Does tomorrow ever come? Disaster narrative and public perceptions of climate change

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The film *The Day After Tomorrow* depicts the abrupt and catastrophic transformation of the Earth's climate into a new ice age, playing upon the uncertainty surrounding a possible North Atlantic thermohaline circulation (Gulf Stream) shutdown. This paper investigates the impact of the film on people's perception of climate change through a survey of filmgoers in the UK. Analysis focuses on four issues: the *likelihood* of extreme impacts; *concern* over climate change versus other global problems; *motivation* to take action; and *responsibility* for the problem of climate change. It finds that seeing the film, at least in the short term, changed people's attitudes; viewers were significantly more concerned about climate change, and about other environmental risks. However, while the film increased anxiety about environmental risks, viewers experienced difficulty in distinguishing science fact from dramatized science fiction. Their belief in the likelihood of extreme events as a result of climate change was actually reduced. Following the film, many viewers expressed strong motivation to act on climate change. However, although the film may have sensitized viewers and motivated them to act, the public do not have information on what action they can take to mitigate climate change.

1. Introduction

The uncertainty and complexity surrounding climate change, its impacts and implications have long hampered efforts to raise its profile on the national and international agenda (Wynne, 1994; Shackley and Deanwood, 2001). Mixed messages, academic controversy and political posturing (Seacrest et al., 2000) have frustrated a public who have a key role to play in any likely mitigation strategies. Frequently, this complex situation is compounded by normative opinions of opposing cultural and ethical agendas, acting to further polarize the debate.

The relationship between lay and scientific knowledge is, of course, complex and dynamic, and interconnected at many levels. Early approaches assumed an ignorant public whose knowledge "deficit" (compared to that of the experts) required that they be provided with simple information. This approach has come under increasing attack as it failed to place

the issues in their wider social and cultural contexts, underestimating the depth of public thought and knowledge of risks they face (Wynne, 1995, 1996, and Jasanoff, 1998, all cited in Horlick-Jones et al., 2003). However, whilst general lay perceptions of climate change and other environmental issues are relatively well understood, knowledge of the forces that shape the perceptions and responses of the public is limited (Bray and Shackley, 2004). Key studies into the ways in which laypeople perceive climate change have found that people commonly exhibit misconceptions about the causes and consequences of climate change (Kempton, 1991; Bostrom et al., 1994; Kempton et al., 1995; Bord et al., 1998; Bickerstaff and Walker, 2001; Poortinga and Pidgeon, 2003). Public misunderstandings of the science of climate change have been found to generate fear about its consequences (Read et al., 1994).

The general public gains most of its knowledge about science from the mass media (Nelkin, 1987; Wilson, 1995). Therefore, the role of the media is significant in the public's cognition and perception of climate change issues. The ways in which television, radio and newspapers communicate complicated issues of science, technology and politics to the public have reached a critical point in post-industrial society as the media have become highly influential and immensely powerful (Wahlberg and Sjöberg, 2000; Weingart and Pansengrau, 2003). Its sway over the public psyche is evident in all sectors, with public understanding of science in particular being communicated by media eager for topical news.

Science and the media tend to inhabit a gray or undefined region within the socio-political psyche, a void in which the metrics of scientific process are often lost in translation from academic findings to news headline. This is particularly true for climate change which, as reported by Boykoff and Boykoff (2004), is skewed in the perceptions of the public in the United States, for example. The authors argue that people have been misled by newspaper reports that tend to give equal weight to both sides of the climate change debate. The journalistic practice of balancing the scientific consensus with a comparatively small number of contrarians has acted to overstate the actual degree of disagreement (Boykoff and Boykoff, 2004; Moser and Dilling, 2004).

When *The Day After Tomorrow* was released, the film's marketing executives emphasized its appeal not as a scientific "treatise" but as an action-adventure, roller-coaster-style experience. However, scientists, politicians, environmental groups and critics speculated about how it might impact on public perceptions and action on climate change. Some believed the vivid images would increase awareness about climate change amongst a global audience and even galvanize publics to put pressure on governments to act on climate issues, while others thought it would reinforce climate skepticism or have no impact at all. This research investigates the impact of the film on people's perception of climate change. Our analysis focuses on four key issues of public perception: the *likelihood* of extreme impacts; *concern* of climate change versus other global problems; *motivation* to take action; and *responsibility* for the problem of climate change. A mix of social science methods was adopted to explore this issue: 300 respondents in the city of Norwich (UK) completed a two-part questionnaire at a number of screenings shortly after the film's release in May 2004. Respondents were then invited to participate in focus groups one month after watching the film to discuss some of the issues in more depth.

2. Lay perceptions of climate change

In order to assess the effect of *The Day After Tomorrow* upon its audience's understanding and beliefs surrounding climate change, we look to the available literature, as a guide. A

necessarily broad image of lay perceptions of climate change is described in a set of exploratory studies using various approaches designed to characterize public understanding of climate change: Bostrom et al., 1994; Bord et al., 1998; Berk and Fovell, 1999; O'Connor et al., 1999; Alerby, 2000; Blake, 2001; Lorenzoni, 2003; Norton and Leaman, 2004. Whilst it should not be suggested that different cultural, ethnic, gender and age groups will necessarily exhibit the same attitudes of knowledge or concerns about climate change, many of these studies found that respondents often demonstrate misconceptions and confusion, particularly regarding the greenhouse effect and stratospheric ozone depletion.

For a specific study of lay perceptions in Norwich, we can look to Lorenzoni (2003) who analyzed 200 questionnaires using a factor analysis during the summer of 2000. It was found that respondents' perspectives on climate change could be subdivided into four separate groups: those *denying* that humans affect the climate, feeling that climate change is *not* important; those that *doubt* the human influence upon the climate but feel that climate change *is* important; an *uninterested* group who felt that humans do affect climate change but that it is of no overall importance; and an *engaged* group who believed that humans *do* affect climate and that climate change is important. The study outlined a range of interests, knowledges and concerns among Norwich respondents, which were also found to be framed by the perceived validity of climate projections in the light of scientific uncertainty.

As a consequence of this situation, the lay public may have difficulty relating climate change policy options such as carbon taxes to climate change mitigation (Stoll-Kleemann et al., 2001). It is suggested in the literature that these basic misperceptions are likely to "inhibit the public's ability to participate meaningfully in democratic discussions of the issue, to understand how their own actions affect the climate and to fully and accurately appreciate how climate change will affect our future" (Seacrest et al., 2000: 261).

