A STUDY OF PUBLIC UNDERSTANDING OF AND RESPONSE TO CLIMATE CHANGE IN THE SOUTH OF ENGLAND

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ABSTRACT

Scientific research has identified human-induced climate change as a serious threat to human societies and the non-human world. Yet, climate change is an issue with major political, economic, socio-cultural, psychological, and ethical implications, which must be understood if policy-makers and wider society are to respond effectively to this issue. The aim of this thesis is to examine the contextual determinants and dimensions of public understanding of, and response to, climate change in order to inform the design of more effective public communication strategies and workable mitigation policies. This study uses a mixed-methodology approach to explore a variety of potentially salient influences on perceptions of and behavioural responses to climate change. One factor given particular attention is experience and understanding of flooding. By focussing on the relationship between flooding and climate change, this study represents an original approach to understanding how the public conceives and responds to both issues.

The findings from this research suggest that flooding and climate change are largely viewed as separate issues. At the same time, the results highlight the public's tendency to associate climate change with other environmental issues, notably ozone depletion and air pollution, through conceptual similarities and moral discourses. Furthermore, the salience of distrust and uncertainty in public perceptions of climate change has been elucidated by this research. The findings indicate disparity between expert and lay conceptions of climate change, and between actions prescribed by policy-makers and those taken by the public to mitigate climate change. The thesis concludes by recommending that information about climate change is tailored to the needs, existing knowledge, and values of particular audiences. Public response to climate change will most effectively be achieved through schemes that demonstrate the efficacy of personal action and result in local benefits. Finally, an iterative and participatory approach to policy-making in respect of climate change is advocated.

CHAPTER 1. CLIMATE CHANGE AS A SCIENTIFIC, POLITICAL, CULTURAL, AND MORAL ISSUE

1.1 INTRODUCTION

In this chapter, I describe the context in which this research has evolved. I outline how climate change emerged as an area of study within the natural sciences and has now become a major political and social issue. I also describe the divergent scientific and political positions that have appeared in response to the issue, and in particular in response to scientific uncertainty about climate change. Furthermore, I describe the action that the UK government has taken to tackle climate change and suggest why their strategy has not achieved its goal of reducing the nation's carbon emissions. This chapter provides an insight into some of the challenges facing educators and policy-makers in engaging with the public over climate change, and indicates why there is a need for social science to provide insights into the public's perceptions and response to the issue. Finally, the theoretical basis and aims of this thesis are described.

1.2 CLIMATE CHANGE AS A SCIENTIFIC ISSUE

1.2.1 Scientific evidence for climate change

Although scientists have been studying the effects of 'greenhouse' gases in the atmosphere since the Nineteenth Century, it was not until 1957 that scientists at the Scripps Institute of Oceanography in California suggested that carbon emissions from human activities might be dangerously changing the climate. 'Greenhouse' gases are those which absorb thermal radiation emitted from the Earth's surface, thereby acting as a 'blanket' to keep the planet warm (Houghton, 2004). The main 'greenhouse' gases are water vapour and carbon dioxide, which exist naturally in the atmosphere. However, while the 'natural greenhouse effect' is necessary for supporting life on Earth, the 'enhanced greenhouse effect' (also referred to as 'human-induced climate change' or 'global warming'[1]) has been identified as a potentially damaging outcome of the increased amount of carbon dioxide in the atmosphere since the Industrial Revolution.

[1] The term 'climate change' is referred to most often in this thesis, and is defined as current or projected changes in climate whether due to natural variability *or* to human activities (IPCC, 2001b). This usage differs from that in the United Nations Framework Convention on Climate Change, where 'climate change' refers to climatic changes directly or indirectly resulting from human activities, over and above natural variation. The former IPCC definition is preferred because it acknowledges the existence of debate over whether human activities are in fact the principal cause of recently-observed changes in climate.

Since 1959, regular measurements of carbon dioxide have been made from an observatory at Mauna Loa in Hawaii. These show an average increase of about 1.5 ppm (parts per million) carbon dioxide concentration (0.4%) in the atmosphere each year (Houghton, 2004, p.31). Other direct and indirect measurements have been used to track changes in global temperatures, climate, and atmospheric concentrations of greenhouse gases for around the past million years. The data sources are diverse, ranging from direct thermometer, weather and tidal records since the 1800s; to ‘proxy sources’ such as ice cores from Greenland and Antarctica for the past 400,000 years, and ocean sediments for the past million years. In addition, highly complex computer modelling has increasingly been used to validate observations and predict changes in climate systems (Houghton, 2004).

In 1988, the Intergovernmental Panel on Climate Change (IPCC) was established by the World Meteorological Organisation and the United Nations Environmental Programme to assess and clearly present current scientific knowledge about climate change, its predicted impacts, and policy responses. The IPCC’s main reports, published in 1990, 1995, and 2001, represent the views of the majority of the world’s climate scientists and have also involved governmental representatives in ensuring the scientific information is presented clearly for policy-makers. The IPCC reports conclude, with near certainty, that there is a “discernible human influence on global climate” (IPCCa, 2001, p.10), while uncertainty remains in the magnitude of climatic change and its specific regional distribution. The report argues that humans are affecting climate principally through burning fossil fuels (coal, oil, gas), which release carbon dioxide, coupled with deforestation and other land use changes. Data from the sources described above show that present levels of carbon dioxide have not been exceeded for at least the past 420,000 years, and that the rate of temperature increase over the past century is unprecedented. Furthermore, during the 20th Century sea levels have risen globally between 0.1m and 0.2m; ice and snow cover have decreased; and patterns of precipitation have changed (IPCC, 2001a). Crucially, most scientists argue that these changes cannot be explained by natural climatic processes alone.

1.2.2 Projected and current impacts of climate change

Future scenarios, based on different economic, social and technological development paths, suggest that annual emissions of carbon dioxide could be as much as five times their current level by 2100, resulting in a global temperature rise of 1.4°C to 5.8°C (IPCC, 2001a). Recently, more comprehensive analysis of a range of climate change scenarios has indicated this figure may be as high as 11°C globally, and higher still in the UK, resulting in a “dramatically different” future (Stainforth et al., 2005; Highfield, 2005). The effects of this global warming encompass social and economic as well as environmental impacts, including more extreme weather events, rising sea levels, droughts, flooding, extinction of species, and impacts on agriculture and human health. Some beneficial impacts from climate change may also occur in some regions, such as increased crop yield and reduced winter mortality. There is considerable variation regionally in terms of the nature and severity of projected impacts, and of the vulnerability of species and human communities to these impacts. The UK climate over the next fifty years is projected to become hotter (particularly in the South East); winters are likely to become wetter and summers drier, and average sea levels will rise by up to 36cm (Hulme et al., 2002). Human health and life in this country will be threatened principally by flooding, storms and excessive temperatures (DoH, 2001).

More disastrous scenarios have also been suggested, where the planet soon becomes uninhabitable. Given that climate systems often do not respond to change in predictable ways, it is also possible that unexpected events (such as releases of methane stored under the Arctic) may trigger a sudden and uncontrollable acceleration of climate change (Hillman, 2004a). In fact, the urgency of the issue has recently been emphasised by European scientists, who warn that action must be taken now to stabilise climate if catastrophe is to be avoided (e.g., Meinshausen, 2005).

Recent biological and climatic trends suggest human-induced climate change is *already* affecting human and non-human life (e.g., Parmesan & Yohe, 2003). In the UK, temperatures and periods of intense daily rainfall have been increasing over the past century; floods in England and Wales in 1998 were the worst for 150 years (Environment Agency, 2001a). 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, 2001b). Furthermore, it is not possible to identify climate change as the cause of specific weather events. Nevertheless, Hulme (2000) argues that "there is no longer such a thing as a purely natural weather event". In other words, human industrial activities are an integral - and potent - dimension of global climate systems. Future climate will be determined largely by societal decisions taken now; thus, the IPCC recommends that carbon emissions "need to decline to a very small fraction of current emissions" in order to stabilise climate (IPCC, 2001a, p.12). Yet increases in temperature, and particularly sea level, will occur even if emissions were to be drastically cut now, due to a time lag between causes and impacts of atmospheric change (Wigley, 2005; Meehl et al., 2005). This points to a need for adaptation to, as well as mitigation of, future climate change.

1.2.3 Scientific uncertainty, complexity and discord

Although the weight of scientific opinion supports the conclusion that current changes in climate are significantly influenced by human activities, there remains considerable uncertainty in scientific understanding of the issue. Houghton (2004) suggests that, while "the basic physics of the greenhouse effect is well understood", there is a range of factors that complicate the measurement and prediction of climate change, particularly on a regional scale. This is acknowledged by the IPCC, whose conclusions and predicted scenarios vary in their degree of confidence (see Table 1).

Table 1. Estimates of confidence in observed and project climatic changes

Confidence in **observed** changes (latter half of 20th Century)	Climatic/ weather changes	Confidence in **projected** changes (21st Century)
66-90% chance	Higher maximum temperatures and more hot days over land areas	90-99% chance
90-99% chance	Higher minimum temperatures, fewer cold days and frost days over land areas	90-99% chance
66-90% chance over many Northern Hemisphere mid to high latitude land areas	More intense precipitation events	90-99% chance over most areas
66-90% chance in a few areas	Increased summer continental dying; risk of drought	66-90% chance over most mid-latitude continental interior
Not observed in the few analysis available	Increase in tropical cyclone peak wind intensities	66-90% chance over some areas

Adapted from: Houghton (2004, p.134)

There are two sources of scientific uncertainty in relation to climate change. Uncertainty arises from scientists' incomplete understanding of global processes, which is likely to be reduced by further research and the use of more powerful climate models (IPCC, 2001a). However, uncertainty arising from the inherent complexity and indeterminism of climate systems is more profound and intractable. Changes in climate occur as a result of internal variability (e.g., long-term geophysical cycles) as well as various 'external' natural and anthropogenic factors. Some of these - such as increased concentrations of greenhouse gases - tend to warm the earth's surface; others - such as aerosol use, volcanic eruptions and reduced solar output - can yield cooling effects (IPCC, 2001a). The concentration of greenhouse gases is also affected by the capacity for land and ocean absorption and storage, which act as 'feedback' systems on climate. Furthermore, anthropogenic influences on climate are shaped by technological development and changes in social, political and economic systems. Making confident predictions based on these complex interactions about the impacts of climate change or the effects of particular mitigation strategies is therefore problematic.

Houghton (2004) describes how, in light of the considerable scientific uncertainty, some scientists involved in the IPCC assessments were concerned about making predictions of the impacts of climate change. Yet, he concludes:

> "It soon became clear that the *responsibility* of scientists to convey the best possible information could not be discharged without making estimates of the most likely magnitude of the change

> coupled with clear statements of our assumptions and the level of uncertainty in the estimates… the climate models, although subject to uncertainty, provide useful guidance for policy" (p.220; emphasis added).

However, the basic conclusion of IPCC assessments that current changes in climate are resultant from human activities has been challenged by a minority of scientists. For example, the Harvard Smithsonian Center recently published a study suggesting that 20th Century climate is not the warmest or most extreme on record (Baliunas & Soon, 2003). Furthermore, there is contention over the scientific methods themselves: the diverse proxy sources of evidence and complex computer models used to predict climate change are considered by some to be inaccurate (e.g., Hansen et al., 1998), or even wholly unreliable (Lindzen, 1997). Finally, even if the influence of human activities on climate is accepted, some scientists point out that global 'feedback' mechanisms may counteract the increased input of greenhouse gases into the atmosphere, eventually stabilising climate (Pearce, 2005). These arguments call into question the fundamental assumptions behind international action to reduce carbon emissions by suggesting that current climatic changes are natural, cyclical and not catastrophic.

The scientific debate surrounding climate change has also hinged on the credentials, affiliation and agenda of the scientific protagonists. Many contend that the oil industry's funding of research that shows climate change to be natural undermines the credibility of this evidence. For example, Bob May, former chief scientific advisor to the UK government, argues:

> "On one hand we have the IPCC, the rest of the world's major scientific organisations, and the government's chief scientific advisor, all pointing to the need to cut emissions. On the other we have a small band of sceptics, including lobbyists funded by the US oil industry, a sci-fi writer [Michael Crichton], and the Daily Mail, who deny the scientists are right. It is reminiscent of the tobacco lobby's attempts to persuade us that smoking does not cause lung lancer" (May, 2005).

Hillman (2004b) similarly claims that the most prominent critics of climate change science and policy "are not climate experts", whereas "the UK's most eminent knighted scientists" agree that human-induced climate change is real and must be tackled through drastic cuts in emissions (p.25). The claim that anthropogenic climate change is established by "scientific consensus" is rhetorically very powerful, and has been made by scientists, politicians and environmental non-governmental organisations (NGOs) alike to argue for political action (Barkham, 2004; May, 2005).

On the other hand, climate change sceptics argue that the scientific evidence has been the subject of misrepresentation and politicisation. Phillips (2004), for example, argues that climate change has become "big business". She suggests political concern about climate change is used by scientists to secure major sources of funding and to enhance reputations. Similar criticisms have been made of environmental NGOs, who are accused of overstating the evidence of extinctions from climate change in order to boost public donations (Day, 2004). This case provides an interesting insight into how scientific uncertainty is mobilised by different actors to achieve their aims. Uncertainty is used by some, notably the US government, to argue against political action to tackle climate change. Environmental fundraising campaigns may ignore scientific uncertainty about climatic impacts in order to press for action. Finally, uncertainty is used by scientific organisations (e.g., IPCC, 2001a; 2001b) to press for funding for further research.

