STUDIECENTRUM VOOR KERNENERGIE
CENTRE D'ETUDE DE L'ENERGIE NUCLEAIRE

EXTERNAL REPORT
SCK•CEN-ER-281

Media framing of fusion

Scoping study for the sociological research programme for EURO Fusion

Tanja Perko[1], Catrinel Turcanu[1], Christian Oltra[2], Luisa Schimidt[3], Ana Delicado[3]

[1]SCK•CEN Belgian Nuclear Research Centre, Belgium
[2] CIEMAT – CISOT, Spain
[3] ICS (UL) - IST, Portugal

EUROfusion Consortium
Grant agreement No 633053

December, 2014

SCK•CEN
Boeretang 200
BE-2400 Mol
Belgium

NST

EXTERNAL REPORT OF THE BELGIAN NUCLEAR RESEARCH CENTRE
SCK•CEN-ER-281

Media framing of fusion

Scoping study for the sociological research programme for EURO Fusion

Tanja Perko[1], Catrinel Turcanu[1], Christian Oltra[2], Luisa Schimidt[3], Ana Delicado[3]

[1]SCK•CEN Belgian Nuclear Research Centre, Belgium
[2] CIEMAT – CISOT, Spain
[3] ICS (UL) - IST, Portugal

EUROfusion Consortium
Grant agreement No 633053

December, 2014
Status: Unclassified
ISSN 1782-2335

SCK•CEN
Boeretang 200
BE-2400 Mol
Belgium

Studiecentrum voor Kernenergie
Centre d'étude de l'énergie Nucléaire
Boeretang 200
BE-2400 Mol
Belgium

Phone +32 14 33 21 11
Fax +32 14 31 50 21

http://www.sckcen.be

Contact:
Knowledge Centre
library@sckcen.be

Contents

This work has been carried out within the framework of the EUROfusion Consortium and has received funding from the Euratom research and training programme 2014-2018 under grant agreement No 633053. The views and opinions expressed herein do not necessarily reflect those of the European Commission.

Introduction

In the framework of the Socio-Economic Studies Project implemented under the EURO-Fusion Consortium one of the focus points for the sociological research to be carried out within the 2014-2018 timeframe concerns media reporting about fusion.

The main goals of this part of the research are:

- To gain more insight into the public understanding of fusion technologies through studying the media frames of these nuclear technologies in both classic news media, such as newspapers in selected countries, and social media.

- To develop 'communication tools' which are of practical use, in order to contribute to the quality of the public debate on nuclear fusion technologies.

In this report we first make a brief overview of media content and media framing theories, concepts and methods. Next, we look more in detail how media reporting was addressed in previous research and finally, we present a full research plan related to the media framing of fusion.

Media reporting

Kasperson et al. (1988) point to the possibility that media can change the original message by intensifying, weakening and/or filtering the information. As such, media are not just neutral intermediaries of information: they modify the information in the process, and this might influence the recipients of their messages. Moreover, since media are far from being ideologically neutral or independent from commercial and political interests, they represent important actors in the production and reproduction of dominant ideologies (Fowler 1991). News are in such manner understood as discourse, which by no means neutrally reflects the "reality" and empirical facts, but interfere with what Berger and Luckmann (1966) named the "social construction of reality".

In media reporting about new technologies journalists emphasize some information and exclude other information in ways consonant with the chosen frame. Numerous studies have demonstrated that frames are consistent patterns of thought that journalists and audiences use regularly to make sense of events and understand what a news story is about (e.g. (Iyengar 1991; Kahneman and Tversky 2000; Druckman 2001; De Vreese 2003). A broad range of scientific methods can be used for text analysis, among which, media content analysis and media framing analysis.

Theoretical and methodological background

Media content analysis

Media content is characterized by a wide range of phenomena including the medium, production techniques, messages, sources quoted or referred to, and context (Macnamara 2007), while the task of content analysis is "to impose some sort of order on these phenomena in order to grasp their meaning" (Shoemaker and Reese, 1996). Although considered by some researchers e.g. Neuendorff (2002) as an essentially quantitative method, Neuman (1997) argues that in content analysis, "a researcher uses objective and systematic counting and recording procedures to produce a quantitative description of the symbolic content in a text", and that there are also "qualitative or interpretative versions of content analysis".

