

Climate change as reported in the press of Finland: From screaming headlines to penetrating background noise

J. LYYTIMÄKI*† AND P. TAPIO‡**

†Finnish Environment Institute, PO Box 140, FI-00251 Helsinki, Finland; ‡Finland Futures Research Centre, Turku School of Economics, Kankurintie 31a, FI-01260 Vantaa, Finland and Department of Environmental Sciences, University of Helsinki, PO Box 27, Viikki E-building, FI-00014 University of Helsinki, Finland

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News coverage of climate change has increased in the English-speaking industrialised countries since 2005. The development of news coverage, especially in the United States, has been widely studied. Knowledge of the development and contents of climate debate in other languages than English is sparse. This paper presents the development on the press news coverage on climate change in Finland during the period 1990–2009 and discusses different social, economic and ecological factors influencing the news coverage.

Keywords: Climate change; Finland; Press coverage; Piercing effect

1. Introduction: the state of the climate debate

Climate change has become the most vigorously debated environmental topic in the mass media. Since 2006, there has been an upsurge in climate news coverage in several developed countries [1–4]. The increase of coverage can be explained by a combination of several factors. One is the continuous increase of scientific knowledge describing climate change. Influential reports include especially the reviews by the United Nations Intergovernmental Panel on Climate Change (IPCC) [5]. Studies estimating the economic implications of climate change adaptation and mitigation measures have also provoked a vivid discussion, especially the report compiled by an expert group led by Lord Nicholas Stern [6].

Scientists, authorities and non-governmental organisations have traditionally been key sources feeding environmental news [7]. In addition, outstanding business leaders, politicians, rock stars and other celebrities have recently expressed their concern over climate change [8]. Examples include entrepreneurs such as Sir Richard Branson, the British chairman of the Virgin group, who announced in September 2006 an initiative to use approximately three

*Corresponding authors. Email: jari.lyytimaki@ymparisto.fi; **petri.tapio@tse.fi; petri.tapio@helsinki.fi

billion dollars for renewable energy and biofuel research [9]. In Finland, attention increased with expressions of concern from Jorma Ollila, chairman of the Nokia Corporation and the Royal Dutch/Shell Group [10]. Perhaps the best known climate celebrity is the former vice-president of the USA, Al Gore, through his documentary film *An Inconvenient Truth*. Although the professed views of many business leaders and celebrities have been met with scepticism, Al Gore and the IPCC jointly received the Nobel Peace Prize in 2007 for their efforts.

Intertwined with scientific results and the activity of individual actors, the political discussions and negotiations especially through the United Nations Framework Convention on Climate Change (UNFCCC) have been a major influence on news coverage. The Kyoto meeting in 1997 raised interest worldwide [2]. In Finland the Kyoto protocol was identified as the key turning point between weak and fragmented and stronger and more focused climate debate [11]. After the Bali meeting in 2007, the US press showed greater confidence in attributing causes and effects for climate change [12].

There are other social processes and events to consider. A growing sense of fear has been induced by the September 2001 terrorist attacks in the USA and also by apprehended and actual outbreaks of pandemic diseases [3]. There is a general trend of perceiving the importance of uncontrollable risks in the 'risk society' [13]. Whether the risks are more apparent than real, is beyond the scope of this paper.

Environmental conditions can influence climate news coverage; for example, the intensive climate debate in the USA related to the exceptionally warm and dry summer of 1988 [14]. Further, the 2005 Hurricane Katrina in the USA and the heat wave of the summer of 2003 in Europe, have been connected with human impacts on climate. The media have also highlighted the loss of Arctic summer ice cover, diminishing mountain glaciers and the breaking of ice shelves in Antarctica as indications of climate change. But, media researchers emphasise that changes in environmental news coverage are the result not mainly of changes of state of the environment, but rather of various social processes [15].

This article focuses on the development of climate coverage, and discusses an example from the Finnish press. As a literature review shows, there is need for studies focusing on the non-English climate coverage. We detail and analyse the results on the development of Finnish news coverage, together with previous results on climate coverage in Finland. We discuss also the social, economic and ecological factors influencing the coverage.

2. Review of the research on climate change media coverage

The English-language press coverage on climate change is well covered in peer-reviewed literature, especially regarding the United States [2,16–22] and the United Kingdom [23–27]. Some studies exist from other English-speaking nations such as Australia [28,29], Canada [30,31] and New Zealand [32]. There are fewer studies in other languages. Some studies address industrialised large countries such as France [33], Germany [34,35] and Japan [4]. There are notable gaps: Brazil, China, Indonesia and Russia appear to be missing from international peer-reviewed literature, despite the importance of global climate policy for these countries. The first study focusing on the English-language press of India was in press in 2009 [36].

Most studies concentrate on one nation. Cross-national comparisons typically take the US situation as a reference point and concentrate on English-language countries or English media in other countries [1,31,37]. There are only a few comparisons between different

language areas. Brossard *et al.* [33] highlighted the differences between French and US news coverage. They concluded that coverage in France was more event-based, focused more on international relations and presented a more restricted range of viewpoints, whereas conflicts were more highlighted in US coverage. Dispensa and Brulle [38] compared reports in the US with those from New Zealand and Finland to find out whether the US media presented a biased view on global warming. Nevertheless, their analysis of the Finnish case was based on only seven news articles from the year 2000.

