

Framing climate change and climate-proofing: From awareness to action

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Abstract

This paper examines two contrasting mental models that can be used to frame climate change and climate-proofing (i.e. adaptation and mitigation). The models refer to common causes and common effects, respectively. Climate change may be relatively easy to grasp if it is conceived as a common cause of different changes in nature. That is important to raise public awareness of the issue. However, climate-proofing will involve a different mental model. This model should consider all the measures necessary to produce the common effect of a climate-proof country. In theory, such a mental model is far more difficult to communicate. These notions are illustrated with data from recent European surveys (Eurobarometer) on environmental and energy issues. The results suggest that the long-lasting rainfall and severe floods in Central Europe have had a significant impact on citizens' concerns. Climate change was often framed in a way that articulates its associations with rain- and river-based problems. This supports the notion of climate change as a common cause of different changes in nature. In contrast, it appeared that many citizens had only vague ideas about the energy situation in their country and that a clear frame for climate-proofing decisions is lacking.

Keywords: climate, frames, mental models, public opinion, European surveys

1. Introduction

In the years to come many new tools will have to be developed for communication and learning on climate change and, in particular, the options that can make a society more climate-proof (i.e. adaptation and mitigation). Taking the role of framing into account may significantly add to these tools, as climate change and climate-proofing can be framed and reframed in several ways. In the early 1990s, for example, many citizens of the developed countries saw the so-called 'greenhouse gas effect' or 'global warming' as an issue with potentially serious but geographically and psychologically distant consequences (Bord, Fisher and O'Connor, 1998; Bostrom, Morgan, Fischhoff and Read, 1994; Kempton, Boster and Hartley, 1995). Since then, however, various salient events, such as unusually long-lasting rainfall and severe floods in Europe, may have contributed to a reframing of the issue in terms of consequences that are much closer to people's personal lives. This change may be happening through a process of

formal and informal risk communication in which risks that were largely implicit are reframed into more explicit risks. As this process will not stop here, it is particularly important to get more insight into the frames that people use to make sense of climate-related issues. As part of a larger multidisciplinary study to support communication and learning on climate change, this paper introduces some key theoretical characteristics of framing. Additionally, it explores which frames the citizens of different Western European countries use to recognize and understand climate-related issues.

Frames are crucial micro-mechanisms in the continuous interactions between humans and the nonhuman natural world. Important insights into their role have been put forward by researchers in such varied fields as anthropology, linguistics, cognitive psychology, social and organizational psychology, management science, sociology, communication and media studies, social movements research, policy science, science studies, and philosophy. Due to disciplinary boundaries, however, much work has still to be done along the lines where these fields converge. The present paper takes as a starting point people's interaction with the environment near to them, such as the room they are sitting in and the newspaper they are reading (see Figure 1). In this inherently perceptual process, frames are the coordinate systems that people use to align data from their memory and data from the environment, for example, to interact with objects in a three-dimensional space (Di Nocera, Couyoumdjian and Ferlazzo, 2006). Similarly, with regard to perception and understanding of more abstract issues, the term frame refers to the organizing principles by which people develop a particular conceptualization of an issue or reorient their thinking about an issue (Chong and Druckman, 2007). In the literature on policy controversies (Schön and Rein, 1994), frames are often depicted in terms of 'underlying mental structures' of belief, perception and appreciation, which enable people to take shared or opposing political positions. Accordingly, frames are not just personal (and idiosyncratic) tools but also cultural structures.

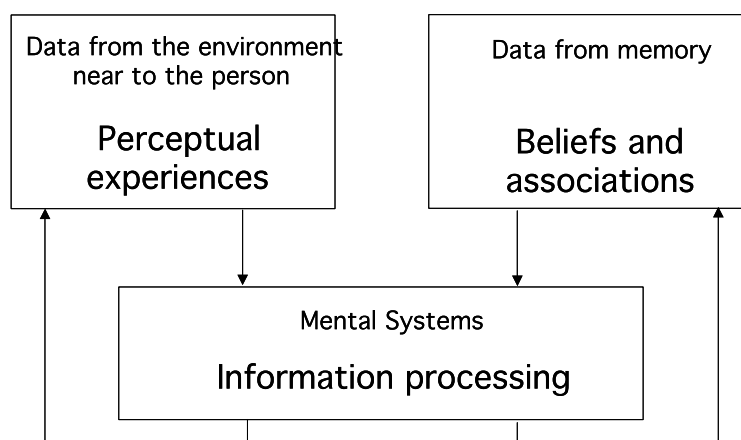


Figure 1. Frame-based information processing creates links between two data sets.