Typical variables assessed within quantitative content analysis include (Macnamara, 2007):

- Media weighting or categorization, allowing high circulation, high rating or highly influential
- Media to be scored higher than small, less important media;
- Recording of impact factors such as page number and the use of photos or visuals;
- Positioning, such as headline mentions, first paragraph mentions, prominent mentions, or passing mentions and 'share of voice' in articles;
- Size of articles or length of radio and TV segments;
- Sources quoted, including the balance of supportive and opposing sources cited in the texts and their position/credibility.

Macnamara (2007) notes that qualitative content analysis can, to some extent, be incorporated within or conducted simultaneously with quantitative content analysis. Examples of key text elements commonly studied in qualitative content analysis are (Macnamara, 2007):

- Adjectives used in descriptions (positive and negative) which give strong indications of a speaker's and writer's attitude (e.g. it was 'disgusting');
- Metaphors used (e.g. labelling a car a 'lemon' or a person a 'rat');
- Whether verbs are active or passive voice;
- Viewpoint of the narrator (i.e. first person, second person, third person);
- Tonal qualities such as aggressiveness, sarcasm, emotional language;
- Visual imagery in text;
- Context factors such as the position and credibility of spokespersons or sources quoted which affects meaning taken from the text (e.g. if one message is presented by a high profile expert it will generally outweigh a non-expert opinion).

Media framing analysis

Another approach to analyse media reporting of an issue is media framing analysis. While producing the news, the media present it within a frame that guides the public on how this news should be understood. There are many definitions of framing available in the literature (Gitlin, 1980; Tversky & Kahneman, 1986; Gamson & Modigliani, 1989; Entman, 1993; Scheufele, 1999; Hallahan, 1999). For the purpose of our research we adopt the definition provided by Entman, according to whom to frame means "to select specific aspects of perceived reality and make them more salient in a communicating text, in such a way as to promote a particular problem definition, causal interpretation, moral evaluation, and/or treatment recommendation" (Entman, 1993, p. 52).

As Hackett observed "framing is not necessarily a conscious process on the part of journalists, but is the result of their unconscious assumptions about the social world" (in Hallahan, 1999, p. 222). Therefore journalistic treatment of risks depends on several psychological and cultural factors, which causes that some risks are addressed and others ignored (Hornig Priest, 2005, p. 208). According to Wolfsfeld (2003) the construction of media frames is an interactive media process, in which journalists "look on their cultural shelf to find a thematic package that is best suited for the events they are covering" (Wolfsfeld, 2003, p. 89). Since journalists working in the same environment share their media frames to a large extent (Scheufele, 2006, p. 67), some stories get quoted very often, which brings us to the role of collective memory within journalistic work.

Berkowitz states that journalists "are often faced with telling news of the unusual and unexpected, yet they must report on tight deadlines with little information. For instance, journalists can draw on to get their job done is the collective memory" (Berkowitz, 2011, p. 201). Therefore: "collective memories can also serve as frames for subsequent events" (Edy, 2006, p. 12). The question is what kind of collective memory use the journalists when reporting about fusion and what other frames they use for media reporting about fusion? As Gitlin (1980) argues, frames make it possible for news reporters to process large amount of information quickly and routinely and package the information for efficient relay to their audience (Gitlin, 1980, p. 7).

An example of media framing is one among the first framing analysis about nuclear energy, investigated by Gamson and Modigliani (1989). They have applied their framing approach to an analysis of television news broadcasts and articles from 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*". Latter, scholars extended the research of media framing of a nuclear energy to the content analysis of nuclear accidents.

Previous research from media reporting about fusion

There is little published evidence on the media coverage of fusion energy. The first study on the media presentation of fusion power (reviewed by Borrelli, 2004) explored news articles in various international newspapers from 1989 to 2002. The study concluded that media coverage of fusion power was irregular, not constant, in the period studied (i.e., daily press only paying attention to the topic when a special event or a new technological achievement takes place). It was also concluded that the dominant media framing was quite neutral and purely technological, with little attention to wider social and political dimensions of the fusion R&D Programme.