Focusing on European media coverage, Dirix and Gelders [39] concluded that content analysis of climate coverage is very sparse, UK coverage being the exception. Yet, although this may be true with regard to peer-reviewed scientific studies in international journals, there are studies that are hidden in the grey literature typically published in national languages. For example, seven studies specifically on climate change coverage and several other studies including the topic were found in a review of Finnish environmental communication research up to 2004 [40]. Most were masters' theses in Finnish universities. In addition, several studies have been published since 2004 (e.g. [41]). The only cross-national study found from Finnish literature was a comparison of local climate change media discussion of Arctic areas in Finland and Canada by Tennberg [42]. All this suggests that the grey literature is even more focused on analysis of coverage inside one nation than international peer-reviewed literature.

The focus of this paper is the Finnish climate discussion. Finnish press coverage can illustrate potential differences and similarities between countries and it may help to build bridges between different culturally and geographically bound ways of perceiving climate change. The Finnish language is spoken as the first language by about five million inhabitants living in Finland. Finnish is also a distinctive language, different from other European languages. Because of its northern location, the whole of Finland is covered by snow in wintertime, with very short daily periods of sunlight. Hence, the risk of snow cover loss might enhance a national concern over global warming.

Climate change is a global problem, mediated by internationally published research results and global climate negotiations. The growing international concentration of media ownership and the convergence of media are likely to increase the uniformity of climate news. Nevertheless, the media can play different roles in the moulding of public attitudes in different countries [33]. In Sweden the media have been reluctant to display any kind of scientific uncertainty that would undermine the demand for collective action on climate policy [43], whereas in the USA the media have, until recently, emphasised the uncertainties and diverging views [37].

Mazur [3,15] reported that rises and falls of news coverage about global warming have been remarkably synchronous in English-speaking nations. But, others have noticed differences between, for example, US and Canadian news coverage [31]. Our assumption is that major differences between countries do exist, especially between different language areas. We maintain that identifying and understanding key differences and the relationship between local and global contexts is important for global climate policies. As proposed by Anderson [44], one key task for research is to unravel complex information flows across countries.

3. Method

We performed a quantitative content analysis focusing on the press news [45]. Despite the growing use and influence of electronic media, the newspapers remain an important source of environmental and other information in Finland. *Helsingin Sanomat* (HS) is the leading national newspaper in Finland, with a circulation of over 400,000 copies and about one

million readers, that is, a fifth of the entire population. Furthermore, the internet site of the newspaper is one of the most popular in Finland. The circulation of most Finnish newspapers, including HS, has gradually declined during recent years [46]. The HS is Finland's dominant newspaper. It is therefore possible to attain a comprehensive and reliable view on the trends in coverage of the environment by examining this one newspaper.

The data on climate change news coverage were collected from the online database of the HS (www.hs.fi/arkisto). This electronic archive contains news material published by the newspaper from 1990 onwards. It includes the titles and texts of the printed material. Information on pictures, picture captions, graphics and other visual illustrations, cartoons and advertisements is excluded from the database. Importantly, the search engine takes into account the inflections of words in the Finnish language.

The results of the searches include the following information: the title of the news item, about the 500 first characters of the body text, and words surrounding the search term if it is found later in the body text. The search engine provides also other information including the date of publication, total number of the characters in the body text, the section in the paper and the number of the edition. There is also a link to the full text.

The search term 'climate change' (*ilmastonmuutos*) was selected based on testing of different search strings, since it gave comprehensive results (4420 hits, 1990–2008) focusing well on climate issues. In Finnish, the term 'global warming' is not suitable since there is no corresponding and widely used translation for it. The direct translation (*globaali lämpeneminen*) generated 111 hits from the database in 1990–2008. The term 'warming of climate' (*ilmaston lämpeneminen*) is much more commonly used, resulting in 1375 hits in 1990–2008, with an increasing trend until 2007. Preliminary searches were also made with other terms, such as 'the greenhouse effect' (*kasvihuoneilmiö*). This gave 1873 hits, with a decreasing trend between 1990 and 2008.

We checked the accuracy of the results from the search string 'climate change' to eliminate possible biases caused by the use of an electronic database [47]. Altogether, 34 news items not related to climate change as an environmental issue were detected and removed. The number of duplicates resulting from errors such as double inclusion of the same news item published in different editions was relatively high (212 during 1990–2008). The highest yearly percentage (33%) of duplicates was found from the year 1990. During the 2000s the average yearly share of duplicates was 5% or less. Only hits found from the latest edition were included.

Based on the titles, we used coding to estimate whether the main focus of the news item was on climate change, on some other environmental issue, or on other issues. Only one category was assigned to one news item. If aspects related to climate change were present in the title, we coded the news item as a climate story even if other categories were also present. For example, we coded a story entitled 'Traditional kick sledging is a victim of warming winters' (*Perinteinen potkukelkkailu on lämpimien talvien uhri*, HS, 15 February 2009) as a climate story since the title refers to the warming winter climate, even though the story itself may be mainly concerned with social issues.

The results of the content analysis appear in the next section, together with selected results from earlier studies and data describing possible factors influencing the climate coverage.

4. Climate change coverage in Finland

The potential of anthropogenic carbon dioxide to increase the global temperature was mentioned at the pages of *Helsingin Sanomat* as early as 1956, but thereafter the issue arose

only occasionally, on average once a year [48]. During the late 1980s the number of stories dealing with global warming and other issues of climate and air protection increased [49,50]. The public interest in environmental issues also increased, and especially the coverage of stratospheric ozone depletion and risks related to acidifying precipitation highlighted the cross-border characteristics of air pollution [15,51]. The hot summer and droughts of 1988 in the USA were also reported as signs of global warming in Finland [52]. Tirkkonen *et al.* [53] credited the foundation of IPCC in 1988 and the Brundtland Commission report [54] *Our Common Future* (1987) with increasing climate awareness.