The main organizing principles for abstract information processing are language and mental models, including causal-chain structures, such as storylines. It is here that major differences may appear between people's beliefs about living kinds and artefacts. Recent research into children's thought processes has shown that even preschool children have intuitions about the essential properties of living kinds, which distinguish them from artefacts (Greif, Nelson, Keil and Gutierrez, 2006). One of these intuitions is the tendency to assume that living things have vital forces inside them that are responsible for growth and activity (Keil, 2006). In contrast, artefacts are developed to serve a function or a purpose. Preschool children, for example, do understand that dogs are different from tables. Dogs and other living kinds are seen as having an essence that works as a common cause of different dog-like phenomena (see Figure 2). In contrast, young children conceive of artefacts in terms of functions. Moreover, tables and other artefacts have to be assembled; their different constituting elements produce the table-like function as their common effect. People assume and prefer a common-cause structure regarding 'natural' categories (Ahn et al., 2001). Common-cause models are relatively easy to understand and can flexibly be extended or reduced. In contrast, common-effect models require more knowledge about the constituting elements and their mutual relationships.

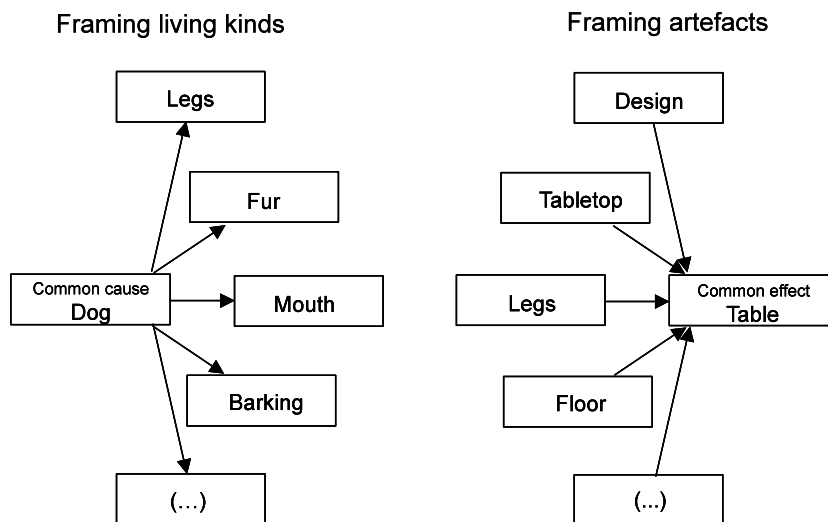


Figure 2. Examples of the dog's essence as a common cause and the table-like function as a common effect.

The common-cause model is not only relevant for purely natural phenomena, but also for people's relationship to the habitable earth. Many stories about this topic have been collected in Glacken's (1967) seminal book on nature and culture in western thought from ancient times onwards. Each of these stories appears to capture one or more of the following themes: (1) the idea of a designed earth that constitutes a fit environment for human beings and other organic

life, (2) the idea of geographical influence on the character of human culture ('geographical determinism'), and (3) the idea of humans as geographic agents who changed the earth from its hypothetical pristine condition. In the past centuries, the stories had strong moral undertones. Many unusual natural events, for instance, were seen as cues that something unpleasant is going to happen ('omen of disaster'). During the Little Ice Age (from around 1300 until about 1730), certain 'unnatural' climatic events were not only attributed to large-scale deforestation but also to the weather-making abilities of witches (Behringer, 1999).

In modern times, the idea of humans as geographic agents is partly captured by a global model of environmental pollution. Basically, this is a common-cause model of the several ways in which human activities may threaten the essence of nature. The old notion of the balance of nature may reinforce the worry that modern humans are playing with things they barely understand. Kempton et al. (1995) suggest that many citizens of the United States applied a pollution model to climate change. Global warming was often seen as a subset of ozone depletion, due to overlapping features and the fact that the ozone issue was established first.