This represents an important issue for effective policy-making, and therefore a greater knowledge of perceptions of the likelihood of climate change is required (Kempton, 1991). In recognition of this need, our research investigated a sample of lay public perception, assessing the perceived likelihood of abrupt climate change and also average climate change (as projected by the Intergovernmental Panel on Climate Change: Third Assessment Report (IPPC, 2001)) before the film, directly after seeing the film and one month after seeing the film.

Lay perceptions of abrupt climate change

The abrupt climate change (triggered by thermohaline circulation/Gulf Stream collapse) portrayed in the film has been the focus of recent scientific debate (Alley et al., 2003; Hulme, 2003), media exposure (e.g. UK British Broadcasting Corporation (BBC) *Horizon* program "The Big Chill," 13 September 2003) and even US government discussions surrounding the issue of national security in the event of abrupt change (Schwartz and Randall, 2003). Some types of abrupt (or rapid) climate change can be conceptualized as high impact, low probability events (e.g. "big switch" events such as a collapse of the thermohaline circulation). However, even this simple definition is fraught with caveats because the causes, outcomes and likelihood are largely uncertain. Indeed, an expert elicitation on abrupt climate change undertaken by Arnell et al. (2004) found that several experts declined to respond because they felt that the science was too uncertain and that subjective judgments would not be appropriate. Thus, there exists no global consensus on the likelihood or extent of rapid climate change and agreement among scientists and policymakers over the "danger" posed by abrupt changes in the climate system appears

unlikely (Lowe and Lorenzoni, in press). Little information exists on lay belief and understanding of the subject.

The media play an important role in reporting often the most shocking and attention grabbing climate change headlines to lay audiences. As a result, reportage of terms such as "rapid" or "abrupt," which individuals may liken to their everyday temporal meaning, may differ considerably from scientific, often geologic timescales (Petts et al., 2004).

> The use of terms which stress thresholds of severe physical outcomes/damage (such as "danger") may downplay concepts of speed of onset of harm, or the underlying subjective characteristics of societal tolerability—such as robustness of scientific knowledge; institutional trust; personal control; impacts on future generations etc. (Petts et al., 2004: 4)

A detailed investigation of subjectivity and the interdependency of human beliefs and attitudes is beyond the scope of this paper. Instead, we question whether *facts* (accepted scientific evidence) determine behavior as much as *perceptions*, where the mediating factors are science, as communicated to the lay public through the news media, and strong visual images, communicated through a Hollywood film.

Lay concern about climate change

A number of authors (Dunlap and Van Liere, 1978; Dunlap and Scarce, 1991; Kempton, 1991) report an increasing concern for climate change in general among the US and Northern European public following surveys, ethnographic interviews and willingness-to-pay studies carried out from the early 1970s. However, despite the agreement of the scientific community that global climate change will entail serious implications for humanity, public concern for climate change appears to be tempered by uncertainty about whether and when climate change will occur, the degree of change and by competition from other seemingly more relevant issues of individual concern (Seacrest et al., 2000; Poortinga and Pidgeon, 2003).

Bord et al. (1998) point out that although a majority of the lay public indicate some level of concern, they express greater concern for many other issues including personal income, crime reduction and education. They conclude that the public both in the United States and in other regions, "perceives substantial threat from global warming, but the threat levels tend to be significantly less than those from other environmental and social problems" (Bord et al., 1998: 83, see also Poortinga and Pidgeon, 2003).

Our research centers upon the effect that the stark images of catastrophic and abrupt climate change impacts portrayed in *The Day After Tomorrow* may have had upon public concern. In contrast to balanced news reports and documentaries, the fictional Hollywood blockbuster presents a more extreme and fantasy-led view of a worst-case scenario and beyond. The "what ifs" of an intangible yet dangerous climate shift are replaced with deadly storm surges and iconic images such as the Statue of Liberty engulfed by ice. However, the question remains: what effect do these representations have upon the public's concern about climate change and is it likely to bring about or encourage behavioral change?

Motivation and responsibility

Seacrest et al. (2000: 261) state that the perception of climate change, like that of other environmental problems, is "rooted in moral decay and human indifference," suggesting the public will often conclude there to be no available solution to climate change. Bostrom et al.

(1994) found that although respondents believed climate change to be a threat and favored action to address it, individuals' mental conceptualizations restricted their ability to distinguish between effective and ineffective mitigation strategies. Kempton et al. (1995) somewhat overturn this view by suggesting that public motivation to take action on climate change may compete with other pressing considerations such as the right to choose, freedom of expression and reduction of government interference in personal behavior. Lorenzoni (2003) observed among focus group participants in Norwich (UK) a feeling that whilst they considered climate change as everybody's problem, the obligation to act falls upon politicians who are seen as having a wider scope for action than individuals. Lorenzoni et al. (in press) also found that individuals from the general public in the US and UK associate climate change with potential far-off consequences, rarely considering possible causes or mitigation strategies.

Bord et al. (1998) point out that for the successful implementation of policy, people's actions are far more important than their perceptions or thoughts. Thus, whilst politicians may support initiatives to mitigate global warming, individuals are not likely to welcome or even tolerate those that may lead to significant alterations to lifestyle. This has been described as the "passive bystander" (Marshall and Lynas, 2003) effect in which blame is apportioned in a perpetrator–victim style; "The South blames the North, cyclists blame drivers, activists blame oil companies and almost everyone blames George Bush" (Marshall and Lynas, 2003: 18). The study reported in this paper explores whether *The Day After Tomorrow* influenced the views on climate change among a sample of the UK public.

Science in films

Communicating a complex issue such as climate change to multiple publics can pose difficulties. In many ways, climate change does not represent a salient, palpable issue on which ordinary people are motivated to be well informed and prepared to take action individually or collectively (Seacrest et al., 2000). Moser and Dilling (2004: 41) advocate the use of more relevant or "trusted messengers" in order to improve credibility and legitimacy in the communication of climate change to lay audiences. They suggest that pioneering industry leaders will appear more legitimate or relevant to industry audiences, religious leaders more legitimate in providing the moral argument and (in the case of climate change) even using the skills of artists, story-tellers and musicians to popularize what is seen by many as a "dry" scientific matter, as a "deeply human affair."

The assertions of the makers of *The Day After Tomorrow* that the film had the potential to address climate change by "making people think about how better to take care of our planet" (Mark Gordon, quoted in *Daily Variety*, 2004) were received by many as an advertising stunt and by others as an opportunity to "talk about the scientific realities of climate change" (Al Gore, quoted in *Daily Variety*, 2004). In both cases, it was implied that a Hollywood film could have the power to capture the public imagination in a way that could literally change the world. The influence of the visual film image is undeniable, with cultural taboos challenged and overtaken via cinema film, public moods controlled by propaganda and trends set through advertising. However, the question remains as to whether film can triumph over social apathy to instigate a long-term, effective social and behavioral change.

