Are flood victims more concerned about climate change than other people? The role of direct experience in risk perception and behavioural response

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Acknowledgements

This paper is based on PhD research funded by the University of Bath, UK. Grateful thanks go to David Gooding, Alan Lewis, Nick Pidgeon, Matthew Peacock and the three anonymous reviewers of an earlier version of this paper for their advice and comments; and to the interviewees and survey respondents who so kindly gave their time to make this research possible.

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ABSTRACT

Climate change is a threat to human health and life, both now and in the future. Despite this, studies show that publics typically do not consider the issue a priority concern or a direct, personal threat. Furthermore, few are taking any preventive or protective action. Previous studies identify direct experience as a major influence on risk perception, learning and action. Drawing on such evidence, this paper focuses on the intangibility of climate change as a key impediment to personal engagement and explores whether relevant experiences of flooding and air pollution influence individuals' knowledge, attitudes, risk perception and behavioural responses to climate change. Perhaps surprisingly, interviews and a survey conducted in the south of England indicate flood victims differ very little from other participants in their understanding of and responses to climate change, but that experience of air pollution does significantly affect perceptions of and behavioural responses to climate change. Air pollution victims are no more likely to cite pollution as a cause of climate change than non-victims; but they do have higher pro-environmental values. Respondents with these values are significantly more likely to consider climate change a salient risk and to take action in response to it. Therefore the relationship between air pollution experience and responses to climate change may be indirect and mediated by environmental values. The paper concludes by highlighting implications of this research for developing climate change policies and strategies for public engagement.

KEYWORDS

Climate change, risk perception, experience, flooding, air pollution

INTRODUCTION

Mounting scientific evidence suggests climate change[i] is a significant threat both to humans and to the wider environment. Although there may be some benefits, most studies suggest impacts – such as increasingly extreme weather events, rising sea levels, flooding and droughts – will threaten human health and life (IPCC, 2001a). Whilst developing countries may be more vulnerable to climate change, many severe impacts are likely to be experienced in Europe (Giorgi, 2006). Furthermore, the threat of climate change is not only a future risk. Recent biological and climatic trends suggest human-induced climate change is already threatening both human and non-human life (e.g., Parmesan and Yohe, 2003). In the UK, for example, both temperatures and periods of intense daily rainfall have been increasing over the past century, with recent flooding affecting many areas which have never been threatened before (Environment Agency, 2001b).

Yet, despite these warning signs, survey research indicates that climate change is not a priority concern for the public. In 2001, the English public rated climate change as a less concerning environmental issue than hazardous waste disposal, livestock methods/BSE, water and air pollution, loss of UK plants/animals, tropical forest destruction, and ozone depletion (DEFRA, 2002). Although concern about climate change is increasing (GlobeScan, 2006), within the UK the issue remains less pressing than air pollution and impacts of chemicals on health (Eurobarometer, 2005). Furthermore, surveys in Europe and the US repeatedly show that economic and social issues as more pressing concerns for the public than any environmental issue (Bord et al., 2000; Poortinga and Pidgeon, 2003; Eurobarometer, 2005).

Similarly, few people perceive climate change as a direct and personal risk. While a majority in England accepts that climate change is beginning to manifest in changing weather and increased flooding (DEFRA, 2002), there persists a prevailing belief that climate change is essentially a distant and future problem. One survey found 85% of UK residents believe the effects of climate change will not been seen for decades (Energy Savings Trust, 2004). In another, less than half (47%) the British

population said they thought the UK will be affected "a lot" by climate change, while over half (52%) believed climate change will have little or no effect on them personally (BBC, 2004). A similar picture emerges in other countries (Dunlap, 1998). In the US, for example, a minority of the public considers climate change a personal threat, and only a small majority even acknowledges it as a long-term threat to society (Bord et al., 2000; NSB, 2002). Worse, a substantial minority of the public in the UK and US are sceptical about whether climate change is even a real phenomenon (Lorenzoni et al., 2006; Whitmarsh, in press) and many others are ambivalent about climate change: the largest proportion of the British public rate the risk as "neither acceptable nor unacceptable" (Poortinga and Pidgeon, 2003). Although the latest polls suggests scepticism about climate change is declining (GlobeScan, 2006), ambivalence is still commonplace (Poortinga et al., 2006).

It is hardly surprising, then, that behavioural response to climate change – including prevention and protection – has been limited. Only a minority of the British public take any energy conservation measures which would reduce greenhouse gas emissions. For example, around a third of the public regularly buys energy-efficient light bulbs (DEFRA, 2002; Norton and Leaman, 2004) and only 42% claim to cut down on car use (DEFRA, 2002; Poortinga and Pidgeon, 2003). Government data shows energy consumption in the UK is still rising, particularly for transport (DTI, 2006). Whilst no research has so far examined the extent of protective actions taken in response to climate change, Environment Agency (2002) research shows only 5% people in the UK take any action (e.g., erecting sandbags or flood boards, moving valuables to higher ground, turning off power supply), to prepare for floods.

The literature on public perceptions of climate change highlights various individual and social barriers to public engagement with it as a risk issue (Lorenzoni et al., in press). This paper focuses on the intangibility of climate change as a key impediment to accepting the issue as a personal risk and taking any responsive action. Climate change is a risk "buried" in familiar natural processes such as temperature change and weather fluctuations (Ungar, 2000), and has low salience as a risk issue because it cannot be directly experienced. Since humans are accustomed to considerable weather and temperature variation on a daily and seasonal basis they underestimate the effects of a predicted rise in

global temperatures of a few degrees (Berk and Schulman, 1995; Kempton, 1991). However, in contrast to climate impacts, "climate" itself is not directly observable, since it refers to the average weather over a period of time and climate change is "only really knowable through mathematical models" and scientific measurement (Kollmuss and Agyeman, 2002, p.253).

Importantly, there remain major gaps in scientific understanding of the issue (Houghton, 2004), in particular about regional impacts (IPCC, 2001c), meaning the risks posed by climate change to individuals are ill-defined. Furthermore, reliance on second-hand information about the reality and severity of the risk of climate change means the risk is defined and interpreted by both the information source and message recipient (Petty and Cacioppo, 1986). Uncertainty about climate change can be exaggerated by the media, which tends to emphasise the scientific and political controversy surrounding the issue (Boykoff and Boykoff, 2004; Corbett and Durfee, 2004; Zehr, 2000), which in turn is used to justify denial and inaction on the part of governments and individuals who feel responding to the issue threatens their values and lifestyles (Stoll-Kleemann et al., 2001).