The common-cause model may help people to become aware of the many ways in which climate change can become manifest, such as by changes at the North pole, in the Alps, in sea level and in patterns of rainfall. This may happen even if their understanding of these issues is not completely in line with established scientific knowledge about differences between climate change and ozone depletion. However, making a country climate-proof by adaptation and mitigation measures requires a completely different mental model. Climate-proofing should be driven by opportunities for technological, institutional and societal innovations, rather than purely by fear of the negative effects of climate change (Kabat, van Vierssen, Veraart, Vellinga and Aerts, 2005). Therefore, climate-proofing is a common effect of different constituting elements that have to be balanced carefully. The contrast between the two mental models is illustrated in Figure 3.

Because frames and mental models cannot be observed directly, their role in information processing has to be derived from comparisons of different situations, such as different sites where people are trying to make sense of what happens in their environment. In the case of climate change, for example, research may focus on comparing people who live in areas with different ecological and cultural circumstances. Interestingly, several recent multi-national public opinion surveys allow us to make such comparisons. This refers to some large data sets, such as the Eurobarometer surveys of the European Union, which are not specifically built for research into beliefs about climate change but which can fruitfully be used for that purpose. Although some data sets include a large number of countries, it was decided to focus the analysis on the countries that belong to Western Europe (i.e. the former EU 15 countries plus Norway and minus Greece).

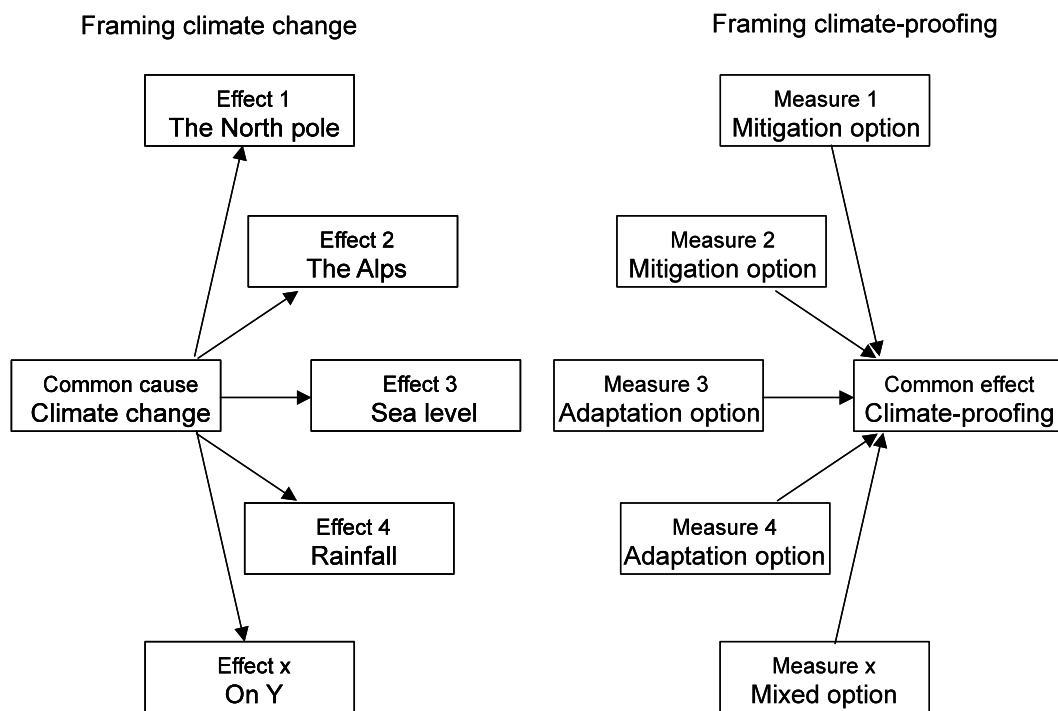


Figure 3. Climate change is a common cause; climate-proofing is a common effect.

A particular advantage of the data sets is that concerns about climate change can be examined in the context of concerns about other environmental issues, such as ozone depletion or natural disasters, and beliefs about energy technology. Hence, the research questions were: (1) is it possible to separate worry about climate change from worries about other environmental topics, (2) to what extent are citizens worried about climate change, (3) do citizens see linkages between climate change and energy, (4) what do these linkages indicate about their mental models?