Equally, while advocates for climate change action use the weight of scientific opinion to support their case, the sceptics conversely use this to their own purposes. Some have likened their position to that of Galileo, who was persecuted for daring to question the mainstream view (Adam, 2005). John Maddox, former Nature editor, has also expressed concerns about the power and non-reflexivity of the IPCC, calling the body "monolithic and complacent" (Adam, 2005). A similar point is made by O'Riordan and Rayner (1991), who argue that such intergovernmental science panels must become more representative of the pluralism of scientific, including social scientific, opinion, particularly where "uncertainty is high and decision stakes great" (p.107).

Thus, we see in climate change the hallmarks of controversial science, in which opposing parties inevitably fall prey to the "experimenter's regress" (Collins & Pinch, 1993). In effect, scientific theories are under-determined by the available data, which can often be interpreted in a number of ways. Scientific evidence is thus intrinsically uncertain and can be used to justify competing personal or political agendas (Pielke, 2004). Since actors cannot rely on the data (i.e. nature itself) to adjudicate their theories, they invoke arguments based on social criteria such as experimental validity, data reliability, or the credibility or political agenda of opponents. Rhetorical claims about the nature of scientific knowledge are also raised in such disputes. For example, outspoken opponents of climate change mitigation policies, such as journalist Melanie Phillips (2004) and science fiction writer Michael Crichton (2004), claim advocates of action have "politicised" science. Such unreflexive criticisms assume science is inherently value-free and can provide unambiguous truth. This popular Enlightenment view of science is undermined by evidence of the social, political and institutional processes involved in the construction of scientific knowledge (Golinski, 1998; Haraway, 1991; Harding, 1991; Kuhn, 1996; Latour, 1998; Pickering, 1995). "Objective knowledge" and "sound science" are socially-determined, often by consensus of a "core set" of experts (Collins, 1982). The following sections describe how scientific uncertainty about climate change has been interpreted and responded to in different ways according to political interests and cultural preferences.

1.3 CLIMATE CHANGE AS A POLITICAL, CULTURAL AND MORAL ISSUE

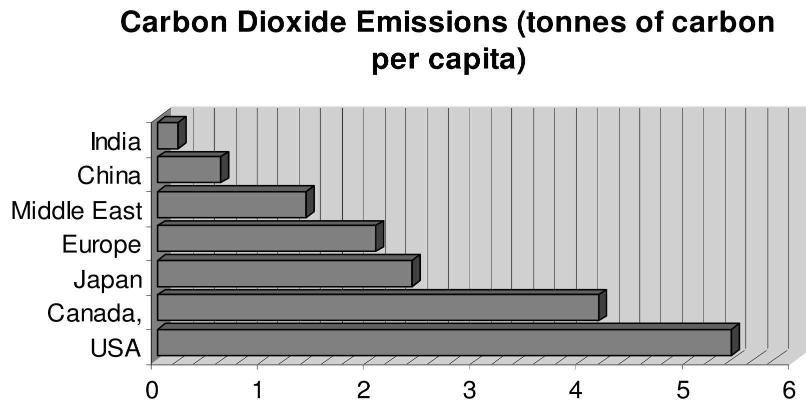
1.3.1 Political and cultural responses to climate change

Climate change has emerged over the past two decades as an issue of global political and social significance. The issue was given political legitimacy by key figures in the late 1980s, (e.g., Thatcher, 1988) and by the collaborative involvement of both political and scientific representatives in the production of the IPCC's reports. As a result, Houghton (2004, p.221) suggests that the assessments have been "owned" by both groups: "an important factor when it comes to policy negotiations"; furthermore, scientific consensus "has been of great importance in persuading [politicians and policymakers] to take seriously the problem of global warming and its impacts". The weight of scientific evidence demonstrating the reality of the threat from climate change was effectively a precondition for government commitment potentially to transform economies and human behaviour (O'Riordan & Rayner, 1991). As Hajer (1996) describes, this is the power of rational argument: "even the big institutions will change if arguments are phrased convincingly and correspond with the scientific evidence available" (p.252).

Given scientific evidence that climate change involves major impacts on humans and is caused primarily by human activities, policy-makers have been faced with the imperative to act in terms of both *adaptation* to the already unavoidable impacts and *mitigation* to prevent more detrimental impacts (Environment Agency, 2001; IPCC, 2001b). Following the establishment of the IPCC, world leaders agreed to sign the United Nations Framework Convention on Climate Change (the 'Climate Convention') at the 1992 United Nations Conference on Environment and Development in Rio. This agreement acknowledges human-induced (or anthropogenic) climate change as a real and serious threat to ecosystems and humans, which requires international action to mitigate its effects.

The Convention considers issues of global and inter-generational equity and the need for sustainable development in poorer countries. In particular, it recognises that developed countries have produced the largest proportion of greenhouse gas emissions and that they should consequently take the lead in action to mitigate climate change (see Figure 1). This represents acceptance of the 'Polluter Pays' principle, that is generally applied to local pollution problems (Houghton, 2004).

Figure 1. *Global inequality in the production of carbon emissions - the main cause of climate change*



Adapted from: Houghton (2004, p.258)

Recognising the costs associated with climate change mitigation, the Convention states that action can be "justified economically in its own right and can also help in solving other environmental problems" such as air pollution (United Nations, 1992; cf. IPCC, 2001d). In effect, this provides a justification for acting under considerable uncertainty about the nature of the threat from climate change. The ultimate aim of the agreement, expressed in Article 2, is the:

> "stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system… within a timeframe sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner" (United Nations, 1992).

Subsequent to the establishment of the Climate Convention, a Protocol was drawn up in Kyoto in 1997 which specified and quantified commitments to reduce emissions amongst the countries ratifying the Convention. The targets for reduction of emissions differ for each country, according to their level of industrialisation. Furthermore, the Protocol allows for emissions 'trading' between counties and the offsetting of emissions obligations against forestation (which acts as a 'sink' to absorb carbon). Flexibility in meeting obligations has been a key determinant in reaching international agreement over other global environmental problems (Morrisette, Darmstadter, Plantinga & Toman, 1991). Following intense negotiations, the details of the 'Kyoto Protocol' were agreed in 2001. Since then, 140 industrial countries of the Convention have ratified it. The US, Australia, China and India - all of whom heavily rely on fossil fuels for economic development - are amongst those countries who have not ratified it. On 16th February 2005, the Protocol came into effect - seven years after it was first negotiated. It expires in 2012. The effect of the Protocol, which will reduce industrialised countries' total emissions by 5%, will reduce global warming only marginally (O'Neill & Oppenheimer, 2002). While some environmental groups argue that the

Kyoto Protocol represents a woefully inadequate attempt to tackle climate change, supporters argue that Kyoto is intended as a symbolic 'first step', establishing the mechanisms through which nations can tackle climate change, and on which future agreements will build (e.g., Hulme et al, 2002).

While acceptance of the reality of climate change is increasing, there remains political disagreement over how, and indeed whether, it should be addressed. The IPCC's recommendations and UN Climate Convention represent only one response to climate change. This response embodies the *'precautionary principle'*, which can be defined as anticipatory action to prevent harm despite scientific uncertainty (O'Riordan & Cameron, 1994). However, given the uncertainty and complexity associated with climate change, others argue against taking action in favour of a *'business-as-usual'* approach. This position is more attractive for some nations than others, given that the threat from climate change is unevenly distributed. The perceived risk of "dangerous" climate change is undoubtedly greater for island nations than for many developed countries or regions projected to experience beneficial impacts (Dessai et al., 2003). For some economies and societies, proposed mitigation policies may pose a greater threat than the projected (and uncertain) impacts of climate change (IPCC, 2001c).

Economic arguments are central to the business-as-usual position. The US policy of non-ratification of the Kyoto Protocol until further scientific research has been carried out is based on an overriding concern for national industry. Since the US is responsible for over 20% of the world's emissions, their non-response to climate change has major implications for the efficacy of action taken by other countries. The economist Bjorn Lomborg (Lomborg, 2001), one of the most vocal critics of the Kyoto Protocol, argues that the cost of policies to reduce carbon emissions cannot be justified in the context of more urgent international development needs. Other opposing discourses are also evident in the climate change debate, for example between proponents of nuclear power and traditional environmental groups favouring non-nuclear sustainable energy options (Kasemir, Jaeger & Jager, 2003b). Here, as in the climate science community, heated debate has resulted in the competence, integrity and agenda of key players being called into question (Pielke, 2004).

Political decisions about whether, how, and by whom, greenhouse gas emissions are reduced are also characterised by *moral* complexity and uncertainty. They are inevitably based on value judgements, such as concerns for social justice and inter-generational equity, and on perceptions of, and responses to, risk and uncertainty, such as adherence to the precautionary principle. Cultural theorists characterise the political responses to climate change and its associated risks and uncertainties according to one of three ideal-typical cultural positions (O'Riordan & Rayner, 1991). These are outlined in Box 1. As I will discuss in Chapter 2, many of the moral and cultural concerns evident in international discussions about climate change are similarly represented at the level of individuals within society.

Box 1. Strategies for responding to climate change based on ideal-typical cultural positions

The *preventive* strategy is based on the belief that nature is fragile and easily subject to irreversible catastrophic change. It views human abuse of nature as immoral and prefers to prevent all potential losses, regardless of economic cost. The approach to uncertainty adopted by preventivists is embodied in the precautionary principle. Environmental groups often tend towards the preventive position.
The *adaptive* strategy sees nature as robust, resilient to change, and a resource for human use. It is driven by the view that curtailment of economic development is immoral by condemning poorer groups to deprivation of the benefits of modern industrial society. Accordingly, it favours a business-as-usual response to uncertainty. The extreme of this view sees environmental change as "presenting new opportunities for human ingenuity that will be revealed through the workings of the marketplace" (O'Riordan & Rayner, 1991, p.100). Accordingly, market organisations tend to favour the adaptive approach to environmental change.
Sustainable development is the synthesis of the previous two positions, and sees nature as robust within limits. It is often favoured by hierarchies and bureaucracies who have to consider competing goals and conflicting interests in their decision-making. The paradoxical concept of sustainable development (WCED, 1987) is a "fuzzy" yet powerful rhetorical construction intended to appeal to seemingly opposed interest groups (Bradbury, 1998; Burgess, Harrison & Filius, 1998; Hajer, 1996; Stables, 1996; Stables & Scott, 2002). The ambivalence of "sustainable development" allows policy-makers considerable freedom in deciding how to operationalise it (Hajer, 1996). Naturally, they tend to follow the "path of least resistance" (Szerszynski, Lash & Wynne, 1996) that is consistent with existing commitments; and to opt for "economic and technical adjustments" and the "technological fix", rather than that of genuine change to cultural values and social identities (Wynne, 1994).

Adapted from: O'Riordan and Rayner (1991).

1.3.2 Responding to climate change in the UK

After signing the Climate Convention in 1992, the then Conservative UK government embarked on plans to stabilise the nation's carbon emissions (DoE, 1994). More recently, the Labour government has identified climate change as a priority issue (BBC, 2004b), and positioned itself as a global leader in addressing it. Sir David King, the UK government's chief scientific advisor has controversially claimed that "climate change is the *most severe problem* we are facing today, more serious even than the threat of terrorism" (King, 2004, p.176). He points out that the risk of flooding alone is expected to increase by up to 30 times present levels in the next 75 years, costing the UK tens of billions of pounds every year from damage to properties. The government is due to publish its comprehensive climate change adaptation strategy by the end of 2005, following a programme of research conducted to determine the impacts of climate change in the UK (e.g., Hulme et al., 2002).

At the same time, the government has emphasised that tackling climate change does not need to, and will not, compromise economic development or standards of living (BBC, 2005). Early measures to mitigate climate change are seen as providing more opportunities for technological development and are projected to be less costly than waiting to respond to more severe climatic impacts (King, 2004). The government is understandably reluctant to introduce unpopular policies that will mean individuals giving up cherished activities and consumer choice. Therefore, its policies are intended to maintain material standards of living by improving product and building efficiency and switching to alternatives sources of energy, rather than reducing demand for energy. As such, the UK government's approach to tackling climate change most closely reflects O'Riordan and Rayner's (1991) compromise cultural position of 'Sustainable Development' (see Box 1).

Under the Kyoto Protocol, the UK is obliged to reduce emissions by 12.5% of 1990 levels by 2010. The government's Climate Change Programme (DETR, 2000) and its Energy White Paper (DTI, 2003) outlines a more ambitious voluntary target of a 20% reduction of carbon dioxide emissions from 1990 levels by 2010. It has also accepted the recommendation made by the Royal Commission on Environmental Pollution for a 60% cut in emissions by 2050 (RCEP, 2000). In part, the government is able to make such bold promises because carbon emissions have been steadily decreasing due to the increasing use of gas, compared to coal and oil. It hopes to achieve further reductions principally through the promotion of energy efficiency and increased use of renewable and alternative sources of energy. This will be achieved in transport, domestic, industrial and commercial sectors through:

- Education and provision of public information, including advertising campaigns, product labelling and advice on energy efficiency;
- Incentives and subsidies, such as differentiated Road Fuel Duty, subsidised public transport, schemes to fund home energy efficiency and subsidies for domestic solar and geothermal power;
- Regulation, including minimum energy efficiency standards on certain appliances and Building Regulations standards for energy efficiency;
- Investment in research and development;
- Voluntary agreements with industry, such as car manufacturers;
- Climate Change Levy and emissions trading scheme for business and industry; and
- Obligation for energy companies to provide 10% of power from renewable sources by 2010.

Emissions produced directly by households - through car use, heating, lighting and appliances - constitute up to half of the UK total (Hillman, 2004a). Public education is therefore a key element of the UK government's climate change strategy. In June 2004, a spokesperson for DEFRA estimated that a total of £13 million had been spent on "climate-related communications" (Select Committee on Environment, Food and Rural Affairs, 2004). The government recognises that regulation and legislation without education is unlikely to be accepted by the public. This is born out by the public protests at increases in fuel prices in 2000. In any case, policies based on higher fuel prices adversely impact on low-income households and hinder the government's legal requirement to eliminate 'fuel poverty' (DTI, 2003). Additionally, manufacturing opportunities to deliver improvements to energy efficiency will be lost unless there is sufficient market demand; and this demand requires consumer awareness and motivation to choose energy efficient products (Boardman, 2004).