According to Weingart and Pansengrau (2003), science in fiction film is hardly a topic at all, with only a handful of books and articles dealing with the role of science in films. However, for a study such as this it is important to understand from a psychological point of view, the effects that visually based media have upon individuals' behavior. In a paper on

the communication of science in media texts such as television and cinema, Kirby reports a detrimental effect of these media upon the individuals' understanding of science and a "corrosion of the public's critical thinking skills which hinders scientific literacy" (Kirby, 2003: 262). Representations of science in entertainment media and mediation among scientists, the entertainment industry and audiences, were said to contain tensions "not only between the narrative forms of media and those of science, but also between the needs of the entertainment industry and those of the scientific community" (Kirby, 2003: 267).

In terms of the desired effect of a film upon its audience, studios often believe that the use of scientific consultants adds "realism" and scientific legitimacy to a film, arguing that a special-effects-derived spectacle, such as *The Day After Tomorrow*, has to be sufficiently credible in terms of what constitutes a rational possibility of the unknown in order to maintain audiences' interest (Hallam and Marshment, 2000) and to avoid audience disenchantment. Kirby (2003) argues that representations of natural phenomena which appear "realistic" (as opposed to science fiction) to film audiences, make it difficult for the public to separate fact from fiction whilst the makers and proponents of *The Day After Tomorrow* argue that the film's scientific basis will change the viewer's belief. Bray and Shackley (2004: 2) suggest two ways in which belief state can be changed based upon the perspective adopted by Boutilier (1998): "belief revision," whereby the individual no longer believes in the phenomenon of e.g. climate change, or alternatively the individual is more inclined to believe the phenomenon whereas previously they had not; and "belief update," which refers to a change in the measure of belief in the existence of e.g. climate change.

Our research tests whether the effect of a quasi-scientific film to create a "realistic" scenario (in the case of *The Day After Tomorrow* through the use of convincing special effects) has significant positive or negative impact upon the public's understanding and concern about climate change. In addition, we attempt to investigate whether the use of "excitement" and "awe" are able to capture the public imagination about the possibility of such catastrophic impacts and, as a result, to change their behavior and attitudes towards the environment.

3. Methodology

Our study investigated the effects of the film on public perceptions of climate change in Norwich using two approaches: 1) a questionnaire survey and 2) focus group discussions. These techniques enabled the collection of quantitative and qualitative data eliciting individuals' views before and after the film. Whilst every attempt was made to avoid leading respondents' reactions during the survey and focus groups, it remains unavoidable that some topics generate "socially desirable" responses, particularly in the focus groups (cf. Bord et al., 1998: 76). Respondents were provided with the minimum of information or priming prior to carrying out the survey. Environmental concerns were put in the context of other global problems (e.g. AIDS, terrorism, poverty), so as to provide comparison and effort was made not to give the impression that the researchers were "environmentalists." Enumerators identified themselves as from the University of East Anglia as opposed to the Tyndall Centre for Climate Change Research.

The questionnaire was designed for cinemagoers of over 12 years of age. It comprised two almost identical sections, the first section (Part 1) was completed before watching the film and the second section (Part 2) was completed immediately after watching the film. Part 1 contained demographic information and five multiple choice questions including motivations for watching the film. Part 2 contained nine questions; in addition to the same

questions posed in Part 1, there were two questions specific to the sudden climate changes witnessed in the film and a final open-ended question, in which respondents were encouraged to note down what message (if any) they had taken away from the film.

The survey took place at the UCI cinema in Norwich, UK, at the Riverside Complex, within one week of the film's launch in the UK. A total of 404 respondents were surveyed by the research team who visited the cinema five times on different days and film showing times over a period of 8 days, from the 5th to 12th of June 2004, thereby covering a wide selection of cinemagoers.[1] Individuals were randomly approached in the cinema foyer after they had bought a ticket to see the film and were offered a discount cinema voucher to participate. Willing respondents were then handed the entire questionnaire (Parts 1 and 2) on a clipboard and asked to complete Part 1. Most took around 5 minutes to fill in this section which was then collected. The almost identical Part 2 of the questionnaire was retained by the respondent and was completed in the cinema foyer after the film had finished.

Part 2 was returned by 306 respondents with five questionnaires incomplete, leaving a total of 301 completed questionnaires for analysis and a usable response rate of 74.5 percent. The data provided by participants who did not return Part 2 of the survey were omitted from the analysis. Data were analyzed using frequencies and means to describe the demographic characteristics of the sample and the respondents' attitudes towards the film and climate change. The impact of the film was assessed using a paired samples t-test, to compare respondents' attitudes and beliefs before and after watching the film.

Three focus groups were conducted one month after the completion of the survey at the cinema. The aim of these groups was to see how people's perceptions had altered one month after watching the film as opposed to straight after the film, and also to allow an in-depth examination of the major issues that had emerged from the survey. The focus groups (which were conducted by a moderator with notes being taken by an assistant moderator) took place on three consecutive evenings at the University of East Anglia, and lasted approximately 90 minutes each. Participants who had indicated on their questionnaires that they would be willing to participate in a follow-up study were contacted. Each was offered £10 to cover travel expenses to reach the venue. A significant proportion of those invited did not attend. Eleven respondents in total took part in small informal groups making it possible for respondents to air their views in a comfortable setting.

The topics of discussion during the focus groups followed the same broad themes covered in the initial questionnaire. However, the protocol was flexible enough to allow respondents to discuss topics that they felt were important. As a warm-up, respondents were asked to list the words and images that came to mind when thinking about the film. The process was repeated in order to gauge respondents' feelings about climate change in general. They were then asked to separate what they felt was fact and what was science fiction in the film. This question led them into the main topics of discussion: *likelihood* (of events displayed in the film occurring e.g. if so when?); *awareness* and *concern* (e.g. did the film make you more concerned/aware of climate change issues?); and *responsibility* and *action* (e.g. who is responsible, what action can we take? Have you taken action as a result of seeing the film?).

The qualitative data were analyzed thematically according to coding defined by the parameters of our research questions i.e. evidence of the film's influence upon respondents' perceptions of likelihood, responsibility, concern and motivation. The data were examined for salient categories which were given a label or code, which is not merely a description of the text, but a theoretical name indicative of a wider phenomenon prominent in the data.