2. Method

Two large data sets were chosen that allow us to put climate-related framing by the citizens of Western European countries in a broader environment and energy perspective. These are (1) Eurobarometer 58, conducted between 1 September 2002 and 7 October 2002 (after the August 2002 flooding in the Elbe and the Danube catchment areas) and focused on attitudes towards the environment (European Commission, 2002); and (2) Eurobarometer 57 (without Norway), conducted between 23 February and 4 April 2002 and focused on attitudes towards energy and energy technology (European Commission, 2003). Both data sets were documented and made available by the 'Zentralarchiv für empirische Sozialforschung, Köln'. From each set, the most relevant questions about climate-related worries and beliefs were taken.

Clearly, multi-national data should be handled with great care. A crucial methodological point is that each country should be seen as a set of conditions, such as latitude, language, religion, education, and wealth (Scheuch, 1989), which makes it difficult to pinpoint exactly how the differences between the countries should be explained. In addition, differences in public opinion between countries are often less stable than the sample sizes (approximately 1000 persons per country) may suggest. Comparisons may also be hampered by differences in language and ways in which people answer survey questions. For instance, questions that are intended to measure people's level of concern about environmental issues may generate a tendency to show a certain degree of concern about all the issues. In Europe, this tendency may be more widespread in the countries of the south than in those of the north (European Commission, 2002; van Herk, Poortinga and Verhallen, 2004).

Therefore, several statistical techniques were applied to adjust the scores for differences in response tendencies. A useful technique is multidimensional scaling by PROXSCALE (SPSS, 2003), as the results are not influenced by overall score level differences in different groups. In addition, multiple regression analysis was used to transform the degree of worry about climate change into standardized residuals that were made independent from worries about other environmental issues. For purposes of presentation the data per country are arranged in an order that takes due account of their latitude and language, from Southern to Northern Europe.

3. Results

One of the potentially relevant ways of viewing climate issues is by putting them in the broader context of all the main environmental issues of our times. In Eurobarometer 58, respondents were asked to indicate their level of worry about 25 environmental issues, ranging from 'destruction of the ozone layer' to 'industrial waste management.' The technique of multidimensional scaling was used to place related worries together and non-related worries further apart. In the solution presented in Figure 4, four dividing lines were drawn on the basis of another analysis (Principal Component Analysis with oblique rotation of the first four correlated components; sharing 61 % of the common variance, all Eigenvalues >1).

The results presented in Figure 4 indicate that there were clear patterns of worries among the citizens of the countries involved. In fact, all the environmental worries could be arranged in four broad clusters, which may be characterised as follows. Water pollution (e.g. rivers, coasts, ground and tap water) and industrial disasters (e.g. oil spills) make up the first cluster. The second one refers to some global environmental issues and includes climate change together with natural disasters and the ozone issue. The third cluster contains local issues and topics that appear to worry urban people in particular (e.g. hunting). The fourth cluster largely involves worries about potential hazardous activities, including the use of nuclear power and the management of chemical waste.