A second study was carried out by Prades et al. (2003) in Spain during 2002-2003 in the context of the Vandellós candidacy to host ITER. The results showed that: i) ITER had a wider impact on the local press. The more closeness to the proposed site, the more prominence is given to the project; ii) The Spanish press transmitted basically news articles (facts) about ITER. iii) Around 41% stories presented a neutral tone, in other words, no position towards ITER became apparent; iv) The institutional support to the candidature, i.e. the promotion of the Vandellós candidacy was the axis of most articles. ("the hosting dynamic"); v) The energy debate had a relevant role in the ITER stories. This debate seems to be unavoidable connected to the fusion project itself; vi) The economic dimension of the project captured a lot of the press attention. The investments in the project, the effects of such investments, and the infrastructures were the more mentioned economic aspects of ITER.

In 2007, in a review by Prades et al. (2007) on earlier work on media coverage of nuclear fusion it was concluded that: i) it is still early to observe a clear formation of media frames about nuclear fusion given that media attention is limited and irregular, and framing tends to be purely technological and neutral; ii) there are no clear data about how the nuclear brand is associated with fusion energy in the media coverage. iii) The study at Vandellós shows, although its results have to be understood in the context of the siting of an international technological facility, that media coverage of the siting of ITER expressed a positive attitude. It seems that the nuclear brand was not, in this context, an important frame in the media discourse.

In 2011, research on the effects of the Fukushima accident on the media presentation of fusion and fission power was carried out by Kepplinger and Lemke (2012) in Germany. The authors concluded that:

- In connection with the extremely intense and negative coverage of the Nuclear energy after the nuclear disaster at Fukushima, the number of news articles about fusion energy / fusion research skyrocketed in the short term. Thereafter, the Intensity of coverage returned to the original value or decreased.
- The extremely negative reporting of nuclear energy after the nuclear disaster Fukushima had no significant effect on the tendency of the coverage of the Fusion Energy / fusion research. If it was an effect, it resulted in more positive than negative representations of the Fusion Energy / fusion research.

- The positive and negative portrayal of certain aspects of Fusion Energy / fusion research was largely independent of the disaster in Japan and its representation in the German media. This suggests that the Reviews and Ratings crucially on the particular aspects / topics depended, not on the current events.

A comparative analysis of media coverage of fusion and fission energy before and after the accident in the nuclear reactors of Fukushima, Japan, was carried out by Schmidt, Horta et al. (2013) under the EFDA Workprogramme 2012. The analysis was based on research addressing three national-based print media – Germany, Spain and Portugal as well as English-language print media addressing transnational elite. The research conducted used mainly the media content analysis method. The results showed that there was no evidence that the accident in Fukushima had a specific effect on media coverage of fusion energy. The number of published articles with fusion related content evolved independently from public attention given to the accident in Japan. In fact, the analysis indicates that the public discourse on fusion is constructed mainly around research challenges, clamorous events and scientific and technological achievements, rather than energy policy debate, climate protection or future economic compensations of fusion research. However, there are some differences when comparing the various media contexts: German press published more articles than Portuguese, Spanish and transnational print media in the period between one year before and one year after Fukushima, not as a result of the accident itself, but rather as a consequence of a more lively and continuing public debate about fusion in Germany, where the decision to eradicate fission propelled the idea of fusion as an alternative, which also became a matter of concern regarding the future of European research financing in this sector. Also the "shock wave" that spread across the world after Fukushima threw some shadows over the future of nuclear technology. While nuclear fission was directly and profoundly affected by the accident in Fukushima, nuclear fusion is considered an important alternative to traditional nuclear energy - safe and unlimited -, even if too costly and postponed (too far-off) for the current urgencies (Schmidt, Horta and Pereira 2014).

As an illustration of the specific findings from this study regarding the media presentation of fusion power, data from the Spanish sample (Oltra and Prades, 2013) showed that:

- The volume of fusion-related content in the print media is limited and linked to special events and new technological achievements. Although the coverage shows a regular tendency around two articles per month, the coverage is clearly irregular (from 3 to 7 articles per year) if we consider each of the newspapers, and mainly linked to special events. This seems a limited number to stimulate the attention of the public.
- There is some evidence of a formation of media frames about nuclear fusion. The presentation of nuclear fusion in the media is generally positive. Fusion is shaped as a new technology producing clean and endless energy and as a potential solution to energy problems. Fusion is characterized as a new source of energy, as a subsidiary product of ITER and as a scientific challenge. There is no evidence of a "nuclear brand" (negative resonances in terms of fear, stigma, etc.) in the media presentation of fusion. In fact, 65% of the articles with fusion-related content do not mention nuclear fission
- The general valuation of fusion energy in the print media is positive. Fusion is mainly presented in terms of an unlimited and clean source of energy. Articles dealing with research projects are, on average, more positive towards fusion than those dealing with energy policy

or investment costs. When linked to safety issues, nuclear fusion is positively presented. Nuclear fusion is poorly associated with climate protection, but also to risk management or accidents.