Our analysis shows that the development of climate change news coverage in the HS was relatively stable during the 1990s (figure 1). Between January 1990 and July 2009 a total of 4438 news stories mentioning climate change appeared. During the 1990s, the monthly average number of news stories mentioning climate change was 4.5. In the 2000s, the monthly average has been 38.7.

Most of the news items dealing with climate change were published in the Letter to the Editor pages (16.6% of all news), domestic news pages (15.6%), foreign news pages (15.1%), or in the editorial section (9.7%). The editorial section publishes editorials by the newspaper staff, but also ‘viewpoint’ articles by external writers. The HS presents main news headlines on the third page of the paper (news front page). Climate issues were mentioned 79 times (1.8%) on this page. A section on science and environment/nature issues appears once a week and this contained 5.2% of all climate stories. Climate issues were often mentioned on the TV and radio program pages (6.2% of all stories).

A relative peak in coverage occurred in November–December 1997 due to the third Conference of the Parties (COP3) of the UNFCCC meeting in Kyoto. A much higher peak followed in November 2000, mainly related to the COP6 meeting in Hague. HS provided several detailed stories describing both the negotiations at the meeting and climate change more generally [55]. Coverage from the Kyoto meeting appears to be surprisingly low, since earlier research has highlighted the meeting as a turning point in Finnish climate change

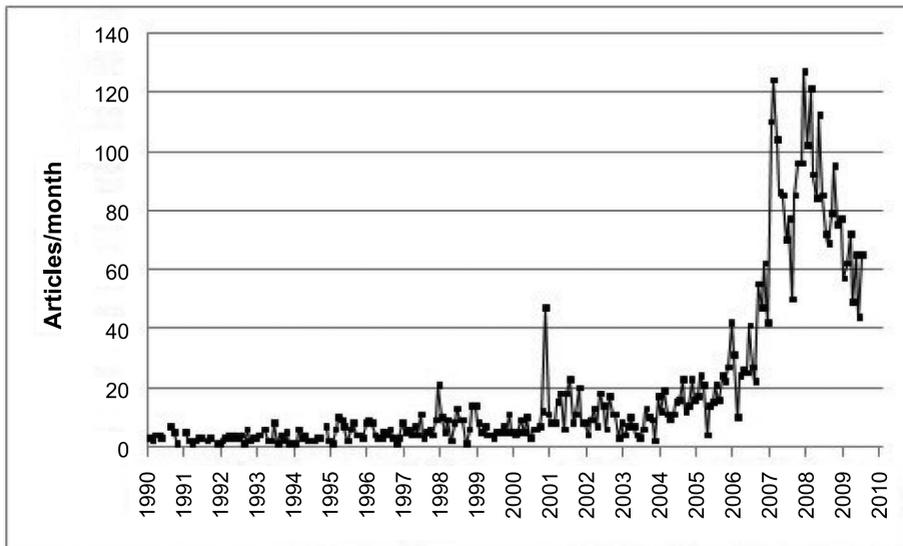


Figure 1. Number of articles covering climate change in Finland's leading newspaper, *Helsingin Sanomat*, January 1990–July 2009.

discussion [11]. A partial explanation for this discrepancy is that the key word 'climate change' was not present in all news items describing the Kyoto meeting. It was commonly identified as the 'Kyoto climate meeting' 'Kyoto climate negotiations' or just as 'Kyoto meeting' (see [56,57]). Furthermore, the domestic discussion on the implications of the Kyoto protocol continued long after the meeting [58].

The early 2000s have been described as 'a period of uncertainty' characterised by a dissen- sus and inconsistency in Finnish climate policy [53]. The coverage was relatively low during 2001–2004 (on average, 11.4 stories per month), despite the fact the Finnish carbon dioxide (CO₂) emissions peaked in 2003 (figure 2). At the end of 2005 an increase in coverage occurred, followed by a drop in early 2006. Cyclical growth of coverage continued in 2006 and an unprecedented increase started at the end of the year. Several contributory factors can be identified. Scientific studies, including the publication of the fourth assessment reports of IPCC (especially the report on the physical basis released in February 2007), were high- lighted in the news, as well as international climate negotiations.

The highest monthly increase in coverage occurred in January 2007. The exceptional winter weather of 2006–2007 was one reason. November 2006 was cold and snowy, but the weather during the following months was very mild. The majority of the Finns live in the southern part of the country. They had to wait until mid-January 2007 for the permanent snow cover [59].

Importantly, during the periods of mild weather, the snow cover reflecting the light was missing from southern Finland. The mild weather was also noticed by the media and it provided journalists with a convenient justification to present climate issues [60]. Snow and ice are culturally important elements for Finns and they are often used to describe climate issues. From 83 pictures related to climate news published by the HS during July 2005 and July 2006, Lehto [41] concluded that pictures of melting glaciers were the most frequently presented natural phenomenon. Other items, such as droughts or forest fires, were not emphasised.

The weather was also exceptionally mild and cloudy during the winter of 2007–2008. For example, the capital city, Helsinki, situated on the southern coast of Finland, had only 20 hours of sunshine during December 2007 and the monthly average temperature remained above 0°C [59]. The Aura river in south-western Finland was ice-free throughout the winter for the first time during 200 years of records ([61], figure 2). The IPCC meeting in December 2007 and the EU decision on energy targets in February 2008 increased the coverage in the front pages of newspapers and TV news, as was noted by the national media coverage appraisal [62]. Lack of snow means lack of light, which is connected to seasonal affective disorder (winter depression) [63].