While the validity and personal relevance of second-hand information is open to question, people more readily trust the evidence of their senses. Thus, while risks are typically under-estimated (Kahneman et al., 1982), the perceived likelihood of a risk increases if it has been experienced or can be readily imagined. This "availability heuristic" means that recent disasters or heavy media coverage are likely to distort perceptions of risk (e.g., Keller et al., 2006). Local risks are similarly likely to seem more important than global risks (e.g., Hinchliffe, 1996). Experience is a filter or heuristic used to evaluate and prioritise the multitude of risks involved in daily life, so for example air pollution information or advice may be ignored if it conflicts with symptoms of asthma or visible signs of pollution (Bickerstaff and Walker, 1999)[ii]. Similarly, those who have directly experienced flooding are more likely to accept that it poses a serious risk (Payne and Pigram, 1981; Hansson et al., 1982; Kates, 1962; de Man and Simpson-Housley, 1988). Knowledge about flooding and how to respond to it has also been found to increase with repeated experiences of flooding (Hansson et al., 1982). In contrast, second-hand sources of information - such as mass media - have been found to have little

influence on perceived flood risk (Gunter and Wober, 1983). Kates (1976) has described this empiricism as the "prison of experience" (p.417).

Experience not only affects how individuals learn about and perceive risks but also their behavioural responses (Baldassare and Katz, 1992; Burton et al., 1978; Laska, 1990). For example, people who believe air pollution constitutes a genuine threat to their health are more likely to take action to protect themselves *and* to prevent air pollution, by using public transport (Evans et al., 1988). This suggests perceived personal threat from environmental risks can lead to action to protect others, as well as oneself. Unfortunately, the evidence for this is not consistent: Skov et al. (1991) found that lung disease sufferers in Copenhagen were somewhat *less* willing than healthy participants to reduce car use during smog episodes (most often this was to protect themselves against exhaust fumes). Similarly, flooding experience does not always lead to behavioural response to flood risk; protective action can also be influenced by factors such as available resources, perceived control, and trust in agencies responsible for managing flood risk (e.g., de Man and Simpson-Housley, 1988; Wong and Zhao, 2001; Burton et al., 1978).

The primacy of direct experience in learning and perception is also well-established in the broader psychological literature (Chawla, 1999; Semper, 1990). Fazio and Zanna (1981) report on a number of studies demonstrating that direct experience (i.e. interaction with attitude object) is more likely than indirect experience to result in stronger, more confident, clearly-focused and persistent attitudes, and in attitude-behaviour consistency. Experience may also motivate people to seek further (second-hand) information to improve their understanding and inform their future responses (Fortner et al., 2000).

Although psychological research highlights the central role played by experiential factors in risk perception, learning and behaviour, these factors have rarely been addressed by research on public understanding and response to climate change. One possible exception is the relationship noted by Bord et al. (2000) between perceptions of air pollution and global warming as threats. The research described in this paper addresses this deficit by exploring perceptions of and responses to climate

change in relation to two types of local experience: flooding and air pollution. Firstly, flooding is expected to be one of the main threats resulting from climate change to communities in the UK (DoH, 2001) and globally (IPCC, 2001a)[iii]. The risk of flooding in the UK is expected to increase by up to 30 times in the next 75 years, costing tens of billions of pounds every year from damage to property (King, 2004). When asked explicitly if recent flooding was due to climate change, two-thirds of the English public agreed, indicating widespread acceptance of the connection between observed flooding and climate change (DEFRA, 2002).

Secondly, experience of air pollution is investigated because of the widespread public conceptual association and possible experiential link between local air pollution and global climate change. Both UK and US publics tend to understand climate change as a form of "air pollution" (Bostrom et al., 1994; Kempton, 1991; Whitmarsh, in press). Hargreaves et al. (2003) found the highest proportion selected "air pollution" from a list of options (72%), while fewer (66%) selected the more specific, technical term "carbon emissions". As mentioned, one study also found that people who perceive air pollution to be a threat are more likely to consider global warming a threat (Bord et al., 2000), perhaps due to conceptual integration of the two issues.

It is therefore hypothesised that people who have experienced flooding or air pollution are more likely to engage with climate change as a risk issue, at cognitive, affective and behavioural levels. In other words, I explore the role of experience in determining knowledge, attitudes, risk perception and behavioural response to climate change. This exploration of the links between local experiences and global risks is an innovative approach to understanding risk perception and environmental behaviour. After describing the methodology and presenting key results, I highlight the implications of this research for developing climate change policies and strategies for public engagement.

METHODOLOGY

Data collection

Data collection for this study comprised two stages. The first involved a series of semi-structured qualitative interviews conducted during 2003. Its aim was to explore how individuals draw on experiences and beliefs about flooding and air pollution in their discussion of climate change. Interviewees (N=24) were recruited from Somerset and Hampshire in southern England, sites selected for their recent history of severe flooding and the willingness of local flood victims to participate in the research. The south of England experienced the worst flooding during autumn 2000, officially the wettest on record for over 270 years, (Environment Agency, 2001b) and its coast is also particularly likely to be endangered by climate change in terms of severe storm impacts and rising sea levels (Wade et al., 1999).

Ten interviewees were male and fourteen female. Twelve had directly experienced groundwater, sewage, or riverine flooding, whilst the remaining twelve had no experience of flooding at all. All but one of the flood victims was recruited through the "National Flood Forum", a non-profit umbrella organisation of local flood action groups. The interviewees without experience of flooding were a heterogeneous, convenience sample recruited through word-of-mouth to ensure participant diversity.

A postal survey drawing on the interview findings was conducted to investigate whether experience of flooding or air pollution significantly affects knowledge, attitudes or behaviour in relation to climate change. Flooding takes various forms and encompasses a range of experiences (Few, 2003). For the purpose of this study, "flooding experience" is defined as experience in the last 5 years of "any form of flood damage (including to your home, garden or vehicle)". This time period was chosen to include those affected by the major flooding of autumn 2000. The measure used for air pollution experience is respondents' own evaluation of health impacts from air pollution[iv]. Whilst this may not reflect the "true" proportion affected by air pollution, knowing its actual health impacts is not necessary for the purposes of this research, which focuses on air pollution as a subjective experience and perceived

threat.

The survey population was restricted to residents of Hampshire due to accessibility of data on past flooding events. The sample included different socio-economic groups within both flood-prone areas, and areas not at risk from flooding; as well as different groups within areas with contrasting levels of exposure to air pollution. The postal questionnaire comprised 8 pages of quantitative and qualitative questions on climate change[v] – addressing awareness, knowledge, perceived threat, attitudes and behavioural response – as well as questions on other environmental concerns, values (as measured by a revised version of the "New Environmental Paradigm" [NEP] scale[vi]) and experience of air pollution and flooding. In total, 1771 questionnaires were distributed during September and October 2003 across 6 wards using stratified random sampling. The survey achieved a response rate of 33% (N=589). A quarter of respondents (25.3%) had experienced flood damage, and a similar proportion (24.4%) claimed their health has been affected by air pollution. Weighting procedures and comparison with census data indicate that the sample can be considered broadly representative (see [reference removed to maintain anonymity] for details).