Some researchers also point out (e.g., Dobson, 2003; Stern & Kirkpatrick, 1977) that economic measures only affect particular behaviours on a short-term and superficial level. Furthermore, over-reliance on economic incentives and disincentives to foster appropriate behaviours can corrode the moral basis for such behaviours, "debasing an individual's voluntary commitment to community-motivated action" (Jones, Cullis & Lewis, 1998, p.10). Education is therefore necessary to change underlying values and attitudes and to encourage long-term shifts in behaviour patterns towards sustainable modes of living. However, as I will discuss below, information alone is not adequate to change behaviour.

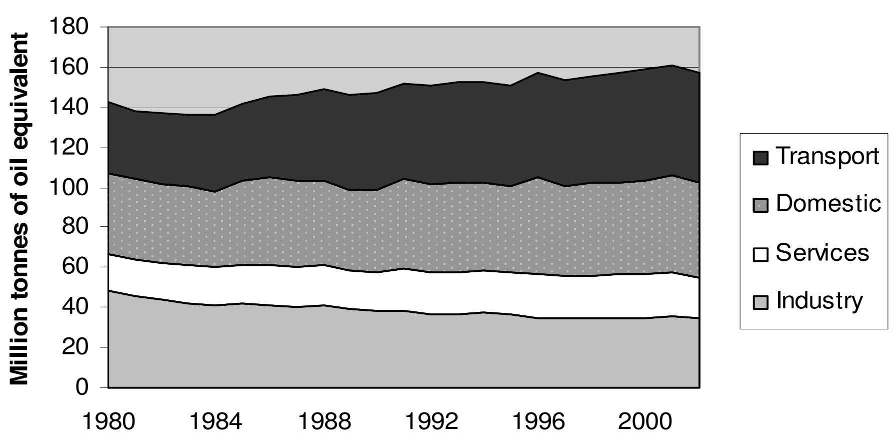
Since the early 1990s, there have been several government information campaigns intended to educate the public about climate change and to encourage personal energy conservation. In 1991, as part of its original climate change strategy, the government launched the £6.2 million *Helping the earth begins at home* media campaign. This aimed to raise awareness of climate change and the role played by energy use in causing it, and to encourage energy efficiency measures. More recently, as part of its public education strategy, the government established the Energy Saving Trust (EST) to promote energy efficiency in homes and small businesses, as well as to stimulate production and use of renewable energy and 'cleaner-fuelled' vehicles. In 1997, the EST launched the 'Energy Efficiency' brand and, in 2000, the 'Energy Efficiency Recommended' logo for products. It has organised several media campaigns, including *Energy Efficiency - It's Clever Stuff* and, more recently, *Save Energy, Money, Environment* intended to encourage energy conservation practices amongst the public.

The three-year high-profile *Are you doing your bit?* (*AYDYB?)* campaign, launched in 1998 at a cost of over £7 million, was intended to provide a national media presence for a number of 'sustainable development' messages, relating to transport and air pollution; energy consumption and climate change; water use; and packaging and waste. The information was intended to highlight the link between individual actions and both local and global environmental problems, and to stress the personal and collective benefits of sustainable action to health and quality of life.

Research indicates that these information campaigns have been largely ineffective in promoting understanding or changing behaviour. Although government evaluations suggest these campaigns have achieved 'brand recognition' amongst certain target groups (Select Committee on Environmental Audit, 1998), independent studies suggest this information has been unsuccessful in dispelling misperceptions or changing behaviour (Hinchliffe, 1996; Lofstedt, 1996). Overall, the body of literature discussed in Chapter 2 demonstrates that there is generally a *lack of public engagement* in the issue of climate change. While awareness of climate change and its main causes is high in the UK and elsewhere, few perceive it as a direct or serious threat. While many profess a concern about the issue, it is not a priority issue compared to more tangible health and social concerns. Furthermore, there is little awareness of the contribution of everyday individual actions to the problem, and a tendency to place responsibility for tackling climate change with international organisations rather than at the level of the individual. There are also a number of other significant discrepancies between official governmental information about climate change and public understanding of the issue. The evidence suggests that there is much that needs to be done to ensure that everyone understands "the evidence for [climate change], its causes, the distribution of its impacts and the action that can be taken to alleviate them" (Houghton, 2004, p.325). Given this apparent lack of engagement in the issue of climate change, it is therefore unsurprising that there has been little change in behaviour.

Overall, energy consumption has risen in recent years. Government data suggests that energy usage in transport, particularly aviation, is increasing the most rapidly; domestic energy consumption has risen slightly; and industrial energy demand is declining (see Figure 2). Social surveys also show a rise in car use from 60% to 70% between 1993 and 2002, and an increase in the proportion of two-car households from 29% to 36% (Exley & Christie, 2003). The proportion of journeys to and from schools made by car has almost doubled since 1975, while the distance covered has actually decreased (DfT, 1995). The proportion travelling by bus or cycling most days remains unchanged at 7% and 3%, respectively, since 1993 (Exley & Christie, 2003).

Figure 2. UK energy use is rising, particularly for travel



Adapted from: DEFRA (2003)

In fact, the UK government has recently been forced to admit that it will not reach its voluntary target of 20% reduction in carbon emissions by 2010, undermining its attempts to persuade other countries to act (Radford, 2004). It has also advocated a revision of its longer-term EU targets (Burgess, 2005). At the same time, a number of other EU countries are likely to fall short of meeting their targets agreed under the Kyoto Protocol (Hillman, 2004a). This suggests that existing strategies for mitigating climate change need to be augmented or revised in order to achieve the required cuts in greenhouse gas emissions.

1.3.3 The need for contextual research into public perceptions of and response to climate change

The UK government's present strategy to reduce the public's energy consumption primarily through information campaigns and economic incentives has been ineffective for a number of reasons. In essence, these can be understood in terms of inappropriate models of communication and behaviour.

1.3.3.1 From the 'deficit model' to interactive models of communication and participatory decision-making

The 'deficit model' of communication (Wynne, 1991; Burgess et al., 1998) underpinning government information initiatives tends to see lay audiences as 'empty vessels' into which unproblematic expert knowledge can unproblematically be dispensed. This model is premised on a number of highly questionable assumptions. Firstly, it presupposes a basis of established and unquestionable 'facts' to be communicated. Yet, as I have already indicated, climate change represents a clear example of the limits to scientific reductionism, prediction and certainty. Understanding and modelling climate change requires insights from various natural and social scientific disciplines and draws on diverse data sources. Furthermore, the evidence for climate change is correlational; the impacts cannot be identified deterministically, but probabilitistically. Scientific uncertainty is compounded by political, cultural and moral uncertainty about how to respond to climate change (O'Riordan & Rayner, 1991). This challenges the popular "mythology" of science, which has dominated Enlightenment thinking and continues to pervade popular culture. According to Midgley (2004), this mythology casts science as provider of objective, value-free, certain and indisputable knowledge on which political and personal decisions can reliably be made. Other forms of knowledge are consequently devalued and marginalised. In reality, science is the product of social processes of knowledge 'construction' (see Section 1.2.3); scientific knowledge is thus inherently uncertain and can benefit from insights provided by other forms of expertise (Wynne, 1992; Irwin, Simmons & Walker, 1999). Yet such considerations are usually ignored when communicating scientific 'facts' to the public. My thesis argues that the complexity and uncertainty of climate change demands a more inclusive approach to decision-making that acknowledges the value of diverse perspectives in effectively responding to climate change. To overcome public disengagement and distrust in the political process, government must clearly demonstrate that it reflects public values, concerns and interests (Whitty, 2004). My research aims to expose these values, concerns and interests that determine how the public perceives and responds to climate change. Here the term 'public' should be seen as similarly applying to scientists and policy-makers, since they also hold 'lay' values and beliefs that can influence their perceptions of climate change.

Secondly, the deficit model assumes that disparity between public and expert knowledge indicates a scientifically illiterate public in need of more scientific 'input' (Royal Society, 1985). This conclusion is based on surveys that have found the public's understanding of science in relation to pre-defined scientific 'facts' is typically low (e.g., Durant, Evans & Thomas, 1989). However, qualitative research highlights the ability of lay individuals to apply scientific facts and principles to meet their particular needs (Claeson, Martin, Richardson, Schoch-Spana & Taussig, 1996; Levy-Leblond, 1992). Thus, scientific understanding is inevitably higher for issues that individuals *need* and *want* to understand than for concepts that scientists believe the public *should* know (Ziman, 1992). Furthermore, divergence between expert and public opinion can reflect valid concerns on the part of the public about the legitimacy of scientific authority or the competence of risk regulators (Wynne, 1991; Michael, 1996). In sum, the deficit model ignores the interactive nature of communication, in which audiences are active in the interpretation and validation of information (e.g., Layton, Jenkins, Macgill & Davey, 1993). Cognitive, social and institutional processes influence how people perceive and evaluate information and whether they subsequently accept or reject it (Michael, 1996; see Section 2.2.3). Researchers are increasingly focussing on the context in which learning takes place, and have developed 'interactive' and 'situational' models of communication (Grunig, 1980; Layton et al., 1993). These models give greater consideration to the role played by beliefs, values, and institutional relationships in perceptions of and response to expert information (Burgess et al., 1998; Dagher & BouJaoude, 1997; Eden, 1993; Grove-White, 1996; Irwin et al., 1999; Wynne, 1991). This approach is consistent with constructivist theories of learning (e.g., Piaget, 1970; Scott, 1987) that describe how individuals build understanding on existing knowledge and beliefs. New information is interpreted in the context of prior concepts and values and adapted to fit into these cognitive frameworks (Marshall, 1995). Information that is inconsistent with existing beliefs, or which threatens personal values, will often be rejected or ignored (Festinger, 1957; Resnick & Chi, 1988).

The research discussed in Chapter 2 highlights the appropriateness of these constructivist models to explain the public's understanding of climate change. Consistent with interactive models of communication, individuals interpret climate change information in terms of existing cognitive frameworks that explain other environmental issues, such as ozone depletion. Furthermore, the source and presentation of information are fundamental in how the issue is perceived, with various ‘filters’ applied that discriminate on the basis of relevance, interest, coherence, credibility and trustworthiness. Climate change appears distant - spatially and temporally - from everyday concerns and experiences. Furthermore, the nature of the threat posed by climate change to particular regions is uncertain. Uncertainty is magnified by media reporting of scientific debate and political disagreement. In the context of more immediate, tangible and local concerns, climate change is not considered a priority issue or perceived to be a direct personal risk. Furthermore, information about climate change may be ignored because the implications for personal energy use are uncomfortable and threaten social identities and values. Consequently, widespread awareness of climate change has not translated into willingness to reduce personal energy consumption.

Widespread mistrust of government coupled with perceived institutional inaction in response to climate change also affects public beliefs about the need and efficacy of individual action. In particular, disparity between government rhetoric and action in relation to climate change further threatens the credibility of public information campaigns that exhort individuals to reduce energy consumption. Hillman (2004; cf. Cook, 2004) observes that, while the *AYDYB?* campaign asks individuals to drive less, planning and transport policies continue to sustain and encourage car-dependency. Furthermore, value added tax (VAT) on domestic fuel has been set at 5%, while it is 17.5% for other products and services (Boardman, 2004). Even in terms of government investment in scientific research, there is a disparity between rhetoric and action. While the Chief Scientific Advisor has claimed that climate change is a greater threat than terrorism (King, 2004), the largest area of government research expenditure is Defence, accounting for 30% of the total budget (Parkinson, 2004). The government’s need to balance diverse interests and conflicting priorities inevitably poses a challenge for formulating consistent and credible climate change policies that will provide the clear signals needed to motivate public action.

Finally, the deficit model of communication underestimates the heterogeneity of different audiences; there is not one ‘public’, but many ‘publics’ reflecting diverse interests, experiences, beliefs and values (Wynne, 1991). Chapter 2 describes how knowledge, perceptions and response to climate change vary according to educational background, age, gender, location, environmental values and cultural context. Previous research indicates that generic information campaigns that aim to appeal to everyone can end up appealing to no-one (Daamen, Staats, Wilke & Engelen, 2001; Lofstedt, 1995). This variation and complexity highlights the inevitable difficulties in communicating a complex issue to a very heterogeneous audience.

1.3.3.2 From a rational actor to a contextual model of behaviour

The information campaigns described above wrongly presuppose that awareness of the environmental and economic benefits of energy conservation will lead people to reduce their energy consumption (Luyben, 1982). The assumption that there is a simple linear progression from information provision to awareness and behaviour change is central to the government's climate change strategy and has tended to dominate sustainable development strategies (Macnaghten & Jacobs, 1997; Kollmuss & Agyeman, 2002; Burgess et al., 1998) as well as theories of environmental behaviour (Hines, Hungerford & Tomera, 1986-7). This model posits that behaviour is preceded by a process of 'rational' decision-making based on the available information.

Yet, this rationalist approach does not acknowledge salient contextual influences on energy consumption, such as personal values, social identity, norms, habits and physical infrastructure (see Section 2.3.3). Modern, industrialised societies are characterised by energy-intensive lifestyles and supporting infrastructures. Car travel has become more convenient and comparatively cheaper in relation to other forms of transport. With changes to the location of facilities and workplaces and pressure to conform to the norm of car ownership, Hillman (2004) argues that we have created a self-perpetuating car-dependent culture. Globalisation and increased opportunities for leisure and tourism have similarly increased demand for national and international travel, in particular air travel. Hillman concludes: "the UK has become a wealthier nation and, with it, expectations of normal life have risen" (2004, p.41).