Despite the overall increasing trend, the coverage diminished temporarily during certain months. In April 2005, only four stories mentioning climate change were published and only one focused on climate issues. In February 2006, only 10 stories were published and only two focused on climate issues. A sharp decrease also occurred between the periods of heightened coverage in spring and summer 2007. Contrary to the southern countries, unusually warm summer weather has not contributed to clear peaks in climate reporting in Finland. Competi- tion with other news topics is a possible factor explaining the relative low intensity of climate reporting in summertime. The focus of Finnish environmental reporting often shifts towards eutrophication, as warm summer weather accelerates the growth of algae [64].

From the end of 2008, the climate coverage decreased again. This can partly be explained by the economic depression (see figure 2) that decreased public interest in environmental issues, and also by the cyclic nature of environmental coverage. There was also more normal

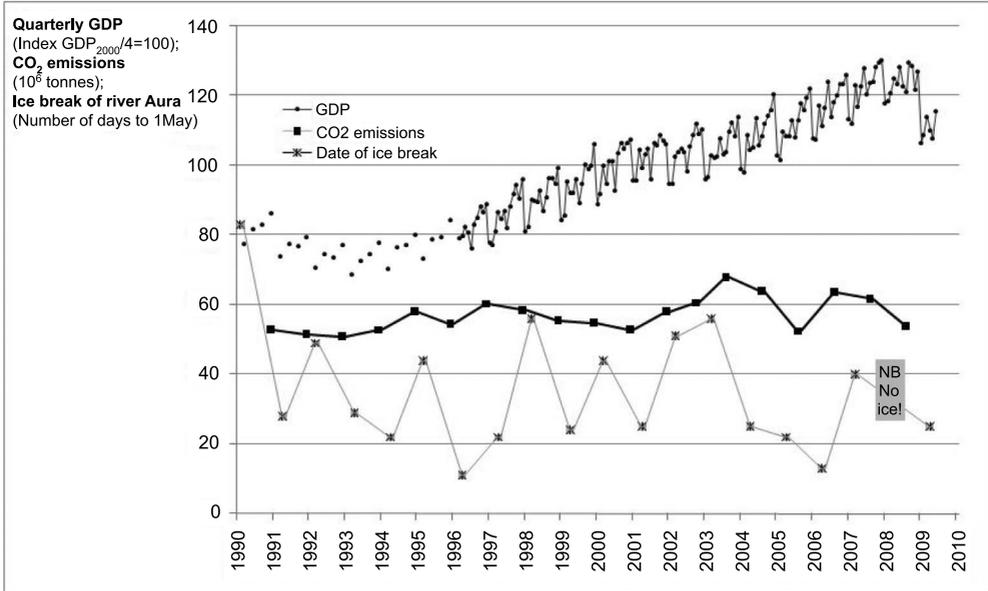


Figure 2. Trends in indicators of driving force, pressure and state of the environment 1990–2009: GDP in real terms, CO₂ emissions from fuel combustion and the ice break date of the river Aura [61,65,66].

winter weather, as the whole of Finland was covered in snow. But, despite the decrease, the amount of coverage during spring and summer 2009 remained well above the levels of coverage in the 1990s and early 2000s.

The titles of the stories showed that about one third (32.5%) of all stories mentioning climate change actually focused on climate change (figure 3). Less than one fifth (18.1%)

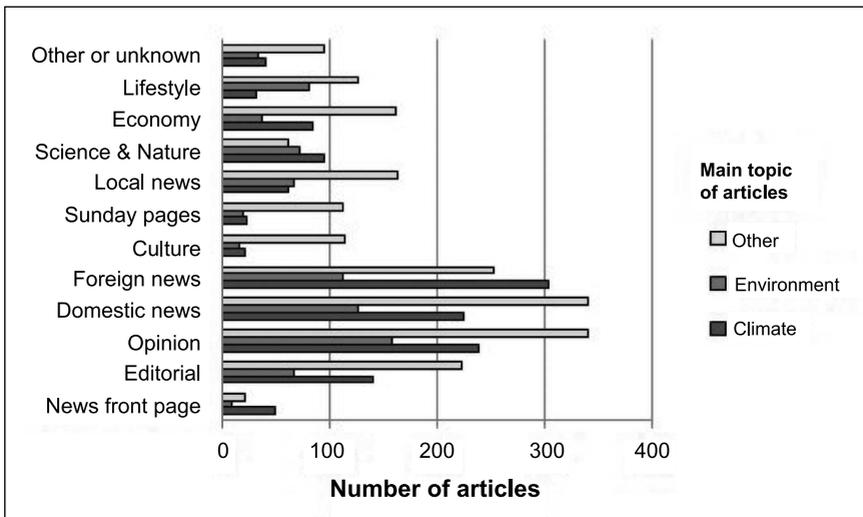


Figure 3. Main focus of the news mentioning climate change in *Helsingin Sanomat*, January 1990 – July 2009. The category ‘Local news’ includes sections: Name of the day, News from Helsinki. Lifestyle includes sections: Price & Quality, Leisure, Life & Health, Housing, Home & Style, Travel. Results from the sections ‘TV and radio programs’ and ‘Where to go’ are omitted.

of titles concentrated on other environmental issues and mentioned climate change in the text. About half (49.4%) the titles described other than environmental issues, for example, the economy or politics. These figures do not include news items from TV and radio pages and from the 'Where to go' section, since most of the hits in these sections are not journalistic material but information about climate-related coverage of other media, or information about events related to climate issues (such as an art exhibition or a public demonstration).

