



Mass-media coverage, its influence on public awareness of climate-change issues, and implications for Japan's national campaign to reduce greenhouse gas emissions

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ABSTRACT

We analyse Japanese newspaper coverage of global warming from January 1998 to July 2007 and how public opinion during parts of that period were influenced by newspaper coverage. We show that a dramatic increase in newspaper coverage of global warming from January 2007 correlated with an increase in public concern for the issue. Before January 2007, we find that coverage of global warming had an immediate but short-term influence on public concern. With such transitory high levels of media coverage we suggest that for more effective communication of climate change, strategies aimed at maintaining mass-media coverage of global warming are required.

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1. Introduction

1.1. Background to Japan's national campaign program to reduce greenhouse gas emissions

The Kyoto Protocol came into effect in February 2005. It obliges developed countries (Annex I countries) to reduce their greenhouse gas (GHG) emissions by at least 5% below 1990 levels in the first commitment period (2008–2012). Japan is required to attain a 6% reduction. However, in the fiscal year (FY) 2004–2005, Japan's total GHG emissions were 8.0% above 1990 levels.² The increase in household-sector emissions, at more than 30% above base-year household levels, was larger than the overall national trend.

In response to the implementation of the Kyoto Protocol, the Cabinet of the Japanese Government adopted the Kyoto Protocol Target Achievement Plan (*Kyoto Giteisho Mokuhyo Tassei Keikaku*) on 28 April 2005 (revised in July 2006, then wholly revised in March 2008). This plan calls for every stakeholder to act to reduce GHG emissions. Under this plan, at the end of April 2005, the

Ministry of the Environment began a national campaign program to reduce GHG emissions (*Chikyu Ondanka Boushi Daikibo Kokumin Undo*). This program was still running at the time of writing (July 2008). It is a unique step for the Japanese environment policy because it involves collaboration with an advertising agency in the organization and running of the campaign. The program was designed to heavily utilize the mass media and includes TV and newspaper advertisements, tied-in with TV programs and events, and magazine articles. The aim is to inform the public of the global warming crisis and encourage people to take pro-environmental actions to reduce GHG emissions.

1.2. Background to studies of mass-media coverage and public awareness of climate change

Mass-media campaigns are among the policy tools most commonly used to attempt to influence public opinion of particular issues. The influence of the mass media on public opinion has been shown to be quite short-lived because media coverage jumps from issue to issue, often from day to day (Driedger, 2007). Over the longer term, media attention of particular issues has been shown to vary considerably, often in identifiable cycles (Downs, 1972). Nevertheless, many public opinion surveys in developed countries have shown that television and daily newspapers are used as primary sources of information (Project for Excellence in Journalism, 2006). In Japan, Aoyagi-Usui

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² For three GHGs (HFCs, PFCs, SF₆); however, the base year for the Kyoto Protocol is 1995.

(2008) revealed that most of the Japanese public get its information about environment issues from television and daily newspapers. The mass media are very influential tools for widening public awareness of environmental issues (Schoenfeld et al., 1979; Slovic, 2000).

Many campaign programs in various environmental fields—including energy conservation campaigns and waste reduction campaigns—have used the mass media (e.g., Viklund, 2004; Davies, 2008). Several European countries, including the Netherlands and United Kingdom, have used the mass media for their national campaigns for GHG emission reduction (Staats et al., 1996; DEFRA, 2007).

There have been various qualitative and quantitative analyses of mass-media coverage of climate-change issues. Some have charted the rise and fall of media attention (e.g., Ungar, 1992; Mazur and Lee, 1993; Major and Atwood, 2004; Carvalho and Burgess, 2005), whereas others have focused on the reasons behind the cyclical nature of media attention (Trumbo, 1996; McComas and Shanahan, 1999; Weingart et al., 2000; Brossard et al., 2004; O'Brien, 2006). Research groups have investigated the factors that affect media perspectives (e.g., Dispensa and Brulle, 2003), the influence of news sources (Mormont and Dasnoy, 1995; Antilla, 2005) and journalistic norms (Boykoff and Boykoff, 2004, 2007; Boykoff, 2007).

Another stream of research is based on surveys of public opinion on climate change. Many scholars have analysed the issue of climate change in terms of public perception (e.g., Berk and Schulman, 1995; O'Connor et al., 1999; Leiserowitz, 2006). The results of these studies have revealed that many people misunderstand the science of climate change and, in particular, are confused about the nature, causes and consequences of climate change (Bord et al., 1998; DEFRA, 2002; Brechin, 2003). Depth of understanding of climate-change issues depends largely on individual characteristics such as educational level, age, gender, occupation and ethnic origin (Aoyagi-Utsui et al., 2003; Ester et al., 2003; Aoyagi-Utsui, 2008).

Most of these studies have focused on how the public, as the receivers of mass-media messages, understand the issue of climate change. However, few studies have focused on the actual relationship between mass-media coverage and public awareness of climate change.

In Japan, Aoyagi-Utsui (2008) compared public opinion surveys from 1997, 2002, 2006 and 2007, and reported that people's awareness of environmental issues is gradually becoming focused on global warming issues. For seven years in the 1990s, Mikami et al. (1998) performed annual public opinion surveys in the Tokyo Metropolitan area. They also analysed weekly changes in Japanese newspaper coverage of climate change in the 20 weeks before their 1992 opinion survey. They found that exposure to the mass media was positively correlated with the level of concern over environmental issues. However, research based on such annual surveys cannot elucidate the influence of the mass media on opinion change. In the UK, Ipsos MORI, a UK survey company, has been conducting monthly political monitoring surveys of respondents nationwide. These surveys reveal that the topics that receive the most attention from people vary from month to month.³

Japanese surveys of this type have focused not on climate change but on political issues such as levels of support for Cabinet or on economic issues such as perceptions of the state of Japan's

economy. We could not find any studies that had explored the relationship between changes in media coverage and changes in public opinion on climate change.

1.3. Study objectives

Our main objective was to assess the influence of the mass media on public awareness of climate change. Because the Ministry of the Environment's national campaign began at about the same time as our study, we also took the opportunity to assess its influence.

Ipsos MORI's monthly surveys in the UK gave us valuable guidance in designing our study.

Mazur and Lee (1993) indicated that the level of public concern about environmental issues tends to be affected by the amount of media attention they receive, rather than by the substantive content of the news reports. Therefore, we considered the number of newspaper articles to be an important factor, rather than article content in detail. We focused on changes in the amount of media coverage, changes in public awareness with time, and the relationship between the two.

