it is possible to have multiple 1's)

**29)**   Tsunami or earthquake,

   2901 – consequences

   2902 – probability

   2903 – specifics (general things)

> **Each of these may be** coded **1** or 0 (it is possible to have multiple 1's)

**30)** Nuclear/radioactive waste (the word "waste" specifically mentioned),

        3001 – management of Fukushima waste (other than sea water)

        3002- management of nuclear waste (general): siting, storage (interim/temporary), disposal (permanent), spent fuel

        3003 – amount (expressed with the measurement unit, e.g. $m^3$, litres, etc.)

**31)** EMERGENCY MANAGEMENT ISSUES:

    3101 - public information (e.g. information system, informing public, INES scale, censorship …)

    3102 - emergency workers + actions: direct involved at the plant  (Fukushima 50, kamikaze …) actions on the plant (cooling, extinguishing the fire, explosions …

    3103- other emergency actors (e. g. military, fire brigade, police, civil protections, volunteers… ) + actions on the plant (cooling, extinguishing the fire, explosions …

    Examples! E.g. monitoring environment: measurement of the contamination of the inhabited areas, using the specific equipment( detectors).

DOUBTCAT – doubt category

        3100 – doubt? Yes=1; no=0

Let's take as example an article on the evacuation of people from a certain area as one of the protective measures to protect against health consequences from radiation. This article has to be coded as being mainly about a protective action and only secondarily about health.

If the coder cannot decide, counting the paragraphs belonging to the different issue codes can help to determine the dominant issue code.

In case the coder has serious doubts about which issue code to assign, he/she should mark the doubt variable **(3100)**. In this case, the coder should briefly state between which codes he/she is hesitating. This area is reserved for the most contentious issues. If a coder feels 90% confident about the issue code, this 10% doubt is not enough to use this doubt variable.

### 23.5. Tendency of the Article

In addition to the issue codes, we include a number of variables affecting the way in which an article is presented or can be interpreted. Coders will be asked to code variables that capture whether the article mentioned a conflict and whether there were any emotions expressed.

**32)** **CONFLICT**: Does the article mention a conflict or strong disagreement?

3200 – Conflict or disagreement?  Yes=1, No=0

"**CONFLICT**" Conflict stories involve a conflict between people/groups/parties/countries. The story contains an explicit mention of the fact that there is disagreement about the issue (e.g. nuclear energy, emergency management, monitoring). This disagreement can be in words (e.g. contradiction positions or claims) or in deeds (e.g. protest, stigmatisation,). If the article includes conflict, code as =1.

The purpose of the conflict variable is to identify stories in which there is an explicit mentioning of some sort of disagreement about a nuclear emergency management or nuclear energy in general. This can be in the form of a disagreement in words. For example, politicians disagree about future or nuclear reactors, unions disagree with the restrictions on farming products, the environmental organisations disagree with (not) evacuation etc. A conflict can also be in the form of deeds. This can for example be in the form of protests, protest against nuclear energy, and rejection of food products from Japan.  Examples of this are: Greenpeace activists chain themselves to trees to stop logging.      The article needs to explicitly mention a conflict or disagreement, but the words or deeds do not need to be the primary topic of the story. For example in Belgium, an article mentioned that there was no significant increase in radiation levels in the country, measured by an advanced monitoring network in the country, but then further the article stated that there was a disagreement between the environmentalists and the nuclear safety authorities related to the measured concentration of radioactivity. Another example is a march to show unity against nuclear energy. The primary topic here is definitely not conflict. However, the article can state that this march was organized because of the growing tensions between pro- and –con nuclear groups, demonstrating conflict.

If the author of the article expresses an internal conflict mentioning arguments pro– and contra- this should not be coded as a conflict (usually this is expressed in subjective types of the articles e.g. letter or editorial).

**33)** **KEYWORD**: Does the article mention words triggering or expressing emotions? (synonyms will be included in accordance to linguistic properties)

3301 – Chernobyl

3302 – panic

3303 - nuclear accident

3304 - nuclear disaster (also apocalypse)

3305 – distrust (no or low trust)

3306 – danger / dangerous

3307 – dread (fear, anxiety)

3308 – anger

3309 – victim (casualties, including deaths)

3310 – sympathy

3311 – compassion

3312 – solidarity (e.g. raising funds to help people in Japan)

3313 – assistance (from international organisation such as IAEA, experts, states)

3314 – blame (who is responsible?)

3315 - chaos

**Each of these may be** coded **1** or  0 (it is possible to have multiple 1's)

Nuclear accidents are linked to a high catastrophic potential and emotional reactions, but,  with the distance from the affected site, the use of emotions decreases [27]. With the "**KEYWORD**" variable we will assess whether the nuclear accident at Fukushima was reported in the direction of a negative insinuation that could stimulate public's emotions and we shall evaluate public emotional response to the event. For this purpose the frequency of appearance in the media of a number of keywords with positive or negative connotation will be calculated. Synonyms (e.g. "dread" also expressed with the words "fear" and "anxiety" or "worry") and words having the same root (e.g. danger-dangerous – endangered) will be accounted for in accordance with linguistic properties. The keyword has to be explicitly mentioned in the article, one or more times. For example, if the word Chernobyl is mentioned one or more times, the variable 3301 has to receive the value 1 (3301 = 1).

## 23.6.  Sources of  information

**34)     SOURCEINT:** All domestic information sources included in the article

**3401 –** Domestic Nuclear safety authority (FANC in Belgium, ASN in Italy and SNSA in Slovenia)

**3402 –** The Nuclear Power Plant in the country – operator, owner, distributor (In Belgium NPP Doel & Tihange, Electrabel Suez; in Italy ENEL and EDISON; and in Slovenia NPP Krško or Electro Slovenije)

**3403 –** Domestic nuclear research institute in country (SCK•CEN in Belgium, INFN  in Italy and  Institut Jozef Stefan in Slovenia)

**3404** - Waste management agency (NIRAS in Belgium, xxx in Italy, ARAO in Slovenia)

**3405 –** Domestic  Ministry of the Environment and Spatial Planning

**3406 –** Domestic  Ministry of Health

**3407 –** Domestic Ministry of External Affairs

**3408 –** Domestic Ministry of Energy

**3409 –** National government

**3410 –** General public/inhabitants

**3411 -** Domestic opinion makers/givers

**3412** - Domestic action groups

**3413 –** Secondary media sources from the country

**3414 –**Another national agency (only Italy: ENEA)

**3499 -** Other

**Each of these may be** coded **1** or  0 (it is possible to have multiple 1's)

**35)     SOURCEEXT:** All information sources included in the article other than domestic or Japanese

**3501 –** Nuclear safety authority

**3502 –** The Nuclear Power Plant– operator, owner, distributor

**3503 –** Nuclear research institute

**3504 –**Ministry of the Environment and Spatial Planning

**3505 –**Ministry of health

**3506 –**Ministry of external affairs

**3507 –** Ministry of energy

**3508 –** National government

**3509 –** General public/inhabitants

**Each of these may be** coded **1** or  0 (it is possible to have multiple 1's)

**3510 -** Opinion makers/givers

**3511** - Action groups

**3512 –** Secondary media sources

**3513 –** IAEA **– UN** International Atomic Energy Agency

**3514 –** European Union

**3515 –** World health organisation WHO

**3516 -** United Nations Food and Agricultural Organization FAO

**3517 –** USA department of energy (DoE)

**3518** – OECD

**3519** – ISPRA (Italy) or IRMM (Belgium)

**3599 -** Other

**36)** **SOURCEJAP:** All sources from **Japan** included in the article

**3601 –** operator TEPCO

**3602 –** government

**3603 –** inhabitants

**3604** – opinion makers/givers

**3605** – non-governmental organisations

**3606** – health organisation

**3607** – emergency management actors

**3608 –** Ministry of Education, culture, sports, science & technology in Japan (MEXT)

**3609** - Ministry of Health, labour and welfare (MHWL)

**3610** – mass media from Japan

**3611**- commercial companies from Japan (Toyota, Sony, Nissan…)

> **Each of these may be** coded **1** or 0 (it is possible to have multiple 1's)