The news front page was the only section where the majority of titles concentrated on climate issues. The reason is that in this section the space for text is very limited and only the key concept of each news item appears. In the 1990s climate change was mentioned in 12 stories on the news front page. Since 2000, the term has appeared in 67 news stories. The second highest portion of titles focusing on climate issues came from the science and nature/environment section. This was expected since this section often presents the results of climate research. The share was also high in the foreign news section, where climate change is often mentioned in the headlines describing international climate negotiations.

In recent years, climate change has been mentioned more often in stories dealing with other than climate or environmental issues. When all hits are included, the results show that 40.2% of stories including the term 'climate change' published during 1990–2004 ($N = 1196$) actually concentrated on climate issues. Since 2005 the share has been 38.4%. Meanwhile, the share of stories concentrating on environmental issues dropped from 24.6% to 20.3% and the share of stories describing mainly other topics increased from 35.2% to 41.3%.

Climate issues are increasingly mentioned on Letter to the Editor pages and also on pages dealing with culture, economics and lifestyle issues. Climate issues are also mentioned in sections from which environmental issues were previously omitted. For example, the sports section mentioned climate change only once during the 1990s but in the present decade climate change has already been mentioned in 15 sports news stories. Climate issues are increasingly connected with non-environmental topics. Culture, local news and Sunday pages are sections that seldom take climate change as a headline but where climate issues appear in connection with other news topics.

5. Discussion

Media coverage is one important factor in the cyclical 'environmental protection process' [67], in which some issues are defined as environmental problems and solutions to these problems are sought and then implemented. In democratic societies, media coverage influences public awareness and policy priorities. Various factors affect media coverage, including activity of news sources [7,9], journalistic practices and norms [18], media ownership [44] and the phase of the discussion [25,68]. Our results show the importance of international and national policy and weather conditions for climate reporting, whereas the level of emissions appears to have only minor importance. As Figures 1 and 2 show, the volume of discussion is not related to increases or decreases in the actual volume of national carbon dioxide emissions. This topic dominates the coverage. Seventy-two titles mention carbon dioxide (CO_2) or carbon emissions. Only seven titles mention methane (NH_4) emissions. Dinitrogen oxide (N_2O) is not mentioned at all.

There is a need for the comparative and interdisciplinary approach to assess the different social contexts and ecological and geographical conditions in different countries. For

example, because Finland enjoys efficient fire control and has a relatively cool and humid climate, risks related to forest fires due to climate change are not considered to be a major issue in Finnish climate coverage. This is in contrast to the southern countries such as Greece, where forest fires are a key topic of environmental reporting [69]. The Finnish case suggests that media publicity focused on national priorities may hinder the development of an idea of global realities in their full force, which – if gained – would permit decision-makers to implement efficient measures in climate policy. This raises a question about the responsibility of the press and the journalists as much as the interest of the politicians in the wider world.

The long-term trend of climate coverage may still be upwards, especially in less developed countries. But, after the probable peak reflecting the Copenhagen COP15 meeting the short-term development of climate coverage is likely to be downwards. Our results, as well as the data from 50 English-language newspapers in 20 countries during 2004–2009, suggest stagnation or decrease of climate coverage at the end of the period [1]. This is what can be expected based on the models developed by media researchers: the high level of reporting is unlikely to last for long. *The issue-attention model* suggests that public interest in certain environmental issue will gradually decrease after alarmed discovery and subsequent realisation of the costs of significant progress [68]. *The public arenas model* focuses on the competition between different news topics and proposes that other issues will eventually take the prominent place in discussion [70]. *The circuit of culture model* maintains that the producers and consumers of media texts are jointly engaged in dynamic, meaning-making activities that are context-specific and that change over time [25].

An important question is what happens when the media coverage on climate change decreases. Mazur [3], in his analysis of a generation of American environmental warnings, lamented that if past patterns continue the post 2006-peak of news coverage will abate even as climate change worsens. The results presented here show that this is largely what is already happening. Although several scientific results published during 2009 indicate even gloomier perspectives than those presented by the IPCC reviews [71], the press coverage of climate news has declined.

Nevertheless, our research shows that even though there may be a substantial decrease, the level of coverage is likely to remain on a higher level than before the peak(s) of publicity, as the *issue-attention model* predicts [68]. The results suggest that because of heightened discussion, the climate issues have now penetrated to almost all fields of public communication. Thus, it seems that climate issues are not entirely fading away, but rather diluting from screaming headlines to a ubiquitous background noise that is present in various sectors. The phenomenon could be called the *piercing effect*. This more thorough presentation of climate issues can be promising for climate policy, where incorporating climate targets in all sectors of society is a prerequisite to making successful adaptation and mitigation efforts [72].

The policy implications of declining news coverage are far from straightforward. *The positive interpretation* might be that climate change is now an overarching issue that is genuinely taken into account in various sectors as everyday routine. *The negative interpretation* is that climate concern is being replaced by other concerns and that climate change reporting is becoming just a disturbing background noise that is tolerated without serious attempts to deal with the problem, especially now when the economic crisis is seen as the top priority. Future analysis will show whether the economic crisis and the climate crisis can both be handled in an efficient and synergistic way.