Our study consisted of three parts. In the first part, we reviewed newspaper coverage of climate-change issues in newspaper articles from January 1998 to September 2007. In the next part, to examine the effects of the Ministry of the Environment's national campaign program on coverage by the mass-media, we reviewed not only newspaper coverage of climate-change issues, but of this campaign from May 2005 to September 2007 (after the beginning of campaign). In the third part, we performed a monthly public opinion survey from July 2005 to September 2007, then we investigated the influence of newspaper coverage on public awareness of climate-change issues from July 2005 to December 2006.

2. Japan's mass-media coverage of global warming in the 10 years following the Kyoto conference

We examined the daily print media because people usually get their daily news from newspapers and from television programs (The Japan Newspaper Publishers and Editors Association,⁴ 2007). We used the G-search Database Service (<http://www.nifty.com/RXCN/>), which offers daily printed news articles from all over Japan. We chose three major newspapers: *Yomiuri Shimbun*, *Asahi Shimbun* and *Mainichi Shimbun*. According to a 2007 circulation survey of the Japan Newspaper Publishers and Editors Association (*Nihon Shimbun Kyokai*; <http://www.pressnet.or.jp/>), the circulations of *Yomiuri Shimbun*, *Asahi Shimbun* and *Mainichi Shimbun* were 10, 8 and 4 million, respectively, reaching 19.3%, 15.5% and 7.7% of all households in Japan. These papers each offer a daily home delivery service, which is very popular in Japan. In fact, in a recent survey, more than 90% of people surveyed 'read the newspaper every day' (The Japan Newspaper Publishers and Editors Association, 2007). We did not include data on news articles read out on television news programs because no database system for such articles was available in Japan at the time of writing.

We searched for newspaper articles published between January 1998 and September 2007 that included keywords 'global warming' (*chikyu ondanka*) or 'climate change' (*kiko hendo*), and found a total of 25,532 articles in the three newspapers. Hereafter we call these the 'articles on global warming'. We checked the

³ Since 1984, Ipsos MORI have conducted the monthly opinion poll with the question—What would you say is the most important issue facing Britain today? We can find the detail information of their results on following web-site <http://www.ipsos-mori.com/content/turnout/the-most-important-issues-facing-britain-today.ashx>.

⁴ This association performs a 'Media Exposure Survey' every year. Their 2007 survey was done in October. Its planned sample size was 6000 and the response rate was 60.3%. Respondents were sampled nationwide from the Basic Residents' Register and ranged in age from 15 to 69 years.

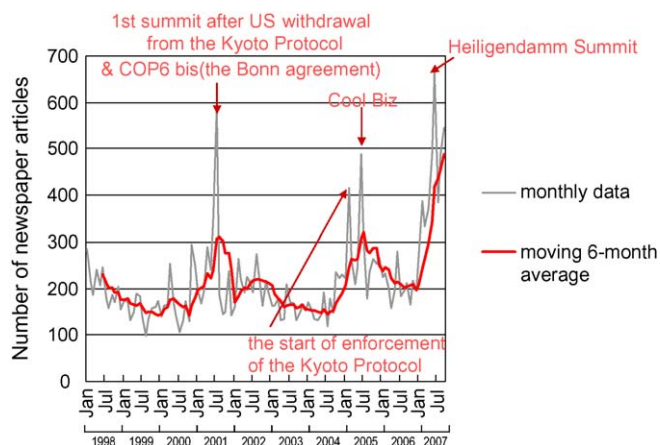


Fig. 1. Newspaper coverage of global warming in Japan's three major national newspapers (*Yomiuri*, *Asahi*, and *Mainichi*) US withdrawal: Time of US President's statement of his opposition to the Kyoto Protocol.

following four items for every article: date, page number, number of characters and headline.

We counted the total number of articles on global warming in every month from January 1998 to September 2007. Then, to evaluate the trend, we calculated the moving 6-month average.

The moving average rose and fell throughout the study period (Fig. 1). The monthly change in the number of articles on global warming had three peaks, in July 2001, February and June 2005, and a sustained series of peaks from January 2007 to the end of the study period. There were more than 400 articles at each peak in all of these months.

After adopting the Kyoto Protocol, the Japanese Government began to improve its legal system in order to reduce the impacts of global warming (Fig. 2). The government hammered out various policy measures and enacted a law to give a fundamental framework for global warming policy in Japan. The fact that it took from 1998 until July 2001 for the first peak to occur shows that these government responses to the Kyoto Protocol did not capture much of the attention of the Japanese mass media.

The first peak, in July 2001, was related to the annual summit of the Group of Eight leading industrialized nations (G8) in Genoa, Italy, shortly after the US president's statement that he had no intention of reversing his opposition to the Kyoto Protocol. The Japanese mass media noted this summit with great interest, as the Kyoto Protocol was said to have become a 'dead letter'. At the summit, Japanese Prime Minister Junichiro Koizumi strongly advocated the need to enforce the Kyoto Protocol. At the same time, the resumed sixth session of the Conference of the Parties (COP6-bis) was held in Bonn, Germany, from 16 to 27 July 2001. One of main agendas at this meeting was carbon sinks. At the time, Japan's carbon sink was expected to account for 3.7% of the 6% emissions reduction target in the first commitment period. Therefore, the outcome of this meeting was also given a large amount of attention. Even though International Panel on Climate Change (IPCC) released a series of Third Assessment Reports (TARs) between January and October 2001, the Japanese mass media paid very little attention to them.⁵ This suggested that the Japanese

mass media were not focusing on all climate-change events occurring internationally.

The second peak was in February 2005, when the Kyoto Protocol came into effect. The third peak was in June 2005. At this time, the Ministry of the Environment began the 'Cool Biz' campaign (described in Section 3.1), which is the main part of the national campaign program to reduce greenhouse gas emissions.

The sustained series of peaks began in January 2007. The number of articles was still rising when the study ended, in September 2007. There were a number of events, both domestically and internationally, during this period. The Ministry of the Environment continued its national campaign, and 2007 began with news of 'unusually light' snowfalls. Japan experienced the warmest winter (December 2006–February 2007) on record. This was accompanied by the release of Al Gore's film, 'An Inconvenient Truth', on 20 January 2007. Then, in February 2007, the IPCC began to release a series of Fourth Assessment Reports (AR4) from each Working Group. Although the TAR series had received little attention in 2001, the Japanese mass media paid a great deal of attention to the AR4 series. Every time the IPCC released a report from one of the working groups, the report was covered on the front page. During our review process, we found that the numbers of related articles, such as editorials and features, also increased. The amount of newspaper coverage on global warming became the highest at the time of the G8 summit at Heiligendamm, Germany in June 2007. At the summit table, leaders of G8 countries discussed a wide range of issues related to climate change, and many newspaper articles reported these discussions. This increasing coverage trend was continuing after June 2007, and there were plans for another G8 summit (held in Japan in July 2008) at which climate change was the main theme (Sampei and Aoyagi-Utsui, 2008).