Data analysis

The interviews and qualitative survey data were analysed using a hierarchical coding procedure (Miles and Huberman, 1984). The qualitative survey data was also quantified and exported to SPSS, which was used to analyse all quantitative data. Chi-square tests were used to determine whether different types of respondents (i.e. flood victims versus non-victims; those affected versus those unaffected by air pollution) gave significantly different responses.

The chi-square tests revealed that experience of air pollution and of flooding were significantly associated with several demographic factors. Respondents affected by air pollution were more likely to be aged 45-64 ($p<0.05$), to hold higher environmental values ($p<0.05$), and to have a vocational science qualification ($p<0.01$). Respondents with experience of flooding were significantly more

likely to vote Liberal Democrat ($p<0.05$), and to be aged 75-84 ($p<0.05$). Whilst chi-square tests can identify significant relationships between two variables (e.g., experience of flooding and concern about climate change), they cannot explore relationships between several variables. Regression analysis was therefore used to determine the relative probabilistic influence of the two experiential variables on participants' responses to climate change compared to demographic variables.

The dependent variables used in the analysis were:

1. *Perceived threat from climate change*: 1 indicates an affirmative response to the question "Do you think climate change is something that is affecting or is going to affect you, personally?" (N=259); 0 indicates a negative or "don't know" response (N=288). The results displayed in Table IVa predict 72.4% of all cases: 67.6% of affirmative cases; and 76.7% of negative and "don't know" cases.
2. *Climate change considered personally "very important"*: Here, 1 indicates selection of the "very important" category for the question "How important is the issue of climate change to you personally?" (N=142); 0 indicates selection of "quite", "not very" and "not at all" responses (N=444). The results displayed in Table IVb predict 78.2% of all cases: 23.2% of "very important" responses; and 95.7% of other responses.
3. *Belief that anthropogenic climate change is real*: This analysis is based on an "Uncertainty Scale" (alpha=0.66) derived from the attitudinal statements relating to uncertainty and scepticism (see Table II). Here, 1 indicates the lowest quartile scores on this scale (i.e. respondents who are most convinced that anthropogenic climate change is real) (N=130); 0 indicates higher scores (N=458). The results displayed in Table Va predict 77.9% of all cases: 20.8% of lowest quartile scorers; and 94.1% of other cases.
4. *Action taken out of concern for climate change*: Here, 1 identifies those respondents who answered "yes" to the question "Have you ever taken, or do you regularly take, any action out of concern for climate change?"(N=185); 0 indicates "no" and "don't know" responses (N=403). The results displayed in Table Vb predict 72.1% of all cases: 35.1% of "yes" responses and 89.1% of other responses.

Since the dependent variables are dichotomous, logistic regression is the most appropriate method of analysis (Field, 2000). This method has been widely used in large-scale attitude surveys, such as the British Social Attitudes Survey (Christie and Jarvis, 2001). All variables to be included in the binary logistic regression were recoded into dichotomous variables (1 or 0) to facilitate interpretation of the results. Variables with the largest regression coefficients can then be said to have the greatest influence in predicting the dependent variable.

RESULTS

In this section, findings from the interview and survey stages are discussed together to elucidate the role played by experiential factors in knowledge, beliefs, attitudes, issue importance, risk perceptions, and behaviour in relation to climate change.

-[Insert Tables I-V about here]-

Threat from air pollution as an influence on climate change perceptions and responses

Knowledge and beliefs about climate change

Chi-square analysis shows respondents whose health has been affected by air pollution are generally more informed about climate change. Table I suggests this group is more likely than those who do not feel they are affected by air pollution to say they have heard about climate change via the Internet, public libraries, or formal education. Table II indicates that this group tends to look at information about climate change. On the other hand, those *unaffected* by air pollution are more likely to hear about climate change from television. We can surmise that those affected by air pollution have a greater personal or professional interest[vii] in climate change, since they do not rely on passive media sources for information, but instead appear to actively seek out information on the issue.

Experience of air pollution is also significantly related to the belief that climate change is real and is caused by human activities. When asked about the causes of climate change, this group was less likely to express uncertainty; and more likely to refer to overuse or misuse of the Earth's resources. Responses to the attitude statements also reveal that those affected by air pollution are more convinced of the reality of anthropogenic climate change, and tend to link recent flooding with climate change (see Table II). The regression results (see Table Va) similarly indicate that those affected by air pollution are amongst the least likely to doubt the reality of anthropogenic climate change.

Consistent with their acceptance of climate change as an anthropogenic problem, those affected by air pollution are also significantly more likely to believe the issue can be tackled by action on an individual and societal level. When asked if anything can be done to tackle climate change, 77.8% of respondents affected by air pollution said something could be done, compared to 60% of those unaffected. When asked how it could be tackled, this group was more likely to cite international action (see Table I). Responses to the attitude statements (see Table II) reveal that a higher proportion of those affected by air pollution considers there is a need for more action by government, industry and wider society, but also accepts personal responsibility for climate change. However, they are no more likely to agree that "leaving the lights on in my home adds to climate change".

Attitudes, issue importance, and perceived risk in relation to climate change

In general, climate change appears to be a more salient issue for respondents affected by air pollution than those unaffected by air pollution. Respondents whose health has been affected by air pollution are more likely to consider the issue interesting (see Table II) and personally "very important" (Table IVb). This group tends to be more pessimistic about the impacts of climate change in general. When specifically asked "What impacts, if any, do you think climate change may have?", those affected by air pollution were significantly more likely to describe catastrophic scenarios, such as global destruction (Table I). Similarly, the attitudinal survey responses highlight a prevalent belief amongst this group that climate change will result in catastrophe, and is frightening (see Table II).

Both the chi-square and regression analyses reveal that experience of air pollution increases perceptions of climate change as a personal risk issue. In fact, respondents affected by air pollution are nearly four times as likely to believe they are being, or will be, affected by climate change, as those unaffected (see Table IVa).

Behaviour in response to climate change

The questionnaire asked two sets of behavioural questions: one addressed actions taken out of concern for climate change; the other asked about a range of environmentally-relevant behaviours, including energy conservation. As shown in Table III, a significantly higher proportion of those affected by air pollution (39.6%) compared to those unaffected (28.8%) said they take, or have taken, action specifically out of concern for climate change. When asked what actions they take out of concern for climate change, those affected by air pollution were more likely to mention indirect (e.g., political, consumer) action. Furthermore, this group is more likely to regularly walk or cycle to work, use public transport, buy energy efficient light bulbs, and take part in environmental campaigns (see Table III). Often these actions are motivated, at least in part, by environmental concern.