**37)** **SOURCENOTKNOWN:** source not known

3701 – is the source unknown? 1=yes, 0=no

**38)** **PRIMACTO :** primary actor in the article

Identifying sources of information is an important part of defining the communication flow, by pinpointing the actors that have been communicating in order to send their message through media channels to the general public. With the content media analysis we will explore the sources of information for media news related to the nuclear accident at Fukushima nuclear power plant. The aim is to find out which sources were referred in mass media and whose information was the most quoted? The code of journalism assumes that a media article must refer to different sources of information, in order to present several views and depict the event taking different aspects into consideration. According to this, we expect that every article will have more than one positive value (1) at dummy variable related to sources.

The sources are divided in three categories: domestic "**SOURCEINT**" (**34**-), international or external source "**SOURCEEXT**" (**35-**) and sources from Japan "**SOURCEJAP**" (**36-**). Every article has to have at least one identified source - code value 1. The coder should always try to establish the main category first: is it the source domestic, from international environment or from Japan. Only then does the coder decide on the more specific code of the source. Only in the case that there is no possibility for source identification he/she should use the dummy variable "**SOURCENOTKNOWN**" value =1. The coder will assign also the primary actor in the article "**PRIMACTO**" (**38-**), using the codes from 34- to 36-.

**39) PRIMACTO :** If one or more actors have been identified, who is the primary actor discussed in the article?

*Identification of **"SOURCEINT"** domestic information sources:*

The domestic Nuclear safety authority (**3401**) is the national nuclear safety administration whose scope of competence includes carrying out administrative and professional tasks. Among these are regulation of the  nuclear and radiological safety of nuclear facilities, transport and handling of nuclear and radioactive materials, accountability and control of nuclear materials, physical protection of nuclear facilities and nuclear materials, professional qualifications of personnel operating nuclear facilities and their training, quality assurance in the nuclear field, radiological monitoring of the environment, early notification in case of nuclear or radiological accidents, international co-operation in the field of competence, nuclear emergency communication. The nuclear safety authority in Belgium is FANC, in Italy  ASN and in Slovenia is SNSA.

The Nuclear Power Plant in the country – operator, owner or distributor (**3402**). The source in this case may be different between the countries since Italy doesn't have

an NPP, but has a distributor of electricity, using the nuclear energy bought abroad. In Belgium, the operators are Doel and Tihange NPP's, the owner of NPP's and distributor is Electrabel (GdF-SUEZ), in Italy ENEL or EDISON and in Slovenia NPP Krško or Electro Slovenije.

The category Nuclear research institute (**3403**) includes scientific institutions carrying out nuclear research: SCK•CEN in Belgium, INFN in Italy and Institut Jozef Stefan in Slovenia. If the information in the article is coming from a research institute or from an expert presented as affiliated to the research institute, the variable 3403 has to receive the code 1. If the article only reports the activities at the research institute and the source of this information is not clearly the institute itself (e.g. spokesperson or press conference) it should NOT be coded under this code.

The waste management agency (**3404**) is in charge with the short and long term management of radioactive waste management. In Belgium it is NIRAS, in Slovenia ARAO, in Italy xxx.

Domestic Ministry of the Environment and Spatial Planning (**3405**) – or the ministry that covers the issue of environment.

Domestic Ministry of Health (**3406**) – or the ministry that covers the issue of health.

Domestic Ministry of external affairs (**3407**) – or the ministry that covers the international relationships and the issues related to citizens abroad.

Domestic Ministry of energy (**3408**) – or the ministry that covers the issues of energy.

National Government (**3409**): This term is used to denote a number of political actors; the president or prime minister, ministers in national government (except for the minister of environment and spatial planning, health and external affairs, which are assigned with own codes). This category is meant for the Federal cabinet ministers and also includes the prime minister. In some cases, a country might have a federal as well as regional governments (Belgium), which means that there are multiple sets of governments that each have their own ministers. If a minister at the Federal level or regional ministers is present, the code 1 should be assigned. The crisis cell also belongs to this category.

General public/inhabitants (**3410**): Refers to the lay persons, usually mentioned in the context of the inhabitants and concerned citizens.

Domestic opinion makers/givers (**3411**): This category of actors includes scientists, well-known personalities and politicians, whose opinion is considered important enough to be represented separately, either in a full-fledged interview or via quotes. The actors grouped in this category represent themselves rather than an institution or a role attributed to them (the opinion given is that of an individual and not of a group). People from academic institutions also fall into this category when the opinion provided is theirs and not that of the department or division they belong to.

This code will be also chosen for articles that are editorials or columns.

Domestic action groups (**3412**) includes activists from a wide spectrum of organizations such as NGOs, citizens' representative groups, anti-nuclear groups such as Greenpeace section form the country.

Secondary media source from the country (**3413**): Secondary sources of information are **reports of other media houses or press agencies**, eg. BELGA in Belgium or STA in Slovenia.

Another national agency (**3414**): <u>only Italy</u>: ENEA.

*Identification **SOURCEEXT** other than domestic information and other than Japan sources included in the article:*

Nuclear safety authority (**3501**) is the nuclear safety administration in other countries e.g. Nuclear Safety Authority of France (ASN).

Nuclear power plant, operator, owner or distributor (**3502**)., e.g. nuclear power plant in Germany.

The category Nuclear research institute (**3503**) includes the scientific institutions carrying out nuclear research and measurements. The code 3503 = 1 has to be given if the information comes from a research institute from another country, e.g. IRSN in France. If the article only reports about the activities of this research institute and the source of this information is not clearly the institute itself (e.g. spokesperson or press conference) it should NOT be coded under this code.

Ministry of the Environment and Spatial Planning (**3504**) – or the ministry that covers the issue of environment.

Ministry of Health (**3505**) – or the ministry that covers the issue of health.

Ministry of external affairs (**3506**) – or the ministry that covers the international relationships and the issues related to citizens abroad e.g. Ministry for external affairs of USA reports the number of USA citizens in Tokyo.

Ministry of energy  (**3507**) – or the ministry that covers the issue of energy.

Government (**3508**): This term is used to denote a number of  political actors; the president or prime minister, ministers in government (except for the minister for the environment and spatial planning, health and external affairs which have own codes), e.g. Austrian government expressed the anti-nuclear orientation of the country.

General public/inhabitants (**3509**): Refers to lay persons, usually mentioned in the context of the inhabitants and concerned citizens, e.g. local people living in the neighbourhood of NPP's in Switzerland.