This trend in Japanese mass-media coverage is different from that in the UK. Boykoff (2007) investigated the numbers of articles on climate change in three prestigious newspapers in the UK by month from 2003 to 2006. He found a steady increase in coverage in both countries, in contrast to the up-and-down cycle of mass-media coverage in Japan around the same period. We rationalized these differences among nations as follows. The Third Conference of Parties to the UN Framework Convention on Climate Change (UNFCCC) in 1997, at which the Kyoto Protocol was adopted, was held in Japan. The Japanese mass media gave this event quite a large amount of attention. Therefore, when the Kyoto Protocol came into effect in February 2005, more newspaper coverage was observed in Japan than in the UK. The Cool Biz campaign also contributed to this larger increase in mass-media coverage. Boykoff (2007) observed a peak in UK newspaper coverage from September 2006 to November 2006. He attributed this primarily to a series of key interrelated events. Al Gore's film was released in mid-September in the UK; this was followed by the Stern Review (31 October 2006) and then UNFCCC COP12 in Nairobi. We observed no increase during that period in Japan; few newspaper articles reported the Stern Review or COP12. 'An Inconvenient Truth' captured the mass-media attention in Japan, but as mentioned above, it was not released in Japan until January 2007 compared to the September 2006 release date in the UK. The Japanese mass media tend to report events about the USA more often than about the other countries (Hagiwara, 2006). We consider that these factors explain the difference between the UK and Japanese media coverage of global warming from 2003 to 2006.

The results were summarized as follows: (1) the overall trend of Japanese media coverage of global warming has been a slight increase over the 10 years before January 2007, characterised by sudden sharp peaks; (2) these sudden sharp peaks were likely to be

⁵ For example, using the G-search database for the period 1 January 2001 and 1 January 2002, we counted the numbers of articles that included the word 'IPCC'. The results were *Asahi Shimbun*, 23 times; *Yomiuri Shimbun*, 26 times; and *Mainichi Shimbun*, 30 times. These numbers included not only news items but also 'editorials' and 'features'.

Events related to global warming	
International event	
<i>Domestic event</i>	
1998	<i>Jun. Guidelines for Measures to Prevent Global Warming</i>
	<i>Oct. Law Concerning the Promotion of the Measures to Cope with Global Warming (Law No.117)</i>
	Nov. COP4: Buenos Aires Plan of Action
1999	<i>Apr. Establishment of the Japan Center for Climate Change Actions (JCCCA)</i>
	<i>Jun. Basic Policy on Measures to Tackle Global Warming</i>
2000	
2001	Jan. Release of WGI report of TARs
	Feb. Release of WGII report of TARs
	Mar. Release of WGIII report of TARs
	Mar. US President's statement of his opposition to the Kyoto Protocol
	Jun. US President's statement of his opposition to the Kyoto Protocol again
	<u>Jul. COP6 'bis': the Bonn agreement (July 16th to 27th) & Genoa Summit (G8) (July 20th to 22nd)</u>
Oct. Release of synthesis report of TARs	
2002	<i>Mar. Guidelines for Measures to Prevent Global Warming</i>
	<i>May Amendment Concerning the Promotion of the Measures to Cope with Global Warming</i>
	<i>Jun. Japan's ratification of Kyoto Protocol</i>
2003	
2004	
2005	<u>Feb. The start of enforcement of the Kyoto Protocol</u>
	<i>Apr. Kyoto Protocol Target Achievement Plan & The national campaign program</i>
	<u><i>Jun. Cool Biz campaign starts (June 1st ~)</i></u>
	<u><i>Nov. Warm Biz campaign starts (Nov 1st ~)</i></u>
2006	<i>Apr. Second amending Concerning the Promotion of the Measures to Cope with Global Warming</i>
	<i>Jun. Cool Asia (Cool Biz 2006) (Jun. 1st ~)</i>
	Sep. Release of Al Gore's film in UK
	Oct. Release of the Stern Review
	<i>Nov. Uchi-eco & Warm Biz 2006 campaign start (Nov 1st ~)</i>
Nov. COP12 in Nairobi	
2007	Jan. Release of Al Gore's film in Japan (Jan. 20 th ~)
	<u>Feb. Release of WGI report of AR4</u>
	<u>Apr. Release of WGII report of AR4</u>
	<u>May Release of WGIII report of AR4</u>
	<u>May Heiligendamm Summit (G8)</u>
	<i>Jun. Cool Executives (Cool Biz 2007) & Uchi-eco (summer version) campaigns start (Jun. 1st ~)</i>

Fig. 2. Chronology of international and domestic events related to global warming. Normal font: international events. Italic font: domestic events. Bold font: events associated with Japan's national campaign program. Underlined: events that attracted a large amount of attention from Japanese mass media.

caused by international political events, especially international events involving the USA; and (3) the exception was the attention given by the Japanese mass media to the implementation of domestic events as part of the national campaign.

Before going on to investigate the relationship between mass-media coverage and public awareness, as our next step it was necessary to review more closely the newspaper coverage of this important national campaign.

3. Effects of the national campaign program on mass-media coverage

3.1. Details of the national campaign program

The national campaign program is nicknamed 'Team Minus 6%'. The framework and logo for the campaign are shown in Fig. 3. Companies and various stakeholders who sign up as 'supporters' are given approval to use the campaign logo, not only in their TV

and newspaper commercials, but also on their product catalogues and leaflets, and even on their employees' business cards.

For each season or target market, the campaign uses a theme: Cool Biz, Warm Biz⁶ or *Uchi-eco* (Eco-action at home)⁷ (Fig. 2). For example, the Cool Biz campaign encourages people to wear smart-casual business clothes in the office in summer, with no tie or jacket, so that air-conditioners can be set to 28 °C to save on energy consumption for reducing GHG emissions. Until the Cool Biz campaign was launched, it had been difficult for office workers to feel comfortable breaking dress codes, but in early summer 2005,

⁶ Warm Biz is an autumn–winter version of the Cool Biz campaign. It promotes office-appropriate businesswear for winter, with the mindset of 'wear more clothes, be warmer, and use less energy'.

⁷ The *Uchi-eco* campaign promotes the strengthening of actions taken to reduce GHG emissions at home in winter and summer, through three strategies: (1) implementing Cool or Warm Biz style at home, (2) using energy-efficient electrical appliances, and (3) choosing eco-friendly goods.