Conceptualising the link between air pollution and climate change

In general, this research and other studies (e.g., Hargreaves et al., 2003) have highlighted the conceptual link between air pollution and climate change amongst the public. When asked about the causes of climate change, the most popular response given by survey respondents in this study was pollution; similarly, when asked about ways of tackling climate change, reducing pollution was the most popular response (see Table I). The following extracts show how interviewees referred to air pollution in explaining climate change:

> "I suppose there's the production from cars, isn't there, car fumes which can cause it, I understand, and just generally the atmosphere can get hotter from the amount of pollutants from industry as well…. And is it that if, um, the rain forests are removed and that the plants, um, they produce oxygen don't they, and they take in carbon- carbon dioxide, produce oxygen. So, um, if there's less rainforest then the actual um sort of earth's sort of breathing mechanism through plants is

going to be affected..." [Male, social care inspector; emphases added]

"I am sure that the weather changes are, in part, created by our pollution, and I have a fairly firm belief that there could well be upper atmosphere changes triggered by all the things we send into space as well… The impacts will be made, on the processes of life… And I don't know what-what the effect is upon the air that we breathe and how it would actually effect us directly." [Female, retired teacher; emphases added]

In the former extract the analogy of the rainforest as a "breathing mechanism" is connected to the idea that "fumes" and air "pollutants" contribute to climate change. The latter extract extends the connection with pollution beyond the causes of climate change to its impacts on air quality (cf. Kempton, 1991, 1997). These examples reveal the ways in which people's understanding of familiar (experienced) processes, like breathing and air pollution, is applied to understand unfamiliar phenomena, like climate change.

As noted above, there is greater recognition of the human influence on the environment amongst those affected by air pollution than those unaffected. Yet air pollution victims are not significantly more likely to cite pollution as a cause of climate change in response to either the general question about climate change or the specific question about causes (see Table I).

Experience of flooding as an influence on climate change perceptions and responses

Knowledge and beliefs about climate change

Compared to respondents with experience of air pollution, the survey found less variation between flood victims' and non-victims' knowledge and perceptions of climate change. In relation to information sources, the survey indicated only one significant difference between flood victims and non-victims. Around a quarter (24.2%) of respondents with flooding experience said they hear about climate change from journals, compared to only 16.8% of those without flooding experience (Table I). Furthermore, flood victims were more likely than non-victims to agree that they tend to look at climate

change information when they come across it (see Table II).

When asked about the impacts of climate change, flood victims were no more likely to mention flooding in their response. Flood victims and non-victims did not significantly differ in their responses to the attitude statements about uncertainty and scepticism in relation to climate change (Tables II, Va). However, flood victims do seem to believe that flooding is increasing, as indicated by their significantly lower agreement with the statement "Flooding is not increasing, there is just more reporting of it in the media these days". Yet, flood victims are less likely to say the effects of climate change will be catastrophic (see Table II).

When asked whether they thought anything could be done to tackle climate change, again flood victims and non-victims did not differ significantly in their responses (Table I). Similarly, there are few differences in the responses of flood victims, compared to non-victims, to the attitude statements regarding responsibility for tackling climate change (Table II).

Attitudes, issue importance, and perceived risk in relation to climate change

Respondents with experience of flooding are more likely to consider climate change to be personally "very important", compared to those without flooding experience (Table IVb). However, their reasons for considering it an important issue do not significantly differ from those of other respondents. When asked if they feel climate change does or will affect them, flood victims in this research were no more likely than non-victims to say yes (Table IVa). However, when asked why they consider they are or will be affected, two-fifths of flood victims cited flooding as a reason, compared to only 9% of the remaining respondents.

Behaviour in response to climate change

There is no significant difference in the proportions of flood victims and non-victims who claim to take any action out of concern for climate change. There are also few differences between these two groups in the regularity of, or motivation for, their environmentally-relevant behaviours, although

flood victims are more likely to regularly use public transport and to take part in environmental campaigns (and to do so out of environmental concern) than non-victims (see Table III).

Conceptualising the link between flooding and climate change

The interview data reveal that flooding and climate change are viewed by flood victims as largely distinct issues. Flood victims tended to identify a number of *local observable* causes for flooding, such as road widening and resurfacing, lack of maintenance of watercourses, removal of hedges, local development, pumping station repairs, and so on. Increased rainfall (though not necessarily from anthropogenic climate change) was felt to be a contributing factor. Indeed, flood victims were often as sceptical as non-victims about the reality and causes of climate change:

> "The actual cause in the change in the weather, I have suspended- that's not an argument that is possible to influence. The experts are all divided on that." [Male, retired]

There was scepticism amongst the interviewees unaffected by flooding, about whether increasing weather-related problems could be attributed to climate change. Several felt ubiquitous media contributed to the impression of worsening weather or increased flooding:

> "I think that's all it is, I think it's more media coverage". [Female, housewife]

> "I don't know if it's only because the news gives us more information now than it did ten, twenty years ago. Maybe [floods] were still happening then, but I didn't come across them". [Female, retired teacher]

Consistent with the views of flood victims, a few non-victims also pointed out that other factors, such as building on floodplains, could explain increased flooding. As one interviewee pointed out, with flooding "we haven't made scientific links to global warming".

When asked if they were concerned about climate change, two flood victims replied:

"No. I shall be dead before it really comes to fruition. You might have problems, but I shan't". [Female, artist]

"Well, no, no. 'Cause I shall try and move! [laughs] Blow you, I shall be alright… hopefully!" [Female, retired]

This reflects a widespread belief amongst the general public, evident in this research and other studies (e.g., Lorenzoni et al., 2006; Lorenzoni et al., in press), that climate change is an uncertain and distant problem rather than a direct, personal risk. By contrast, flood victims see flooding as an immediate and pressing problem demanding attention in its own right. Once a flood alleviation scheme is implemented (or they move away from the flood risk area), they will no longer be affected by flooding. Since climate change is considered a long-term issue by most interviewees, it seems many flood victims feel future projections of worsening flooding will not affect them.

Demographic variables and environmental values as influences on climate change perceptions and responses

The regression analyses (Tables V and VI) reveal that experiential variables are not always the most significant predictors of perceptions of and responses to climate change. For all four dependent variables, environmental values have a strong and positive predictive influence. In other words, respondents who believe the environment is delicate, resources are limited, and non-human life has intrinsic value are more likely to believe anthropogenic climate change is real, to consider it personally very important and threatening, and to be taking action in response to it. In fact, environmental values are the strongest predictor of personal importance, belief, and action; experience is only a more salient influence in the case of perceived threat from climate change.

Age has a negative (partially-significant) influence on perceived threat from climate change, perhaps reflecting the widespread assumption that climate change is a future risk. Income has a positive (partially-significant) influence on perceived threat from climate change. Non-voters are significantly

less likely to consider it a personal threat or to take action out of concern for it. Tabloid readers are also significantly less likely than non-readers to take any action out of concern for climate change, perhaps reflecting the lack of coverage in this media (Hargreaves et al., 2003).

DISCUSSION AND CONCLUSIONS

Drawing on evidence from previous studies of risk perception and environmental behaviour identifying direct experience of risks as a major influence on perception, learning and action, this research has examined the role of experiential factors in understanding and responding to climate change. Climate change itself cannot be directly experienced but its impacts can. It was therefore hypothesised that experience of flooding – the most widespread impact from climate change – would influence understanding and response to climate change.