Opinion makers/givers (**3510**): This category of actors includes scientists, well-known personalities and politicians, whose opinion is considered important enough to be represented separately, either in a full-fledged interview or via quotes. The actors grouped in this category represent themselves rather than an institution or a role attributed to them (the opinion given is that of an individual and not of a group). People from academic institutions also fall into this category. when the opinion provided is theirs and not that of the department or division they belong to. Also celebrities belong to this group, E.g. famous movie actor raised the money for casualties of disaster.

Action groups (**3511**) include activists from a wide spectrum of organizations such as NGOs, citizens' representative groups, anti-nuclear groups such as Greenpeace section, e.g. activist from Amsterdam.

Secondary media source (**3512**): Secondary sources of information are reports of other media houses or press agencies, eg. REUTERS, or Sunday Times…

IAEA International Atomic Energy Agency (**3513**) is an organisation of the United Nations. IAEA provided updated information on the Fukushima accident and posted it on the public website on a regular basis. The IAEA continued to monitor the situation in and around the Fukushima Daiichi nuclear power plant around the clock. IAEA was in close contact with Japanese authorities on stabilisation measures. They reported that, overall, the situation at the Fukushima Daiichi nuclear power plant remained very serious during the two month considered in our content analysis. (http://www.iaea.org/newscenter/news/2011/fukushimanote.html)

The IAEA experts were working daily with colleagues in Japan and around the world to acquire and analyze information to develop the clearest possible picture of the accident.


The European Commission or other EU institutions (**3514**) are responsible for the ECURIE (European Community Urgent Radiological Information Exchange) notification network which allows any EU Member State to notify the EC and the other Member States in case of a radiological accident and to exchange radiological information. In this group belong also commissionaires of EU or representatives of EU or European food agency. All information on the nuclear accident at Fukushima was published daily through the EU public information system RAPID.


The World Health Organisation WHO (**3515**) is the directing and coordinating authority for health within the United Nations system. It is responsible for providing leadership on global health matters, shaping the health research agenda, setting norms and standards, articulating evidence-based policy options, providing technical support to countries and monitoring and assessing health trends. WHO has been monitoring the international food implications related to the accident at Fukushima and continued to provide regular and detailed updates of the information on the event.


The Food and Agriculture Organization FAO is a specialised agency of the United Nations (**3516**) that acts as a neutral forum where all nations meet as equals to negotiate agreements and debate policy. FAO is also a source of knowledge and information, and helps developing countries and countries in transition modernise and improve agriculture, forestry and fisheries practices, ensuring good nutrition and food security for all.


The Department of Energy (**3517**) addresses energy, environmental, and nuclear challenges through transformative science and technology solutions. It has provided support to Japan for mapping the radioactive contamination after the Fukushima accident.

The Organisation for Economic Cooperation and Development (OECD), (**3518**) , (French: Organisation de coopération et de développement économiques, OCDE) is an international economic organisation of 34 countries founded in 1961 to stimulate economic progress and world trade. One of the special bodies of OECD is the Nuclear Energy Agency (NEA), which is an intergovernmental multinational agency. The mission of the NEA is to "assist its Member countries in maintaining and further developing, through international co-operation, the scientific, technological and legal bases required for the safe, environmentally friendly and economical use of nuclear energy for peaceful purposes."

**3519** stands for European JRC: ISPRA in Italy, IRMM in Belgium.

NOTE: If the article mentions **only** United Nations as a source, without reference to any specific agency, the coder has to check:

- if the information is related to inspections, countermeasures, nuclear reactors, the INES scale, nuclear energy then choose the code 3513 (IAEA)

- if the information is related to health effects, psychological, social factors, then choose 3515 (WHO)

- if the information is related to food or agriculture, then choose 3516 (FAO)

In the group other (**3599**) are international or external sources that don't belong to any of other sub-groups.

*Identification of information sources from Japan **"SOURCEJAP"***

The Tokyo Electric Power Company TEPCO (**3601**) is an operator of nuclear power plant in Fukushima

To the government (**3602**) belong Japanese prime minister, all other ministers and governmental agencies from Japan except Ministry of Education, Culture, Sports, Science & Technology in Japan (MEXT)  (**3608**),  Ministry of Health, labour and welfare (MHWL) (**3609**).

Population (**3603**) are inhabitants of the region, citizens of Japan or people being at the time of accident in Japan also embassy personnel being in Japan at the time of reporting belong to this group, e.g. families of Belgian citizens being at the time of the reporting in Japan or secretary of the Slovenian embassy in Tokyo.

The category opinion makers/givers (**3604**) includes scientists, well-known personalities and politicians, whose opinion is considered important enough to be represented separately, from the official governmental opinion. The actors grouped in this category represent themselves rather than an institution or a role attributed to them (the opinion given is that of an individual and not of a group). People from academic institutions also fall into this category. To this group belong also celebrities or experts from universities. E.g. Tokio university professor that wrote a petition.

Non-governmental organisations (**3605**) are different groups, consisting of different action groups, civil organisations… e.g. Greenpeace of Japan.

Emergency management actors (**3606**) is group consisting of many organisations and institutions. The fire-fighters, hospitals (doctors and other medical personnel), military, monitoring agencies, food agencies, marine institute …  The group is diverse, but the goal of actors was to measure, prevent and minimise the radiation effects to the population and the environment.

Ministry of education, culture, sports, science & technology in Japan (MEXT) **(3608) .**

Ministry of health, labour and welfare (MHWL) (**3609**); This ministry provides regulations on maximum residue limits for agricultural chemicals in foods, basic food and drug regulations, standards for foods, food additives, etc.

Mass media from Japan (**3610**)  e.g. Japan press agency or local TV station.

Commercial companies **(3611)** such as Sony, Toyota, Nissan are included in this category.

**37) PRIMACTOR**: If one or more actors have been identified in questions 34-through 36-, please select the primary actor from the list below (in Excel, this will be a sheet 2):

**3701** Domestic Nuclear safety authority (FANC in Belgium, ASN in Italy and SNSA in Slovenia)

**3702** - The Nuclear Power Plant in the country – operator, owner, distributor

**3703 -** Domestic nuclear research institute in country (SCK•CEN in Belgium, INFN  in Italy and  Institute Jozef Stefan in Slovenia)