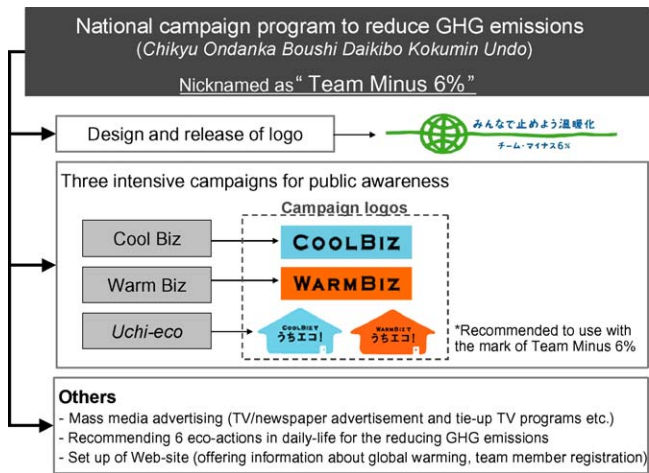


Fig. 3. Framework of the Japanese national campaign program. The Japanese characters say, 'Let's stop global warming as a team! Team Minus 6%'. These marks, with their original colors, can be seen on the official site of Team Minus 6% (<http://team-6.jp/try/download/index.html>).

when the campaign started, Environment Minister Yuriko Koike launched a series of associated fashion shows.

Minister Koike had been a journalist before she was elected to the Diet, and her past experience probably gave her some advantages in formulating strategies for this campaign. She asked top business people, such as members of the Japan Business Federation or the CEOs of major department stores, to appear as models at a series of Cool Biz fashion shows. The shows attracted a large amount of mass-media attention and were broadcast repeatedly. The next year, the Minister held a Cool Biz fashion show 'Cool Asia', which was a part of the Cool Biz campaign in 2006; she asked Asian ambassadors to Japan to join the fashion show as models wearing their nations' traditional clothes. After that Cool Biz fashion shows have been held with different catchphrases every year.

The number of organizations and business entities participating in the Cool Biz campaign passed 8000 by December 2007. The Ministry of the Environment reported that these intensive campaigns were widely recognized by companies and the public and had had some favourable effects. A questionnaire survey conducted by the Ministry of the Environment showed that levels of awareness of the terms 'Cool Biz' and 'Warm Biz' were both over 90%.⁸

3.2. Mass-media coverage of the national campaign program and global warming

We examined the extent to which the media publicized the national campaign program from May 2005 (after the campaign began) to September 2007. We then examined the relationship between changes in the number of these articles and in the number of articles on global warming to determine the degree to which the campaign had increased media coverage of global warming. We

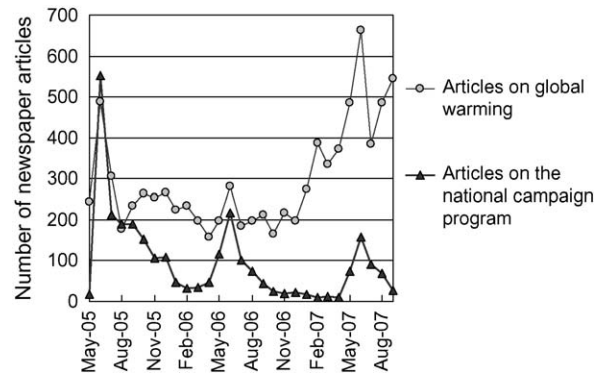


Fig. 4. Coverage by three major national Japanese newspapers of key terms on global warming and from the Japanese national campaigns.

also examined the reporting of global warming in articles written on the national campaign program.

To search for articles related to the national campaign program, we applied the same procedure used to look for articles on global warming to keywords related to the national campaign program, for example, 'Team Minus 6%', 'Cool Biz', 'Warm Biz' and 'Uchi-eco'. We found a total of 2774 articles. We then examined the changes in the numbers of articles on the national campaign program over the study period (Fig. 4). The numbers of articles on global warming in the graph were derived from the data obtained in the first step of the study.

The number of articles on the national campaign program showed seasonality, with peaks in June every year. In Japan, June is 'Environment Month', and 1 June is the launch date of the Cool Biz campaign each year. On this day, traditionally, most students and company employees change into their summer uniforms. Many newspaper articles reported on Cool Biz in relation to this national tradition of changing clothes.

The gap in numbers between global warming articles and national campaign program articles widened with time, but at least in the beginning, the national campaign program markedly raised the total number of newspaper articles published about environmental issues. The peak number of articles on the national campaign program during the study period was observed in June 2005 ($n = 552$), not that much smaller than the peak number of articles on global warming in June 2007 ($n = 663$).

The number of articles on global warming increased with increasing number of articles on the national campaign program, suggesting that the national campaign program had an effect in keeping media attention on global warming. However, an examination of the contents of articles on the national campaign program from May 2005 to September 2007 revealed that only 20.2% of these campaign articles mentioned global warming. We therefore considered that the campaign program had a large effect in giving the public information about the program itself, but it had little effect in providing information about global warming issues in general, and people might not connect the national campaign program with global warming. Otway and Wynne (1989) indicate that the accuracy of peoples' risk perceptions would be improved by understanding the context of the causes and effects of the risk. We therefore hypothesized that articles on the national campaign program do not affect public awareness of global warming issues.

In the next section of the study, we therefore focused on the relationship between public awareness of global warming and mass-media coverage of global warming, rather than on the national campaign program.

⁸ Reports in English are available at <http://www.env.go.jp/en/earth/tm6/061110.html> (Cool Biz) and <http://www.env.go.jp/en/earth/tm6/061027.html> (Warm Biz). Web-based questionnaire surveys were conducted. The research company's 1200 Internet panelists included both males and females and were chosen by a random sampling technique from 100,000 panelists all over the country. The CO₂ reduction by Cool Biz campaign in 2006 was estimated at 1.14 million tonne-CO₂, and that by Warm Biz campaign in 2005 was estimated at 1.41 million tonne-CO₂.

Table 1
Twenty-five categories of answers to the questions about the most serious issues in the world and in Japan, with average response rates from July 2005 to September 2007.

Category for 'the most serious issue in the world'	(%)	Category for 'the most serious issue in Japan'	(%)
Peace	25.3	Pension	14.0
Environment	23.8	Falling birth-rate and aging population	13.7
War/terrorism	14.6	Economy	11.4
Poverty/disparity in wealth	5.1	Education	9.1
Nuclear weapons	5.1	Financial administration	7.7
Resources/energy	3.3	Social security	6.5
International relations/diplomacy	3.3	Diplomacy (general topics)	4.8
Abductions/North Korea	2.8	Government/policy	4.4
Economy	2.5	Employment/unemployment	3.4
International relations of Middle East	2.0	Diplomacy (Asia)	3.3
Food issues	1.5	Crime/public safety	3.2
International relations of USA	1.4	Life of peace	2.6
Religious issue	1.1	Environment	2.5
International relations of Asia	1.1	Peace/war/terrorism	2.4
Crime/public safety	0.8	Social divide	2.3
National security	0.6	Moral/spirit/patriotic feelings	1.9
Education	0.6	Raising children	1.7
Population issue	0.5	National security/safety assurance	1.5
Natural disaster	0.5	Food issues	1.3
Military arsenal/armament reduction	0.5	Resources/energy	0.8
Disease/medical attention	0.4	Local administration	0.6
Human rights/discrimination	0.3	Disaster control/countermeasure	0.4
Developing countries issues	0.3	National consciousness/public interest	0.3
Refugees	0.2	Nuclear weapon/nuclear power	0.2
Others	2.4	Others	0.2

Bold font: the top five issues.