Contrary to expectations, the research found that flood victims differ very little from other participants in their understanding of and response to climate change. This was clear from both the interview data and survey responses. Although flood victims are more likely to feel that climate change is an issue of personal importance, they are no more knowledgeable, concerned or active in relation to climate change than people without flooding experience. Even flood victims who cited climate change as an issue of personal importance in the survey were no more likely than other people to attribute this to increased flooding from climate change. Furthermore, flood victims are no more likely to mention flooding as a consequence of climate change than other groups. Interestingly, when asked what actions they were taking out of concern for climate change, nobody explicitly mentioned strategies to adapt to those changes.

Evidently flood victims view climate change and flooding as largely *separate issues*. While this may initially seem rather surprising, and even short-sighted on the part of flood victims, the interview data and previous risk perception research provide some explanation for this. It was clear from the

interviews ([reference removed to maintain anonymity]) that direct experience of flooding is central in accepting that *flooding* poses a genuine personal risk (cf. Kates, 1962; Keller et al., 2006). In contrast, second-hand information about flood risk was found not to produce these changes in attitudes and behaviour. Furthermore, personal observation was evidently the most trusted source of information on the causes of flooding. So, blocked ditches and drains, road resurfacing and local development were considered the primary causes of local flooding, with "changing weather patterns" only indirectly contributing to flood risk. These findings demonstrate the primary role played by personal experience and observation in risk perception and response that has consistently appeared in previous research.

Yet experience of flooding does not "prove" human-induced *climate change* is real or threatening in the way that it proves the risk from *flooding* is real. Flood victims rely principally on second-hand information about climate change and the reasons for changing weather patterns just as the rest of the non-expert public do. As discussed earlier, climate change is characterised by complexity and uncertainty and public perceptions of the issue reflect this. Furthermore, the focus of attention amongst policy-makers in responding to climate change has been on mitigating the risk, rather than adapting to climate impacts (DEFRA, 2006). This may contribute to low salience of adaptive strategies amongst respondents ([reference removed to maintain anonymity]).

It is quite understandable that flood victims focus on the immediate and pressing issue of their own flooding problem through individual or community action. Once a flood defence scheme has been implemented, residents may be at no greater risk from climate change than people living in areas with no risk of flooding. Thus, while individuals and communities can act effectively to reduce flood risk, personal action to mitigate climate change could not produce any such tangible, local gain. In sum, there remain major barriers to the public responding to climate change (Lorenzoni et al., in press), irrespective of relevant experience.

While flooding experience appears to have little impact on perceptions of and response to climate change, this study has found that experience of air pollution is significantly more influential in this

respect. Respondents whose health has been affected by air pollution are more likely to see climate change as a salient risk issue for them and are more pessimistic about the impacts of climate change. Bord et al. (2000) similarly noted a significant relationship between perceived risk from air pollution and perceived risk from global warming. Experience of air pollution is also related to the belief that climate change is caused by human activities and, accordingly, that it can be tackled by action on an individual and societal level. Finally, those affected by air pollution are significantly more likely to take environmentally-relevant actions and action specifically out of concern for climate change.

What might be the reason for this relationship between air pollution experience and climate change response? Since air pollution is commonly understood as the main cause of climate change (Table I; cf. Hargreaves et al., 2003; Kempton, 1991), it may be that experience of local pollution enables people to more readily accept – and mitigate – the risks associated with climate change. Perhaps the benefits from climate change mitigation are considered to be the same as those from action to reduce pollution. The temporal characteristics of flooding and air pollution might also be relevant: flooding, as an intermittent problem, may be a less persistent reminder than air pollution of the problem of climate change. However, this study found that air pollution victims are no more likely to cite pollution as a cause of climate change than non-victims. This appears to undermine the proposition that there is a conscious, rational link between air pollution and climate change mitigation.

Instead, the analysis has revealed that air pollution victims have higher pro-environmental values, and that respondents with these values are significantly more likely to consider climate change a salient risk issue and to take action in response to it. It may be that the relationship between air pollution experience and response to climate change is indirect, mediated by environmental values. Further research should explore this hypothesis.

The implications of these findings for policy-making and communication of climate change are three-fold. Firstly, attempting to communicate climate change risks with reference to increased flooding is likely to be ineffective where audiences differ from communicators in their view on the causes of

flooding and do not trust the institutions communicating or managing these risks. Flood victims and non-victims alike are sceptical about whether climate change is a primary cause of flooding. It is significant that flood victims readily identified blame for flooding locally, and often within the context of localised political decision-making, while politicians more often emphasise the global environmental context of flooding. For example, Deputy Prime Minister John Prescott called the Autumn 2000 flooding "a wake-up call to the impacts of climate change" (Environment Agency, 2001b, p.i). The absence of a shared view of the responsibility for flooding may undermine the credibility of official information which emphasises the connection between flooding and climate change.

Secondly, the findings indicate a need to foster environmental values – or environmental "citizenship" (Dobson, 2003) – to encourage response to global environmental issues like climate change. Concern for personal welfare is a powerful motivation for responding to immediate and tangible risks (Macnaghten, 2003). Yet, where the risk is apparently greater for other people or species, individuals tend to act if they value these threatened groups and consider they have some responsibility for helping them (Stern et al., 1993). Changing values and fostering responsibility for environmental damage could be considered as a long-term, structural response to climate change.

Thirdly, the findings discussed here suggest that public response to climate change will most effectively be achieved through schemes that demonstrate the efficacy of action and result in tangible local benefits (cf. Eden, 1993). Although awareness and concern about climate change is increasing (GlobeScan, 2006), willingness to take action remains limited (Eurobarometer, 2005). The flood victims who participated in this research had made significant personal sacrifices in terms of time, effort, and money to tackle flooding because it is posed an immediate and pressing threat that they could directly mitigate through personal or community efforts. Tackling climate change requires major changes to societal structures and values (Lorenzoni et al., in press) but may also be encouraged through community engagement in developing solutions that produce local benefits (IPCC, 2001b). Improvements in air quality may be one such local benefit to reducing emissions that could be

highlighted by climate change communicators, which in turn builds on the widespread conceptual association of air pollution and climate change.