**3704** - Waste management agency (NIRAS in Belgium)

**3705 –** Domestic  Ministry of the Environment and Spatial Planning

**3706 –** Domestic  Ministry of Health

**3707 –** Domestic Ministry of External Affairs

**3708 –** Domestic Ministry of Energy

**3709 –** National government

**3710 –** General public/inhabitants

**3711 -** Domestic opinion makers/givers

**3712** - Domestic action groups

**3713 –** Secondary media sources from the country

**3714 –** Another national agency (only in Italy: ENEA)

**3715 –** Nuclear safety authority (another country, not Japan)

**3716 –** The Nuclear Power Plant– (another country, not Japan)

**3717 –** Nuclear research institute, (another country, not Japan)

**3718 –**Ministry of the Environment and Spatial Planning, (another country, not Japan)

**3719 –**Ministry of health, (another country, not Japan)

**3720 –**Ministry of external affairs (another country, not Japan)

**3721 –** Ministry of energy (another country, not Japan)

**3722 –** National government (another country, not Japan)

**3723 –** General public/inhabitants (another country, not Japan)

**3724 -** Opinion makers/givers (another country, not Japan)

**3725** - Action groups (another country, not Japan)

**3726 –** Secondary media sources (another country, not Japan)

**3727 –** IAEA International Atomic Energy agency

**3728 –** European Union

**3729** – World health organisation WHO

**3730** - United Nations Food and Agricultural Organization FAO

**3731** – USA department of energy (DoE)

**3732** - OECD

**3733** – ISPRA (Italy) or IRMM (Belgium)

**3734** – operator TEPCO

**3735** – government of Japan

**3736** – inhabitants of Japan

**3737** – opinion makers/givers in Japan

**3738** – non-governmental organisations of Japan

**3739** – health organisation of Japan

**3740** – emergency management actors in Japan

**3741 –** Ministry of Education, culture, sports, science & technology in Japan (MEXT)

**3742** - Ministry of Health, labour and welfare (MHWL)

**3743**– mass media from Japan

3744 – other (domestic, external or Japan)

3745 – Commercial companies from Japan

0 – not known

The primary actor in an article is the person, organization, or institution that the article is mostly about. In order to retain consistency, the primary actor for this study is the first actor to appear in the title or the first two paragraphs of the article. If no actor appears in the title or the first two paragraphs, there is no primary actor.

Even if some actors have been identified in questions 34 through 36, it is still possible in some rare occasions that none of these actors are the primary actor in an article. For example, a story that is primarily about a natural disaster can mention a statement by a minister. However, this statement does not have to be the essence of the article. If the story is not primarily about the statement, no primary actor should be coded.

### 23.7. Primary or secondary

**4000 –** primary article? 1=primary, 0=secondary

Primary=1:  the Nuclear accident is of main importance (description of the accident, situation in Japan – direct effects of the accident)

Secondary= 0: the Nuclear accident is only of secondary importance (not the accident itself, but consequences induced by the accident)

With this category we will be coding whether the origin of the article is the nuclear accident in Fukushima "**PRIM**"  or the accident is of secondary importance "**SEC**". We define an article of primary importance one that is written in response to the nuclear accident in Fukushima e.g. a report about the event. An article of secondary importance "**SEC**"  is an article reporting a story induced by the accident, e.g. stress test of nuclear installations or future of nuclear energy. E.g. If people from China are buying salt because they think it protects them against radioiodine, this article has to be coded as 0.  The protective measures in Japan have to be coded as 1. Determining whether an article is primary or secondary importance will help scholars determine whether or not the media agenda has developed from the reporting about the accident in some other agenda.

Correctly distinguishing which articles are primary or secondary is extremely complex because a number of different factors determine whether or not the story originates from nuclear accident (e.g. number of evacuated people) or is a result of nuclear accident (e.g. discussion about safety of nuclear reactors in EU).

### 23.8.   Focus of the article

**40) TECHASP** = technical aspect                      **4001** = 1 if yes, 0 if no

**41) CRISMAN =** crisis management                      **4101** = 1 if yes, 0 if no

**42) INHAB =** affected inhabitants (casualties)      **4201** = 1 if yes, 0 if no

**43) INREAC =** international reaction          **4301** = 1 if yes, 0 if no

**44) SAFRISK =** safety/risk aspect                      **4401** = 1 if yes, 0 if no

**45) INFOEXCH =** information exchange                      **4501** = 1 if yes, 0 if no

**46) FUTNUC =** future of nuclear                      **4601** = 1 if yes, 0 if no

**47) ENERCONS =** energy consumption and energy supply    **4701** = 1 if yes, 0 if no

**48) SUSTENER =** sustainable energy                      **4801** = 1 if yes, 0 if no

**49) BLAME =** who has to be held responsible for the accident and consequences **4901** = 1 if yes, 0 if no

**50) Ecomic impact**                                    **4909= 1 if yes, 0 if no**

**51) FOCOTHER =** other focus (open category!)

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| Only one of 4001 till 4909 can be coded 1; the rest have to be coded 0 |
| --- |

In this section, we will outline how we will identify the most important focus of the article. The purpose of this category is to determine as objectively as possible whether the article is mainly focused on "technical aspects", "emergency management" "inhabitants", "international reaction", "safety/risk aspect", "information exchange" "future of nuclear" "energy consumption/electricity supply", "sustainable energy", "economic impact" or "other".

The analysis of the main focus of the articles allows identifying the main challenge and the focal point of the communication during first two months after the Fukushima nuclear accident. The coder should always try to establish the major focus, i.e. try to identify the unique variable among 4101 till 4909 that could be coded 1. Only if none of the categories is applicable the coder can use code "**FOCOTHER**". For this category, the coder will be asked to write with few words what was the focus of the article. Each article can have only one focus - only one positive dummy variable although the articles may touch more than one aspect. Example: if the article is about the restrictions on specific food products in Japan, about the measurements of internal contamination of people, and also mentions the technical details of the contamination, the article has to be coded as **CRISMAN** and not **TECHASP** since the main focus is emergency management (protective actions). <u>Usually it is possible to identify the focus of the article by the title of the article or by reading the first paragraph of the article</u>. The aspects that appear later in the article are usually not the focus, but related themes.

With the code **"TECHASP"** will be coded articles that deal with the technical aspects of the accident, e.g. the technical data about the state of the reactors or the spent fuel ponds.

The articles for which **CRISMAN (4101)** will be coded 1 belong to emergency management and usually address protection measures for people or societal effects of the crisis, without too much focus on the technical aspects. The article has to describe the crisis management of the nuclear accident and it will be mainly limited to Japan, e.g. protective actions for local population or activation of the military. The articles that discuss the establishment of crisis management teams elsewhere than in Japan also belong to this category, e.g. the European commission established an emergency team.

The public information articles discussing protective measures or level of accident (INES) belong to this group. (But NOT the problems or criticism to public information actors e.g. government or Tepco. This would be coded as INFOEXCH)

The code **INHAB** will be given to the articles that address the affected inhabitants in the frame of casualties. These are the people that were living in the contaminated area, which were evacuated or contaminated. In other words they were directly affected by the accident. This can be for instance a farmer from the contaminated area that committed suicide. Also affected workers (health affects) at the NPP belong to this group.

Under this code we don't code the people that evacuated by themselves (self-evacuation) because of their risk perception or uncertainty. For instance, if the article reports about the Belgians that took the possibility to fly back to Belgium and were exposed to thyroid measurements, then this article has to be coded as **CRISMAN.**

With code **INREAC** will be coded the articles describing an international reaction on the Fukushima nuclear accident. E.g. protest of people in Germany, assistance or solidarity for Japan.

**SAFRISK** is the code corresponding to the articles discussing safety and/or risk aspects of nuclear installations, not only the NPP Fukushima (could be related to Chernobyl). In this category belong all articles discussing the possibility of an accident (e.g. in the first day after the earthquake, before any major radioactive release occurred), probabilistic estimations of accidents in NPP's or articles related to stress tests, probabilities to get sick, contamination of food…. The articles discussing the radioactivity or contamination in general, how danger/safe it is … belong to this category.