The mixed quantitative and qualitative methods employed in the study enabled findings to be triangulated and robust results to be drawn. These complementary methods have also

allowed us to explore the issues in a more detailed and meaningful fashion than would otherwise have been possible using just one method. It is acknowledged that the small numbers involved in the focus groups do not permit significant extrapolation, therefore direct quotes from respondents are used where necessary to exemplify and reinforce the quantitative results. The sections below report the findings of our analysis.

4. Quantitative findings

Characteristics of survey respondents

The survey respondents represented a fairly young portion of society with nearly half (46 percent) of all those filling in the questionnaires between the ages of 12 and 29 years. A further 26 percent were in their thirties with older age groups relatively poorly represented (Table 1). The sex ratio was almost evenly split with only 5 percent more females questioned than males and a variety of occupations represented (Table 1). As shown in Table 2, most respondents' motivation for seeing the film was either because they liked the trailer (74 percent) or because they enjoy action and disaster films (13 percent). Only 5 percent said they were interested in films about environmental or climate related issues.

Table 1. Age and occupation of respondents ($n = 301$)

	Group	%
Age	12–19 years	15.3
	20–29 years	30.9
	30–39 years	26.6
	40–49 years	17.9
	50–59 years	8.3
	60 years or more	1.0
Occupation	Shops/services/carer	23.6
	Professional or academic	18.9
	Student (school or university)	15.9
	Manual worker skilled (plumber, electrician)	11.0
	Administrative/secretarial	8.0
	Manual worker unskilled (factory)	7.0
	Homemaker	3.0
	Unemployed	2.3
	No occupation given	10.3

Table 2. Why did the respondents come to see the film? ($n = 301$)

Reason	%
Liked the trailer	74.4
Likes action/disaster films	13.6
Other	8.6
Likes to watch all big films	8.3
Interested in climate change or environmental films	5.0
Couldn't get into the film they wanted to see	3.0
Watches every film that plays	0.3

Likelihood and concern

When viewers were asked about the main cause of sudden climate change in the film in Part 2 of the questionnaire, the vast majority of respondents (83 percent) suggested freshwater inflow to the North Atlantic (as portrayed in the film), whilst a small proportion mentioned factors more commonly seen by the lay public as drivers of climate change i.e. greenhouse gases (30 percent), ozone depletion (16 percent), and other causes (1 percent) (Table 3).

Before and after perspectives on the likelihood of catastrophic climate change and concern about environmental and other risks indicate mixed and sometimes confused reactions. Some statistically significant changes to respondents' attitudes after viewing the film were observed. Figure 1 shows the percentage of respondents whose concern changed after the film; the values presented on the axis were calculated by subtracting the concern before the movie from the concern after the movie, measured with a 5-point Likert-type scale (from "not concerned at all" to "very concerned"). Respondents were slightly more concerned about climate change after they had watched the film (paired samples t-test, $t = 4.018$, $p < .001$); the mean concern of the sample on a 1–5 Likert-type scale increased from 4.20 (SD .91) before to 4.39 (SD .76) after the film.

However, respondents were also more concerned about many other global problems (except terrorism) after they had seen the film than before. This is particularly clear for environmental risks, such as radioactive waste disposal and biodiversity loss (Figure 2). This may be due to a general feeling of uncertainty about the possibility of the impacts portrayed in the film. Also, it may represent a lay mental model in which environmental issues are not mutually exclusive, but instead are perceived as being interrelated e.g. most commonly, climate change and ozone depletion (Bord et al., 1998). It also suggests that perhaps people's awareness of the human impact upon the planet had been heightened; "I did think that . . . how careless mankind is in general, especially in western society" (focus group respondent 4#).

Interestingly, on average, respondents felt that sudden climate change as portrayed in the movie had a medium likelihood (the mean was 4.34, SD = 1.67, on a 1–8 scale from "absolutely impossible" to "absolutely certain"). Respondents also felt that they were less likely to experience climate change within their own lifetime after seeing the film (moving from 5.55 (SD = 1.71) on the 1–8 scale before the film to 5.32 (SD = 1.70) after the film; paired samples t-test, $t = -2.580$, $p = .010$). Thus, there appeared to be a heightened awareness of the problem and increased anxiety, typified by comments on questionnaires such as "climate change is a very real threat" and "be prepared—anything might happen," but also a belief that the kinds of extreme impacts portrayed in the film were science fiction and thus more unlikely or unsubstantiated.

Table 3. The main cause(s) of sudden climate change according to filmgoers in *The Day After Tomorrow* (*n* = 301)

Reason	%
Freshwater inflow to the North Atlantic	83.4
Build up of greenhouse gases in the atmosphere	30.0
Depletion of the ozone layer	15.6
Scientists drilling in the Atlantic	7.0
Earthquake	1.7
Other	1.0
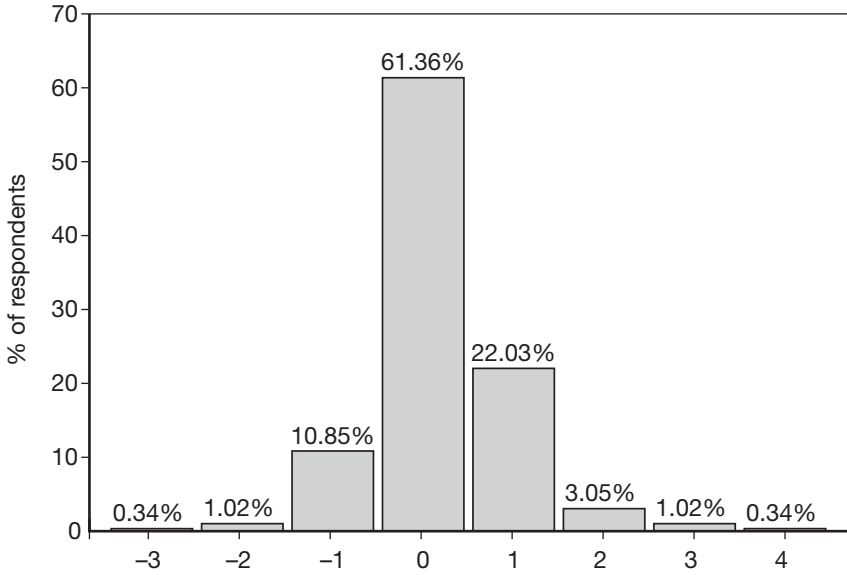
Figure 1. Change in concern about climate change before and after seeing the film.
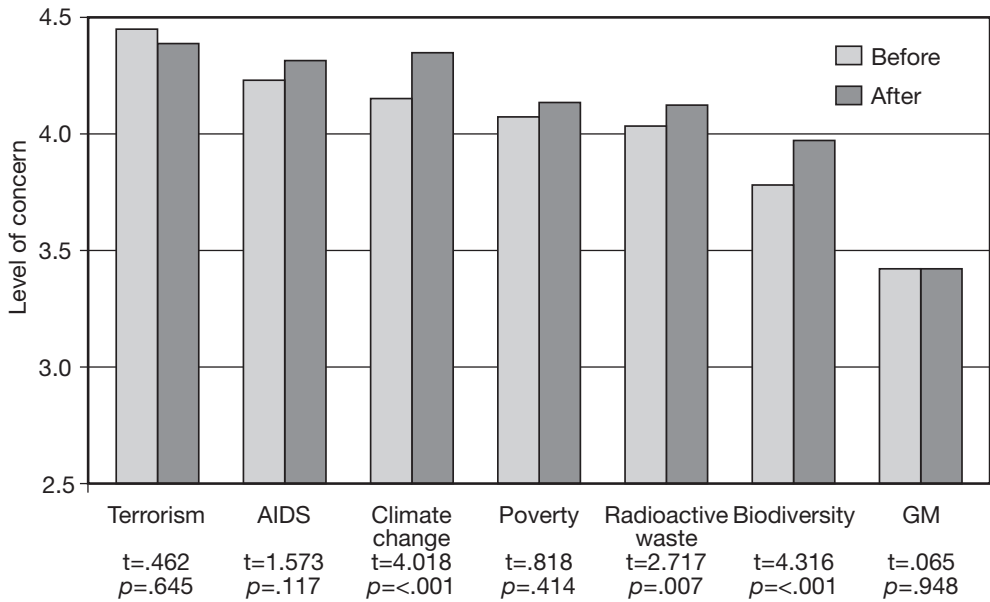
Figure 2. Levels of concern about major issues before and after seeing the film (paired sample t-test statistics are presented for each "problem' or "technology"); concern was measured using using a 5-point scale (from not concerned at all to very concerned).