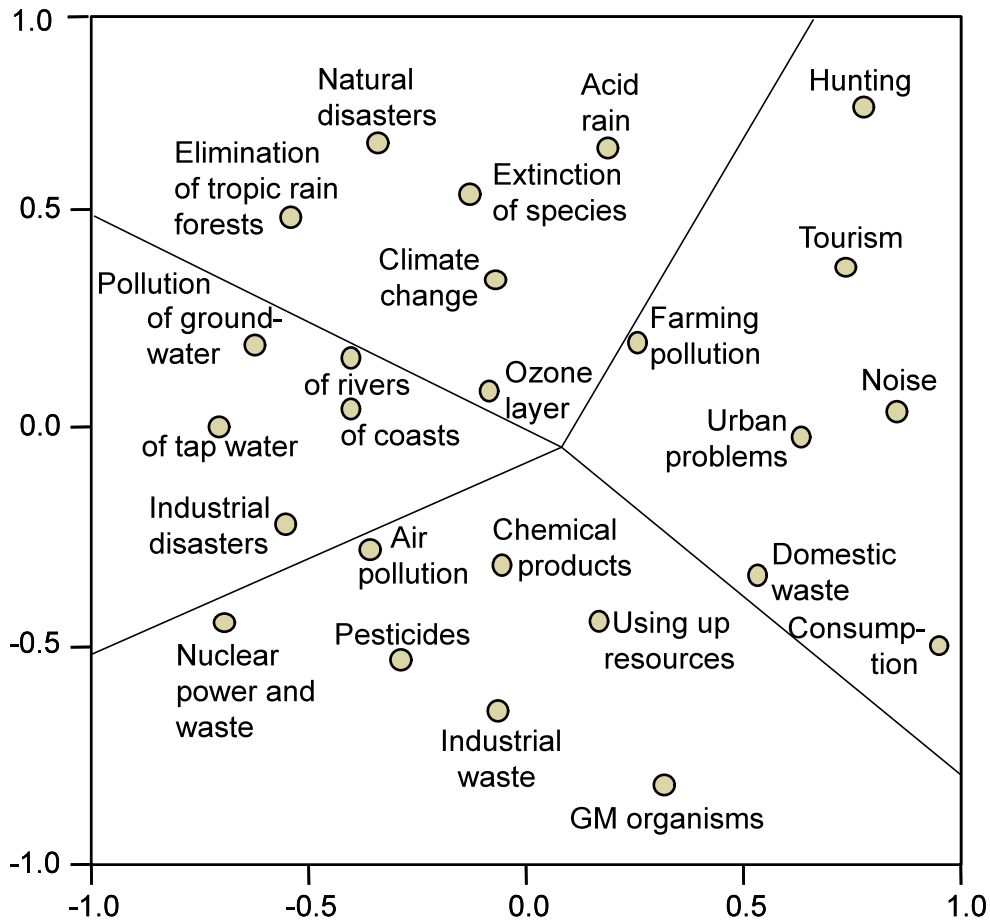


Figure 4. Multidimensional scaling of the worries¹⁾ taken from Eurobarometer 58 ($n = 16054$, Normalized Raw Stress .089).

¹⁾ Question 39: 'At present, are you very worried, fairly worried, not very worried or not at all worried about (...)'.
 ...

The set of clusters showed that it was possible to separate worries about global environmental issues from the other ones. Citizens who were relatively more worried about climate change were often also relatively more worried about topics such as deforestation, extinction of species, natural disasters and ozone depletion. This pattern of associations may be the result of a common-cause model of thinking about global issues. Further, the set of clusters was used to shed more light on the relative level of worry about climate change and natural disasters. That is, a multiple regression analysis was applied to transform the degree of worry about climate change into standardized residuals that were made independent from worries about water pollution, hazardous activities and local issues. The same analysis was applied to the degree of worry about natural disasters.

Figure 5 displays the results of the analyses per country after standardization across the data set as a whole. It appears that the level of worry about climate change was relatively high in the countries of Central Europe. This pattern of results corresponds with higher levels of worry about natural disasters and, as depicted in Figure 6, higher partial correlations between both worries.

The results of Figures 5 and 6 should be seen in relation to the long-lasting rainfall and severe floods that have stricken Central Europe since 1990. These events may have had a significant impact on people's worries about climate change. Among the citizens of countries as Austria and Germany, the levels of worry about climate change and natural disaster were relatively high and both items were significantly correlated. In these and other countries worry about natural disasters was higher in rural areas than in large towns.

Interestingly, a river-oriented pattern was also found in the Netherlands, where 60% of the territory is located below sea level and 70% of the gross national product is earned in these flood prone areas (Kabat et al., 2005). The highest correlation between worry about climate change and natural disasters was found among citizens in the provinces that are river-oriented ($r = .34, n = 524, p < .001$) instead of coast-oriented ($r = .23, n = 474, p < .001$). This outcome is not really surprising, as the past decade has revealed that certain parts of the Netherlands are very vulnerable to river-based floods. However, especially in the lowlands with their long coastline, climate change may have much more consequences than rain- and river-based problems only.