In the following year, the Portuguese and Spanish teams working under the EFDA Workprogramme 2013 focused their analysis on the comparison between fusion and other emerging energy technologies in media coverage in Portuguese and Spanish newspapers (Schmidt et al. 2014). The quantitative analysis of the articles regarding emerging energy technologies shows that nuclear fusion is less covered than offshore wind power and hydrogen in both countries and, additionally, wave power in Portugal. The differences in the proportion of articles written about nuclear fusion are minor when comparing the two countries, whereas the approaches clearly diverge: news coverage in Spain more critical and in Portugal is more enthusiastic, there are more articles with positive assessments, mainly linked to its low environmental impact and unlimited energy, but also more articles with negative assessments, mainly linked to the fact that the technology is still not ready. In both countries the proportion of articles about nuclear fusion reached its peak in 2010 (the year of an important meeting of the board of directors of ITER), declining sharply afterwards. This also indicates that media interest on nuclear fusion is primarily linked to the decision processes, research activities and budgetary issues that arise from the ITER cooperation framework. Nuclear fusion is primarily appreciated in both countries for its low environmental impact, unlimited production of energy and the possibility to replace nuclear fission and fossil fuels. Nuclear fusion is negatively evaluated in Portugal, especially with regard to its stage of development (incipient) and costs of investments. It is also considered the only technology that consumes more energy than it produces. In Spain, fusion is considered the most costly technology of all, but still shows less negative evaluations when compared to hydrogen with regard to the stage of development and to IV nuclear generation with regard to public acceptance and future prospect.

The main findings from the overall research based on four samples of news articles are formulated in six ideas that could be of use for the media framing analysis conducted in the continuation of the project. These findings are described in following paragraphs (Schmidt, Horta et al. 2013: p. 33-36):

Representations of fusion energy as portrayed in the media are rooted in the idea that fusion is safe, unlimited and clean from the core. Dissociation from conventional nuclear energy and nuclear accidents plays in favour of a positive image of fusion energy. The in-depth analysis revealed that fusion is much appraised when compared with fission technology and less when compared with renewables, balancing in this case between views that include fusion as a complement to renewables in future energy scenarios and those that support only the fostering of renewables, especially considering the costs of fusion research.

a) The technological feasibility of fusion raises doubts constantly. Fusion is still seen as a scientific curiosity, a controlled experiment in research and laboratorial environments that does not represent any danger to populations, but which does not provide an answer to the real challenge of current energy needs in contemporary societies. It is seen as a distant promise and without transposition to the economy (in contrast to nuclear fission, clearly associated with productive activity).

So how do we get from science to the economy? How do we go from a scientific marvel to productivity? A possible route would be to find content that expressed victories in stages, creating an expectation of evolutionary progress.

b) Another criticism that public discourse, especially in transnational news, issues about fusion is that fusion energy is a long-term option – a continually postponed project (decades in the future). This could be transformed into a 'journey of conquest'. The technological progress should be communicated as it is achieved, as should the next steps, the countries investing, and the countries that are coming on board.