6. Conclusions

This study has presented an analysis of the Finnish press coverage of climate change from 1990 to 2009. The results showed a sharp increase of coverage since 2006 caused by many intertwined factors, including both social and ecological issues on global and national levels. One specific feature of the Finnish case is the strong impact of warm winter weather on the coverage. It is suggested that the climate debate is shifting towards a new phase, where the climate coverage will be lower than in 2006–2008, although still remaining on a relatively high level. Importantly, climate issues are discussed widely under topics other than environmental ones. This could be called *the piercing effect*. Based on the titles, half the news stories mentioning climate change focused on topics other than environmental issues. This kind of treatment of climate issues is likely to have profound implications for climate policy. A comparative, interdisciplinary approach is important to understand the multiple factors which affect the way the press reports and comments on environmental matters.

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References

- [1] Boykoff, M. and Mansfield, M., 2009, *2004–2009 World Newspaper Coverage of Climate Change or Global Warming* (Oxford: Center for Science and Technology Policy Research, University of Colorado & University of Exeter, Oxford University). Available online at: http://sciencepolicy.colorado.edu/media_coverage/, accessed 5 October 2009.
- [2] Boykoff, M.T., 2008, Lost in translation? United States television news coverage of anthropogenic climate change, 1995–2004. *Climatic Change*, **86**(1), 1–11.
- [3] Mazur, A., 2009, American generation of environmental warnings: avian influenza and global warming. *Human Ecology Review*, **16**(1), 17–26.
- [4] Sampei, Y. and Aoyagi-Usui, M., 2009, Mass-media coverage, its influence on public awareness of climate-change issues, and implications for Japan's national campaign to reduce greenhouse gas emissions. *Global Environmental Change*, **19**(2), 203–212.
- [5] IPCC, 2008, *Climate Change 2007: Synthesis Report. Contribution of Working Groups I, II and III to the Fourth Assessment, Report of the Intergovernmental Panel on Climate Change* (Geneva: IPCC).
- [6] Stern, N., 2007, *The Economics of Climate Change. The Stern Review* (Cambridge: Cambridge University Press).
- [7] Anderson, A., 1997, *Media, Culture and the Environment* (London: UCL Press).
- [8] Boykoff, M.T. and Goodman, M.K., 2008, Conspicuous redemption? Reflections on the promises and perils of the 'Celebrization' of climate change. *Geoforum*, **40**(3), 395–406.
- [9] Prudham, S., 2009, Pimping climate change: Richard Branson, global warming, and the performance of green capitalism. *Environment and Planning A*, **41**(7), 1594–1613.
- [10] Nousiainen, A., 2007, *Ollilan uusi missio* In Finnish: The new mission of Mr Ollila. *Helsingin Sanomat*, 28 January.
- [11] Tirkkonen, J., 2000, *Ilmastopoliittika ja ekologinen modernisaatio. Diskursiivinen tarkastelu suomalaisesta ilmastopoliittikasta ja sen yhteydestä metsäsektorin muutokseen* [In Finnish: Climate Policy and Ecological Modernisation: A Discursive Study of Finnish Climate Policy and Its Connection to the Change in the Forest Sector], Acta Universitatis Tamperensis 781 (Tampere: Tampereen yliopistopaino).
- [12] Kuha, M., 2009, Uncertainty about causes and effects of global warming in U.S. news coverage before and after Bali. *Language & Ecology*, **2**(4), 1–18.
- [13] Beck U., 1986, *Risikogesellschaft: auf dem Weg in eine andere Moderne* (Frankfurt am Main: Suhrkamp).
- [14] Weart, S., 2008, *The Discovery of Global Warming. Revised and Expanded edition* (Cambridge, MA: Harvard University Press).