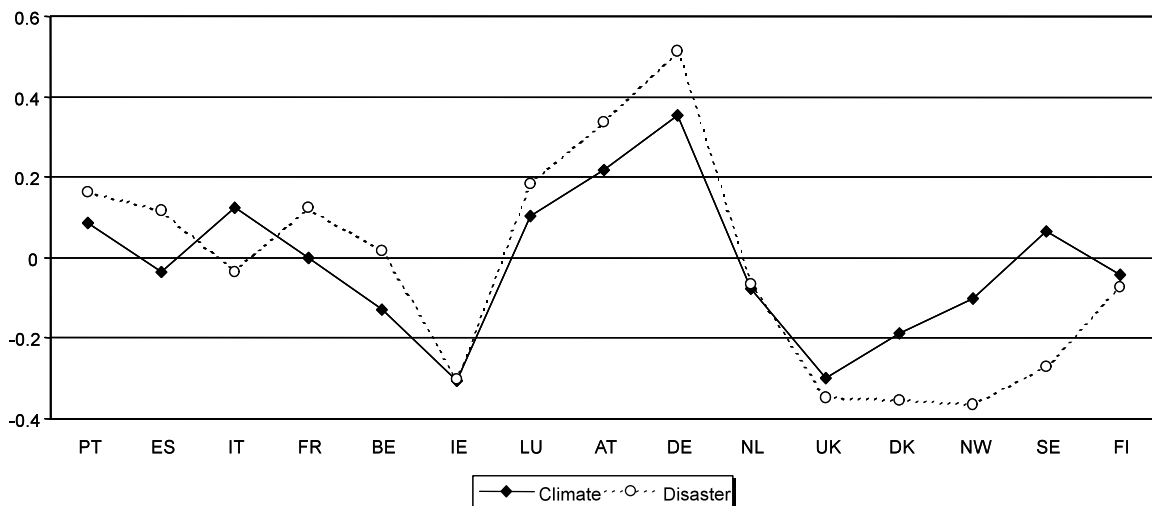


Figure 5. Mean levels¹⁾ of worry about climate change and natural disasters per country.

¹⁾ Standardized residuals (overall $M = 0, SD = 1$) of degree of worry about climate change and natural disasters, given people's level of worry about water pollution, hazardous activities and local issues.

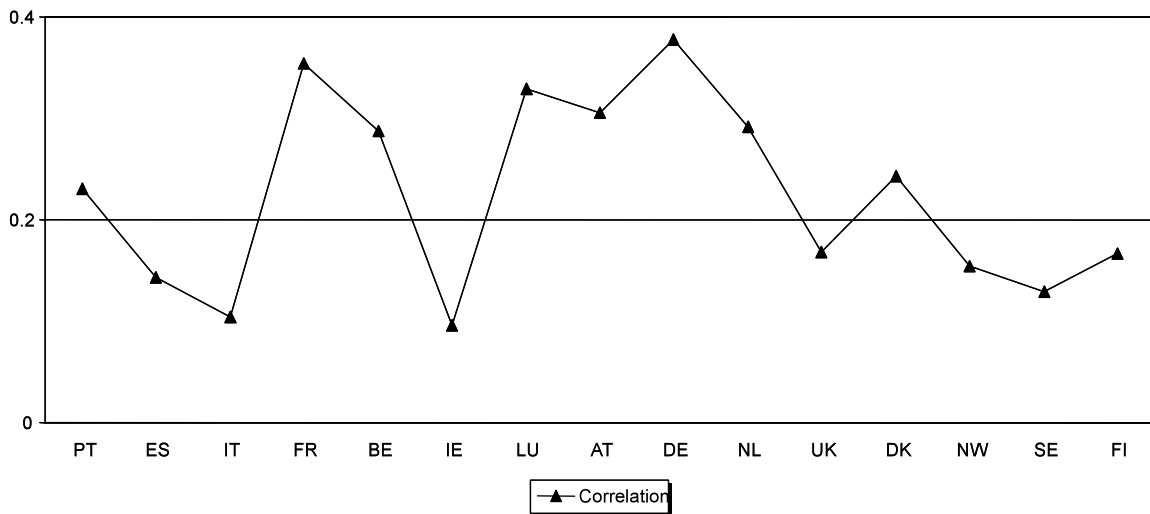


Figure 6. Partial correlations between worry about climate change and about natural disasters, given people's level of worry about water pollution, hazardous activities and local issues.