Responsibility and action

Climate change was seen by a large proportion of respondents following the film as an issue of common responsibility. Sixty-seven percent of respondents believed that everybody (including themselves) is responsible for climate change; "Everyone has to do something" (respondent statement). Only 24 percent attributed responsibility to governments and world leaders; 8.3 percent did not reply to this question. Whilst this response may seem encouragingly altruistic, it can also be viewed as a means of evading individual actions. The film does, however, appear to have had some impact on people's motivation to act. After seeing the film, nearly 44 percent of respondents said that they will try to do more than they are already doing, with less than 5 percent believing there was no point in doing anything (Table 4).

It was felt that this reported increase in individuals' motivation might have been subject to bias given the ease with which concern can be expressed through a simplistic willingness to act and the imperative felt by some to produce a socially desirable response. Thus, the sincerity of respondent pledges for action was probed one month later during the focus groups.

5. Qualitative findings

Focus group analysis

The quantitative results presented above are felt to provide a robust and representative indication of the likely effects of viewing a film such as *The Day After Tomorrow* upon a sample population. However, certain important aspects, such as the longevity of individuals' change in concern and the sincerity of indications of behavioral change, could not be examined through a quantitative survey alone. Thus, small focus groups provided an opportunity to discuss people's reactions to the film one month after they had seen it. Below is a synthesis of the major themes prevalent in all three focus groups.

Concern, feeling, emotions and images

When asked what images and words came to mind when thinking about climate change, participants related their responses to a range of experiences and conceptualizations of climate change. They mentioned large-scale and distant physical, social and economic impacts including: changes in temperature, changes in weather patterns, sea-level rise, droughts, impact on food production, increased unpredictability, melting polar ice caps,

Table 4. Action respondents considered likely to take to reduce climate change after watching the film

Action	%
I already do things but I will try to do more	43.9
I haven't really thought about it before, but I will try some small things (such as driving less, energy saving bulbs, etc.)	25.2
I would like to do some things but I don't know enough about it	15.3
I already do as much as I can	11.3
I will do nothing, there is no point	4.3
I will join an environmental group and/or lobby the government	2.7
Other	1.0

impact on poorer countries, disruption of the seasons, and social and economic change. When asked about images and words which came to mind when thinking about the film, participants mentioned the far more specific and perhaps tangible impacts portrayed in the film, i.e. New York covered in snow, human relationships in the film, dramatic changes in the climate, survival, the way the science was portrayed, satellite pictures, fatalities, tornadoes and devastation.

Participants reported a range of emotions whilst viewing the film and shortly afterward. It appears that in general the film *was* considered as thought provoking, although many admitted that the concern was soon overtaken by other day-to-day matters or that they had gone to see the film with the single intention of being entertained. Comments ranged from little or no effect:

> I think it didn't personally affect me. (Respondent 1#)

> I felt strongly about it anyway. (Respondent 9#)

to quite sincere concern:

> first of all I got worried you know . . . it made me question what would happen. (Respondent 2#)

> It made you think, it certainly made you think about things anyway. (Respondent 5#)

> I think maybe it is just the suffering so many people have to go through in so many countries I think that really for me it made me more aware of that. I was aware of it, but I think that the possibility of the changes, I feel that it just could be a lot worse for people than it is now. (Respondent 5#)

> It does make you think well perhaps that could happen, so yes it does concern me definitely . . . it just made me think more . . . well shortly afterwards. Although I have to say the feelings fade don't they as you get on with your day-to-day life. I did think that . . . how careless mankind is in general, especially in western society . . . it made me quite sad actually. (Respondent 4#)

Others saw the film purely as entertainment, instilling in them no stronger emotions than any other disaster/horror/romantic film:

> I was entertained, I thought it was a good film, spectacular, so I wasn't really coming out wringing my hands or anything about the situation. (Respondent 7#)

> I came out of *28 Days Later* [a horror film] and for about a month after that I started thinking about; how would I survive if the whole country turned to zombies and I was one of the only people left? How would I protect myself and my family? So this film has only done what every film does to me . . . you know any film which leaves me thinking in any sort of way. (Respondent 11#)

The film did appear to have illustrated the possible effects of climate change for one respondent, perhaps clarifying his mental model or conceptualization of an issue which had previously been based upon statistics gleaned from other media.