Against this background, climate change not only poses a major threat to human welfare, it also represents a serious challenge to societal values and behaviours. By requiring that developed societies reduce their energy consumption, responding to climate change "strikes at the heart of human resources and activities - such as energy and transport - upon which our quality of life depends" (Houghton, 2004, p.323). Some have suggested this reduction should be in the order of 90% in the UK (Hillman, 2004b). Where consumption (of goods and energy) is such a central feature of social identity in material individualistic society (e.g., Bibbings, 2004b; Steg, Vlek & Slotegraaf, 2001), this poses problems for introducing effective energy reduction policies (IPCC, 2001c). This is implicitly recognised by the UK government in their climate change strategy, which relies on technological improvements to 'business as usual', rather than on fundamental changes in patterns of behaviour or production. In a speech on 14th September 2004, Tony Blair explicitly stated "action can be taken without disturbing the essence of our way of life, by adjusting behaviour not altering it entirely". However, as I have shown, this approach has so far been largely ineffective.

The issue of climate change demands that industrial societies, and individuals within those societies, examine the appropriateness and impact of their values, beliefs and actions in relation to consumption and the natural environment. To put this in more radical terms, it might be argued that climate change symbolises the limitations of economic growth, consumerism, and scientific certainty, prediction and control, as unquestioned goods (Beck, 1992). That the risks associated with industrial activities have now become global and long-term in nature indicates that the consequences of modernisation are even more serious and unbounded than previously imagined. In this sense, Hillman (2004a) argues, the issue of climate change "is foremost a moral one and has to be seen as such, however problematical that may be" (p.7). Thus, while climate change itself is generally not accepted as a threat, the effects of policies to tackle it implicitly threaten social values, identities and lifestyles. In order to reduce cognitive dissonance (see Section 2.2.3.6) between personal energy use and awareness of its effects, many choose to deny the threat from climate change or the need to act. Climate change policy measures that ignore or threaten social identities and values expressed in energy use - in other words, impose social costs - are unlikely to receive widespread public support.

Furthermore, trying to change individual behaviour without recognising climate change as a collective problem is futile (Hinchliffe, 1996). Contrary to the assumptions of the 'rational actor' paradigm, individuals do not exist as "rational isolates, but as members of social groups" (Layton et al., 1993, p.20; cf. Bandura, 1971; Szerszynski et al., 1996). Individuals are particularly reluctant to make personal reductions to their energy consumption when they believe other people are not making the same sacrifices (Black, Collins & Snell, 2001). As I demonstrate in this thesis, perceptions of social, political and institutional inaction in response to climate change constrain self-efficacy and individual willingness to act. In effect, climate change represents what is known as a 'social dilemma' (Dawes, 1980), whereby the benefits to an individual of not reducing their energy consumption are greater than if they voluntarily sacrifice activities or goods for the benefit of society and the environment. Since global risks can only be tackled collectively, political ideologies based on individualism and unconstrained personal choice are unlikely to offer adequate solutions (Cook, 2004). Effective, long-term action to address climate change and other global socio-environmental issues therefore requires questioning the fundamental cultural, social, economic and political structures that have given rise to them (O'Riordan & Rayner, 1991). Inevitably, though there will be immense difficulties in problematising social norms and identities "as part and parcel of the global environmental predicament" (Wynne, 1994, p.186), when there is a tendency for people to avoid conflict by interpreting new information in terms that are compatible with existing beliefs and values.

Thus, simply providing information about climate change and exhorting individuals to reduce their energy consumption ignores the context in which information is perceived and whether it is acted upon. Grove-White (1996) points out that government information campaigns and policy decisions are often grounded in a "knowledge culture which embodies a truncated and inadequate conception of the human subject – that is, of what real people are like and what their relational and communal needs may be, in the circumstances of modern complex societies" (p.283). Similarly, Burgess et al.

(1998) state:

> "As a growing number of studies show, the reception of environmental communications and their 'effectiveness' in delivering change in people's attitudes and values [and, we might add, behaviour], is highly contingent on many factors, not least the local social and cultural contexts in which people live" (p.1446-7).

The failure of government information and economic incentives to deliver changes in understanding or patterns of behaviour indicates a lack of awareness of these "local social and cultural contexts". Without understanding the context in which the public understands climate change, how their priorities may differ from those of decision-making bodies, and what barriers they perceive to reducing their energy consumption, climate change policies and education risk being useless (IPCC, 2001c). There is therefore a need for research that is sensitive to the people's everyday world, to their unique circumstances and experiences (Grove-White, 1996).

1.4 AIMS AND STRUCTURE OF THESIS

My research *principally examines the contextual determinants and dimensions of public understanding of, and response to, climate change*. It is hoped that this study will build on the findings from previous research, described in Chapter 2, by providing a more inter-disciplinary and in-depth analysis of public understanding and response to climate change in the UK. I apply both qualitative and quantitative approaches in order to give an insight into how individuals construct discourses of understanding and behaviour, and to analyse a range of influences on understanding and behaviour. Although this study explores a variety of potentially salient influences on perceptions and behavioural responses to climate change, one factor that is given particular attention is *experience and understanding of flooding*. By focussing on the relationship between flooding and climate change, this study represents an original approach to understanding how the public conceives and responds to both issues. Experiential factors have been largely unaddressed in previous research on public understanding and response to climate change, but their central role in risk perception, learning and behaviour is highlighted in the wider psychology literature.

This research focuses on an area of the UK - the South Coast - which is particularly likely to be at risk from sea-level rise, extremes of weather and flooding associated with climate change (Hulme et al., 2002). This geographical feature of the research is also original. It provides a detailed case study in its own right of a community at significant risk from climate change impacts, but also allows for some comparison with surveys conducted nationally on public perceptions of climate change and energy use (e.g., DEFRA, 2002).

Specifically, the following questions are addressed in this thesis:

1. *How do flood victims understand and respond to flooding? In what ways, if at all, do they relate their experience and understanding of flooding to climate change?*
2. *What are the dimensions of the public's understanding of, and behavioural response to, climate change?* How does the public understand 'climate change', and how (if at all) does this differ from their understanding of 'global warming'? What sources of information on climate change do people use and perceive to be most trustworthy? Who do people feel is responsible for tackling climate change, and how should it be tackled? To what extent is climate change perceived as a personal risk, a priority environmental concern, or an issue of personal importance? What constitutes public behavioural response to climate change, in terms of both actions explicitly intended to tackle climate change and (if different) energy reduction measures? What are the motivations and barriers to energy reduction?
3. *How, if at all, does public understanding and behavioural response to climate change differ from scientific conceptions, and official rhetoric and prescribed actions (i.e. energy reduction)?*
4. *What determines understanding of and response to climate change?* In particular, what roles do experience of local environmental issues (particularly, flooding) and perceived threat from climate change play?

As I have indicated, the value of this research will be in offering practical support for communicators and policy-makers involved in engaging the public in the issue of climate change and developing workable mitigation policies. This requires an understanding of the multiple, social 'realities' and responses to climate change. Therefore the prevalence and reasons for both belief *and doubt* in the reality of climate change will be examined. However, my research is motivated by a personal belief that climate change is, in all probability, more than "mere" social construction and poses a genuine risk to humans and the wider environment. To this extent, I subscribe to a philosophy of *pragmatism*, which sees a role for epistemic constructivism but not ontological constructivism (Szerszynski et al., 1996; Benton, 2001; Hannigan, 1995). In other words, social, political and cultural processes define the status of certain types of knowledge (Irwin & Wynne, 1996) and the point at which environmental conditions become "unacceptably risky and therefore actionable" (Hannigan, 1995, p.30). However, this recognition does not undermine the reality of environmental problems or the valuable contribution that scientific knowledge can make in identifying environmental problems and their causes along with policy options. Benton highlights the political risks associated with focussing on the social side of the nature-society dichotomy and reducing the natural world to the "language of" nature:

> "Independently existing nature is dissolved away into a plurality of 'natures', constituted by the equally various systems of representation available to human cultures. What a comforting invention! If we make a catastrophic mess of our own 'nature', we can discursively construct another. Fortunately for the indigenous peoples of the tropical moist forests, their 'nature' is a different one from that of the loggers and dam-builders: both can happily co-exist in their incommensurable cultural universes (I don't think!)" (Benton, 2001, p.142).

Similarly, emphasising the culturally 'constructed' and 'epistemologically questionable' character of scientific knowledge about environmental problems like climate change is "music to the ears" of petrochemical, construction and road transport industries (Benton, 2001, p.141).

Scientific knowledge plays an important role in understanding and responding to climate change, since the issue has principally been detected and defined through scientific measurement and modelling. Yet climate change is a particularly complex and necessarily inter-disciplinary area of science in which traditional scientific assumptions of certainty and prediction are fundamentally challenged. Furthermore, climate change is not simply a 'scientific' issue; it is a fundamentally social, political, cultural and moral one. The causes, impacts and solutions cannot be separated from human societies and economies, their values and lifestyles. In fact, as I have suggested, the implications of the findings from climate change research pose a direct challenge to wider social values, such as free choice and consumption (Poortinga & Pidgeon, 2003). *Thus climate change is an issue that demands a role for scientific expertise, along with diverse perspectives from other areas of society. It is hoped that this thesis will contribute to future debate and decision-making about climate change by providing an insight into public understanding and response to the issue.*

The remaining chapters are structured in the following way. Chapter 2 reviews the research that has been conducted to date on the public's understanding of and response to climate change, drawing on relevant theoretical insights and highlighting limitations. Chapter 3 describes the methodology used for the present study on public understanding of and response to climate change in the South of England. Chapters 4, 5, 6, and 7 discuss the findings from this study; each results chapter deals in turn with the four main research questions described above. Finally, Chapter 8 summarises the key findings and arguments of this thesis, offers recommendations for policy and education, and suggests areas for further research.

CHAPTER 2. UNDERSTANDING AND RESPONDING TO CLIMATE CHANGE: LITERATURE REVIEW

2.1 INTRODUCTION

Climate change has been identified as a major threat to human and ecological welfare that demands a global response. Yet communicators and policy-makers face a number of challenges to raising awareness of climate change and promoting appropriate behaviour amongst the public. This chapter reviews the research that has been conducted to date on public perceptions of and response to climate change, where appropriate drawing on explanatory insights from theories of risk perception, sociology of science and environmental behaviour. This presents an inter-disciplinary perspective on how individuals perceive, understand and respond to the issue of climate change. Previous research on perception and response to flood risk is also discussed. The focus of this review is on the UK context, although research conducted in other countries is discussed where relevant. The chapter concludes by describing how the present study builds on and extends this previous research.

2.2 PUBLIC PERCEPTIONS AND UNDERSTANDING OF CLIMATE CHANGE

Research in the UK on public perceptions and understanding of climate change has largely been restricted to quantitative surveys. These include regular government surveys of public attitudes towards the environment (DEFRA, 2002; Hinds, Carmichael & Snowling, 2002) and recent surveys conducted by Poortinga and Pidgeon (2003), Hargreaves, Lewis and Speers (2003), Bibbings (2004a), MORI (Norton & Leaman, 2004), and the BBC (2004). A small-scale exploratory study involving focus groups and a non-representative survey was also conducted to examine public perceptions to carbon capture and storage initiatives (Shackley, McLachlan & Gough, 2004). Two small scale predominantly qualitative studies were also conducted in the early 1990s (Hedges, 1991; Lofstedt, 1996).

In the US, a number of qualitative (Kempton, 1991; Bostrom, Morgan, Fischhoff & Read, 1994) and quantitative studies (Bord, O'Connor & Fisher, 2000; Fortner et al., 2000; Kempton, 1997; Read, Bostrom, Morgan, Fischhoff & Smuts, 1994; Berk & Schulman, 1995) have examined public perceptions of climate change. European research includes focus group studies (Darier & Schule, 1999; Stoll-Kleemann, O'Riordan & Jaeger, 2001), the regular EU Eurobarometer survey, and research into how school children learn about climate change (e.g., Henriksen & Jorde, 2001). A survey comprising both open and closed questions was also conducted in Newcastle, Australia in 1996 (Bulkeley, 2000). Finally, Dunlap (1998) reports on a survey of public perceptions of global warming conducted in six nations: Canada, USA, Mexico, Brazil, Portugal and Russia.

In the following sections, I review the findings of these previous studies and offer insights from broader psychological and risk literatures to elucidate why, despite widespread awareness and concern about this issue, climate change is not perceived by the public to be a serious risk. Furthermore, I will describe evidence of common 'misperceptions' about the causes of climate change and how these might be explained from the point of view of educational psychology and sociology of science. Finally, beliefs about tackling climate change are shown to be related not only to these misperceptions, but also to wider social, political and cultural influences. These findings provide a basis for the investigation described in subsequent chapters.

2.2.1 Awareness and knowledge of climate change

Previous research shows widespread awareness of the issue of climate change. In England, 99% of the public have heard of either 'climate change', 'global warming' or 'the greenhouse effect', although the term 'climate change' alone is less widely recognised than 'global warming' (DEFRA, 2002; Norton & Leaman, 2004). Similarly, two-thirds of the British public say they know 'a great deal' or 'a fair amount' about 'global warming', compared to 59% who claim this level of knowledge about 'climate change' (Norton & Leaman, 2004). The proportion claiming to understand 'global warming' in Europe is slightly higher at 72% (Eurobarometer, 2001). The variation in awareness by terminology may be a result of the media's tendency to refer to 'global warming' instead of 'climate change' (Corbett & Durfee, 2004), the latter being the term preferred by scientists and policy-makers.