- [15] Mazur A., 1998, Global Environmental Change in the News. *International Sociology*, **13**(4), 457–472.
- [16] Antilla L., 2005, Climate of skepticism: US newspaper coverage of the science of climate change. *Global Environmental Change*, **15**(4), 338–352.
- [17] Boykoff, M.T. and Boykoff, J.M., 2004, Balance as bias: global warming and the US prestige press. *Global Environmental Change*, **14**(2), 125–136.
- [18] Boykoff, M.T. and Boykoff, J.M., 2007, Climate change and journalistic norms: a case-study of US mass-media coverage. *Geoforum*, **38**(6), 1190–1204.
- [19] Mazur, A. and Lee, J., 1993, Sounding the global alarm: environmental issues in the US national news. *Social Studies of Science*, **23**(4), 681–720.
- [20] McComas, K. and Shanahan, J., 1999, Telling stories about global climate change: measuring the impact of narratives on issue cycles. *Communication Research*, **26**(1), 30–57.
- [21] Nissani, M., 1999, Media coverage of the greenhouse effect. *Population and Environment*, **21**(1), 27–43.
- [22] Trumbo, C., 1996, Constructing climate change: claims and frames in US news coverage of an environmental issue. *Public Understanding of Science*, **5**(3), 269–283.
- [23] Carvalho, A., 2005, Representing the politics of the greenhouse effect: discursive strategies in the British media. *Critical Discourse Studies*, **2**(1), 1–29.
- [24] Carvalho, A., 2007, Ideological cultures and media discourses on scientific knowledge: re-reading news on climate change. *Public Understanding of Science*, **16**(2), 223–243.
- [25] Carvalho, A. and Burgess, J., 2005, Cultural circuits of climate change in UK broadsheet newspapers, 1985–2003. *Risk Analysis*, **25**(6), 1457–1469.
- [26] Ladle, R.J., Jepson, P. and Whittaker, R.J., 2005, Scientists and the media: the struggle for legitimacy in climate change and conservation science. *Interdisciplinary Science Reviews*, **30**(3), 231–240.
- [27] Taylor, N. and Nathan, S., 2002, How science contributes to environmental reporting in British newspapers: a case study of the reporting of global warming and climate change. *The Environmentalist*, **22**(4), 325–331.
- [28] Henderson-Sellers, A., 1998, Climate whispers: media communication about climate change. *Climatic Change*, **40**(3–4), 421–456.
- [29] McManus, P., 2000, Beyond Kyoto? Media representation of an environmental issue. *Australian Geographical Studies*, **38**(3), 306–319.
- [30] Einsiedel, E., 1992, Framing science and technology in the Canadian press. *Public Understanding of Science*, **1**(1), 89–101.
- [31] Takahashi B., 2008, Framing climate change: a comparative analysis of a US and a Canadian newspaper. *International Journal of Sustainability Communication*, **3**, 152–170.
- [32] Bell, A., 1994, Climate of opinion: public and media discourse on the global environment. *Discourse & Society*, **5**(1), 33–64.
- [33] Brossard, D., Shanahan, J. and McComas, K., 2004, Are issue-cycles culturally constructed? A comparison of French and American coverage of global climate change. *Mass Communication & Society*, **7**(3), 359–377.
- [34] Peters, H.P. and Heinrichs, H., 2008, Legitimizing climate policy: the ‘risk construct’ of global climate change in the German mass media. *International Journal of Sustainability Communication*, **3**, 14–36.
- [35] Weingart, P., Engels, A. and Pansegrau, P., 2000, Risks of communication: discourses on climate change in science, politics and the mass media. *Public Understanding of Science*, **9**(3), 260–283.
- [36] Billet S., 2009, Dividing climate change: global warming in the Indian mass media. *Climatic Change*, DOI: 10.1007/s10584-10009-19605-10583.
- [37] Boykoff, M.T., 2007, Flogging a dead norm? Newspaper coverage of anthropogenic climate change in the United States and United Kingdom from 2003 to 2006. *Area*, **39**(2), 470–481.
- [38] Dispensa, J.M. and Brulle, R.J., 2003, Media’s social construction of environmental issues: focus on global warming – a comparative study. *International Journal of Sociology and Social Policy*, **23**(10), 74–105.
- [39] Dirikx, A. and Gelders, D., 2008, Newspaper communication on global warming: different approaches in the US and the EU?, in: Carvalho, A. (ed.) *Communicating Climate Change: Discourses, Mediations and Perceptions* (Braga: Centro de Estudos de Comunicação e Sociedade, Universidade do Minho), pp. 98–109.
- [40] Lyytimäki, J. and Palosaari, M., 2004, *Ympäristöviestinnän tutkimus Suomessa* [in Finnish: Environmental Communication Research in Finland] Suomen ympäristö 683 (Helsinki: Suomen ympäristökeskus).
- [41] Lehto, E., 2007, *Ilmastonmuutoksen konkretisointuminen Helsingin Sanomien valokuvissa* [in Finnish: Concretisation of Climate Change in the News Photography of the *Helsingin Sanomat*] (Tampere: Tampereen yliopisto).
- [42] Tennberg, M., 2004, *Arktisen aika. Ilmastonmuutos ja ajanpolitiikka arktisella alueella* [in Finnish: Arctic Time. Climate Change and Politics of Time in the Arctic], Arctic centre research reports 42 (Rovaniemi: University of Lapland).
- [43] Olausson, U., 2009, Global warming-global responsibility? Media frames of collective action and scientific certainty. *Public Understanding of Science*, **18**(4), 421–436.
- [44] Anderson, A., 2009, Media, politics and climate change: towards a new research agenda. *Sociology Compass*, **3**(2), 166–182.
- [45] Krippendorff, K., 2004, *Content Analysis: An Introduction to Its Methodology*, 2nd edn (Thousand Oaks, CA: SAGE).