> I think it really sort of highlighted . . . because of the visual effect of it, it actually brought it home to you, it made it more real than just going down a page of statistics and I think it shows the knock-on effect of the Atlantic current and the effects that the current would actually have, I think that's the main thing that I was more aware of—the knock-on effects. (Respondent 6#)

Another participant identified the way in which the film played on people's fears, perhaps suggesting that any possible message intended by the filmmakers about global catastrophe and disaster as a result of climate change may be viewed by the public purely as a method of making the film more exciting and enticing to viewers:

> This is something that taps into people's fears, because that's what they do, they tap into people's fears, like Armageddon or whatever to sell the film ... it's like any disaster film it plays on people's fears. (Respondent 9#)

Despite the efforts of the filmmakers to impart a feeling of global catastrophe through the use of satellite images and climate change impacts around the world, i.e. snow in Delhi, giant hailstones in Tokyo and deadly cold in Scotland (which also of course reflected an attempt to reach a global market), some respondents reported a feeling of dislocation from the events depicted. This finding is perhaps due to the lack of familiar UK sights and the use of foreign images such as the Statue of Liberty buried in ice and oil tankers in streets of New York.

> I mean the film was like you said unreal, so in some ways it would kind of make people think that this is something that is a million miles away and it is just like fantasy. (Respondent 9#)

Film portrayal of science

Participants were clearly unsure about the proportion of scientific fact to fiction portrayed in the film. For some, the lack of factual science was so great that it created a sense of disbelief: "it was so fairytale that it was completely lost ... I don't believe any of the timescales" (Respondent 10#). Similarly, some respondents felt frustrated not by the film's obvious departure from established science, but by the lack of reference to the point at which this occurred.

> ... one of the biggest let downs of the film was that you didn't actually know how likely certain things were, whether they were actually likely. ... so you didn't know exactly where the truth ended and Hollywood started. If you knew just how scientific the film was then it would probably have a stronger impact, because as you are unaware how much of it is actually artistic licence it takes the edge off that side. (Respondent 6#)

Some individuals' incomplete and sometimes confused ideas of the possible impacts and the processes by which climate change may occur, appeared to be compounded having watched the film: "I don't know enough about it to know if that is really going to happen" (Respondent 9#).

Interestingly, some participants raised the issue of trust and credibility, particularly associated with the medium through which climate change is portrayed.

> I think that if the same film was done by the BBC with a voice over by someone from the north of England or with a regional accent, then you'd suddenly be thinking ... umm how serious is this, is this something that is really ...? (Respondent 8#)

Likelihood of various climate change impacts

When asked about the likelihood of events in the film, most focus group participants expressed sincere disbelief in the film feeling that there was no chance of the events ever

coming true. Others thought them very unlikely, suggesting instead that gradual or minor change ought to be expected.

> I don't personally agree that the world can freeze in a day. It can't, how can you freeze the world in a day? You can't, it won't happen. I mean it would take . . . I don't believe it could happen and I don't believe the science behind it was conveyed well enough. It made it completely unbelievable . . . (Respondent 10#)

> if we are expecting some kind of apocalyptic change that was described in that film, I don't think that is going to happen . . . the film was over the top. (Respondent 7#)

Adaptive capacity and vulnerability

There was a general consensus that future generations are more likely to be impacted by climate change. This realization did not provoke a great deal of concern, rather a feeling that future generations will be able to better cope with the altered conditions: "Personally I think it is the next generation and generations after that it will affect more than it will me" (Respondent 3#). Whilst it was generally felt that future generations in developed countries would be able to cope, some participants mentioned the conditions needed for adaptation, including the differential adaptive capacity between countries.

> I think that because we [the West] have got the resources we will be able to cover our arses basically, whereas a lot of people in poorer countries you know if the desert spreads they have to move, they don't have resources and I think what is going on right now in the world in terms of politics, people are fighting over resources now and things like that . . . The wealthiest and most powerful countries will protect themselves . . . they [poorer countries] will just be more and more exploited. (Respondent 9#)

Responsibility

The film itself conveyed a fairly strong political message regarding responsibility for climate change, portraying scientists as the heroes, politicians as the villains and the public as the victims of disaster brought about in part by political inaction. Similarly to the survey findings, focus group respondents felt a great deal of collective human responsibility for the causes of climate change. However, it was generally felt that public concern could not lead to action without the aid of political support. Three main groups were depicted by respondents as being responsible.

> *Everyone*:

> Us. (Respondent 3#)

> In very simplistic terms everyone has a individual responsibility to do what they can to try and help. (Respondent 8#)

> *Government*:

> It is the government's responsibility. (Respondent 10#)

> If we are going to do anything about preventing disaster there has to be a clear political way of doing it, it has to be political, individuals can't do very much. (Respondent 7#)

> And *individuals led by government*:

> I think everyone should take some degree of responsibility, but I think it has to be strongly led. People are not just going to do it on their own . . . so I do think that it should be something that is led by government really. (Respondent 4#)

Motivation to take action

Moser and Dilling (2004) report the way in which an incomplete understanding of climate change amongst the lay public can lead to overwhelming and frightening images of potentially disastrous impacts. With no sense of how to avoid this dark future, individuals can feel there is no way to channel this sense of urgency towards remedial action. Thus, in order to gauge the impact of the film's catastrophic scenes on film watchers' motivation to act, the focus groups further investigated the heightened concerns about climate change which were identified in the survey results.[2]

Participants tended to link climate change to broader environmental and general "green" issues by thinking about how their lifestyles and activities contribute to the problem and what changes might be made. Among the actions cited as important were personal transport, domestic energy efficiency and recycling.

Despite a feeling that climate change would not affect their daily lives (see subsection "Likelihood of various climate change impacts" above), several participants mentioned that the film had inspired them sufficiently to find more information on action that they could take. This motivation was most frequently translated into increased recycling efforts (e.g. Respondent 8#), although some found it difficult to think of environmentally friendly actions that they could carry out apart from this (e.g. Respondent 5#). Others felt that the film missed an opportunity to suggest ways in which concerned viewers could act on their concern (e.g. Respondent 6#).

> I do actually [recycle] more. We have different bins and perhaps I wasn't as environmentally friendly as I should have been, but it certainly made me look at life differently and I do that now. (Respondent 8#)

> It made me feel like I wanted to do something; but I didn't quite know what I could do. (Respondent 5#)

> It made you think you should do something and it kind of finished without telling you what you could actually do. We said that if it had been something the BBC had made then it probably would have ended with a sentence saying: right you can do this. (Respondent 6#)

Although in general our respondents experienced a heightened awareness of environmental issues following the film (possibly increased further by our interest in their response, media attention attracted by the film and climate change issues during this time), our finding was that the sense of urgency to act had diminished in the four weeks following the initial survey:

> It did make me more aware and it did affect me in the short term . . . you quite often quickly just go back to getting on with your everyday life and not being as pro-active as you might be. (Respondent 4#)

> Unfortunately I have to say that my awareness and involvement and concern will fade away until the next thing triggers it to the forefront. Because again I think that environmental issues are only one of a number of concerns for me in my daily life. (Respondent 8#)

On the basis of this observation, the focus groups spent some time exploring what (apart from the incorporation of an environmental message in the film) the respondents felt was needed to translate motivation into action. Some participants strongly backed the incorporation of environmental stewardship and responsibility in the education system, feeling that the current adult generation is unable to take on board significant changes to lifestyle.