Overall, only a quarter of the public claims to be 'well-informed' about climate change (Hargreaves et al., 2003). When compared to other risk issues including GM food, radioactive waste and mobile phones, however, it seems that the public feels they are more informed about climate change (Poortinga & Pidgeon, 2003; Eurobarometer, 2001). We should be wary, though, in interpreting the public's claim to be under-informed about particular issues, since this can be used to justify inaction or resistance (Darier & Schule, 1999). In this sense, 'ignorance' is constructed by the public, as well as by those concerned to rectify a perceived social deficit of knowledge (Michael, 1996). In fact, Berk and Schulman (1995) conclude from their study of public perceptions and willingness to pay for climate change mitigation that the public is able to understand and evaluate complex material about climate change scenarios. Other research has also found that the public's self-assessment of their scientific understanding is often lower than the amount of science they actually know (Michael, 1996). Section 2.2.4 explores the extent to which lay conceptions of climate change reflect scientific knowledge.

Awareness and knowledge of climate change is higher amongst men, graduates and middle-aged people. In England, a higher proportion of men (86%) than women (69%) have heard of 'climate change'. In both UK and US studies, men have been found to be more aware of the impacts and causes of climate change, while more women identify 'incorrect causes', such as ozone depletion and mobile phone use (DEFRA, 2002; O'Connor, Bord, Yarnal & Wiefek, 2002; Bibbings, 2004a).

Graduates (91%) are more likely than those without qualifications (68%) to have heard of climate change (DEFRA, 2002). Similarly, those with a higher level of education are also more likely to know that sea levels will rise as a result of climate change (Eurobarometer, 2001). Furthermore, people with a formal science qualification are more likely to understand the process through which climate change works (Hargreaves et al., 2003). These findings are consistent with reported higher levels of interest and knowledge about science issues in general, amongst men and those with a higher level of education (MORI, 2005; Eurobarometer, 2001; Evans & Durant, 1995; Office of Science and Technology and The Wellcome Trust, 2000; Durant et al., 1989; Hargreaves et al., 2003). Fewer 18-25 year olds (63%) have heard of 'climate change' than 45-64 year-olds (78%). Similarly, awareness of the causes and impacts of climate change is generally lowest amongst the under-25 and over-65 age groups (DEFRA, 2002; Bibbings, 2004a; Hargreaves et al., 2003).

Reflecting greater coverage of climate change in broadsheet newspapers, tabloid readers tend to be less knowledgeable about climate change than broadsheet readers (Hargreaves et al., 2003). Interestingly, people from higher social classes tend to cite more 'correct' and 'incorrect' causes of climate change. This suggests that "people from more deprived social classes feel less confident in their knowledge of climate change", although they may not be less knowledgeable (Bibbings, 2004a, p.18).

These findings highlight the importance of research that explores variation in awareness and knowledge of climate change amongst different sections of the public. Accordingly, this thesis examines the role of demographic factors, such as age, gender, income and education on public perceptions of and response to climate change (see particularly Section 6.7).

2.2.2 Concern about climate change

Previous UK and international studies demonstrate that concern for climate change has, over the past two decades, become widespread (Thompson & Rayner, 1998). Yet while most people in

England (80%), Scotland (67%) and Wales (66%) say they are fairly or very worried about climate change, this issue is not one of the public's main environmental concerns (DEFRA, 2002; Hinds et al., 2002; Bibbings, 2004a; Poortinga & Pidgeon, 2003). In England, disposal of hazardous waste, livestock methods/BSE, water and air pollution, loss of plants/animals in the UK, tropical forest destruction, and ozone depletion are all rated higher. Even in terms of future environmental issues, traffic and air pollution are rated more concerning than climate change (DEFRA, 2002). In Scotland, concern about climate change has dropped significantly over the last ten years relative to other environmental concerns (Hinds et al., 2002).

Furthermore, health, security and social issues feature higher in the public's concerns than environmental issues (MORI, 2005; Portsmouth City Council, 1999; Poortinga & Pidgeon, 2003; Bord et al., 2000). Only 11% of UK citizens identify environment/pollution as one of the two or three issues affecting their quality of life, while more people cite money, health, crime, job, neighbours, transport and housing (DEFRA, 2002). Similarly, while most people (84%) consider climate change to be 'fairly' or 'very' important to their current and future quality of life, most social issues (health, crime, education), as well as local environmental issues (recycling, air quality), are rated as more important (DEFRA, 2002; cf. Witherspoon & Martin, 1992). Unsurprisingly, global risks tend to be underestimated as there is a natural (evolutionary) need to concentrate on more immediate, local risks (Slovic, Fischhoff & Lichtenstein, 1978; Cary, 1993; cf. Hardin, 1968). Overall, environmental issues were more salient amongst public concerns in the UK during the 1980's, while defence and public services have since become more pressing (Norton & Leaman, 2004; BBC, 2004). When explicitly asked which global issue poses the most serious threat, terrorism was selected by the largest proportion of the public (Norton & Leaman, 2004).

These survey findings highlight the influence of contextual factors on public concerns, such as the media and political focus on the BSE crisis prior to DEFRA's survey of 2001. Other research conducted in the US suggests that public concern about climate change varies with media attention and weather fluctuations (Ungar, 1992; see Section 2.2.3.5). This is consistent with the 'availability heuristic' in risk perception, described below (e.g., Slovic, 1986).

Furthermore, concern varies amongst different demographic groups. Women and middle-aged people tend to be more concerned about climate change. More women than men are convinced that climate change is happening, is caused by human activities, and considers recent UK flooding the result of climate change (DEFRA, 2002; O'Connor et al., 2002). Women are also more likely to be 'very worried' about climate change (DEFRA, 2002; Bibbings, 2004a), and to see it as a serious threat (Norton & Leaman, 2004). This is consistent with the broader environmental psychology literature. In general, women tend to be more concerned than men about environmental problems and risks (Baldassare & Katz, 1992; Barnett & Breakwell, 2001; Hampel, Boldero & Holdsworth, 1996; Pidgeon & Beattie, 1998; Stern, Dietz & Kalof, 1993; Witherspoon & Martin, 1992). These gender differences may be a result of socialisation, in which contextual awareness tends to be fostered more amongst females than males (Stern et al., 1993). Gender differences may also arise from differences in power relations with, and trust in, risk-producers and risk-handlers (Gustafson, 1998). The variation in concern by age is more ambiguous. Recent studies indicate that younger people are *less concerned* than older age groups about climate change (Bibbings, 2004a) and the environment in general (DEFRA, 2002; Christie & Jarvis, 2001; Witherspoon & Martin, 1991). This variation with age cannot be explained in relation to starting a family: Bibbings (2004a) and Norton and Leaman (2004) found that people with dependent children are no more likely to be concerned about climate change. Yet younger respondents are *more likely* than older respondents to believe that recent UK flooding is due to climate change (DEFRA, 2002). These apparent incongruities suggest a need for more qualitative approaches to explore concern for climate change amongst different age groups.

There is also variation in the level of concern about climate change by location and country. DEFRA (2002) found that concern increases with settlement size: 42% of villagers, compared to 49% of residents of major conurbations are 'very worried' about climate change. Those living in London and the South of England are also more worried than those living elsewhere. Other research has indicated that environmental concern is higher amongst urban residents because they are more likely to attach symbolic meanings (such as the "moral superiority of nature") to natural environments; while those who live and work in rural areas are more likely to see nature as a resource (Hajer, 1996). Concern about climate change tends to be higher in Europe and Canada than in the US (Bord, Fisher & O'Connor, 1998).

Although research shows that graduates are more likely to feel environment/pollution affects their quality of life and is a priority area for government, compared to those with no qualifications, concern about climate change in particular is slightly lower amongst graduates (44%) than those without qualifications (47%) (DEFRA, 2002). Yet there does seem to be an association between knowledge and concern in relation to climate change. Broadsheet readers tend to be more concerned about climate change than tabloid readers, reflecting the attention given to the issue by each type of newspaper (Hargreaves et al., 2003). Concern and perceived threat from climate change also increases with social class (Bibbings, 2004a; Norton & Leaman, 2004), suggesting some support for 'post-materialism' (Inglehart, 1990), described in Section 2.3.3.6. Finally, Poortinga, Steg and Vlek (2002) found that concern about climate change is higher amongst people who have higher environmental values (measured using the New Environmental Paradigm scale; Dunlap & Van Liere, 1978).

The findings described in this section indicate that widespread reported concern about climate change should not be taken at face value. When examined in the context of other personal, social and environmental concerns, climate change is not amongst the most pressing issues for the public. Furthermore, concern about climate change is determined by contextual factors, such as media coverage, demographic background, location, knowledge and environmental values. This indicates a need to examine the relative importance of climate change, and the influences on concern, in order to provide a more meaningful and contextual picture of public concern (see Section 6.3.1).

2.2.3 Perceptions of climate change as a risk issue

The low ranking of climate change amongst the public's concerns is reflective of a widespread perception that climate change does not pose a direct, personal threat. While there is acceptance that climate change is beginning to manifest in changing weather and flooding, there seems to be a prevailing belief in the UK that climate change is essentially a *distant and future* problem. The Energy Saving Trust (EST, 2004) recently found that 85% of UK residents believe that the effects of climate change will not been seen for decades. Less than half the British population think the UK will be affected 'a lot' by climate change; the majority (52%) also believes climate change will have little or no effect on them personally (BBC, 2004). MORI (Norton & Leaman, 2004) similarly found that only 18% of British adults see global warming as a serious threat to their local environment, compared to over two-thirds who rate crime and vandalism as a local threat. Similarly, Bibbings (2004a, p.ii) found that only 31% in Wales agree strongly that 'climate change could have serious consequences for our way of life in Wales'. In the US, too, a minority of the public believes climate change to be a personal threat, and only a small majority even acknowledges it as a long-term threat to society (Bord et al., 2000; NSB, 2002). Other research conducted in several countries indicates that, while the public generally believe climate change has already started to happen, they do not perceive the problem to be as serious as other environmental issues (Dunlap, 1998).

There are a number of reasons why climate change is not widely conceptualised as a personal risk:

2.2.3.1 Balancing costs and benefits

An important dimension of how risks are perceived and whether they are considered 'acceptable' is the balance between the *costs and benefits* associated with the risk issue (Slovic, 2000; Eiser, Spears, Webley & van der Pligt, 1988). For example, most people accept the risk of radiation from mobile phones because they consider it to be outweighed by the benefits of this technology (Poortinga & Pidgeon, 2003). Most people do not have strong feelings about climate change: Poortinga and Pidgeon (2003) found that a quarter of respondents consider climate change to be 'neither good nor bad', while the largest proportion (38%) rate it as only 'fairly bad'. They also found that the public rate the risks of climate change for themselves as moderate, and only somewhat higher than the benefits for themselves. In some cases, climate change is dismissed as a benign issue, or even beneficial. For example, when asked about the impacts of climate change for the UK, some people identify beneficial impacts such as wine growing (15%) (DETR, 1997). A US study similarly found that only 51% of respondents judged the greenhouse effect to be bad for them personally, while 75% rated it bad in general (Bostrom et al., 1994). When asked to rate the acceptability of the risk from climate change, the largest proportion of the UK public rated it as 'neither acceptable nor unacceptable' (Poortinga & Pidgeon, 2003). As I discuss in Sections 2.3.2.4 and 2.3.3, the public may view the possible risks from with climate change as being outweighed by the benefits associated with energy use.

2.2.3.2 Scientific complexity and uncertainty

This ambivalence may relate to the high proportion of respondents agreeing that climate change has 'unknown consequences'. In effect, there may be a reciprocal relationship between risk perception and knowledge in relation to climate change, whereby those who do not consider the issue a threat will be unmotivated to learn about it (and its adverse consequences for oneself and valued others) (cf. Ungar, 2000; Fortner et al., 2000; Stern et al., 1993; see Section 2.3.2). On the other hand, the impacts of climate change are not fully known even to scientists, at least on a regional level (IPCC, 2001b). Thus, the precise nature of the threat from climate change remains uncertain. Although it will have a number of physical and ecological impacts, these may not all be negative or directly experienced by humans. Furthermore, the most serious impacts are likely to be experienced by people in developing countries and future generations. The threat of climate change is therefore distant both spatially and temporally, and consequently often not conceptualised as a significant personal risk (Adams, 2004; Burgess et al., 1998; DEFRA, 2002; Lewis, 2003; Resnick & Chi, 1992; Witherspoon & Martin, 1991). A risk issue is likely to become powerful and capture the public's imagination if the cause, effect and victim are clearly *identifiable,* such as in the case of development on contaminated ground (Harvey, 1996; Slovic, Fischhoff & Lichtenstein, 1980). Similarly, the link between ozone depletion and skin cancer is relatively well-established and straightforward. Thus, while ozone depletion is an issue with many similarities to climate change, it poses a more immediate and observable threat to health than climate change (Ungar, 2000).

Ungar (2000) also points out that climate change is an extension of the natural greenhouse effect, "creating the problem of finding the human 'fingerprint' amidst highly variable and complex natural processes" (p.305). Furthermore, humans are generally familiar with considerable weather and temperature variation, on a daily and seasonal basis, and consequently underestimate the effects of a rise in global temperatures of a few degrees due to climate change (Kempton, 1991; Berk & Schulman, 1995). Previous risk perception research has identified the characteristics of risks that are generally considered ‘risky’: these include a sense of dread associated with *unfamiliar and ‘unnatural’* phenomena (Slovic et al., 1980; Otway & von Winterfeldt, 1982). Such judgements can be based on lack of experience as well as cultural imagery (Haste, 1997). Thus, while climate change is a risk ‘buried’ in natural and familiar processes, Ungar (2000) argues that the hole in the ozone layer generated a greater degree of public response than climate change because “it is apparent to anyone that the ‘hole’ is an aberration, something that a protective shield should not have” (Ungar, 2000, p.305).