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Table I. Variation in responses to questions about knowledge and beliefs about climate change according to experience of air pollution and flooding (chi-square results) (N=589)

Survey question	**Response categories** (pre-defined or coded)	**Affected by air pollution**	**Not affected by air pollution**	**Exper. of flooding**	**No exper. of flooding**
Where have you heard about climate change?	Television	87.5%*	92.8%*	95.3%	90.2%
	Radio	66.7%	65.4%	71.8%	63.6%
	Newspaper	81.9%	86.1%	86.6%	84.5%
	Friends/ family	37.5%	36.0%	38.9%	35.5%
	Energy suppliers	21.5%	20.2%	18.1%	21.4%
	Government agencies/ info.	25.0%	21.6%	22.8%	22.3%
	Local council	13.2%	11.9%	11.4%	12.5%
	Environmental groups	34.7%	34.2%	33.6%	34.5%
	Specialist publ./acad. journals	27.1%**	16.0%**	24.2%*	16.8%*
	Internet	18.1%*	11.7%*	14.1%	13.0%
	School/ college/ university	27.8%*	18.7%*	20.8%	20.9%
	Public libraries	11.1%*	5.8%*	6.0%	7.5%
What do you think causes climate change? †	1. pollution	22.9%	22.7%	21.5%	23.2%
	2. ozone layer depletion	15.3%	15.5%	15.4%	15.5%
	3. cars/traffic/exhaust fumes	13.2%	10.3%	10.1%	11.4%
	uncertainty	2.8%*	7.6%*	6.7%	6.4%
	overuse/misuse of earth's resources	11.1%***	3.4%***	4.0%	5.7%
What impacts, if any, do you think climate change may have? †	1. changes/extremes in weather	24.3%	22.0%	25.5%	21.6%
	2. flooding	21.5%	21.6%	22.1%	21.4%
	3. sea level rise/loss of land	15.30%*	23.1%*	20.8%	21.4%
	catastrophe/global destruction	10.4%***	3.1%***	7.4%	4.1%
Do you think anything can be done to tackle climate change?	Yes	77.8%***	60.0%***	62.4%	65.0%
	No/ Don't know	22.2%***	40.0%***	37.6%	35.0%
If yes, what do you think can be done to tackle climate change? †	1. reduce pollution/emissions	18.8%	18.7%	12.8%*	20.7%*
	2. international action	16.0%*	9.9%*	9.4%	12.0%
	3. government action	9.7%	7.6%	7.4%	8.4%

* $p<0.05$ **$p<0.01$ ***$p<0.001$

† Responses listed are coded from qualitative data; three most common responses and any other responses where there is significant variation between experience variables are given

Table II. Variation in responses to attitude statements according to experience of air pollution and flooding (chi-square results) (N=589)

Attitude statement	Total agreement			
	Affected by air pollution	**Not affected by air pollution**	**Exper. of flooding**	**No exper. of flooding**
I tend to consider information about climate change to be irrelevant to me	6.9%*	8.3%*	5.8%	8.7%
If I come across information about climate change I will tend to look at it	79.4%	74.6%	81.3%*	73.9%*
Leaving the lights on in my home adds to climate change	55.9%	54.6%	46.7%	57.6%
Human activities have no significant impact on global temperatures	4.4%**	8.2%**	10.2%	6.3%
We can all do our bit to reduce the effects of climate change	92.6%**	80.3%**	80.9%	84.1%
Nothing I do makes any difference to climate change one way or another	7.4%*	10%*	8.8%	9.5%
People should be made to reduce their energy consumption if it reduces climate change	86.7%*	79%*	82.6%	80.4%
Radical changes to society are needed to tackle climate change	88%***	66.7%***	73%	71.7%
There is no point in me doing anything about climate change because no-one else is	4.6%**	7.1%**	7.3%	6.1%
Nothing I do on a daily basis contributes to the problem of climate change	6%***	11%***	11.8%	9.1%
Industry and business should be doing more to tackle climate change	94.8%*	83.7%*	85.4%	86.8%
The government is not doing enough to tackle climate change	80.5%**	64.6%**	68.3%*	68.5%*
It is already too late to do anything about climate change	5.9%*	8%*	8.6%	7.1%
I feel a moral duty to do something about climate change	72.4%***	57.8%***	62.3%*	61.2%*
Uncertainty scale:				
Climate change is something that frightens me	53.4%***	28.4%***	36.7%	33.9%
The effects of climate change are likely to be catastrophic	66.2%***	43.8%***	44.5%*	51%*
Claims that human activities are changing the climate are exaggerated	8.8%***	17%***	15.9%	14.7%
The evidence for climate change is unreliable	20.7%*	26%*	31.9%	22.3%
I do not believe climate change is a real problem	6.7%***	10.5%***	11.6%	8.9%
The media is often too alarmist about issues like climate change	40.6%*	51.8%*	52.1%	48%
It is too early to say whether climate change is really a problem	17.1%*	25.2%*	24.5%	22.9%
There is too much conflicting evidence about climate change to know whether it is actually happening	31.6%***	36.3%***	42.3%	32.7%
I am uncertain about whether climate change is really happening	10.4%***	22.9%***	16.9%	20.7%
Climate change is just a natural fluctuation in earth's temperatures	14.1%	23.6%	24.6%	20.2%
Flooding is not increasing, there is just more reporting of it in the media these days	11.1%*	17.4%*	11.4%*	17.4%*
Recent floods in this country are due to climate change	47%*	38.2%*	34.8%	42.3%

* $p<0.05$ **$p<0.01$ ***$p<0.001$

Table III. Variation in environmentally-relevant behaviours according to experience of flooding and air pollution (chi-square results) (N=589)

Survey question	**Response categories** (pre-defined or coded)	**Affected by air pollution**	**Not affected by air pollution**	**Exper. of flooding**	**No exper. of flooding**
Have you ever taken, or do you regularly take, any action out of concern for climate change?	Yes	39.6%*	28.8%*	34.9%	30.2%
	No/ Don't know	60.40%*	71.2%*	65.1%	69.8%
If yes, what did you do/ are you doing? †	1. recycling	22.9%	16.0%	19.5%	17.0%
	2. avoid driving car	9.0%	7.6%	9.4%	7.5%
	3. conserve energy	6.9%	6.3%	6.7%	6.4%
	indirect (pol, fin, etc.)	6.3%*	2.2%*	3.4%	3.2%
The following is a list of activities that you may do. For each one you do regularly, please indicate your reason or reasons for doing so	Walk or cycle to work regularly	51.4%*	41.0%*	44.2%	43.3%
	- to protect environment	22.2%**	11.6%**	16.3%	13.5%
	Use public transport regularly	46.5%**	33.7%**	43.5%*	34.6%*
	- to protect environment	11.8%**	5.2%**	9.5%	6.0%
	Turn off lights I'm not using regularly	95.1%	95.9%	93.2%	96.6%
	- to protect environment	43.1%	40.3%	35.4%	42.9%
	Buy energy efficient light bulbs regularly	73.6%*	63.8%*	69.4%	65.1%
	- to protect environment	46.5%**	33.0%**	37.4%	36.0%
	Take part in a campaign about an env. issue regularly	31.3%***	13.0%***	25.2%**	14.9%**
	- to protect environment	18.8%***	7.3%***	15.0%*	8.5%*

* p<0.05 **p<0.01 ***p<0.001

† Responses listed are coded from qualitative data; three most common responses and any other responses where there is significant variation between experience variables are given

Table IV. Combined table for logistic regression results for predicting a) perceived threat from climate change and b) personal importance of climate change issue