Nuclear fusion has to stop being seen as an unattainable objective (a Holy Grail) and start being seen as 'good sense', and increasingly less associated with a utopia and fantasy and increasingly seen more as a viable reality. This means referring to it, with the contribution of credible and renowned actors, as something that already exists, but which needs more time to be productive. It needs to be seen as 'useful science'.

c) Another negative point mentioned in public discourse is that of economic cost and high investment. It is true that the return on current expenditure/investment is far off. However, this current expenditure stimulates various other industries. It is important to explain the corollary of activities that fusion originates and promotes, highlighting that all this expenditure will one day result in cheap and abundant energy.

d) Nuclear fusion does not appear in public discourse explicitly associated with climate change. The linkage to renewable energy and to climate change seems to be crucial to capture public attention towards fusion properties and potentialities, moreover now that the USA has already accepted climate change as a fact. Therefore it is important to 43 underline that fusion will not impact climate change negatively, and will be capable of contributing to decarbonate energy. It can be presented not only as a benign energy regarding climate change (satisfying environmentalists), but also as one of the only sources of energy capable of decarbonating the economy using modern technology.

e) This points to another aspect. Nuclear fusion is, at the same time, represented as "big science and hard technology". This is a theme where it is possible to call extreme positions to dialogue. It could be a kind of mediator – a meeting place for environmentalists and productivists. But since it also results from international cooperation, its installation transcends frontiers – it could also be a bridge between countries and peoples, limiting the possibility of conflict. Fusion implies trans-nationality and cooperation in terms of knowledge and technology, which could be presented as a very positive aspect. While nuclear fission is very much associated with war, fusion could become associated with a policy of peace and cooperation. It could take us to the proposal made in 1985 by Mikhail Gorbatchev to Ronald Reagan concerning the launch of a programme to develop fusion energy for peaceful ends.

For this to happen, fusion has to strengthen its communicative association and capacity with respect to political decision makers. It has to form a link between scientists and politicians with regards to the collective value or public interest of fusion energy (contrary to the corporate or private interests that prevail in energy markets and nuclear fission).

Future communication of fusion energy can benefit from its distinctive features already underlined, mainly with regards to conventional nuclear energy

f) The analysis carried out on public discourse on fusion over different studies has allowed us to conclude that fusion energy is suffering from a problem of science communication. The communication is insufficient, fragile and crude. The big question in terms of communication is that scientists exaggerate prudence to gain credibility. And in this case, excessive prudence could be fatal for communication, creating a growing distance between people's conscience and the scientific project of fusion. We all know that research on fusion will take time, which it is a complex process, and therefore requires caution. But we put the question in another way: does anyone believe that so many countries would spend so much money if fusion were so unrealistic and unattainable as this caution suggests?

Also, in-depth information and inclusion of social actors, other than scientists or politicians in public debates about the role of fusion in present and foreseen energy scenarios, can also play in favour of public acceptance, or at least, public understanding of fusion energy. Safety and cleanliness should be constantly emphasised.

Continuation of the research: Media framing of fusion

(The research will be steered and conducted in collaboration with prof. Baldwin van Gorp Baldwin.VanGorp@soc.kuleuven.be from KU Leuven, Belgium involved in a PhD research conducted and supported by SCK-CEN.)

The aim of this research supported by EURO-Fusion Consortium is to gain more insight into the public understanding of fusion by studying the media frames of this nuclear technology in both classic news media, such as newspapers, and social media. In addition, the influence of media frames on public interpretation and perception of fusion technologies will be studied. Furthermore, the project's deliverables will include some 'communication tools' which are of practical use, in order to contribute to the quality of the public debate on fusion technologies. As with any debate, also here the quality of the communication on nuclear technologies may be improved in at least two ways. First, through a better understanding of fusion technologies, of how they work and what their characteristics are. Second, through a more nuanced debate on the benefits and risks of these technologies, which implies going beyond a simple 'yes - no game' of 'feasible' or ' not feasible'.

Media framing will function as the main theoretical and methodological approach in the project (Entman, 1993; Gamson & Modiglini, 1989; Joris, d'Haenens & Van Gorp, 2014; Reese 2007). In layman's terms one could say that each frame presents a perspective on a phenomenon, in such a way that a frame acts as a lens through which people look at reality (Severin & Tankard, 2001). But if an issue is always looked at from the same perspective, it may be that the view of reality offered by that one frame is seen as the reality, so that one loses sight of the fact that there are always several frames giving meaning to an issue. That is what a frame analysis does: it charts the various perspectives on a many-sided reality. With a view to successful communication, this can be enlightening, because, firstly, knowledge of several frames also offers a greater understanding of a

complex reality, and, secondly, it is possible to choose more deliberately for certain frames. Understanding the variety of frames broadens the view and consequently also broadens the view of reality.