2.2.3.3 Experience and risk

The literature on risk perception highlights the role of direct experience in people’s evaluation of environmental threats (e.g., Slovic, Fischhoff & Lichtenstein, 1979). This represents a barrier to believing climate change to pose a genuine threat: ‘climate change’ is a global and long-term phenomenon and so *cannot be directly experienced or ‘seen’*. In fact, ‘climate’ is not directly observable at all, since it refers to the average weather over a period of time. Thus, it is exposed and defined through scientific measurement and communicated to the public through second-hand media sources. Climate change is “only really knowable through mathematical models” (Kollmuss & Agyeman, 2002, p.253), although more visible, experiencable effects are beginning to be evident (such as unpredictable weather and increased flooding).

While many risks are typically under-estimated (Kahneman, Slovic & Tversky, 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 (Slovic, 1986; Tversky & Kahneman, 1974). Local risks are similarly likely to seem more important than global risks (Burgess et al., 1998; Hallin, 1995; Hinchliffe, 1996; Slovic et al., 1978). Personal experience to a greater extent than second-hand information influences the perceived ‘reality’ and likelihood of a particular risk. In a sense, experience is a filter or heuristic applied to evaluate and prioritise the multitude of risks involved in daily life. People trust the evidence of their senses, while second-hand information is more open to question. Direct sensory evidence is used to expose potential environmental threats. Air pollution, for example, is detected using visual cues (Evans, Colome & Shearer, 1988). Furthermore, the primacy of direct experience means that second-hand information will often be evaluated against sensory data. For example air pollution information or advice may be ignored if it conflicts with residents’ more credible sensory evidence of symptoms of asthma or visible signs of pollution (Bickerstaff & Walker, 1999; Irwin, 1995). Similarly, Kempton (1997) found that climate change was seen as a credible explanation for people’s experiences of changes in weather since their childhood. This empiricism has been described by Kates (1976) as the “prison of experience”. He even contends “there is question if we can know beyond the experiential” (p.417).

The primacy of direct experience in learning and perception is also well-established in the broader psychological literature (Chawla, 1999; Semper, 1990; Rayner & Rickert, 1988). Fazio and Zanna (1981) report on a number of studies that demonstrate that direct experience (i.e. interaction with attitude object) is more likely than indirect experience (e.g., reading or being told about something) to result in stronger, more confident, clearly focussed and persistent attitudes, and in attitude-behaviour consistency. They suggest the reasons for these findings are:

- Direct experience may make *more* information available about the attitude object, and thus result in a more *accurate* attitude. "Having more information at hand after a direct experience, the individual could more easily evaluate the object in a clear, confident and meaningful way" (Fazio & Zanna, 1981, p.186). Furthermore, differences in terms of information processing exist between direct and indirect experience. With direct experience the experience itself and one's behaviour is salient, but with indirect experience, it may be the medium and description provided about the attitude object that is salient (relating to issues of credibility and persuasion). Furthermore, subjective experience tends to be more emotionally involving than indirect 'factual' information (Ittelson, 1973; Abram, 1996);
- Direct experience may cause the person to focus on their behaviour, "which tends to facilitate the ease with which one can decide on one's attitude" (Fazio & Zanna, 1981, p.193). As Bem's self-perception theory (1967, p.79-80) suggests, "individuals have difficulty accessing their attitudes and feelings unless they have engaged in some freely performed behaviour toward the attitude object. Such behaviour is generally perceived to be more reflective of an internal disposition than is other information. Without the benefit of prior behaviour and without the opportunity to infer an attitude from that behaviour, an individual is forced to, in some sense, 'guess' his or her attitude from other less attitudinally reflective information". There may, alternatively, be a more deliberate, conscious process at work, as Festinger (1957) suggests, in which the individual seeks self-consistency and "attempts to live up to his or her conception and evaluation of the attitude object" when encountering the object again (Fazio & Zanna, 1981, p.194). In fact, experience may motivate people to seek further (second-hand) information, to improve their understanding and inform their future response to the issue (Fortner et al., 2000);
- Similarly, attitudes based on direct experience may be more accessible from memory than attitudes based on indirect experience, accounting for the relative strength of direct experience attitudes (Fazio & Zanna, 1981). That is, different storage and retrieval differences may exist between direct and indirect experiences.

The precedence of direct experience in environmental perception represents a major obstacle for responding to climate change. As O'Riordan (1976) states: "until the event has actually been experienced, there are numerous pathways which lead most people into not taking any anticipatory action" (p.221). Climate change remains an elusive concept defined by scientific data and computer models. It is therefore unlikely to be perceived as a direct and serious risk. However, previous research has not so far examined whether experience of *the impacts of climate change, such as flooding,* influences perceptions of climate change. The relationship between flooding experience and perceived risk from climate change is a key focus of this thesis.

2.2.3.4 Trust and credibility of risk information

Since climate change cannot be directly experienced, it is therefore necessary to trust the scientists who - like tribal leaders - mediate and impart this knowledge about the world (Spengler, 1932). Most often, this knowledge is conveyed to the public through the media (Eurobarometer, 2001; Hargreaves et al., 2003). *Trust and credibility* of these second-hand sources therefore becomes a central influence on whether the issue of climate change is perceived as a genuine and serious risk. Previous research shows that the public tends to distrust industry, government, journalists, and people or organisations perceived to have vested interests (Hargreaves et al., 2003; Eurobarometer, 2001; Worcester, 2001; Burgess et al., 1998; Bickerstaff & Walker, 1999). On the other hand, expertise, independence and familiarity are qualities that tend to be associated with credibility. Thus, scientists who are perceived to be 'independent', as well as friends and family, are highly trusted sources of information. Environmental organisations are also trusted to provide information about environmental issues (Corrado, 2001; Eurobarometer, 2001; Worcester, 2001; Brehm & Kassin, 1996; Gardner & Stern, 1996). Direct personal contact with experts has also been found to be more persuasive than mediated technical information (Rayner & Rickert, 1988). Furthermore, when people perceive a communicator as being similar to them, they are more likely to engage with the message. So, when members of the public (as opposed to experts) are used as sources in science news reports (e.g., MMR), this is more likely to engage people with these issues (Hargreaves et al., 2003). Thus, as Rayner and Rickert conclude, "the medium is often much more important than the message" (1988, p.43).

Poortinga and Pidgeon's (2003) survey specifically examined public trust in relation to particular sources of climate change information. Friends and family were rated the most trusted source (4.1 on a 5-point scale), followed by environmental organisations (4.0), doctors (4.0), and scientists working for universities (3.9). Oil companies (2.3), car companies (2.4) and national government (2.7) were considered the least trustworthy. Media was not identified as a separate source of information in this survey, although other research suggests the media inspires only a moderate amount of trust in delivering climate change information (Fortner et al., 2000). Fortner et al (2000) found individuals' trust in media climate change information to be significantly related to their attitudes and certainty about the issue.

The public's distrust of government as a source of climate change information clearly has implications for the government efforts to raise awareness and change behaviour through information campaigns. In the context of other recent scientific controversies, such as BSE and MMR, the public are more likely to distrust scientific and risk information (Hargreaves et al., 2003), as well as institutions' capacity to effectively deal with risks like climate change (see Section 2.2.5).

2.2.3.5 Media construction of risk and controversy

Since the media is the most prevalent source of climate change information, its presentation of the issue has been a salient influence on public perceptions (Hargreaves et al., 2003). The global media has played a major role in 'constructing' climate change; that is, in exposing the issue and defining its social significance (Hannigan, 1995; Trumbo, 1996). Research indicates an agenda-setting effect of media, with public concern for particular issues being shown to rise and fall with the amount of media coverage. The public are also active in this process: as public interest increases, the media tends to respond by providing more coverage (Mazur & Lee, 1993). The media has not only drawn public attention to scientific and political debate about climate change (e.g., Hargreaves et al., 2003), it also offers visual 'evidence' of changing weather patterns and their impacts on humans and ecosystems (Darier & Schule, 1999; Uzzell, 2000). Furthermore, the media's focus on climate change in the context of social and political developments, such as impacts of weather events on communities and the US rejection of Kyoto, casts the issue as a concrete human narrative rather than an abstract science issue (Hargreaves et al., 2003; Peters & Heinrichs, 2004). This narrative style invokes shared social symbols, experiences and values to garner public interest (Wilkins, 1993; Hargreaves et al., 2003; McComas & Shanahan, 1999).

Climate change is often dramatised in the media by emphasising - intentionally and unintentionally - the scientific and political controversy surrounding the issue (Corbett & Durfee, 2004; Hargreaves et al., 2003; Zehr, 2000; Fortner et al., 2000). The journalistic convention of presenting a balance of opinions tends to delineate and polarise the views of different groups, giving the impression of parity of evidence (Hargreaves et al., 2003; Wilkins, 1993). Furthermore, climate change may be intentionally constructed as "scientific controversy", with uncertainty and expert disagreement exaggerated for dramatic effect (Zehr, 2000). In UK and US coverage, journalists often refer to the "global warming debate" and quote scientists and lobby groups with conflicting opinions (e.g., Watson, 2005). One US study found that climate change was more often discussed in tentative and uncertain terms in newspapers and on television news reports than it was in scientific journals (Fortner et al., 2000). This is despite a general tendency amongst journalists to make more definitive and unqualified statements than experts (Peters & Heinrichs, 2004). Other research suggests dramatic impacts of climate change were given more media attention when scientific evidence and predictions were initially announced in the 1980s; controversy has now become the focus as politicians and special interest groups debate appropriate responses to climate change (Trumbo, 1996) and journalists seek to maintain audience interest (McComos & Shanahan, 1999). The entertainment media similarly tend toward extreme (fictional) representations of climate change, ranging from catastrophic climate change scenarios in the space of a few days (the 2004 Hollywood film *The Day after Tomorrow*) to climate change as a global conspiracy invented by environmental extremists (Michael Crichton's 2004 novel, *State of Fear*).

The media presentation of risk issues as 'controversy' can strongly influence public perceptions about the reality and seriousness of an issue, and of the credibility of the scientific evidence and policy responses to it (e.g., Bibbings, 2004a). For example, Hargreaves et al. (2003) found that even where media coverage indicated that the bulk of the evidence about the MMR jab suggested it was safe, "what people appear to have heard was simply two sides of the debate" (p.4). The public can be confused by expert disagreement (Burgess et al., 1998; Bickerstaff & Walker, 1999; Hargreaves et al., 2003) and can react to uncertainty by avoiding contradictory information (Janis & Mann, 1977). Most people agree, for example, that "there is so much conflicting information about science that it is difficult to know what to believe" (Poortinga & Pidgeon, 2003). In fact, a sizeable minority of the UK and US publics doubt the reality of climate change. DEFRA (2002) recorded that only 43% of the English public claim to be 'very convinced' that climate and long-term weather patterns are changing, while up to one-fifth of the US public doubt global warming exists (NSB, 2002; Fortner et al., 2000). Doubt about the human causes of climate change is discussed further in Section 2.2.4.4.

2.2.3.6 Dissonance and denial

Finally, the public *may not want to accept* that climate change poses a risk to them. Hillman (2004a) suggests that denying the immediacy or seriousness of climate change is a psychological defence mechanism in the face of stressful or threatening information. Findings from previous research provide some support for this contention (e.g., Evans et al., 1988). Lazarus and Folkman (1984) have shown that coping with threat can include problem-focussed responses and emotion-focussed responses. In the case of emotion-focussed response, this may involve ignoring or denying the threat altogether (Rochford & Blocker, 1991). There is also evidence that producing negative information about environmental problems may be counter-productive because people become disempowered or indifferent (Cantrill, 1992; Lazarus & Folkman, 1984; Burgess et al., 1998; Seed, 1994; Naess, 1987).

Similarly, the risk of climate change may be denied because action to mitigate it - principally, energy reduction - threatens social norms, lifestyles and personal freedoms. In effect, acknowledging the damage caused by one's personal energy consumption can result in 'cognitive dissonance'. Cognitive dissonance is an uncomfortable psychological state resulting from awareness of holding conflicting beliefs, or acting inconsistently with one's attitude (Festinger, 1957). People typically act to reduce cognitive dissonance by changing their attitude to justify their behaviour, claiming (or perceiving) to have little or no choice in their action, or denying any inconsistency (Brehm & Kassin, 1996). Theories of learning similarly highlight the tendency for individuals to attend to and integrate information that supports existing cognitive schema, while ignoring or rejecting contradictory information (Resnick & Chi, 1992; Marshall, 1995). European focus group research suggests that people tend to reduce the dissonance between their attitudes and action in relation to climate change by *denying* their energy use is significant in contributing to climate change, highlighting *impediments* to taking energy reduction action, or pointing to other ways in which they protect the environment in order to *defend* their energy-dependent lifestyles. As Stoll-Kleemann et al. (2001, p.112) explain:

> "From an emotional viewpoint such responses help to assuage guilt, to reinforce victim status, to justify resentment or anger, and to emphasise the negative feelings towards disliked behaviour (e.g., the disagreeable qualities of relying on public transport and the loss of social prestige involved)".

van der Pligt (1985) similarly found that people who do not conserve energy but are environmentally concerned justify this dissonance by overestimating the prevalence of non-conservation, that is they claim non-conservation is a habit shared by other people. These findings point to important social and cultural barriers in responding to climate change, which will be discussed further in Sections 2.2.6 and 2.3.2.

In summary, this section has provided some explanation of why climate change is often not perceived as a serious risk by the lay public. The findings from the research reviewed here on risk perception highlight how divergence can arise between expert and lay definition of risks (Slovic et al., 1979). Public perception of risks depends on a range of psychological and social influences; official information about climate change will form only one part of the non-expert public's 'hybrid' conceptions of risk (Irwin et al., 1999). This thesis investigates the way in which the public constructs climate change as a 'risk' issue (see Sections 5.3.3, 5.4.4 and 6.5).