Dependent variables:	**a) Perceived threat from cc**				**b) Personal importance of cc**			
Independent variables (comparison groups in brackets)	**Std. Error**	**Wald**	**Sig.**	**Exp(B) †**	**Std. Error**	**Wald**	**Sig.**	**Exp(B) †**
Air pollution affected own health (No)								
Yes	0.25	28.59	0.00	3.84	0.25	7.67	0.01	1.99
Experience of flooding in last 5 yrs (No)								
Yes	0.24	3.33	n.s.	1.56	0.25	6.01	0.01	1.83
Gender (female)								
Male	0.23	0.09	n.s.	0.93	0.24	0.12	n.s.	1.09
Age (16-24)								
25-34	0.58	1.58	n.s.	2.08	0.59	0.01	n.s.	1.05
35-44	0.54	1.08	n.s.	0.57	0.57	0.17	n.s.	0.79
45-54	0.55	0.93	n.s.	0.59	0.57	0.12	n.s.	0.82
55-64	0.53	1.02	n.s.	0.58	0.56	0.10	n.s.	0.84
65-74	0.56	2.22	n.s.	0.44	0.59	0.51	n.s.	0.65
75 or over	0.61	5.68	0.02	0.23	0.67	2.07	n.s.	0.38
Unknown	1.02	0.65	n.s.	0.44	0.95	0.82	n.s.	0.42
Annual income (up to £9,999)								
£10,000 to £19,999	0.35	0.53	n.s.	1.29	0.38	3.07	n.s.	1.93
£20,000 to £29,999	0.39	1.80	n.s.	1.70	0.42	2.61	n.s.	1.98
£30,000 to £39,000	0.46	5.28	0.02	2.87	0.49	1.64	n.s.	1.87
£40,000 and above	0.45	1.25	n.s.	1.65	0.51	0.49	n.s.	1.43
Unknown	0.36	4.58	0.03	2.14	0.38	3.51	n.s.	2.05
Highest general qualification								
GCSE/O-Level	0.45	0.43	n.s.	1.34	0.47	0.08	n.s.	0.88
A-Level/Higher/BTEC	0.47	1.00	n.s.	1.60	0.49	0.04	n.s.	1.10
Vocational/NVQ	0.55	0.60	n.s.	1.53	0.59	0.26	n.s.	0.74
Degree of equivalent	0.49	2.41	n.s.	2.14	0.51	0.00	n.s.	1.00
Postgraduate qualification	0.53	3.27	n.s.	2.60	0.55	0.00	n.s.	0.99
Other	0.56	0.28	n.s.	1.34	0.60	0.35	n.s.	0.70
Unknown	0.98	0.00	n.s.	0.98	0.89	0.02	n.s.	1.15
Highest qualification in a science-related subject (no formal qualifications):								
GCSE/O-Level	0.34	0.43	n.s.	1.25	0.36	1.45	n.s.	0.65
A-Level/Higher/BTEC	0.43	0.00	n.s.	0.99	0.45	0.42	n.s.	1.33
Vocational/NVQ	0.75	0.34	n.s.	1.55	0.75	0.04	n.s.	0.86
Degree or equivalent	0.46	0.26	n.s.	0.79	0.50	1.54	n.s.	0.54
Postgraduate qualification	0.59	0.48	n.s.	0.66	0.66	0.99	n.s.	0.52
Other	0.74	1.43	n.s.	0.41	0.75	0.16	n.s.	0.74
Unknown	0.48	0.88	n.s.	0.64	0.48	0.14	n.s.	1.20
Political party most likely to support (Labour):								
Conservative	0.34	2.00	n.s.	0.62	0.37	2.25	n.s.	0.57
Liberal Democrat	0.35	1.55	n.s.	0.64	0.36	0.63	n.s.	0.75
Other	0.66	0.05	n.s.	1.16	0.63	0.34	n.s.	1.45
Unsure/floating voter	0.62	0.34	n.s.	0.70	0.62	0.16	n.s.	0.78
Would not vote	0.41	10.04	0.00	0.27	0.44	2.88	n.s.	0.48
Unknown	0.37	0.90	n.s.	0.70	0.38	0.00	n.s.	0.98

Table IV. cont.

Dependent variables:	**a) Perceived threat from cc**				**b) Personal importance of cc**			
Independent variables (comparison groups in brackets)	**Std. Error**	**Wald**	**Sig.**	**Exp(B)**	**Std. Error**	**Wald**	**Sig.**	**Exp(B)**
Newspaper regularly read (none)								
Broadsheet	0.25	0.10	n.s.	0.92	0.26	0.20	n.s.	1.12
Tabloid	0.23	0.28	n.s.	0.89	0.24	0.69	n.s.	0.82
Member of environmental org. (No)								
Yes	0.31	2.47	n.s.	1.62	0.28	5.68	0.02	1.96
NEP score (bottom quartile):								
2nd quartile	0.32	3.81	0.05	1.86	0.43	2.77	n.s.	2.05
3rd quartile	0.33	7.46	0.01	2.47	0.42	9.86	0.00	3.78
Top quartile	0.33	12.20	0.00	3.16	0.41	20.32	0.00	6.40
Constant	0.70	3.04	n.s.	0.29	0.77	10.76	0.00	0.08

Significant variables are shaded

† The value of Exp(B) indicates the change in odds of the dependent variable resulting from a unit change in the independent variable (if Exp(B) is more than 1: as the predictor increases, the odds of the outcome occurring increases; if Exp(B) is less than 1: as the predictor increases, the odds of the outcome occurring decreases; Field, 2000).

Table V. *Combined table for logistic regression results for predicting a) belief in anthropogenic climate change and b) action taken about of concern for climate change*