Journalists and news media form a particular group of professionals who state where the problems lie in society, being guided by frames as those used by journalistic sources or themselves introducing frames (Strömback et al., 2013). The consequence of this strategic framing is that it confronts us with a constant problematization of society. In order to bring more nuances into the debate, the problematizing frames need to be counterbalanced by counter-frames. Chong and Druckman (2007) argue that problematizing framing is more current, the more so because many stakeholders contribute to it, it will probably initially be deemed to be more convincing and therefore stronger. Further, people who had an 'open mind' are spurred in circumstances in which several frames were playing simultaneously and challenging each other, to take a positive action on the basis of the information and arguments from reports. They weighted up pros and cons of measures to counter an issue (Nisbet et al., 2013).

Scientific contribution and novelty

The scientific contribution and novelty of this research is twofold.

- Firstly, there will be a focus on media frames of fusion technologies since media frames research paid little attention to fusion technologies, focusing mostly on frames related to fission technology and nuclear accidents.

- Secondly, the focus is on both frames and counter-frames. Simply put, frames problematize and counter-frames deproblematize. It is striking that the interest that is hidden in the deproblematizaton of issues is generally overlooked. There are only a few studies to consider it. The reason is, probably, that a great many actors in the social arena have the formulation of problems in a professional manner as their daily task, precisely because they have an interest in a specific framing of the problems. This leads to a competitive wrestling with frames (Scheufele & Tewksbury, 2007). The aim then is to persuade others to adopt the suggested frame, so that they will seek a solution based on the definition thus formed.

Research design (2014-2018)

1. *Frame-analysis of newspaper content*. The project starts with an inductive frame analysis, in which a qualitative interpretive form of content analysis is used to reconstruct a number of figuratively used frames and counter-frames in the news media that are used to give meaning to 'fusion technologies'. The frames will be split up in problematizing frames and deproblematizing counter-frames, according to the methodology developed and tested by Van Gorp (e.g., Van Gorp, 2007, 2010; Van Gorp & Vercruysse, 2012). In a second step, it will be tested deductively to what extent these frames en counter-frames are applied in newspaper content on the topics of nuclear fusion. A period of 15 years (2000-2014) will be taken into account. This gives the researchers the opportunity to look for 'frame attention cycles' (Miller & Riechert, 2001), that is, the sequence of different frames. This sequence can

be influenced by so-called 'key events'. Therefore, the Fukushima nuclear accident will be taken as such a pivotal point, at which the balance between problematizing frames and deproblematizing counter-frames may shift considerably. Newspapers from four countries will be analysed: Belgium, Japan, UK and France related to frames applied for fusion technologies. Additional newspapers from Portugal, Spain and Germany will be analysed related to frames applied to fusion technologies. The exact number of newspapers analysed per country may vary according to the number of retrieved newspaper articles. For each country at least 100 newspaper articles will be collected and included in the sample. An automated content analysis will be used to track patterns of words and propositions throughout the articles. The articles will also be analysed more in-depth qualitatively by using the methodology applied in the inductive phase.

2. *Experiments to verify the effect of framing and counter-framing on the elaboration during news processing in Belgium*. The second part of the project includes a number of small-scale experiments in which it will be tested whether or not the effects of the frames as defined in the first part may actually contribute to the manner in which the general public perceive fusion technologies. Nuclear fusion and fission will be taken as a concretisation of these technologies. For practical reasons, the participants in the experiments will be limited to people with the Belgian nationality. In a first experiment the hypothesis will be tested whether the use of multiple frames and counter-frames in a message leads to more elaboration. Several studies have demonstrated that manipulating the framing of a message may result in more or less extensive processing of the message (e.g., Martin, Hewstone & Martin, 2007; Smith & Petty, 1996). The contribution here is that not only the effects of rather 'simplistic' bipolar negative and positive message framing will be tested, but those of a 'many-sided' problematizing and deproblematizing framing of news content. The main hypothesis is that a combination of multiple frames will prevent people from a mere heuristic acceptance of the presented framing, as a result of a more detailed message processing at the cognitive level. A second hypothesis is that information about these technologies is more accurately remembered when it is embedded in a news message in which both problematizing frames and deproblematizing frames are applied (in contrast to messages in which only problematizing or only deproblematizing frames are used).