4. Influence of mass-media coverage on public awareness

4.1. Changes in the public's concern of global warming as 'the most serious issues'

Since July 2005, after the launch of the national campaign program, we have performed a nationwide monthly public opinion survey, and the survey was still ongoing at the time of writing (July 2008). A nationally representative sample of 2000 respondents aged 20 years and older was taken at 140 sampling points. Respondents were interviewed face to face in their homes, using only two open-ended questions: 'What is the most serious issue in the world?' and 'What is the most serious issue in Japan?' Demographic information, including gender, age, occupation and education level, was also collected. All respondents are randomly drawn from Japan's Basic Residents Register (*Jumin Kihon Daicho*). We summarized all of the responses and sorted them into 25 categories by question (Table 1).

We performed a time-series analysis of responses to the question on 'the most serious issue in the world' between July 2005 and September 2007 (Fig. 5). The 'environment' response rate ranged from 9.6% to 51.6%. In contrast, the 'environment' response

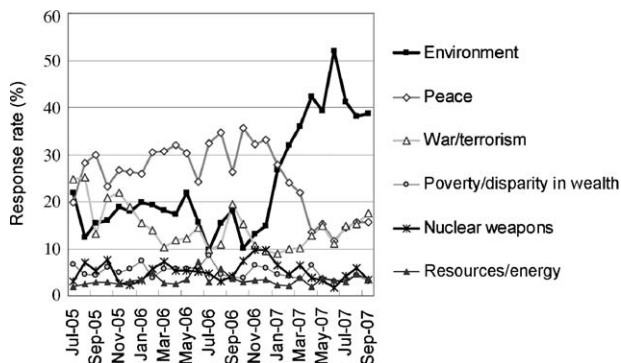


Fig. 5. Response rates for the most common categories in the public opinion survey of 'the most serious issue in the world'.

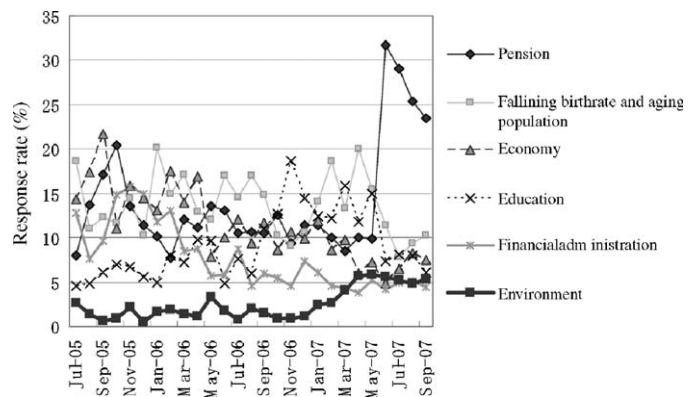


Fig. 6. Response rates for the most common categories in the public opinion survey of 'the most serious issue in Japan'.

to the question about 'the most serious issue in Japan' remained quite low (Fig. 6), ranging from 0.6% to 5.9%. 'Pension', 'falling birth-rate and aging population' and 'economy' were the top three responses to this question. A number of other studies have also revealed that the public does not consider global warming to be an important domestic issue (e.g., Lorenzoni et al., 2006; Lowe et al., 2006). We consider this to be because the rates of mass-media coverage of global warming were comparatively low. Although the coverage of global warming showed an increasing trend, with sharp peaks, during the study period, the coverage of issues such as pension or economy was much higher than the coverage of global warming.⁹ Moreover, as we mentioned earlier, mass-media coverage of global warming in Japan was based primarily on international events—especially actions by the USA. We consider that these facts caused people to answer that global warming was the most serious issue in the world, but not in Japan. Therefore,

⁹ For example, using the G-search database, during July 2005 and September 2007, the monthly average number of articles that included the word 'pension' (*nenkin*), 'low birth-rate and aging population' (*shoshika, koreika* or *shoshi-korei ka*) or 'economy' (*keizai*) was 1000 in each case, whereas that of articles on global warming was less than 300.

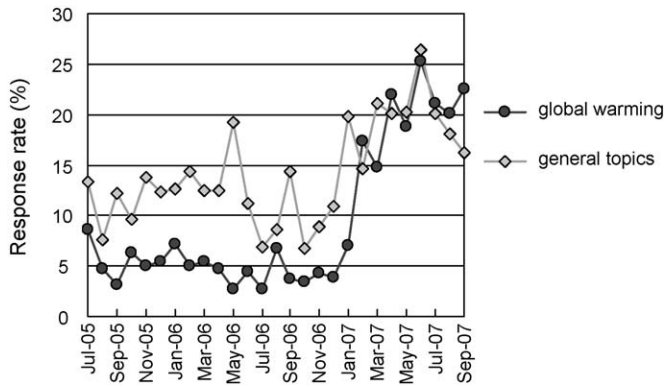


Fig. 7. Response rates for the two sub-categories of the ‘environment’ response, ‘global warming’ and ‘general topics’.

hereafter we focus on the responses to the question, ‘What is the most serious issue in the world?’.

‘Peace’ was the most frequently and consistently used response to the question of ‘the most serious issue in the world’ before January 2007 (Fig. 5); at this time, ‘environment’ was the second or third most common response. From May to December 2006, the ‘environment’ response rate tended to decrease. On 4 July 2006, North Korea launched several missiles. The Japanese public and mass media became alarmed at North Korea’s nuclear weapons and missile development program, which continued to receive media attention until August 2006. During this period, the ‘environment’ response rate decreased. However, from January 2007 the ‘environment’ response rate began to increase. It reached 42.1% in April 2007 and more than 50% in June. The sharp rise from January 2007 paralleled the rise in the number of articles on global warming (see Fig. 1).