> With the education that is now coming through we are being told more about the changes that are happening and we are seeing films like we have seen, so educational and being shown them more and they will be experiencing the slight differences of weather changes and worse weather patterns coming in. (Respondent 5#)

> I think it is probably easier to teach children—the next generation as it were, because you are actually teaching them from the start to do something one way rather than trying to break people's habits. (Respondent 6#)

Similarly to the findings of Bord et al. (1998), in which survey respondents endorsed the idea of driving less and cutting their own energy consumption in other ways, but were skeptical that their fellow citizens would do likewise, our focus group respondents recognized the economic basis for other people's inaction, suggesting that individuals are locked into a particular lifestyle which is governed by financial inducements and constraints. It was not in everyone's power to operationalize their environmental concerns, with the authority to introduce change lying with the government.

> Yeah I agree, it made me more aware of course of climate change, but what I can do is more difficult, because maybe I could stop driving a car, but I like my car, you know things like that. (Respondent 2#)

One participant used a metaphorical example from his own personal experience in order to explain a likely cause of motivation for a societal shift in environmental behavior, suggesting the need for a shock or extreme event such as were seen in the film:

> . . . but I used to drive quite fast until I had a very bad crash, since then I have driven a lot more sensibly and I think that it might take something quite massive like . . . to get people to realise, you know, bring it on, do it now rather than let there be something catastrophic . . . or at least a bit harsh, but at least if there is something that humans can do it is going to take something massive, like that film to change people's minds. So whatever that word is . . . a lesson to be learnt, or bring it on, that's what I say. (Respondent 10#)

6. Discussion

Trust

Some important factors can be identified from our analysis. The first concerns the issue of trust in sources of information. "Who" is giving the information is important to the public. A number of respondents and focus group participants explained that if the film had been made by a more authoritative, trusted group, then the message would have been interpreted differently. The expectations (in terms of type and delivery of information/entertainment) of a Hollywood produced film are different to those of a BBC documentary or drama. The BBC appeared to have authority and legitimacy—in fact in some cases, it was the yardstick viewers used to refer back to and judge the "science" of the film, in trying to recall what they had seen or heard on BBC documentaries, news and radio features.

Disbelief and denial

Second, is the relationship between the portrayal of extreme, unlikely impacts and how this perception of low probability leads to disbelief and in turn to denial. Especially relevant is

the relationship between the communication of severe impact events in a "shock" format and their impact on behavior. Research has shown that people feel overwhelmed by shocking images and, although it heightens their concern, it also reduces their self-efficacy to take action and lessen these events through personal action (Nicholson-Cole, 2004; Petts et al., 2004). The fact that people were more concerned but felt more distanced, less likely to be impacted and confused about what to do reflects that people felt denial and disbelief. "The film sensationalises an important topic and does more harm than good" (quotation from open-ended questionnaire question).

Vicarious experience

Third, there was a widely held perception that the climate is already changing. This was linked to people's own direct experiences of weather-related phenomena, and also to recognition of worldwide climate events. This too is backed up by other studies (Palutikof et al., 2004) which indicate that there is an internalization of climate change, that people have identified evidence of the phenomenon, and verifying sensitivity and awareness of a changing climate. In fact some participants even observed climate change through the insurance market (see Dessai et al., 2004).

Actions and responsibility

Finally, there was also recognition of adaptation and the adaptive capacity of human species. This is manifest in at least two different ways. On one hand, the adaptive capacity of humans can be used as an excuse not to take mitigative action. The idea that humans have been able to cope with huge upheavals in the past, and that we have technology and resources on hand to help us now was expressed by some participants. The difficulty in changing lifestyles and established habits was acknowledged, to the extent that some participants felt that it was hopeless trying to change the behavior of adults and that all efforts should be concentrated on children who could be educated to not be reliant on cars, to be more energy efficient and to generally consume less. On the other hand there was much discussion in the focus groups of the differential capacity of different sectors of society to adapt and of different countries to be able to cope with the impacts of climate change and a moral responsibility to help them. This seemed, in part, to be stimulated by the film's sub-plot on US–Mexico relations and the way in which climate change turned the tables on the rich versus poor country relationship.

Our results revealed that people do link the issue of climate change more broadly to North–South development debates and to processes of globalization. There was recognition that even if "we"—the rich, in the North—can cope with the impacts of climate change, then poorer people in other countries may not be able to. So, the differential vulnerabilities were accepted and the views expressed were not wholly self-centered or parochial, although ultimately people disagreed with whom the responsibility should lie and articulated some of the complexities inherent in successfully addressing such a pervasive and global phenomenon.

Science fact or science fiction?

Demographic information obtained in our survey shows that the cinemagoers involved represented a mainly young and diverse proportion of the Norwich population, suggesting that *if* this medium (film) *does* have the ability to affect perceptions and behavior, it provides

access to a social group often displaying apathy towards environmental issues of civic or global concern. *The Day After Tomorrow* heightened viewers' awareness and sensitivity to climate change to varying degrees and lengths of time. Several focus group participants pointed to the fact that the film broadened their perceptions of what climate change means. Rather than consider just the typical responses of polar melting and increased storminess, respondents appeared to recognize the multiple dimensions of climate change, including the changing nature of the seasons, and the potential for regional cooling. Furthermore, the film's political and social elements of climate change, as portrayed in the migration of North Americans over the border into Mexico, for example, were cited by several participants as issues that they had hitherto not considered. This indicates not only an increase in awareness of climate change (albeit fairly short-lived), but an advancement in individual understanding of the scientific and political complexities, and potential social impacts, associated with future climate change.

Whilst *The Day After Tomorrow* did increase awareness of the variety of potential effects of climate change, there was uncertainty about the likelihood of such events actually occurring. For some focus group participants the idea of potential cooling seemed para-doxical to a phenomenon commonly known as "global warming," and greater incredulity was expressed with regard to the rate of change portrayed in the film. Although most viewers recognized that these extreme impacts were highly unlikely, they were unsure about the envelope of possibility, or which impacts were more likely than others and the boundaries of future climate realities. This added to the general anxiety expressed by some viewers about destructive human activities, as articulated in the focus groups and reflected by the changes in levels of concern about a number of environmental risks identified by the survey (Figure 2).