3. *Is the medium the message? Experiments to measure the impact of media channels on the 'acceptance' of framed messages.* A next series of small-scale experiments will be set up to find out what the role is of the media channel, i.e. the 'carrier' of a message about nuclear technologies, on, first, the risk perception of these technologies, second, the assessment of the message its credibility, and, third, its acceptance. Already in the1960s, Marshall McLuhan suggested that the medium might be more important than the content of the message. More recently, Schulz, Utz en Göritz (2011) found additional empirical evidence, more specifically with regard to social media. In the third part of the project, in all experimental conditions the very same framed message will be used, whereas only the medium will vary: (1) quality newspaper; (2) popular newspaper; (3) public broadcast's news website (e.g., deredactie.be); (4) a blog; (5) Facebook; (6) Twitter. The main assumption is that there will be a 'halo effect' for the quality newspapers and the public broadcast's website, which implies that it will be

assessed as more 'objective' content. Blogs, on the other hand, may be perceived as a more 'independent' voice, especially when the blogger is portrayed as a kind of investigative journalist who operates outside from the usual news media. Facebook has as a main advantage that the message may be coming from an acquaintance, which refers to the importance of interpersonal communication. Twitter, finally, takes a specific place, because it might carry breaking news, which might, however, be just rumours that have to be verified.

References

Berger, P. L. and T. Luckmann (1966). The Social Construction of Reality: a Treatise in the Sociology of Knowledge. London, Penguin Books.

Borrelli, G. (2004). Reports for EFDA SERF.

De Vreese, C. H. (2003). Framing Europe: Television news and European integration. Amsterdam, The Nedarland, The University of Amsterdam.

Druckman, J. N. (2001). "Evaluating framing effects." Journal of Economic Psychology 22(1): 91-101.

Fowler, R. (1991). Language in the News; Discourse and Ideology in the Press. London, Routledge.

Gamson, W. A. and A. Modigliani (1989). "Media discourse and public opinion on nuclear power: a constructionist approach." The American Journal of Sociology 95: 1 - 37.

Iyengar, S. (1991). Is anyone responsible? How television frames political issues. Chicago, IL, University of Chicago Press.

Kahneman, D. and A. Tversky (2000). Choices, values and frames. Cambridge, UK, Cambridge University Press.

Kasperson, R. E., O. Renn, et al. (1988). "The Social Amplification of Risk - A Conceptual Framework." Risk Analysis 8(2): 177-187.

Macnamara, J. (2007). "Media content analysis: Its uses; benefits and best practice methodology." Asia Pacific Public Relations Journal 6(1): 1-34.

Neuendorff, K. (2002). The Content Analysis Guidebook. Thousand Oaks, California, Sage Publication.

Neuman, W. (1997). Social research methods: qualitative and quantitative approaches, Needham Heights MA: Allyn & Bacon.

Schmidt, L., A. Horta, et al. (2013). Comparative Analysis of the public discourse about fusion and nuclear energy before and after Fukushima. WP12-SER-ACIF-1. Lisbon, Portugal, INSTITUTO DE CIÊNCIAS SOCIAIS UNIVERSIDADE DE LISBOA.

Schmidt, L., Horta, A., Pereira, S. (2014). Public discourse on (old and new) nuclear energy technologies before and after Fukushima. In Sustainability and Environmental Sociology. Proceedings, Tokyo: Organizing Committee for the Pre-Congress Conference, pp. 99-117.

Schmidt, L. et al. (2014) Confrontation of fusion and other future energy technologies' representations in the public discourse – media analysis (Portugal and Spain) Report for Task Agreement WP13-SERF-ACIFLisbon: ICS ULisboa

Chong, D. & Druckman, J. N. (2007). Framing theory. Annu. Rev. Polit. Sci., 10: 103-125.

De Vreese, C. H. (2003). Framing Europe: Television news and European integration. Amsterdam: The University of Amsterdam.

Druckman, J. N. (2001). Evaluating framing effects. *Journal of Economic Psychology*, *22*(1), 91-101.

Entman, R. M. (1993). Framing: towards clarification of a fractured paradigm. *Journal of Communication*, *43*(4), 51-58.

Gamson, W. A., & Modigliani, A. (1989). Media discourse and public opinion on nuclear power: A constructionist approach. *American Journal of Sociology*, *95*, 1-37.