With **INFOEXCH** we want to know whether the focus of the story is related to the information exchange. The articles that will be coded with INFOEXCH will discuss the problem of information flow. E.g. IAEA sent a remark to the government of Japan concerning their lack of transparency in communication.

All articles that discuss the future of nuclear energy or reactors will be coded as dummy 1 on variable **FUTNUC.**

**ENERCONS addresses** the energy consumption and/or energy supply, including discussion about policy of electricity suppliers or operators. E.g. Electrabel's nuclear rent.

**SUSTENER** addresses the articles discussing sustainable energy e.g. solar panels

**BLAME** refers to article discussing who has to be held responsible for the accident and its consequences

**ECONOMICIMPACT** refers to article discussing the economic impact of an accident in different countries. E.g. changes in stock markets, decrease in value of goods.

The variable **FOCOTHER** other focus is an open category for which the coder has to write what was the focus of the article in words. This is only in the case when the coder is not able to assign any other category.

## 23.9. Numeracy

51 ) **NUMERACY** = what units are used in the article to describe the radioactivity

5100 = mSv (milli sievert)

5101 = mSv/h (millisievert per hour)

5102 = µSv/h (microsievert per hour)

5103 = nSV/h (nanosievert per hour)

5104 = Sv  (Sievert)

5105 = Sv/h (Sievert per hour)

5106 = Bq/kg (Bequerel per kilogram)

5107 = Bq/g (Bequerel per gram)

5108 = Bq/l (Bequerel per litre)

5109 = kBq/kg (kilo Bequerel per kilogram)

5110 = MBq/kg (mega Bequerel per kilogram)

5111 = Bq/m$^2$ (Bequerel per square meter)

5112 = Bq/cm$^2$ (Bequerel per square centimetre)

5113 = kBq/cm$^2$ (kilo Bequerel per square centimetre)

5114 = MBq/m$^2$ (mega Bequerel per square metre)

5115 = MBq/km$^2$ (mega Bequerel per square kilometre)

5116 = TBq/km$^2$ (terra Bequerel per square kilometre)

**Each of these may be** coded **1** or  0 (it is possible to have multiple 1's)

5117 = no measurement units related to radioactivity in the article

5118= another measurement unit related to radiation (e.g. air concentration in Bq/m3)

52 ) **COMPRISK** = does the article present any comparison related to radioactivity?

5200 = no comparisons

5201 = with risks from medical purposes (e.g. x-ray)

5202 = with risks from flying

5203 = with natural radiation background (usually the word "normal" will appear)

5204 = with professional (normal) exposure to radiation of workers at nuclear installations

5205 = with something else (open variable! Coder has to write with what the risk of radioactivity from Fukushima nuclear accident was compared)

5206 = with limits or norms (words such as "limits", "norms", "maximal allowed levels" have to appear).

5207 = with a historic nuclear accident e.g. Chernobyl (NOT the atomic bombs at Hiroshima or Nagasaki) – It has to be comparison of radioactivity and not an accident in general! E.g. Number of victims or size of evacuation would not belong to this category. The comparison of the rating given on the INES scale – Fukushima and other accidents – is included.

With these categories we will be coding the units that radiation was expressed "**NUMERACY**" and coding the possible radiation risk comparisons "**COMPRISK**". We will try to assess how the media described the risks by making use of numbers and/or examples. In the article different units and comparisons might be used to describe the risks of radioactivity due to the nuclear accident in Fukushima. The coder has to find the unit explicitly written in the article in order to give the value 1 to the corresponding dummy variable. If there is a value that is used to express the unit of radioactivity and is not listed, the coder has to write the unit in the variable **5205** as it is written in the article. The coder has to be careful also if the "squares" are written as " $^2$ ". e.g. $kBq/cm^2$. In this case the value 1 has to be given to **5205** and the unit from the article has to be written in Excel.

60) **NUCLORIENT** = Article orientation towards nuclear energy

6001 Positive connotation (in favour of nuclear energy)

6002 Negative connotation (against)

6003 Balanced (presents both arguments in favour, as well as against)

6004 Neutral (it does not discuss the nuclear energy)

This category records the article orientation towards **nuclear energy – if energy is good or bad (not the orientation towards nuclear industry, management or authorities!)** For instance, if there is more space given to pro-nuclear opinions, than the article will be coded with 6001=1. If article concerns only the accident and not nuclear energy in general is coded as neutral (1).

### 23.10. Additional codes in interest of specific research group

Every research group can include the codes that are in their specific interest and will not be applied in all countries.

**Additional codes in Belgium**

**53) SCK•CEN – Studiecentrum voor kernenergie SCK•CEN**

    5301 Explicitly mentioned 1 (yes)

    5302 Positive connotation of the Centre

    5303 Negative connotation of the Centre

    5304 Neutral connotation of the Centre

**54) MYRRHA - Multi-purpose hYbrid Research Reactor for High-tech Applications**

    5401 If explicitly mentioned 1 (yes)

    5402 Positive connotation of MYRRHA

    5403 Negative connotation of MYRRHA

    5404 Neutral connotation of MYRRHA

**Additional codes in Italy**

**55) Referendum  about nuclear energy**

            5501 Has the referendum been mentioned? Yes=1, No=0

# 24.    Annex - Computation of inter-coder reliability

For the calculation of the inter-coder reliability it is important that the final file of each coder is saved separately, in order to allow the comparison of the codes. One Master file has to be made based on the comparison of the codes and the discussion on the possible differences. For the cases when the codes that are different, but consensus was not achieved, the original codes have to be preserved in the files of each coder. The master coder has to decide the value for master file.

**Krippendorff's alpha ($\alpha$)** is a reliability coefficient developed to measure the agreement between observers, coders, judges, raters, or measuring instruments.

Let us consider two coders which have to code N units of information using the same answering categories for each unit (e.g. "a" to "e" or "0" to "1").

The reliability matrix can be constructed as follows, and it contains 2*$N$ values:

| **Units:** | *1* | *2* | *…* | *u* | *…* | **N** |
|---|---|---|---|---|---|---|
| **Observers:**   **1:** | $c_{11}$ | $c_{12}$ | … | $c_{1u}$ | … | $c_{1N}$ |
| **2:** | $c_{21}$ | $c_{22}$ | … | $c_{2u}$ | … | $c_{2N}$ |

For each article, we can calculate $\alpha$ as follows:

$$\alpha = 1 - \frac{D_o}{D_e}, \text{ where}$$

$D_o$ = the observed disagreement:

$$D_o = \frac{1}{n} \sum_{c \neq k} o_{ck} \; ;$$

$D_e$ = the disagreement one would expect when the coding of units is attributable to chance rather than to the properties of these units:

$$D_e = \frac{1}{n(n-1)} \sum_{c \neq k} n_c \cdot n_k \; ;$$

*c, k*  = codes given for the different observation units (one observation = one fully coded article);

$o_{ck}$ = $\Sigma_u$ (Number of (***c, k***) pairs in unit *u*). **Remark**: if coder 1 gave the code c and coder 2 gave the code k for a unit u, the we shall have to consider both (c,k) as well as (k,c) (there is no order on the coders);

$n_c$ = number of occurrences of answer "c" (e.g. "0") in the reliability matrix, taking **both** coders into consideration at the same time;

*n=2\*N.*

Perfect reliability ($D_o$=0 and $\alpha$=1) occurs when the coders agree perfectly. The absence of reliability is indicated by $D_o$=$D_e$ and $\alpha$=0; this case would mean that coders failed to observe and made arbitrary choices on their data.