Linkages between climate change and energy issues were analysed on the basis of Eurobarometer 57. Many people in Western Europe agreed with the statement about the significant contribution of the use of fossil fuels (coal, oil, gas etc.) to global warming. This connection was confirmed by more than 80% of the citizens in five of the countries (Figure 7). Although this indicates at least some general understanding of the issue, it should be added that there were also associations that indicate confusion. For instance, many citizens had the opinion that nuclear power also contributes to global warming (Figure 8). Explicit denial of this impact was higher in countries in the north where the average level of education is higher, but in these countries as well a large percentage agreed (overall, the correlation between length of education and agreement–disagreement with this item is $r = .17$ ($n = 15036$)).

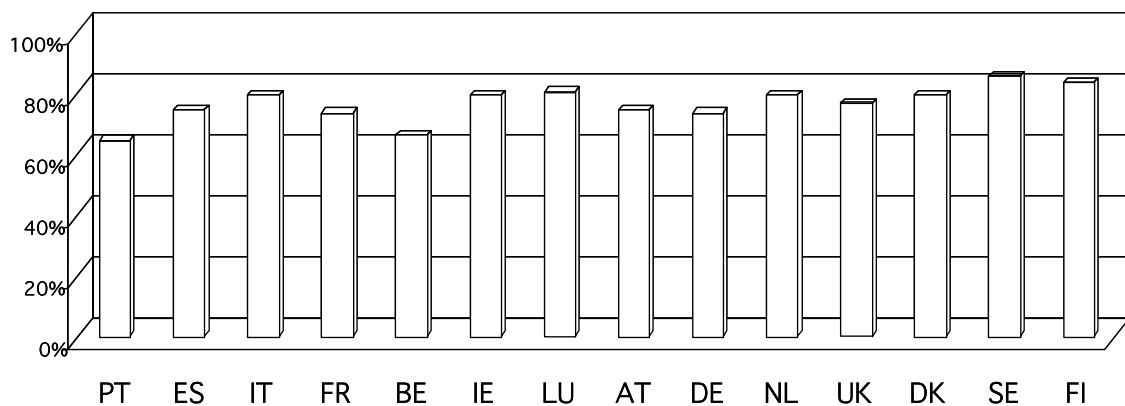


Figure 7. Percentage per country that agreed with the statement: 'The use of fossil fuels (coal, oil, gas etc.) contributes significantly to global warming and climate change'.

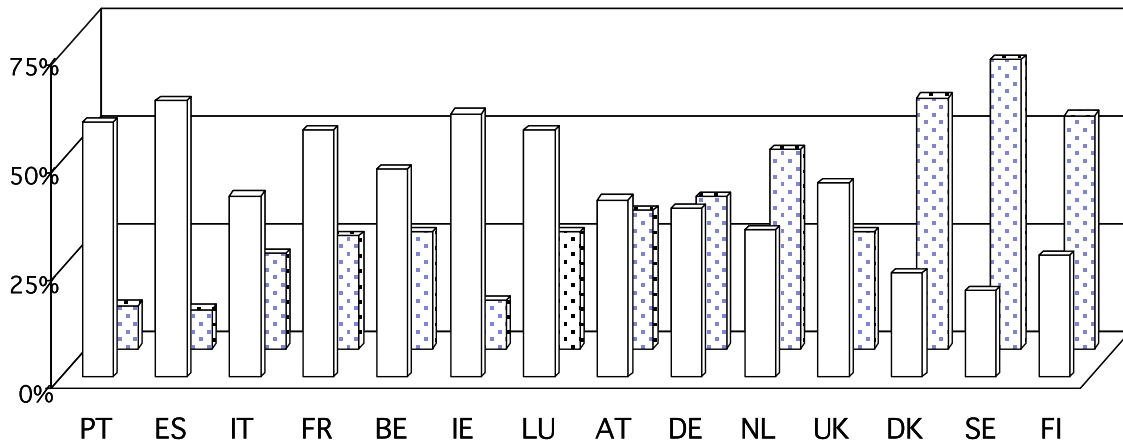


Figure 8. Percentage per country that agreed (front row) or disagreed (back row) with the statement: 'Nuclear power contributes significantly to global warming and climate change.'