To see more detail, we divided the ‘environment’ response for ‘the most serious issue in the world’ into two sub-categories, ‘global warming’ and ‘general topics associated with the environment’. Answers to the question on ‘the most serious issue in the world’ that indicated direct concern for global warming, such as ‘global warming’, ‘climate change’, ‘CO₂ emission’ and ‘Kyoto Protocol’, were categorized as ‘global warming’. Other answers, such as ‘global environment’, ‘environment’, ‘environmental pollution’ and ‘environmental destruction’, were categorized as ‘general topics’. Until January 2007, the ‘general topics’ response rate was consistently higher than the ‘global warming’ response rate in every month, but in February 2007, this pattern changed. Sometimes ‘global warming’ was higher than ‘general topics’, but they both increased markedly from January to September 2007 (Fig. 7).

The results of this public opinion survey indicated that the entire study period had two distinct phases: the first was before January 2007, and the second was from January 2007 onward. In the second phase, public concern for global warming as a serious issue seemed to increase dramatically.

4.2. Cross-correlation analysis between mass-media coverage and public opinion over time

We used a cross-correlation analysis to investigate the relationship between mass-media coverage and public opinion change. Cross-correlation is a time-series technique that can be used to evaluate the statistical correlation between two sets of data (e.g., Haugh, 1976; Phillips et al., 1999). We used this to reveal the importance of the public response to media coverage after a given number of months. The public opinion survey was conducted on about the 10th day of each month. Therefore, for this analysis we re-counted the monthly number of newspaper articles on global warming from the 11th day of the previous month to the 10th of each month.

We focused on July 2005 to December 2006, the first public opinion phase. We chose this period of analysis because we considered that the rapid change in public concern in the second phase was influenced not only by newspaper, but also by other media, such as Al Gore’s film or TV programs. Single-media (newspaper) may not have been enough to assess the media influence on public awareness after January 2007.

Fig. 8 shows one of the results of the cross-correlation analysis. Fig. 8a is the cross-correlation function (CCF) of the ‘global warming’ response rate and the total number of newspaper articles on global warming, and Fig. 8b is the result for ‘number of front-page articles’. The ‘global warming’ response rate was significantly correlated with the total number of newspaper articles (at zero time lag; CCF = 0.60). The correlation between ‘global warming’ response rate and number of newspaper articles on the front page was weaker, but still significant (at zero time lag; CCF = 0.58).

Aoyagi-Usui (2006) revealed that the majority of the public knew the word ‘global warming’ but could not explain what it was. She also revealed that many people misconceived of global warming issues to be related to ‘ozone layer depletion’ or ‘air pollution’. Respondents who thought that global warming was important might therefore answer, for example, ‘air pollution’, which would then be categorized into ‘general topics’. Therefore, we also calculated the CCF of the ‘environment’ response rate and (a) the total number of newspaper articles on global warming and (b) the number of front-page newspaper articles (Fig. 9). The CCF between the ‘environment’ response rate and the numbers of articles on the front page was significant at zero time lag

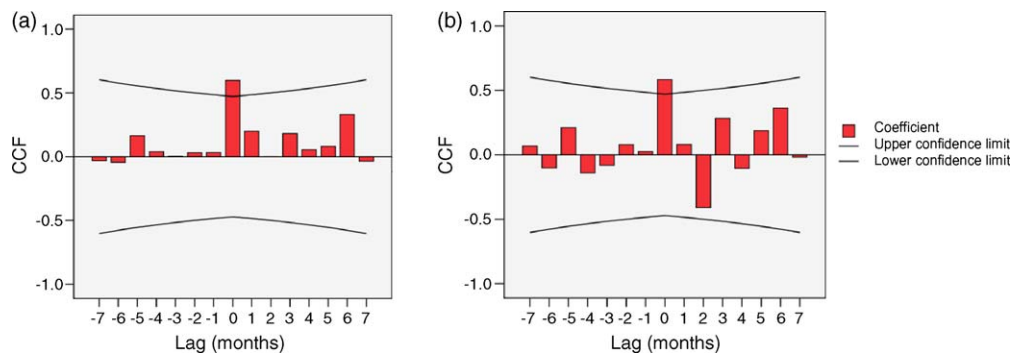


Fig. 8. Cross-correlation function (CCF) between media coverage of global warming and public perception of global warming (as represented by the global warming response rate) using monthly time-series data. (a) leading indicator is all articles. (b) leading indicator is front-page articles only.

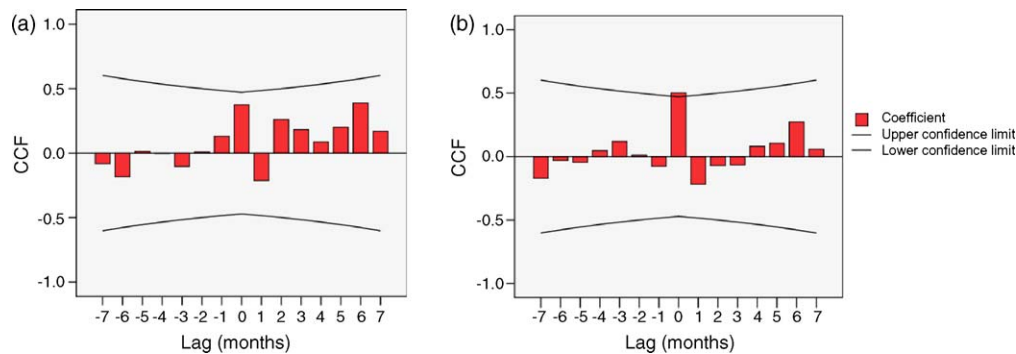


Fig. 9. Cross-correlation function (CCF) between media coverage of global warming and public perception of environmental issues (as represented by the 'environment' response rate), using monthly time-series data.

(a) leading indicator is all articles.

(b) leading indicator is front-page articles only.

(CCF = 0.50). No statistically significant coefficient between the 'environment' response rate and the number of all newspaper articles was observed at any time lag.

These results showed that an increase in media coverage of global warming had an immediate influence on public awareness of global warming issues, but this effect did not last for more than a month. These results are consistent with those of Mazur and Lee (1993). Many social issues are competing in the policy arena. The global warming issue has joined this competition to win media attention and political advantage over other issues. We consider this to be one of the reasons why the influence of mass-media coverage lasted only for the zero time-lag period.

Our results also showed that the number of people who mentioned 'global warming' as the most serious issue in the world significantly increased with increasing total number of articles on global warming. However, the number of people who mentioned just 'environment' increased only with an increase in the number of front-page articles on global warming. This suggested that people who mentioned global warming were more concerned about global warming than were people who mentioned just 'environment'. Therefore, these 'global warming' respondents may well have followed the relevant articles on global warming regardless of where they appeared in the newspaper.

The people who mentioned just 'environment' might have considered that environmental issues are serious only if they are placed on the front page. Items that appear on the front page of a newspaper are the major social issues on that day. This suggests that an increase in the number of front-page articles on global warming raises these people's anxiety, rather than their concern about environmental issues.