2.2.4 Understanding the impacts and causes of climate change

2.2.4.1 Conceptualising climate change as 'weather'

Findings relating to the public's understanding of the effects of climate change vary according to the methodology used. When shown a list of ecological and social problems (many of which scientists have not linked to climate change) - ranging from sea level rise to oxygen shortages and war - most respondents of a US survey considered they were possible effects of climate change (Read et al., 1994).

Yet when asked, *unprompted*, what the effects of climate change will be, both US and UK publics most commonly identify changes in *weather*, including increased temperatures and rainfall (BBC, 2004; DEFRA, 2002; Dunlap, 1998; Hinds et al., 2002; Kempton, 1997; Lofstedt, 1996). Qualitative studies indicate that there is a lack of distinction between weather and climate in lay understanding (Kempton, 1991; Bostrom et al., 1994). Furthermore, many perceive changes in weather are already happening (Darier & Schule, 1999; Bostrom et al., 1994; Kempton, 1997), and that changed weather patterns are proof of climate change (Bibbings, 2004a). This reflects the coverage in the media which tends to discuss climate change in the context of local weather-related stories, such as UK flooding (Hargreaves et al., 2003). In England, when asked explicitly if recent flooding is due to climate change, two-thirds of the public agreed (DEFRA, 2002). Kempton (1997) warns, however, that the conceptual integration of weather and climate change can lead people to dismiss climate change as benign or unproblematic, especially in areas where there are large natural fluctuations in weather patterns (see Section 2.2.3). On the other hand, Read et al. (1994) warn that public concern over climate change may *only* occur during periods of unusual or particularly hot weather, and wane at other times. This highlights the difficulty, discussed earlier, in communicating long-term global risks when people tend to define risks more locally and in terms of sensory evidence.

2.2.4.2 Beliefs about the causes of climate change

There is acceptance by most people that climate change is a human-caused problem and a general awareness of the main causes (Hargreaves et al., 2003; BBC, 2004). When prompted, most people can 'correctly' identify destruction of forests, carbon dioxide emissions, emissions from transport, and emissions from power stations as contributors to climate change (DEFRA, 2002; Hinds et al., 2002; Bibbings, 2004a; BBC, 2004; Bostrom et al., 1994). In England, the proportion able to identify the main causes of climate change has grown since 1993, suggesting awareness is increasing (DEFRA, 2002). Yet, when respondents are *not* provided with a checklist of possible causes, their understanding is shown to be lower. MORI (Norton & Leaman, 2004) found that only 30% of Britons named carbon dioxide as the main gas contributing to climate change. Only 18% of respondents in a US survey mentioned burning fossil fuels, unprompted, as a cause (Read et al., 1994). Furthermore, while deforestation is widely recognised by the public as contributing to climate change, qualitative studies indicate that the role played by forests in sequestering carbon dioxide is not understood. Rather, many believe deforestation reduces oxygen production and the amount of "clean air" available (Kempton, 1991; Bostrom et al., 1994). These findings highlight two important points. Firstly, compared to checklist surveys, research that examines the unprompted and contextual beliefs provides a more revealing insight into, and a more accurate reflection of, public understanding of climate change. Quantitative surveys can suffer from acquiescence bias, where respondents tend to agree with whatever options or statements are presented to them (Ray, 1989). Secondly, the public's interpretation of key concepts and terminology referred to in quantitative surveys should not be assumed to match expert definitions; qualitative research is needed to expose the various meanings associated with concepts like 'deforestation'.

Where qualitative research has been conducted, this reveals an interesting insight into the way in which the public understands climate change as part of a broader set of social and environmental issues. Darier and Schule (1999) found that in both Manchester and Frankfurt, focus group participants discussed anthropogenic causes of climate change in terms of industrialisation, consumption and over-population. Similarly, the public tends to understand climate change as a form of *'air pollution'* - a more generic and morally-loaded term than 'fossil fuels' or 'carbon dioxide' (Kempton, 1991; Bostrom et al., 1994). Hargreaves et al. (2003) found from a list of options the higher proportion selected 'air pollution' (72%), while slightly fewer (66%) selected the more specific, technical term 'carbon emissions'. Interestingly, Bord et al. (2000) noted that people who perceive air pollution to be a threat are more likely to perceive global warming as a threat.

There is also a tendency to make connections between climate change and other environmental issues, particularly *ozone depletion* (Henriksen & Jorde, 2001; Kempton, 1991; BBC, 2004; Hargreaves et al., 2003; Eurobarometer, 2001; Bostrom et al., 1994; Lofstedt, 1996). In 2001, DEFRA (2002) found that, when prompted, 70% of the English public identified the hole in the ozone layer as a contributor to climate change; this proportion has increased since 1993 in line with awareness of other causes. In Scotland, the hole in the ozone layer was the contributor most commonly identified from a list of options (Hinds et al., 2002). Even without prompting, ozone depletion and climate change are conceptually linked: MORI (Norton & Leaman, 2004) found that 20% of Britons identified CFCs (the group of gases responsible for ozone depletion) as the main cause of climate change; this compares to 30% identifying carbon dioxide. Although climate change and ozone depletion are indirectly related, scientific evidence indicates that their main causes are distinct (Houghton, 2004). Yet, the non-expert public commonly considers ozone thinning to be the mechanism through which greenhouse gases affect climate (Hargreaves et al., 2003). Even people with a high level of education, and those claiming to understand ozone depletion, believe climatic impacts are due to holes in the ozone layer (Eurobarometer, 2001; Bostrom et al., 1994).

Nuclear power and *mobile phone radiation* are also linked to climate change by a significant minority of the public. One in ten people in England, and 15% in Scotland, identified from a list of options the use of mobile phones as a contributor (DEFRA, 2002; Hinds et al., 2002). Three in ten people in Scotland think nuclear power produces greenhouse gases, while only 37% think coal and oil power generation do (Hinds et al., 2002). Hargreaves et al. (2003) found that 44% of the British public identified nuclear power plants as a cause of climate change. When presented with a list, the BBC (2004) found that as many as 29% of respondents identified aerosols and 13% intensive farming. European and US researchers have similarly found that lay individuals associate climate change with a range of causes including nuclear power, pesticides, space travel, and aerosols (Querol, Swartling, Kasemir & Tabara, 2003; Bord et al., 2000; Kempton, 1991; Dunlap, 1998). These findings are not only evident in survey research, which presents respondents with a list of possible alternatives from which to select - or guess - the correct answer. Indeed, connections between climate change and other issues are also made by non-experts in qualitative interviews (e.g., Bostrom et al., 1994). Even amongst respondents with a high level of education, Read et al. (1994) conclude that lay understanding of climate change is "encumbered with a large number of secondary, irrelevant, and incorrect beliefs" (p.979).

It has been suggested that the reason why the non-expert public makes links between climate change and other environmental issues is because they are trying to build explanations on partial knowledge (Hargreaves et al., 2003). Many people can identify the link between emissions and climate change, yet "few people can explain the process behind this link and, as a consequence, see climate change as a consequence of a whole hotch potch of environmentally sensitive issues" (Hargreaves et al., 2003, p.35). "Environmental issues", such as nuclear power, climate change, holes in the ozone layer, organic food and so on, tend to be linked in people's minds and often "associations may be standing in for causal relationships" (Hargreaves et al., 2003, p.38). This process of building explanations on partial knowledge has been referred to as 'information short-cuts' (Popkin, 1991).

It has also been suggested that the conceptual integration by the public of climate change and ozone depletion may be because the media thematically associates them, both being global environmental problems caused by anthropogenic emissions in the atmosphere (Read et al., 1994; Hargreaves et al., 2003). While no causal connection is made in the media between the ozone holes and climate change, the greenhouse effect itself is often not explained and "in the absence of any other explanation offered, most people tend to assume" a causal connection (Hargreaves et al., 2003, p.37).

Other research that examines how the public learns about climate change shows that new information is often 'grafted on' to existing concepts (Kempton, 1991; Henriksen & Jorde, 2001).

In particular, new information about climate change is assimilated into the ozone layer framework, which has become well-established in the public's consciousness (Ungar, 2000). This explanation is consistent with constructivist theories of learning, which posit that people do not simply reflect what they see and hear; rather they build knowledge for themselves (Piaget, 1970; Resnick & Chi, 1992). People typically perceive new information in the context of existing beliefs and knowledge, and they adapt and assimilate this new information to fit with their prior conceptions (Marshall, 1995; Eysenck & Keane, 2000).

> "Once formed, initial impressions tend to structure the way that subsequent evidence is interpreted. New evidence appears reliable and informative if it is consistent with one's initial beliefs" (Slovic, 1986, p.405).

This is an adaptive strategy that effectively enables people to deal with complex situations and ideas more quickly (Kempton, 1997). Thus the concept of ozone depletion, as well as knowledge of other environmental issues like air pollution and mobile phone radiation, is commonly used to give meaning to novel information about climate change.

However, sociological researchers have offered a different explanation for the evident disparity between expert and lay conceptions of the causes of climate change. Jasanoff and Wynne (1998) suggest that public identification of aerosols and pollution, for example, as causes of climate change do not indicate confusion or ignorance but "the extension of a generalized, historically grounded, distrust of industry" (p.40). This interpretation is not incompatible with the psychological approach described above. The two positions can be summarised as pointing to a tendency for the public to understand scientific issues in terms of both existing personal knowledge and in relation to broader cultural values and beliefs. The institutional, cultural and moral dimensions of public perceptions of climate change are also evident in beliefs about tackling climate change (see Section 2.2.5).

2.2.4.3 Underestimating energy use as a cause of climate change

Yet, while there is a general awareness of the human causes of climate change, there is little understanding of the relationship between climate change and energy systems (Thompson & Rayner, 1998). Although the public is able to identify the role played by emissions in causing climate change, this is not supported by a real understanding of how these affect climate (Bostrom et al., 1994). In contrast to other scientific and technological developments, energy is not to be associated with negative environmental consequences or risks to health (MORI, 2005). In particular, few people make any connection between *domestic energy consumption* and climate change (Bibbings, 2004b). When shown a list of possible causes, only one in five people in England, and slightly less in Scotland, identify gas and electricity used in the home as a contributor to climate change (DEFRA, 2002; Hinds et al., 2002). One US survey explicitly asked respondents whether they believed their own actions contributed to climate change. A minority (41%) agreed that their actions exacerbate climate change; of these, most mentioned driving (58%) or using aerosol cans (38%).

This disconnection between individual actions and climate change is also reflected in British media coverage of the issue. Hargreaves et al. (2003) found that, while some reports referred to 'fossil fuels', less then 2% indicated how the public might contribute to tackling climate change. Yet, this tendency is not uniquely British. Bord et al. (2000) and Connor et al. (2002) found that Americans also underestimate the role of domestic energy consumption and, to a lesser extent, personal transport in causing climate change. It may be, as Kempton (1997, p.14) suggests, that the pollution model that often frames the public's understanding of climate change "obscures the roles of invisible and seemingly non-polluting human activities" including domestic energy use. In addition, the underestimation of personal energy use in contributing to climate change may reflect a strategy of reducing cognitive dissonance by denying responsibility for tackling climate change (see Sections 2.2.3.6 and 2.2.5).

2.2.4.4 Doubt about the reality or human causes of climate change

Furthermore, there is some doubt about whether climate change is caused by human activities (Fortner et al., 2000; Bostrom et al., 1994). DEFRA (2002) found 13% of the English public does not believe that climate change is the result of human activities, and a further 16% say they do not know. In Wales, 10% not do believe humans cause climate change, and 31% say they do not know (Bibbings, 2004a). In 2004, a BBC poll found that almost one in five Britons believe it is too early to say whether human or natural causes are more to blame for climate change. As suggested in Section 2.2.3.5, this scepticism may be a product of the US and UK media presentation of climate change as controversial and uncertain. Furthermore, doubt may arise because, unlike many other anthropogenic environmental problems, the human causes of climate change are not self-evident. Personal energy consumption has no immediate or observable impacts on climate; causal actions and ultimate impacts to societies and the non-human environment are disconnected spatially and temporally (DeAngelo & Harvey, 1998; Rayner & Malone, 1998). Hargreaves et al. (2003) make the same observation from their research on media communication of climate change:

> "General lack of certainty about the causes of climate change is also reflected in the difficulty people have in connecting the local with the global, thereby understanding how the daily choices in their own lives might be linked to climate change" (p.37).

Thus, not only are the impacts of climate change perceived as distant and irrelevant (see Section 2.2.3), the causes are also divorced from personal actions - and even human activities altogether.

The findings discussed in this section reveal a number of interesting disparities between lay and expert conceptions of climate change. These disparities can be interpreted and explained in a number of ways, depending on disciplinary perspective and methodology used to define public 'understanding'. The research described in subsequent chapters explores unprompted lay beliefs about climate change and examines the role played by scientific concepts and terminology in explaining the issue. Both constructivist theories of learning and insights from sociology of science are used to interpret these findings.

2.2.5 Beliefs about tackling climate change

2.2.5.1 Strategies and responsibility for mitigation

US studies that examine the public's beliefs about effective strategies to tackle climate change have highlighted the ways in which people make logical inferences from their understanding of the causes of the issue. As discussed in Section 2.2.5, this understanding is partial and draws on knowledge of other environmental issues. Read et al. (1994, p.980-1) explain:

> "In the absence of specific information, subjects' default assumptions may be that things that seem bad for the environment also cause global warming, while environmentally friendly actions reduce global warming".

Thus, reducing deforestation, banning aerosols, and implementing air pollution controls are commonly cited as the main ways in which climate change can be tackled (Kempton, 1997; Bostrom et al., 1994). When asked specifically about individual action, the highest proportions of respondents to one US survey suggested that reducing driving (43%) and taking political action (34%) would help prevent global warming (Read et al., 1994). Yet the same survey found that only 41% believed they contribute to climate change. A small-scale UK survey found the most popular suggestions were reducing driving (61%) and reducing aerosols (37%) (Lofstedt, 1996). In general, energy reduction is not commonly identified as a major feature of climate change mitigation, corresponding with low awareness of energy use as the main cause.