Dependent variables:	**a) Lowest uncertainty scores**				**b) Action out of concern for cc**			
Independent variables (comparison groups in brackets)	**Std. Error**	**Wald**	**Sig.**	**Exp(B) †**	**Std. Error**	**Wald**	**Sig.**	**Exp(B) †**
Air pollution affected own health (No)								
Yes	0.25	10.81	0.00	2.29	0.23	3.28	n.s.	1.53
Experience of flooding in last 5 yrs (No)								
Yes	0.26	0.02	n.s.	1.04	0.23	0.15	n.s.	1.09
Gender (female)								
Male	0.25	0.04	n.s.	1.05	0.22	0.09	n.s.	1.07
Age (16-24)								
25-34	0.61	1.20	n.s.	1.94	0.55	1.17	n.s.	1.81
35-44	0.60	0.05	n.s.	0.88	0.54	0.23	n.s.	0.77
45-54	0.60	1.09	n.s.	1.86	0.54	0.05	n.s.	0.88
55-64	0.60	0.04	n.s.	1.13	0.53	0.07	n.s.	1.15
65-74	0.63	0.01	n.s.	1.05	0.56	0.31	n.s.	0.73
75 or over	0.72	0.45	n.s.	0.62	0.60	0.25	n.s.	0.74
Unknown	1.06	0.12	n.s.	1.45	0.87	0.49	n.s.	0.54
Annual income (up to £9,999)								
£10,000 to £19,999	0.38	3.04	n.s.	1.96	0.34	2.55	n.s.	0.58
£20,000 to £29,999	0.43	1.44	n.s.	1.69	0.38	0.52	n.s.	0.76
£30,000 to £39,000	0.51	0.72	n.s.	1.54	0.44	1.33	n.s.	0.60
£40,000 and above	0.50	2.92	n.s.	2.36	0.44	1.14	n.s.	0.62
Unknown	0.40	1.76	n.s.	1.71	0.34	0.20	n.s.	0.86
Highest general qualification								
GCSE/O-Level	0.50	1.11	n.s.	0.59	0.47	0.01	n.s.	1.06
A-Level/Higher/BTEC	0.52	0.10	n.s.	0.85	0.48	0.96	n.s.	1.60
Vocational/NVQ	0.61	0.98	n.s.	0.55	0.56	0.44	n.s.	1.45
Degree of equivalent	0.54	1.21	n.s.	0.55	0.49	1.09	n.s.	1.66
Postgraduate qualification	0.57	0.11	n.s.	0.83	0.52	0.99	n.s.	1.68
Other	0.63	0.73	n.s.	0.58	0.56	0.76	n.s.	1.63
Unknown	1.39	3.15	n.s.	0.08	0.87	0.80	n.s.	2.18
Highest qualification in a science-related subject (no formal qualifications):								
GCSE/O-Level	0.38	1.04	n.s.	1.47	0.34	0.00	n.s.	1.02
A-Level/Higher/BTEC	0.52	0.28	n.s.	0.76	0.43	0.08	n.s.	0.89
Vocational/NVQ	0.81	0.06	n.s.	1.23	0.71	0.44	n.s.	0.62
Degree or equivalent	0.51	0.91	n.s.	1.63	0.44	0.34	n.s.	0.77
Postgraduate qualification	0.63	0.97	n.s.	1.86	0.57	0.36	n.s.	1.40
Other	0.94	0.69	n.s.	0.46	0.69	0.03	n.s.	0.89
Unknown	0.48	4.37	0.04	2.75	0.48	0.30	n.s.	0.77
Political party most likely to support (Labour):								
Conservative	0.38	1.07	n.s.	0.68	0.34	1.54	n.s.	0.66
Liberal Democrat	0.37	0.13	n.s.	0.87	0.34	0.46	n.s.	0.80
Other	0.74	0.60	n.s.	0.56	0.61	1.78	n.s.	2.26
Unsure/floating voter	0.61	0.00	n.s.	0.97	0.55	0.05	n.s.	0.88
Would not vote	0.42	0.13	n.s.	0.86	0.43	5.64	0.02	0.36
Unknown	0.39	0.36	n.s.	0.79	0.35	0.19	n.s.	0.86

Table V. cont.

Dependent variables:	**a) Lowest uncertainty scores**				**b) Action out of concern for cc**			
Independent variables (comparison groups in brackets)	**Std. Error**	**Wald**	**Sig.**	**Exp(B)**	**Std. Error**	**Wald**	**Sig.**	**Exp(B)**
Newspaper regularly read (none)								
Broadsheet	0.27	0.08	n.s.	0.93	0.24	2.11	n.s.	1.42
Tabloid	0.25	0.03	n.s.	1.04	0.23	15.91	0.00	0.41
Member of environmental org. (No)								
Yes	0.30	1.89	n.s.	1.51	0.28	1.57	n.s.	1.41
NEP score (bottom quartile):								
2nd quartile	0.45	1.67	n.s.	1.79	0.34	2.00	n.s.	1.61
3rd quartile	0.45	9.12	0.00	3.85	0.34	9.42	0.00	2.86
Top quartile	0.43	23.25	0.00	8.02	0.34	11.65	0.00	3.17
Constant	0.82	15.22	0.00	0.04	0.71	3.18	n.s.	0.28

Significant variables are shaded

† The value of Exp(B) indicates the change in odds of the dependent variable resulting from a unit change in the independent variable (if Exp(B) is more than 1: as the predictor increases, the odds of the outcome occurring increases; if Exp(B) is less than 1: as the predictor increases, the odds of the outcome occurring decreases; Field, 2000).

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[i] This paper adopts the definition of climate change used by the UN Framework Convention on Climate Change (UNFCCC): "climatic changes directly or indirectly resulting from human activities, over and above natural variation".

[ii] This is part of a common tendency to unconsciously select information that conforms to pre-existing beliefs and filter out non-corresponding information (for a review of 'confirmation bias' research see Nickerson, 1998).

[iii] Increased flooding cannot solely be attributed to climate change: other factors such as development on floodplains and changes in land use are also contributors (IPCC, 2001a). Nevertheless, increased precipitation and flooding are widely accepted as being primary impacts of climate change (Environment Agency, 2001a); flooding experience is therefore hypothesised as being relevant to climate change perceptions.

[iv] The survey also included another, less direct, measure of experience of air pollution: namely, whether air pollution had affected the health of family members or friends. Over a third (35.7%) of participants said that air pollution had affected the health of family/friends. There is a large overlap between this group and those who said their own health has been affected: 83.3% of respondents whose family/friends have been affected said they have been affected themselves (Cramer's V = 0.57; $p<0.001$). In light of this overlap, the chi-square tests show that direct experience of air pollution and friends'/family's experience of air pollution relate to many of the same variables. Since this paper focuses on the role of direct rather than indirect experience, only the former results are presented and discussed in detail here.

[v] Two versions of the questionnaire were used: half the sample received a questionnaire which used the term "climate change"; the other half received a questionnaire in which "global warming" was used. In all other respects the questionnaires were identical. Differences in responses are reported elsewhere ([reference removed to retain anonymity]). In this paper, I use the term "climate change" as a short-hand for either climate change or global warming.

[vi] The NEP scale (Dunlap and Van Liere, 1978; Dunlap et al., 2000) has been widely used in survey research, including in studies of perceptions and response to climate change (e.g., Bord et al., 2000; Poortinga and Pidgeon, 2003; Poortinga et al., 2002). The pilot for the current study indicated that a number of people had difficulty interpreting nine of the fifteen original NEP items, so these items were excluded from the final questionnaire. The shortened version included the statements: "Humans have the right to modify the natural environment to suit their needs"; "Humans are severely abusing the planet"; "Plants and animals have the same rights as humans to exist"; "Nature is strong enough to cope with the impact of modern industrial nations"; "Humans were meant to rule over the rest of nature"; "The balance of nature is very delicate and easily upset". Principal Components Analysis of the shortened NEP scale shows it to be reliable (Cronbach's alpha = 0.72).

[vii] Although (as noted earlier) those affected by air pollution were more likely to hold a vocational science qualification, they were no more likely to hold science degrees than other people. Without knowing the professions of participants, we are unable to deduce any relationship between educational level and professional interest.