For binary variables, since $o_{01}$ = $o_{10}$, the expression of $\alpha$ is reduced to:

$$\alpha = 1 - \frac{D_o}{D_e} = 1 - (n-1)\frac{o_{01}}{n_0 \cdot n_1}.$$

Table 3 summarises the results for the inter-coder reliability calculated separately for each variable across all articles in French and Dutch, respectively.

**Table 3 Inter-coder reliabilities and number of disagreements between coders**

| SECTION | VARIABLE | COMMENT | Inter-coder reliability FR | Number of disagree-ments FR | Inter-coder reliability NL | Number disagree-ments NL |
|---|---|---|---|---|---|---|
| TYPE OF ARTICLE | 1001 | NEWS? | 0.93 | 4 | 0.92 | 6 |
| | 1002 | INERVIEW? | 1.00 | 0 | 1.00 | 0 |
| | 1003 | EDITORIAL? | 1.00 | 0 | 1.00 | 0 |
| | 1004 | COLUMN? | 1.00 | 0 | 1.00 | 0 |
| | 1005 | LETTER? 0/1 | 1.00 | 0 | 0.97 | 1 |
| | 1006 | FEATURE? 0/1 | 0.97 | 1 | 0.82 | 5 |
| | 1007 | MIXED? 0/1 | 0.78 | 5 | 0.69 | 5 |
| | 1008 | OTHER? 0/1 | 1.00 | 0 | 0.95 | 1 |
| | | | | 0 | | |
| DOMISSUE | 2101 | Domestic? | 0.97 | 1 | 0.93 | 2 |
| | 2102 | European? | 1.00 | 0 | 1.00 | 0 |
| | 2103 | Japan? | 1.00 | 0 | 0.89 | 8 |
| | 2104 | Another country? | 1.00 | 0 | 0.91 | 2 |
| | 2105 | International or global? | 0.96 | 1 | 0.88 | 6 |
| | | | | 0 | | |
| EMPHASE | 2201 | Preparedness? | 0.73 | 4 | 0.66 | 3 |
| | 2202 | Crisis response? | 0.96 | 2 | 0.79 | 14 |
| | 2203 | Recovery or evaluation? | 0.96 | 2 | 0.85 | 9 |
| | | | | | | |
| ISSUE CODES | | | | | | |
| ENERGY | 2301 | Energy supply (e.g. shortage) | 1.00 | 0 | 0.27 | 5 |
| | 2302 | Future of nuclear energy | 0.97 | 1 | 0.88 | 4 |
| | 2303 | Energy production | 0.91 | 1 | 0.76 | 4 |
| | 2304 | Climate change | 1.00 | 0 | 0.66 | 2 |
| | 2305 | Waste | 1.00 | 0 | 1.00 | 0 |
| | 2399 | Another issue related to energy | 0.85 | 1 | 0.66 | 3 |
| *Is energy main topic?* | | | 0.97 | 1 | 0.84 | 6 |
| HEALTH | 2401 | Cancer | 1.00 | 0 | 1.00 | 0 |
| | 2402 | Next generations | Not selected | | 1.00 | 0 |
| | 2403 | Other disease than cancer | Not selected by coder1 | 1 | 0.91 | 1 |
| | 2404 | Psychological | Not | 1 | 1 | 0 |

| SECTION | VARIABLE | COMMENT | Inter-coder reliability FR | Number of disagree-ments FR | Inter-coder reliability NL | Number disagree-ments NL |
|---|---|---|---|---|---|---|
| | | consequences | selected by coder2 | | | |
| | 2499 | Another issue related to health | 0.80 | 1 | 0.89 | 1 |
| *Is health main topic?* | | | 0.85 | 1 | 1 | 0 |
| PROT. ACTIONS FOR FOOD | 2501 | Drinking water | Not selected by coder2 | 1 | 1.00 | 0 |
| | 2502 | Farming products | Not selected | 0 | 1.00 | 0 |
| | 2503 | Sea food, incl. fish | 1 | 0 | 1.00 | 0 |
| | 2504 | Food import/export | 1 | 0 | 1.00 | 0 |
| | 2505 | Restrictions on food | Not selected | 0 | 1.00 | 0 |
| | 2506 | Food control | 1 | 0 | 0.80 | 1 |
| | 2599 | Another issue related to food | 1 | 0 | 1 | 0 |
| *Are prot. actions main topic?* | | | 0.88 | 1 | 1 | 0 |
| NUCLEAR TECHNOLOGIES | 2601 | Technical aspects reactors Japan | 0.90 | 2 | 0.49 | 9 |
| | 2602 | Technical aspects other reactors | 0.56 | 3 | 0.66 | 2 |
| | 2603 | Stress tests for nucl. Installations | 0.85 | 1 | 1.00 | 0 |
| | 2604 | New types of reactors (Gen III, IV) | Not selected | 0 | Not selected | 0 |
| | 2605 | Other nuclear technology | Not selected | 0 | Not selected | 0 |
| *Are nuclear technologies main topics?* | | | 0.87 | 3 | 0.54 | 9 |
| ACCIDENT EFFECTS (other than health or food) | 2701 | Contamination of land | 1 | 0 | 0.87 | 2 |
| | 2702 | contamination of sea | 1 | 0 | 0.91 | 1 |
| | 2703 | Contamination inhabited areas | 0.88 | 1 | 0.90 | 2 |
| | 2704 | Contamination of goods from Japan | 1 | 0 | 1.00 | 0 |
| | 2705 | Other effects e.g. radioactivity, material damage, disturbance of daily life (schools, transport) | 0.82 | 6 | 0.96 | 1 |
| | 2706 | Radioactivity in air (cloud,..) | 0.85 | 2 | 1 | 0 |

| SECTION | VARIABLE | COMMENT | Inter-coder reliability FR | Number of disagree-ments FR | Inter-coder reliability NL | Number disagree-ments NL |
|---|---|---|---|---|---|---|
| | 2707 | Economic impact | 1 | 0 | 0.95 | 1 |
| *Are acciedent effects main topic?* | | | 0.91 | 4 | 0.93 | 4 |
| OTHER PROTECTIVE ACTIONS (not food) | 2801 | Decontamination | 1 | 0 | Not selected | 0 |
| | 2802 | Monitoring environment | 0.66 | 1 | 1.00 | 0 |
| | 2803 | Evacuation of people | 0.79 | 2 | 1.00 | 0 |
| | 2804 | Sheltering of people | 0.80 | 1 | 1.00 | 0 |
| | 2805 | Stable iodine (tablets) | 1 | 0 | Not selected | 0 |
| | 2806 | Measurement contamination people (internal or external) | 1 | 0 | 1.00 | 0 |
| *Are other protective actions main topic?* | | | 0.85 | 2 | 1.00 | 0 |
| TSUNAMI or EARTHQUAKE | 2901 | Consequences | 0.84 | 3 | 0.74 | 4 |
| | 2902 | Probability | 0.80 | 1 | Not selected by coder1 | 1 |
| | 2903 | Specifics (general things) | 1 | 0 | 0.66 | 1 |
| *Are tsunami or earthquake main topic?* | | | 0.84 | 3 | 0.76 | 4 |
| NUCLEAR / RAD. WASTE | 3001 | manag. waste Fukushima | Not selected | 0 | 1.00 | 0 |
| | 3002 | manag. waste (general): siting, storage, disposal, spent fuel | Not selected | 0 | 1.00 | 0 |
| | 3003 | amount 'm3, litres, etc) | Not selected | 0 | 1.00 | 0 |
| *Is nuclear/rad.waste main topic?* | | | Not selected | 0 | 1.00 | 0 |
| EMERGENCY MANAGEMENT | 3101 | public information (e.g. information system, informing public, INES scale | 0.96 | 1 | 0.90 | 3 |
| ISSUES | 3102 | emergency workers: directly involved at the plant  (Fukushima 50, kamikaze …) | 0.83 | 2 | 0.47 | 8 |
| | 3103 | other emergency actors (e. g. military, fire brigade, police, civil protections, | 0.90 | 2 | 0.85 | 1 |