Gitlin, T. (1980). *The whole world is watching: mass media in the making & unmaking of the new left*. Berkeley, CA: University of California Press.

Iyengar, S. (1991). *Is anyone responsible? How television frames political issues*. Chicago, IL: University of Chicago Press.

Joris, W., d'Haenens, L., &Van Gorp, B. (2014). The euro crisis in metaphors and frames: Focus on the press in the Low Countries. *European Journal of Communication, 29*(5), 608-617.

Kahneman, D. & Tversky, A. (Eds.) (2000). *Choices, values and frames*. Cambridge, UK: Cambridge University Press.

Kepplinger, H. and Lemke, R. (2012). Der Einfluss des Reaktorunfalls von Fukushima auf die Medienberichterstattung über Fusionsforschung und –energie. Internal project report.

Martin, R., Hewstone, M. & Martin, P. Y. (2007). Systematic and heuristic processing of majority and minority-endorsed messages: the effects of varying outcome relevance and levels of orientation on attitude and message processing. Pers Soc Psychol Bull, 33(1): 43-56.

Miller, M. M. & Riechert, B. P. (2001). The sprial of opportunity and frame resonance : mapping the issue cycle in news and public discourse. In S.D. Reese, OH. Gandy & A.E. Grant (Eds.), *Framing public life: Perspectives on media and our understanding of the social world* (pp. 107-121). Mahwah, NL: Erlbaum.Nisbet, E. C., Hart, P. S., Myers, T., & Ellithorpe, M. (2013). Attitude Change in Competitive Framing Environments? Open-/Closed-Mindedness, Framing Effects, and Climate Change. Journal of Communication, 63(4), 766-785.

Oltra, C. and Prades, A. Public discourse on nuclear energy after Fukushima. Report prepared for the EFDA Workprogramme 2012 WP12-SER-ACIF-1

Prades, A. Doval, E., Solá, R, Riba, D. (2003b). Public Involvement Around Vandellòs ITER Site. EISS3 – Stage 2. A Picture of the media coverage of ITER: Content Analysis of the Spanish Press. INF-EISSV3-SE2.2-005. Issue: 1. Date: 20 -11-2003

Prades López, A., Horlick-Jones, T., Oltra, C. and Navajas, J. (2007). Investigating lay understanding and reasoning about fusion technology. Report prepared for EFDA by CIEMAT and Cardiff University.

Reese, S. D. (2007). The Framing project: A bridging model for media research revisited. *Journal of Communication*, *57*: 148–154. doi: 10.1111/j.1460-2466.2006.00334.x

Scheufele DA, & Tewksbury D. (2007). Framing, agenda setting, and priming: The evolution of three media effects models. *Journal of Communication*, *57*: 9-20.

Schultz, F., Utz, S., & Göritz, A. (2011). Is the medium the message? Perceptions of and reactions to crisis communication via twitter, blogs and traditional media. *Public Relations Review*, *37*, 20-27.

Severin, W. J., & Tankard, J. W. (2001). *Communication theories: Origins, methods, and uses in the mass media*. New York, NY: Longman.

Smith, S. M., & Petty, R. E. (1996). Message Framing and Persuasion: A Message Processing Analysis. *Pers Soc Psychol Bull March, 22(3), 257-268.* doi: 10.1177/0146167296223004.

Strömbäck, J., et al. (2013). Sourcing the News: Comparing Source Use and Media Framing of the 2009 European Parliamentary Elections. *Journal of Political Marketing*, *12*:1, 29-52, DOI: 10.1080/15377857.2013.752227.

Tversky, A. & Kahneman, D. (1981). The framing of decisions and the psychology of choice. *Science*, *211*, 453-458.

Van Gorp, B. (2007). The constructionist approach to framing: Bringing culture back in. *Journal of communication, 57*(1), 60-78.

Van Gorp, B. (2010). Strategies to take subjectivity out of framing analysis. In: D'Angelo P., Kuypers J. (Eds.)*, Doing news framing analysis: Empirical and theoretical perspectives*. New York: Routledge, 84-109.

Van Gorp, B., & Vercruysse, T. (2012). Frames and counter-frames giving meaning to dementia: A framing analysis of media content. *Social Science & Medicine, 74*, 1274-1281.