Respondents' doubts over the likelihood of the events portrayed in the film reflect a wider recurring theme about the credibility of the film. Thus, Kirby's (2003) assertion that audiences accept scientifically mediated science fiction as science fact cannot be upheld in this instance. Focus group participants were acutely aware of the dramatization in a film typical of the "disaster" genre. The realistic way in which phenomena were depicted in the film (through the use of high quality special effects) appears to have created difficulties for respondents in determining where the accepted scientific evidence ended and the fiction began. That said, the film's special effects do appear to have aided the visualization of scientific data and information for some and, for many participants, the force of this imagery was sufficient to heighten their concern about the potential impacts of climate change after seeing the film. Issues of credibility reduced the overall impact of the film, with feelings of distance heightened by the predominance of US-based iconography. As a communication medium, *The Day After Tomorrow* seems to have been trusted to a lesser extent than other platforms, for example, news media and "high brow" documentaries.

Taking action

The findings from this study have implications for the development of effective policy on climate change mitigation. As Bostrom et al. (1994) state: "In order to educate the citizenry, we must start by educating ourselves about what they already know and believe and how it differs from what they need to know in order to make effective decisions" (p. 959). Thus, our understanding of public reactions to *The Day After Tomorrow* suggests a more motivated public, aware of the problem of climate change, but unclear as to its causes and effects and

the ways individuals and groups may be directly affected and may in turn act to combat the effects.

In many ways these findings resonate with those of earlier studies (Bord et al., 1998; Kempton et al., 1995; Bostrom et al., 1994 and many others, see section 2) which found a moderate baseline concern for climate change among a public whose interest and motivation could be heightened temporarily by either direct experience of climate extremes or other events capturing the public imagination, for example government speeches, media coverage, major Hollywood films. Surveys on environmental issues may generate socially desirable responses with interviewees tending to overstate their concern (Sterngold et al., 1994). This is supported by the observation that while the majority may indicate a concern for climate change, other issues frequently take precedence when juxtaposed against climate change (Seacrest et al., 2000; Poortinga and Pidgeon, 2003). In addition, individuals' character-izations of climate change have been found to "fluctuate according to the individual's opinions on a particular issue at a certain point in time" (Lorenzoni, 2003: 46). However, capturing and sustaining the concern and interest expressed by the lay public is necessary before concrete action to mitigate climate change can be taken. As articulated by one focus group participant, "I think that we can educate people but that doesn't necessarily mean that people will take a responsibility" (Respondent 7#).

In order to effect action, the nature of barriers to societal and behavioral change needs to be considered and catalysts to action identified. For behavior toward climate change to alter there is a need for a reorganization of knowledge, changing social identification e.g. fashion (the way in which people perceive themselves), an appeal to self-image and the enablement of constructive adaptation (Stoll-Kleemann et al., 2001).

7. Conclusion

The Day After Tomorrow is a Hollywood disaster blockbuster that raised awareness of climate change and triggered anxiety among some viewers about the possible impacts as well as about other environmental risks. A key finding was that Norwich viewers generally recognized the film as fiction and not as science. Whilst many pundits expressed fears about the negative effect of such a fantasy-led portrayal, our findings suggest that some viewers made links with existing understandings and factual information on climate change. This led many to conclude that, with such great uncertainty surrounding climate change and its impacts, it was not possible to completely rule out the events portrayed in the film.

A critical finding is that some viewers of the film expressed strong motivation to act on climate change; more so than prior to seeing the film. In fact, only a very small percentage (less than 5 percent) of our sample believed that there was no point in taking action. This was strongly related to "who" or "what" they felt was responsible for the problem itself. However, our analysis shows that although strongly motivated, people require specific guidance and support on what they can do to mitigate climate change. For example, although people are aware that transport is a major source of greenhouse gas emissions, the incentives for individuals to adopt different forms of transport do not generally promote mitigating behavior. Overall, the film, like government policy, sends mixed messages and, although it can be said to have sensitized viewers and perhaps motivated them to act on climate change, the individuals who participated in this study do not feel they have access to information on what action they can take or the opportunity in their daily lives to individually or collectively implement change.

This finding has implications for climate policy and provision of public information. If stark images and words are to be used to inform the public and communicate risks associated with climate change, it is important to capitalize upon public reactions. As our study has shown, the effects upon the public psyche may be brief and quickly overtaken by more pressing day-to-day issues and we know that some forms of communication eclipse others in their ability to produce vicarious experiences (Bostrom, 2003). Thus, a more focused message in response to major news items and attention grabbing headlines is necessary. By understanding the characteristics of risk information, knowing what is important within that information and conveying these messages through the media of choice, a more efficient and effective use can be made of communication tools, either planned or opportune. Of equal importance, however, are systems to implement change following a successful communication strategy.

A set of strategies to build on communication research, that utilize information processing and emotional and cognitive responses to risk information, is proposed by Moser and Dilling (2004: 41). Among their suggestions is the use of relevant opportunities as "teachable moments," creating the institutional capacity, through careful relationship building, to comment on climatic disasters or news events, e.g. major scientific findings, in a way that does not overstep scientific credibility and that links in meaningful ways with people's lives and concerns.

We suggest, as a communication measure, acceptance that within society multiple publics exist with different views, perceptions and needs. Groups to which films such as *The Day After Tomorrow* provide the greatest advancement in individual understanding and therefore concern (termed by Boutilier (1998) as "belief revision" and "belief update") should be identified—these may, for example, consist of those least knowledgeable about the wider issues or those most passionate about the subject (Huddy and Gunnthorsdottir, 2000). This may, in turn, result in the identification of "discourse coalitions" (Bray and Shackley, 2004) to whom "teachable moments" may be directed via media more acceptable and legitimate to their mental models (see also Bostrom, 2003).

Our findings suggest that the intangible large-scale effects of climate change which are so often reported to the public become "real" only when put in more local terms, with the public often only associating climate change with environmental measures such as recycling. Our understanding of the cycle of blame and people's detachment from the causal influences of climate change should also be further investigated in order to formulate more effective policy responses to the climate change problem and effect the necessary transformations in human behavior.

Notes

1 It was hoped that this action would enable the elicitation of information from a wide range of social and economic backgrounds. Data depicting the representativeness of a typical cinema audience are not available.
2 It should be considered that a certain amount of "self-selection" may have occurred among the focus group respondents, suggesting that those individuals most willing to attend may have had an existing interest in environmental matters and were therefore more likely to be motivated to action. However, we consider that such views are not apparent among the respondents.

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