| SECTION | VARIABLE | COMMENT | Inter-coder reliability FR | Number of disagree-ments FR | Inter-coder reliability NL | Number disagree-ments NL |
|---|---|---|---|---|---|---|
| | | volunteers… ) | | | | |
| *Is emergency management main topic?* | | | 0.95 | 2 | 0.78 | 10 |
| Doubt | 3100 | Is there doubt? | 0.87 | 2 | 0.44 | 7 |
| | | | | | | |
| CONFLICT | 3200 | Conflict or disagreement? | 0.91 | 5 | 0.91 | 4 |
| | | | | | | |
| KEYWORD | 3301 | Chernobyl | 1.00 | 0 | 1.00 | 0 |
| | 3302 | panic | 0.88 | 2 | 1.00 | 0 |
| | 3303 | nuclear accident (drama) | 0.95 | 3 | 0.82 | 5 |
| | 3304 | nuclear disaster, apocalypse | 0.95 | 3 | 0.90 | 7 |
| | 3305 | distrust (or low trust) | 1.00 | 0 | 1.00 | 0 |
| | 3306 | danger* | 1.00 | 0 | 0.87 | 7 |
| | 3307 | dread (fear, anxiety) | 1.00 | 0 | 0.86 | 6 |
| | 3308 | anger | 1.00 | 0 | 1.00 | 0 |
| | 3309 | victim (casualty) | 0.95325 | 2 | 0.98 | 1 |
| | 3310 | sympathy | 1.00 | 0 | Not selected | 0 |
| | 3311 | compassion | 1.00 | 0 | Not selected | 0 |
| | 3312 | solidarity | 1.00 | 0 | 1.00 | 0 |
| | 3313 | assistance | 1 | 0 | 0.90 | 2 |
| | 3314 | blame | 1.00 | 0 | 0.74 | 2 |
| | 3315 | chaos | 0.85 | 1 | Not selected | 0 |
| | | | | | | |
| SOURCEINT | 3401 | Domestic Nuclear safety auth. (FANC /AFCN, ASN, SNSA) | 1.00 | 0 | 1.00 | 0 |
| | 3402 | Domestic NPP (Doel, Tihange) | 1.00 | 0 | 1.00 | 0 |
| DOMESTIC | 3403 | Domestic nuclear research institute (SCK•CEN in BE, ISPRA in IT, Jozef Stefan in SI) | 1.00 | 0 | 0.89 | 1 |
| | 3404 | Domestic rad.waste agency (NIRAS-ONDRAF) | Not selected | 0 | 1 | 0 |

| SECTION | VARIABLE | COMMENT | Inter-coder reliability FR | Number of disagree-ments FR | Inter-coder reliability NL | Number disagree-ments NL |
|---|---|---|---|---|---|---|
| | 3405 | Domestic Min. Environment | Not selected | 0 | Not selected | 0 |
| | 3406 | Domestic Min. Health | Not selected | 0 | Not selected | 0 |
| | 3407 | Domestic Min.External Affairs | 1.00 | 0 | Not selected | 0 |
| | 3408 | Domestic Min. Energy | 1.00 | 0 | 1.00 | 0 |
| | 3409 | National gov (other than above) | 1.00 | 0 | 1.00 | 0 |
| | 3410 | General public/inhabitants | 1.00 | 0 | Not selected by coder1 | 1 |
| | 3411 | Domestic opinion makers/givers | 0.92 | 2 | 0.90 | 4 |
| | 3412 | Domestic actions groups | 0.92 | 1 | 1.00 | 0 |
| | 3413 | Secondary media sources | 1.00 | 0 | 0.85 | 1 |
| | 3414 | Another national agency (in Italy ENEA) | Not selected | 0 | Not selected | 0 |
| | 3499 | Other | 0.80 | 1 | 0.91 | 1 |
| *SourceInt selected?* | | | | | | |
| SOURCEEXT | 3501 | Nuclear safety auth. | 1.00 | 0 | 1.00 | 0 |
| | 3502 | NPP | Not selected | 0 | 1.00 | 0 |
| EXTERNAL | 3503 | Nuclear research institute (SCK•CEN) | Not selected | 0 | Not selected | 0 |
| | 3504 | Min. Environment | 1.00 | 0 | 1.00 | 0 |
| | 3505 | Min. Health | Not selected | 0 | 1.00 | 0 |
| | 3506 | Min.External Affairs | Not selected by coder2 | 1 | 1.00 | 0 |
| | 3507 | Min. Energy | 1 | 0 | Not selected | 0 |
| | 3508 | National gov (other than above) | 1 | 0 | 1.00 | 0 |
| | 3509 | General public/inhabitants | 0.80 | 1 | 1.00 | 0 |
| | 3510 | Opinion makers/givers | 0.95 | 1 | 0.93 | 2 |
| | 3511 | Actions groups | 1.00 | 0 | 0.93 | 1 |
| | 3512 | Secondary media | 0.88 | 4 | 0.83 | 4 |

| SECTION | VARIABLE | COMMENT | Inter-coder reliability FR | Number of disagreements FR | Inter-coder reliability NL | Number disagreements NL |
|---|---|---|---|---|---|---|
| | | sources | | | | |
| | 3513 | IAEA Int. Atomic energy Agency | 1.00 | 0 | 0.95 | 1 |
| | 3514 | European Union | 0.3 | 1 | 1.00 | 0 |
| | 3515 | World Health Organis. WHO | 1.00 | 0 | 1.00 | 0 |
| | 3516 | UN food and Agricultural Org. FAO | Not selected | 0 | Not selected | 0 |
| | 3517 | USA Dept. of Energy (DoE) | Not selected | 0 | Not selected | 0 |
| | 3518 | OECD - NEA | 1.00 | 0 | Not selected | 0 |
| | 3519 | ISPRA (Italy) or IRMM (Belgium) | Not selected | 0 | Not selected | 0 |
| | 3599 | Other | 1.00 | 0 | 0.89 | 2 |
| *SourceExt selected?* | | | | | | |
| SOURCEJAP | | | | | | |
| Japan | 3601 | Operator- TEPCO | 1.00 | 0 | 1.00 | 0 |
| | 3602 | Government | 1.00 | 0 | 0.90 | 5 |
| | 3603 | Inhabitants | 1.00 | 0 | 0.93 | 2 |
| | 3604 | Opinion makers/givers | 0.91 | 1 | 0.92 | 1 |
| | 3605 | Non-governmental organisations | 1.00 | 0 | 0.49 | 2 |
| | 3606 | Health organisation | Not selected | 0 | 1.00 | 0 |
| | 3607 | Emergency management actors | 0.80 | 1 | 1.00 | 0 |
| | 3608 | MEXT: Min. Education, science, techn. … | Not selected | | 1.00 | 0 |
| | 3609 | MHWL: Min. Health, Labour,Welfare | 1.00 | 0 | 1.00 | 0 |
| | 3610 | Mass media from Japan | 1.00 | 0 | 0.94 | 1 |
| | 3611 | Commercial companies from Japan | Not selected by coder 2 | 2 | 0.66 | 1 |
| | | | | | | |
| SOURCENOTKNOWN | 3701 | Source not known | 0.83 | 5 | 0.97 | 1 |
| PRIMACTO | 3702 | Primary actor - select from list | N/A | | N/A | |
| | | | | | | |