We consider this suggestion quite interesting. It is widely known that the mass media can influence public perception of risk (e.g., O'Connor et al., 1999). However, our results suggest that a temporary increase in mass-media coverage would not necessarily increase the public perception of risk. The total number of people who mentioned 'general topics' was more than twice the number who mentioned 'global warming' in the first phase (see Fig. 7). The number of articles on global warming on the front page from July 2005 to December 2006 was 167. This accounted for only 4.3% of the total number of articles on global warming. Therefore, although overall mass-media coverage of global warming increased, most of the articles seem to have been neglected by the majority of people unless they were on the front page.

5. Conclusion

We reviewed mass-media coverage of global warming issues over a 10-year period from 1998 to 2007 and then looked more

closely at the mass-media coverage after May 2005, especially the mass-media coverage of the national campaign program. We also performed a monthly public opinion survey from July 2005 and analysed the changes in public concern about global warming issues and environmental issues in general. We then used a cross-correlation analysis to determine the relationship between public concern and mass-media coverage.

Our review of the 10-year trend in newspaper coverage of global warming issues revealed that mass-media coverage of global warming increased slightly overall before January 2007 and then increased dramatically from January 2007. The increasing Japanese media coverage of global warming issues was driven largely by international events involving the USA, not by all events outside Japan. However, this trend in the Japanese mass media seems to have changed recently, as AR4 received wide mass-media coverage. We also found that the national campaign program successfully captured mass-media attention.

We looked closely at mass-media coverage after the beginning of the national campaign program. The national campaign program contributed much to the increase in mass-media coverage. However, we found that only 20% of the newspaper articles that reported on the national campaign also mentioned global warming. We considered that articles on this national campaign program had little effect in providing the public with information on global warming issues in general.

Therefore, we focused on the relationship between public awareness and mass-media coverage of global warming, rather than on the national campaign program. Our monthly public opinion survey revealed that, along with the increase in mass-media coverage, public concern for global warming increased dramatically from January 2007. Applying cross-correlation analysis, we found that the number of front-page articles on global warming and also the total number of articles on global warming significantly influenced public concern for global warming. We also found that the number of articles on global warming on the front pages of newspapers significantly influenced public concern for global environmental issues. However, in all case the significance of results occurred only with a time lag of zero. This means that the articles had a significant impact only at the time they were published.

The findings suggest that we can expect the mass media to play a role in raising public awareness of global warming if only temporarily. However, if no other environment-related news breaks, then other political or social issues take over. Downs (1972) argued that environmental issues attract widespread attention in mass media and then decline from public view, though the issues remain largely unresolved. Our results also indicated that high levels of media coverage did not last for a long time. Moreover, we

revealed that coverage of global warming on the front pages of the newspapers influenced the environmental concerns of a large proportion of people.

In the light of these points the Ministry of the Environment needs to reconstruct its strategy for the national campaign program in order to keep mass-media attentions to global warming issues. Kitzinger and Reilly (1997) indicated that a lack of policy events leads to a lack of media interest. Risk reporting in the mass media is influenced by what journalists perceive to be relevant to themselves, their audiences and their editors (Kitzinger, 1999). To ensure that journalists recognize information as worthy of featuring on the front page, the Ministry of the Environment should consider when and how information should be provided to the mass media. It is also important to find a way to provide information that journalists will report in connection with global warming.

Our analysis of the relationship between mass-media reporting and public concern over global warming covered the period July 2005 to December 2006. The trend in reporting in the Japanese mass media changed after this period, and global warming issues have continued to capture the attention of both the mass media and the public since the beginning of 2007. This rise might provide us with clues as to how to construct a strategy to maintain high levels of public awareness of global warming. The sharp rising of public concern from January 2007 also provides an example of Moser and Dilling's (2004) 'teachable moments'—that is the key moment to bring peoples' attention to global warming.

We focused here on only the amount of newspaper coverage. However, several previous studies have revealed that the way in which a problem is presented in the mass media can influence people's choices (e.g., Kahneman, 2003), and certain ways of expressing climate change can lead the public to be less concerned (e.g., Leiserowitz, 2004). We therefore need to consider the content of mass-media coverage of global warming as well as the amount.

We focused also on the influence of mass media on public awareness, but the final goal of our research is to find effective ways to encourage the public to make their lifestyles more sustainable. In our next step we will be investigating the factors that motivate people to change their lifestyles. There have been a number of investigations in this area. Otway and Wynne (1989) argued that we can expect public risk-avoidance actions to be influenced not only by recognition of countermeasures, but also by an understanding of the context of the causes and effects of risk. For public lifestyle change, we consider that a public understanding of the risks of global warming might be important in our next step. As some previous studies have indicated (e.g., Rogers, 2002), personal communication, rather than mass communication, would also be useful in this next step. Research will be needed to reveal how we should utilize not only mass communication tools, but also personal communication tools, to improve public understanding.

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References

Antilla, L., 2005. Climate of scepticism: US newspaper coverage of the science of climate change. *Global Environmental Change* 15, 338–352.