- [46] Statistics Finland, 2007, *Finnish Mass Media 2006* (Helsinki: Statistics Finland).
- [47] O'Donnell, C. and Rice, R.E., 2008, Coverage of environmental events in US and UK newspapers: frequency, hazard, specificity and placement. *International Journal of Environmental Studies*, **65**(5), 637–654.
- [48] Karppinen, P., 1993, *Kasvihuoneilmion kasvu kuumaksi uutisaiheeksi Helsingin Sanomissa* [in Finnish: The Rise of Greenhouse Effect as a Hot Topic in the Coverage of *Helsingin Sanomat*] (Tampere: Tampereen yliopisto).
- [49] Heiskala, R. (ed.), 1993, *Materiaalia ympäristötietoisuudesta 1: Helsingin Sanomat, Suomen Kuvalehti ja Suomen Luonto vuosina 1951–1990* [in Finnish: Material on Environmental Awareness 1: Environmental Coverage in *Helsingin Sanomat*, *Suomen Kuvalehti* and *Suomen Luonto*, years 1951–1990] (Helsinki: Helsingin yliopisto).
- [50] Suhonen, P., 1994, *Mediat, me ja ympäristö* [in Finnish: Media, Us and the Environment] (Helsinki: Hanki ja jää).
- [51] Väliverronen, E., 1996, *Ympäristöuhkan anatomia* [in Finnish: The Anatomy of Environmental Threat] (Tampere: Vastapaino).
- [52] Kantola, A., 1996, Tri Otsoni ja Mr Kasvihuone. Mediapaniikkeja kauhun rajamailta [in Finnish: Dr Ozone and Mr Greenhouse. Media Panics from the Edges of Horror], in: Luostarinen, H., Kivikuru, U. and Ukkola, M. (eds) *Sopulisilppuri. Mediakritiikin näkökulmia* (Lahti: Helsingin yliopiston Lahden tutkimus- ja koulutuskeskus), pp. 157–176.
- [53] Tirkkonen, J., Tapio, P. and Wilenius, M., 2002, The development of climate discourse: internationally, in Finland and in Finnish transport futures studies, in: Käyhkö, J. and Talve, L. (eds) *Understanding the Global System. The Finnish Perspective* (Turku: Finnish Global Change Research Programme FIGARE), pp. 193–199.
- [54] WCED, 1987, *Our Common Future: Report of the World Commission on Environment and Development* (Oxford: Oxford University Press).
- [55] Venesmäki, E., 2002, *Ilmastovastuuta jakamassa. Kestävän kehityksen diskurssi ilmastopolitiikan välineenä Helsingin Sanomissa* [in Finnish: Sharing the Climate Burden. The Discourse of Sustainable Development as a Tool of Climate Policy in the Coverage of *Helsingin Sanomat*] (Tampere: Tampereen yliopisto).
- [56] Hagelin, H., 1999, *Taistelu prosentteista. Viiden sanomalehden uutisointi Kioton ilmastokokouksesta* [in Finnish: The Battle of Percentages. Kyoto Climate Meeting Coverage in Five Newspapers] (Tampere: Tampereen yliopisto).
- [57] Strandén, T., 1998, *Ympäristökysymykset ja Helsingin Sanomien uutisjournalismi. Vertailututkimusjaksot vuosilta 1987 ja 1997* [in Finnish: Environmental Questions and the News Journalism of *Helsingin Sanomat*. Comparative Periods from Years 1987 and 1997] (Tampere: Tampereen yliopisto).
- [58] Perimäki, A., 2002, Päästökatto, talouden rajat ja energian tarve. Suomalaisen energiakeskustelun muotoutuminen [in Finnish: Emission Ceiling, Limits of the Economy and the Need of Energy. The Shaping of Finnish Energy Debate]. *Yhteiskuntapolitiikka*, **67**(2), 148–161.
- [59] FMI, 2009, *Ilmastotilastot* [in Finnish: The Climate Statistics] (Helsinki: Finnish Meteorological Institute), available online at: <http://www.fmi.fi/saa/tilastot.html>, accessed 29 September 2009.
- [60] Shanahan, J. and Good, J., 2000, Heat and hot air: influence of local temperature on journalists' coverage of global warming. *Public Understanding of Science*, **9**(3), 285–295.
- [61] City of Turku, 2009, *Jäänlähtö Aurajoesta 1800–2009* [in Finnish: Ice Breaking Date in River Aurajoki 1800–2009], available online at: <http://www.turku.fi/Public/default.aspx?contentid=2303>, accessed 16 September 2009.
- [62] Suikkanen, R., Saloniemi, A. and Holma, A., 2008, *Suomalaisen uutismedian vuosiseuranta 2008* [in Finnish: The State of the Finnish News Media 2008], Tampereen yliopiston tiedotusopin laitoksen julkaisuja B 51 (Tampere: Tampereen yliopisto).
- [63] Partonen, T. and Lönnqvist, J., 1998, Seasonal affective disorder. *Lancet*, **352**(9137), 1369–1374.
- [64] Lyytimäki, J., 2007, Temporalities and environmental reporting: press news on eutrophication in Finland. *Environmental Sciences*, **4**(1), 41–51.
- [65] Statistics Finland, 2009, *Preliminary Energy Statistics 2008* (Helsinki: Statistics Finland), available online at: http://www.stat.fi/til/ehkh/2008/04/ehkh_2008_04_2009-03-24_tau_012.xls#1.2!A1, accessed 16 September 2009.
- [66] Statistics Finland, 2009, *PX-Web Statfin Database* (in Finnish) (Helsinki: Statistics Finland), available online at: http://pxweb2.stat.fi/Databas/StatFin/databasetree_fi.asp, accessed 16 September 2009.
- [67] Tapio, P. and Willamo, R., 2008, Developing interdisciplinary environmental frameworks. *Ambio*, **37**(2), 125–133.
- [68] Downs, A., 1972, Up and down with ecology: the 'issue-attention' cycle. *The Public Interest*, **38**, 38–50.
- [69] Tsekos, C.A. and Matthopoulos, D.P., 2008, Environmental news in Greece: evaluation of the way newspapers deal with environmental issues. *International Journal of Environmental Studies*, **65**(2), 209–218.
- [70] Hilgartner, S. and Bosk, C.L., 1988, The rise and fall of social problems: a public arenas model. *American Journal of Sociology*, **94**(1), 53–78.
- [71] Füssel, H.-M., 2009, An updated assessment of the risks from climate change based on research published since the IPCC Fourth Assessment Report. *Climatic Change*, DOI 10.1007/s10584-10009-19648-10585.

- [72] Mickwitz, P., Aix, F., Beck, S., Carss, D., Ferrand, N., Görg, C., Jensen, A., Kivimaa, P., Kuhlicke, C., Kuindersma, W., Mañez, M., Melanen, M., Monni, S., Pedersen, A., Reinert, H. and van Bommel, S., 2009, *Climate Policy Integration, Coherence and Governance*, PEER-Report No 2 (Helsinki: Partnership for European Environmental Research).

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