| SECTION | VARIABLE | COMMENT | Inter-coder reliability FR | Number of disagree-ments FR | Inter-coder reliability NL | Number disagree-ments NL |
|---|---|---|---|---|---|---|
| Nuclear accident PRIMARY? | 4000 | Nuclear accident primary importance? (1=primary; 0=secondary) | 0.96 | 2 | 0.85 | 9 |
| | | | | | | |
| FOCUS | | | | | | |
| TECHASP | 4001 | Technical aspect | 0.85 | 2 | 0.79 | 6 |
| CRISMAN | 4101 | Crisis management | 0.88 | 5 | 0.73 | 13 |
| INHAB | 4201 | Affected inhabitants | 0.96 | 1 | 0.88 | 5 |
| INREAC | 4301 | International reaction | 0.92 | 1 | 0.32 | 4 |
| SAFRISK | 4401 | Safety/risk aspect | 0.92 | 3 | 0.69 | 7 |
| INFOEXCH | 4501 | Information exchange | 0.85 | 2 | 0.90 | 2 |
| FUTNUC | 4601 | Future of nuclear | 1.00 | 0 | 1.00 | 0 |
| ENERCONS | 4701 | Energy consumption and supply | Not selected | 0 | 0.66 | 2 |
| SUSTENER | 4801 | Sustainable energy | Not selected | 0 | Not selected | 0 |
| BLAME | 4901 | Blame | 1.00 | 0 | 1.00 | 0 |
| ECONOMY | 4909 | Economic impact | 0.85 | 1 | 0.956322 | 1 |
| FOCOTHER | 5001 | Other focus (open) | N/A | | N/A | |
| | | | | | | |
| NUMERACY | 5100 | mSv (milli sievert) | 1 | 0 | 1 | 0 |
| | 5101 | mSv/h (millisievert per hour) | 1 | 0 | 1 | 0 |
| | 5102 | µSv/h (microsievert per hour) | 1 | 0 | 0.80 | 1 |
| | 5103 | nSV/h (nanosievert per hour) | 1 | 0 | 0 | 1 |
| | 5104 | Sv (Sievert) | 1 | 0 | 1 | 0 |
| | 5105 | Sv/h (Sievert per hour) | 1 | 0 | 1 | 0 |
| | 5106 | Bq/kg (Bequerel per kilogram) | 1 | 0 | 1 | 0 |
| | 5107 | Bq/g (Bequerel per gram) | Not selected | | Not selected | 0 |
| | 5108 | Bq/l (Bequerel per litre) | 1 | 0 | 1 | 0 |
| | 5109 | kBq/kg (kilo Bequerel per kilogram) | Not selected | 0 | Not selected | 0 |
| | 5110 | MBq/kg (mega Bequerel per kilogram) | Not selected | 0 | Not selected | 0 |
| | 5111 | Bq/m2 (Bequerel per square meter) | Not selected | 0 | Not selected | 0 |

| SECTION | VARIABLE | COMMENT | Inter-coder reliability FR | Number of disagree-ments FR | Inter-coder reliability NL | Number disagree-ments NL |
|---|---|---|---|---|---|---|
| | 5112 | Bq/cm2 (Bequerel per square centimetre) | 1 | 0 | Not selected | 0 |
| | 5113 | kBq/cm2 (kilo Bequerel per square centimetre) | Not selected | 0 | Not selected | 0 |
| | 5114 | MBq/m2 (mega Bequerel per square metre) | Not selected | 0 | Not selected | 0 |
| | 5115 | MBq/km2 (mega Bequerel per square kilometre) | Not selected | 0 | Not selected | 0 |
| | 5116 | TBq/km2 (terra Bequerel per square kilometre) | Not selected | 0 | Not selected | 0 |
| | 5117 | no measurement units related to radioactivity in the article | 0.96 | 1 | 0.74 | 10 |
| | 5118 | other units related to radiation | 1 | 0 | 0.91 | 1 |
| | | | | | | |
| COMPRISK | 5200 | no comparisons | 1 | 0 | 0.73 | 16 |
| | 5201 | with risks from medical purposes (e.g. x-ray) | Not selected | 0 | Not selected | 0 |
| | 5202 | with risks from flying | Not selected | 0 | Not selected | 0 |
| | 5203 | with natural radiation background | 0.85 | 2 | 0.95 | 1 |
| | 5204 | with workers' exposure to radiation at nuclear inst. | 0.66 | 1 | 1 | 0 |
| | 5205 | with something else (open variable! ) | Not selected by coder 2 | 2 | 1 | 0 |
| | 5206 | with (legal,..) limits, norms | 1 | 0 | 0.94 | 2 |
| | 5207 | with a historical nuclear accident | 0.91 | 1 | 0.93 | 2 |
| | | | | | | |
| Article orientation towards nuclear | 6001 | Positive | 1.00 | 0 | 0.79 | 2 |
| | 6002 | Negative | 0.96 | 1 | 0.89 | 2 |
| | 6003 | Balanced (both views) | 0.95 | 1 | 0.89 | 1 |

| SECTION | VARIABLE | COMMENT | Inter-coder reliability FR | Number of disagree-ments FR | Inter-coder reliability NL | Number disagree-ments NL |
|---|---|---|---|---|---|---|
| | 6004 | Neutral (doesn't concern this) | 0.95 | 2 | 0.78 | 9 |
| | | | | | | |
| SCK•CEN | 5301 | Explicitly mentioned? (1=yes; 0=no) | 1 | 0 | 0.60 | 5 |
| | 5302 | Positive connotation of the Centre | Not selected | 0 | Not selected | 0 |
| | 5303 | Negative connotation of the Centre | 1 | 0 | Not selected | 0 |
| | 5304 | Neutral connotation of the Centre | 1 | 0 | 0.89 | 1 |
| | | | | | | |
| MYRRHA | 5401 | Explicitly mentioned? (1=yes;0=no) | 1 | 0 | Not selected | 0 |
| | 5402 | Positive connotation of MYRRHA | Not selected | 0 | Not selected | 0 |
| | 5403 | Negative connotation of MYRRHA | Not selected | 0 | Not selected | 0 |
| | 5404 | Neutral connotation of MYRRHA | 1 | 0 | Not selected | 0 |

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