These results underline the conclusion of public opinion researchers that many citizens of the European Union had only vague ideas about the energy situation (European Commission, 2003). For example, the same data set revealed that Europeans gave high priority to renewable energy sources (conventional and new) and that they tended to overestimate the actual use of renewable energy sources in their country. This was particularly salient in the Netherlands where 23% gave the answer that renewable energy sources are used 'much' to produce energy in this country. Accordingly, many citizens had no idea about the steps that still have to be taken to make 'renewables' a more than marginal source of energy. These outcomes demonstrate that the common-effect model needed for thinking about a climate-proof country will not be easy to communicate.

4. Conclusions

Although far more research is necessary, the secondary analysis of the European surveys has produced valuable insights into climate-relevant information processing. Climate change was often framed in a way that articulates its associations with rain- and river-based problems. This indicates that the notion of climate change may be relatively easy to grasp if it is conceived as a common cause of various changes in nature. Policy-makers may need such an approach to increase public awareness of the issue. In contrast, many citizens of Western Europe had only vague ideas about the energy situation in their country. This illustrates that climate-proofing will involve a different mental model. It will require hard thinking to consider all the measures necessary to produce a climate-proof country. Paying attention to the distinction between a common-cause and a common-effect model may be of help in this context.

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References

- Ahn, W. K., Kalish, C., Gelman, S. A., Medin, D. L., Luhmann, C., Atran, S. et al. (2001) 'Why Essences are Essential in the Psychology of Concepts,' *Cognition* 82: 59-69.
- Bord, R. J., Fisher, A. and O'Connor, R. E. (1998) 'Public Perceptions of Global Warming: United States and International Perspectives,' *Climate Research* 11: 75-84.
- Bostrom, A., Morgan, M. G., Fischhoff, B. and Read, D. (1994) 'What Do People Know about Global Climate Change? 1. Mental Models,' *Risk Analysis* 14: 959-70.
- Chong, D. and Druckman, J. N. (2007) 'Framing Theory,' *Annual Review of Political Science* 10: 103-126.
- Di Nocera, F., Couyoumdjian, A. and Ferlazzo, F. (2006) 'Crossing the Pillars of Hercules: The Role of Spatial Frames of Reference in Error Making,' *Quarterly Journal of Experimental Psychology* 59: 204-21.
- European Commission (2002) *Eurobarometer 58.0: The Attitudes of Europeans Towards the Environment*. Brussels: European Commission, Directorate-General Environment.
- European Commission (2003) *Eurobarometer. Energy: Issues, Options and Technologies*. Luxembourg: Office for Official Publications of the European Communities.
- Glacken, C. J. (1967) *Traces on the Rhodian Shore: Nature and Culture in Western Thought from Ancient Times to the End of the 18th century*. Berkeley, CA: University of California Press.
- Greif, M. L., Nelson, D. G. K., Keil, F. C. and Gutierrez, F. (2006) 'What do Children Want to Know about Animals and Artifacts? Domain-specific Requests for Information,' *Psychological Science* 17: 455-59.
- Kabat, P., van Vierssen, W., Veraart, J., Vellinga, P. and Aerts, J. (2005) 'Climate Proofing the Netherlands,' *Nature* 438: 283-84.
- Keil, F. C. (2006) 'Explanation and Understanding,' *Annual Review of Psychology* 57: 227-54.
- Kempton, W., Boster, J. S. and Hartley, J. A. (1995) *Environmental Values in American Culture*. Cambridge, Mass.: MIT Press.

Scheuch, E. K. (1989) 'Theoretical Implications of Comparative Survey-research - Why the Wheel of Cross-cultural Methodology Keeps on Being Reinvented,' *International Sociology* 4: 147-67.

Schön, D. A. and Rein, M. (1994) *Frame Reflection: Toward the Resolution of Intractable Policy Controversies*. New York: Basic Books.

SPSS (2003) Release 12.0. Chicago, IL: SPSS Inc.

van Herk, H., Poortinga, Y. H. and Verhallen, T. M. M. (2004) 'Response Styles in Rating Scales - Evidence of Method Bias in Data from Six EU Countries,' *Journal of Cross-Cultural Psychology* 35: 346-60.

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