- Aoyagi-Usui, M., 2006. Exploring communication strategies for people's understanding of climate change consequences and actions. In: Annual Meeting of the Society for Risk Analysis, p. 47.
- Aoyagi-Usui, M., 2008. An analysis of the effective factors for promoting pro-environmental actions from the information gain and social capital point of view. *Review of Environmental Economics and Policy Studies* 1 (2), 37–50 (in Japanese).
- Aoyagi-Usui, M., Vinken, H., Kuribayashi, A., 2003. Pro-environmental attitudes and behaviors: an international comparison. *Human Ecology Review* 10 (1), 23–31.
- Berk, R.A., Schulman, D., 1995. Public perceptions of global warming. *Climatic Change* 29, 1–33.
- Bord, R.J., Fisher, A., O'Connor, R.E., 1998. Public perceptions of global warming: United States and international perspectives. *Climate Research* 11, 75–84.
- Boykoff, M., 2007. Flogging a dead norm? media coverage of anthropogenic climate change in United States and United Kingdom from 2003 to 2006. *Area* 39, 470–481.
- Boykoff, M.T., Boykoff, J.M., 2004. Balance as bias: global warming and the US prestige press. *Global Environmental Change* 14, 125–136.
- Boykoff, M.T., Boykoff, J.M., 2007. Climate change and journalistic norms: a case-study of US mass-media coverage. *Geoforum* 38, 1190–1204.
- Brechin, S., 2003. Comparative public opinion and knowledge on global climatic change and the Kyoto Protocol: the U.S. versus the world? *International Journal of Sociology and Social Policy* 23, 106–134.
- Brossard, D., Shanahan, J., McComas, K., 2004. Are issue-cycles culturally constructed? A comparison of French and American coverage of global climate change. *Mass Communication and Society* 7 (3), 359–377.
- Carvalho, A., Burgess, J., 2005. Cultural circuits of climate change in UK broadsheet newspapers, 1985–2003. *Risk Analysis* 25 (6), 1457–1469.
- Davies, R., 2008. Civil society activism and waste management in Ireland: the Carranstown anti-incineration campaign. *Land Use Policy* 25 (2), 161–172.
- DEFRA, 2002. http://www.defra.gov.uk/environment/climatechange/pubs/impacts/pdf/ccimpacts_defra.pdf.
- DEFRA, 2007. It's time to ACT ON CO₂—climate change campaign launched. <http://www.defra.gov.uk/news/issues/2007/climate-0326.htm> (page published: 26 March 2007; accessed 1 July 2008).
- Downs, A., 1972. Up and down with ecology: the issue attention cycle. *The Public Interest* 28, 38–50.
- Dispensa, J.M., 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.
- Driedger, S.M., 2007. Risk and the media: a comparison of print and televised news stories of a Canadian drinking water risk event. *Risk Analysis* 27 (3), 775–786.
- Ester, P., Vinken, H., Simoes, S., Aoyagi-Usui, M. (Eds.), 2003. Culture and Sustainability: A Cross-National Study of Cultural Diversity and Environmental Priorities Among Mass Publics and Decision Makers. Dutch University Press.
- Hagiwara, S., 2006. Trend of foreign related news in Japanese television, November 2003–August 2004 (*Nihon no TV ni Okeru Gaikoku Kanren Hodo no Doko*). *Keio Media Communication Research* 56, 39–57 (in Japanese).
- Haugh, L.D., 1976. Checking the independence of two covariance stationary time series: a univariate residual cross correlation approach. *Journal of the American Statistical Association* 71, 378–385.
- The Japan Newspaper Publishers and Editors Association (Nihon Shimbun Kyokai), 2007. Report on Consumer Satisfaction and Influence of Newspaper (Kobai Manzoku to shimbun enge-jimennto), Tokyo (in Japanese).
- Kahneman, D., 2003. Maps of bounded rationality: psychology for behavioral economics. *American Economic Review* 93, 1449–1475.
- Kitzinger, J., 1999. Researching risk and the media. *Health, Risk and Society* 1 (1), 55–69.
- Kitzinger, J., Reilly, J., 1997. The rise and fall of risk reporting. *European Journal of Communication* 12 (3), 319–350.
- Leiserowitz, A., 2004. Before and after the day after tomorrow: A U.S. study of climate change risk perception. *Environment* 46 (9), 22–37.
- Leiserowitz, A., 2006. Climate change risk perception and policy preferences: the role of affect, imagery, and values. *Climatic Change* 77, 45–72.
- Lorenzoni, I., Leiserowitz, A., Doria, M., Poortinga, W., Pidgeon, N.F., 2006. Cross-national comparisons of image associations with "global warming" and "climate change" among laypeople in the United States of America and Great Britain. *Journal of Risk Research* 9 (3), 265–281.
- Lowe, T., Brown, K., Dessai, S., Doria, M., Haynes, K., Vincent, K., 2006. Does tomorrow ever come? Disaster narrative and public perceptions of climate change. *Public Understanding of Science* 15 (4), 435–457.
- Major, A.M., Atwood, L.E., 2004. Environmental risks in the news: issues, sources, problems and values. *Public Understanding of Science* 13, 295–308.
- Mazur, A., Lee, J., 1993. Sounding the global alarm: environmental issues in the US national news. *Social Studies of Science* 23, 681–720.
- McComas, K., Shanahan, J., 1999. Telling stories about global climate change: measuring the impact of narratives on issue cycles. *Communication Research* 26 (1), 30–57.
- Mikami, S., Takeshita, T., Kawabata, M., 1998. Influence of the Mass Media on the Public Awareness of Global Environmental Issues in Japan. Paper presented at the International Workshop on Eco-Consciousness in Asia and the Pacific, The University of Hong Kong, pp. 26–27.
- Mormont, M., Dasnoy, C., 1995. Source strategies and the mediatization of climate change. *Media, Culture and Society* 17 (1), 49–64.
- Moser, S.C., Dilling, L., 2004. Making climate hot: communicating the urgency and challenge of global climate change. *Environment* 46 (10), 32–46.

- O'Brien, K., 2006. Are we missing the point? Global environmental change as an issue of human security. *Global Environmental Change Part A* 16 (1), 1–3.
- O'Connor, R.E., Bord, R.J., Fisher, A., 1999. Risk perceptions, general environmental beliefs, and willingness to address climate change. *Risk Analysis* 19, 461–471.
- Otway, H., Wynne, B., 1989. Risk communication: paradigm and paradox. *Risk Analysis* 9, 141–145.
- Phillips, N., Oren, R., Zimmermann, R., Wright, S.J., 1999. Temporal patterns of water flux in trees and lianas in a Panamanian moist forest. *Trees* 14, 116–123.
- Project for Excellence in Journalism, 2006. <http://www.stateofthenewsmedia.com/2006/>.
- Rogers, E.M., 2002. Intermedia processes and powerful media effects. In: Bryant, J., Zillmann, D. (Eds.), *Media Effects: Advances in Theory and Research*. 2nd edition. Lawrence Erlbaum Associates, New Jersey.
- Sampei, Y., Aoyagi-Usui, M., 2008. Effect of mass-media coverage on public perceptions of global environmental issues. In: *Proceedings of the Annual Meeting of the Society for Environmental Economics and Policy Studies Japan* (in Japanese). pp. 180–181.
- Schoenfeld, A.C., Meier, R.F., Griffin, R.J., 1979. Constructing a social problem: the press and the environment. *Social Problems* 27 (1), 38–61.
- Slovic, P., 2000. Informing and educating the public about risk. In: Slovic, P. (Ed.), *The Perception of Risk*. Earthscan Publications Ltd, London.
- Staats, H.J., Wit, A.P., Midden, C.J.H., 1996. Communicating the greenhouse effect to the public: evaluation of a mass-media campaign from a social dilemma perspective. *Journal of Environmental Management* 46, 189–203.
- Trumbo, C., 1996. Constructing climate change: claims and frames in US news coverage of an environmental issue. *Public Understanding of Science* 5, 269–283.
- Ungar, S., 1992. The rise and relative decline of global warming as a social problem. *Sociological Quarterly* 33 (4), 483–501.
- Viklund, M., 2004. Energy policy options—from the perspective of public attitudes and risk perceptions. *Energy Policy* 32, 1159–1171.
- Weingart, P., Engels, A., Pansegrau, P., 2000. Risks of communication: discourses on climate change in science, politics, and the mass media. *Public Understanding of Science* 9, 261–283.