Consistent with the lack of awareness of their own contribution to climate change, the public tends to place *responsibility* for tackling climate change with international organisations, followed by national government (DETR, 1997; BBC, 2004; Norton & Leaman, 2004). In 1997, DEFRA found that only 16% of the public thought 'individuals/everyone' was responsible; in 2004, the BBC found only 9% of Britons identified individual households as best placed to tackle global warming. In part, these findings may reflect a more general tendency to deny personal responsibility for environmental problems and to displace blame onto others (Douglas, 1992; Evans et al., 1988; Hinchliffe, 1996). For example, the Scottish Executive's survey found that over three-quarters of the public agree that there is a need to change the way of life of *most people* in Scotland to benefit future generations, yet under half feel they should *personally* change (Hinds et al., 2002).

Consistent with this, there is widespread support for policies to tackle climate change which do not involve individuals directly paying. Thus, incentives (e.g., rewarding drivers with lower emissions and improving public transport) and technological solutions (e.g., renewable energy) receive more support than carbon/energy taxes, road tolls (DEFRA, 2002; BBC, 2004) or higher energy bills (Shackley et al., 2004; Kasemir et al., 2003a; Bord et al., 2000; O'Connor, Bord & Fisher, 1999).

When presented with alternative technological solutions, the public also has clear preferences. There continues to be widespread resistance to the use of nuclear energy (NSB, 2002), even as a means to reduce the UK's carbon emissions (Shackley et al., 2004). Preliminary research to determine public reactions to carbon capture and storage initiatives suggest there are some anxieties in terms of potential risks of leakage, as well as scepticism about the motivations of organisations associated with the technology (Shackley et al., 2004). In contrast, the public largely supports increased energy efficiency and the use of renewable energy sources, such as wind, wave and solar power (Bibbings, 2004a). These sources are believed to be far less polluting than fossil fuels or nuclear power (Hinds et al., 2002). Yet, while there is support for renewable energy in theory, there is often considerable public opposition when wind power becomes a *local* development issue. This highlights important differences between distant and local risk perceptions. Both the perceived costs (e.g., aesthetic impacts and health risks) *and benefits* (associated with economic development) are greater for local developments (e.g., Eiser et al., 1988). Accordingly, Bibbings (2004a) found that people living near a windfarm are more likely than those living further away to both support wind energy *and* express concerns about it. Together, these findings highlight the way in which technological risks are socially-defined in the context of perceived risks and benefits, institutional trust, and cultural fears (see Section 2.2.3).

2.2.5.2 Institutional barriers to individual action

While responsibility for tackling climate change is more often placed at governmental and international levels, there is also evidence that the British and European public is aware of the need for wider collective and individual involvement in responding to climate change (Querol et al., 2003; Lofstedt, 1996). When asked explicitly whether they felt they could help stop global warming, two-thirds of British people agreed they could (DETR, 1997). Furthermore, a BBC (2004) poll found that 85% of the British public say they 'would be prepared to change the way they live in order to lessen the possible impact of global warming'.

Yet the same poll found that little over half the population (54%) believed that changing their own behaviour would have any impact on climate change (BBC, 2004). This may reflect a more profound *political disenfranchisement, distrust and fatalism* amongst the British public that has been noted elsewhere (MORI, 2005; Poortinga & Pidgeon, 2003; Worcester, 2001; Norton & Leaman, 2004; Grove-White, 1996; Stoll-Kleemann et al., 2001; Haste, 2004b). There has been a decline in electoral participation in recent decades; and while there has also been a rise in non-electoral forms of social participation and protest, this has largely been the preserve of highly educated groups who *also* vote (Curtice & Seyd, 2003). In general, there is an increasing tendency for the public to question those in authority (House of Lords Select Committee on Science and Technology, 2000). Qualitative research highlights a prevailing belief amongst the public that they can do little to influence political processes and that their concerns and opinions are irrelevant to policy-makers (Bibbings, 2004b; Macnaghten & Jacobs, 1997).

In relation to climate change, a minority believes the government shares their own views on the issue or listens to public concerns (Poortinga & Pidgeon, 2003). Although public and community involvement in decision-making about climate change is something the public has explicitly stated should happen, when asked whether they would personally like to be consulted in policy making decisions about climate change, agreement is much lower (Poortinga & Pidgeon, 2003). This suggests apathy and disengagement from political processes has become customary for many people, who perhaps are sceptical about the utility of contributing to political debates.

There is also a prevalent view that government is doing little to protect the environment (DETR, 1997), and a lack of awareness of climate change policies and public information in the UK (Norton & Leaman, 2004). In terms of public information, few people (8%) feel the government provides the public with all relevant information about climate change (Norton & Leaman, 2004; cf Poortinga & Pidgeon, 2003), or indeed about environmental issues in general (DETR, 1997). A recent survey by MORI (Norton & Leaman, 2004) found that 50% of the British public have never heard of the Kyoto Agreement. Of those who are aware of this Agreement, the vast majority knows that the US is opposed to it (Hargreaves et al., 2003). Furthermore, half the population feel it is a waste of time trying to tackle global warming in the UK without international agreement (Norton & Leaman, 2004). The majority also lack confidence in the government to tackle climate change, believing it to be unduly influenced by industry in responding to the issue (Poortinga & Pidgeon, 2003). This distrust and perceived governmental inaction in relation to climate change, which is evident across Europe (Querol et al., 2003), undoubtedly influences public beliefs about the need and efficacy of individual action. Furthermore, many feel that individual efforts to respond to climate change are wasted because other members of society are not taking action (Hinchliffe, 1996). As Bibbings (2004b) notes, the public accepts in theory that responsibility for environmental problems should be shared between society, business, industry and government but perceives that, in practice, "nobody is living up to their side of the bargain" (p.103). Trust also affects the credibility of government exhortations for the public to reduce their energy use, and - as I will indicate in Section 2.3.2 - their willingness to take personal action.

2.2.5.3 Moral and cultural dimensions of beliefs about tackling climate change

Previous research indicates that there is a *moral* dimension to participants' understanding about climate change, in particular concern about global and national inequalities in tackling it (Darier & Schule, 1999; Poortinga & Pidgeon, 2003). In Darier and Schule's focus group study (1999), participants discussed the need for fair global policies that ensure developed countries lead by example in reducing emissions, but do not deny developing countries the privileges enjoyed by developed countries. Kempton (1991) also found that concern for future generations was a common framework around which interviewees argued for climate change mitigation.

There are also interesting cultural and regional differences in the way in which potential climate change mitigation strategies are viewed by the public. Research conducted in the US shows the public to be hostile about the notion of energy reduction, which is equated with a lower standard of living rather than environmental benefits (Kempton, 1991). The notion of energy reduction also conflicts ideologically with the American ethos of individual freedom and unlimited consumption. In Europe, there is greater recognition that energy reduction is a necessary feature of climate change mitigation (Kasemir et al., 2003a), although a similar reluctance to personally reduce energy use (Stoll-Kleemann et al., 2001). Berk and Schulman (1995) also found that willingness to pay for climate measures is higher amongst those living on a coastal area of the US, compared to those living inland. This may be due to an increased awareness of risk from sea level rise, or higher environmental values associated with residents of the coastal area.

Furthermore, the political and cultural context influences the public's sense of personal and collective agency. The UK public tends to perceive a failure by government and the business sector to take action in response to climate change, while in Germany people perceive individuals' and businesses' economic interests to constrain effective action (Darier & Schule, 1999). It has been suggested that this variation in response to climate change can be explained by cultural theory. As I outlined in Section 1.2.4, distinct cultural positions have been identified that incorporate environmental worldviews, social solidarities (perceived responsibility, trust and agency) and judgements about fairness. So for example, people who value a high-growth, technological society are likely to see the benefits of development as greater than the risks from climate change; those who primarily value social equity and environmental quality may consider these risks unacceptable (Buss, Craik & Dake, 1986). Although most of the research on cultural worldviews focuses on response to climate change at the institutional level, there is evidence that individuals who perceive the environment as fragile and resources limited are more willing to take measures to mitigate climate change (O'Connor et al., 1999; Poortinga et al., 2002). Given the option of adapting to climate change *instead of* mitigating it, however, very few people accept this as a response strategy. Despite scientific uncertainty, Europeans and Americans show a clear preference for mitigation measures to be taken (Kasemir et al., 2003a; Stoll-Kleemann et al., 2001; Kempton, 1991). This indicates widespread support for the Precautionary Principle, embodied in the UN Climate Convention (see Section 1.2.4).

The findings discussed in this section highlight the complex interplay of knowledge, perceived costs and benefits, moral considerations, cultural symbols and institutional relationships in the public beliefs about tackling climate change. These influences are also evident in public perceptions of climate change as a risk issue (Section 2.2.3), and in individual action in response to climate change (Sections 2.3.2.5 and 2.3.3.4) and highlight the need for an inter-disciplinary and contextual approach to studying public understanding and response to climate change.

2.3 PUBLIC ACTION IN RESPONSE TO CLIMATE CHANGE

2.3.1 Defining action in response to climate change: impact-oriented and intent-oriented approaches

In relation to the research that has been conducted to date on the public's behavioural response to climate change, an important distinction emerges between *impact-oriented* and *intent-oriented* behavioural research (Stern, 2000). Impact-oriented studies are concerned with the actual impacts of behaviour on environmental issues; intent-oriented research examines behaviour from the point of view of the motivation of the actor in respect of the environmental issue. Research has primarily addressed climate change action from the perspective of *impact* rather than *intent* - focusing on those actions that have been defined *by experts* as having the greatest impact on climate change (i.e. energy reduction) rather than on actions lay individuals may conduct with the intention of mitigation climate change (e.g., recycling). The distinction is salient for two reasons: firstly it exposes whether and why people are investing their energies in "futile activities" that they mistakenly believe will mitigate climate change (Read et al., 1994, p.980). Secondly, it allows for analysis of the *various* motivations that may underlie decisions about energy use; often environmentally beneficial actions result from non-environmental concerns, such as a desire to save money (Stern, 2000).

A number of studies based in the UK and elsewhere have examined the public's energy use, often as a behavioural component of a survey on public understanding of climate change (DEFRA, 2002; Poortinga & Pidgeon, 2003; Norton & Leaman, 2004). This is despite clear evidence that energy reduction measures are often taken for reasons unconnected to climate change (DEFRA, 2002; see Section 2.3.3.1). However, research to date has not explicitly asked *which actions* the public are taking *with the express intention* of mitigating climate change. One study that asked US respondents what action they *could* take to prevent global warming, found that suggestions included reducing driving, political action, personal awareness, recycling and reducing aerosol use (Read et al., 1994). Other US research similarly points to a significant divergence between the public's understanding and expert conceptions of effective mitigation strategies (Kempton, 1997). Moreover, some surveys have examined the prevalence and determinants of *willingness* to address climate change (e.g., BBC, 2004; Bord et al., 2000; Fortner et al., 2000; see Section 2.3.2). As I will discuss in the following two sections, the distinction between intent-oriented and impact-oriented action is important because energy reduction is influenced by a larger range of factors than simply a conscious desire to mitigate climate change. These results suggest that surveys measuring energy reduction as an indicator of public response to climate change provide an incomplete picture of public behaviour. Conversely, policies to reduce individuals' energy use that do not take account of the complex conscious and unconscious influences on action, will inevitably fail.

2.3.2 Prevalence and determinants of willingness to address climate change

As discussed, it is unclear what actions are being taken with the explicit intention of mitigating climate change, by whom, or under what circumstances. However, some studies have recently addressed the level of *willingness* amongst the public to address climate change - both directly through personal actions, and indirectly through support for policy measures (BBC, 2004; Bord et al., 2000; O'Connor et al., 2002; O'Connor et al., 1999; Stoll-Kleemann et al., 2001). When asked what actions they *would be* prepared to take to mitigate climate change, there is evidently resistance to significantly changing existing habits and lifestyles. The BBC (2004) poll found that 85% of the British public say they 'would be prepared to change the way they live in order to lessen the possible impact of global warming': of these, most claimed they would recycle more household waste and improve home energy efficiency, while fewer would change their transport habits or pay more to travel. US researchers have found a similar resistance to change driving habits, while there is generally a greater willingness to adopt domestic energy conservation practices, such as installing insulation and using energy efficient appliances (Bord et al., 2000; O'Connor et al., 2002; O'Connor et al., 1999; Fortner et al., 2000).

Since the BBC survey did not address the *determinants* of willingness to adopt climate change measures, the findings discussed in this section relate to the US-based surveys that used multivariate analysis and to European qualitative research. These studies suggest that key determinants of individual behavioural intentions to mitigate climate change and support for mitigation policies include *knowledge, risk perception*, *environmental values, institutional relationships* (e.g., self-efficacy), and *education.* I will argue that these findings indicate support for Stern et al.'s (1993) extended norm activation model of behaviour and social dilemma theory (Dawes, 1980). These theories are also discussed in the context of the research conducted for this thesis.

2.3.2.1 Knowledge of climate change

Firstly, knowledge of the causes of climate change has been shown to be a key predictor of behavioural intentions to address climate change (O'Connor et al., 2002; O'Connor et al., 1999). Bord et al.'s (2000) US survey, for example, found that 'accurate' knowledge of the causes of global warming (generators of carbon dioxide and deforestation) was the strongest predictor of behavioural intentions and support for mitigation policies. The salient link between knowledge and action has also been demonstrated in the broader environmental psychology literature (Hines et al., 1986-7). Research shows, for example, that people are more likely to adopt environmentally responsible behaviour when they are informed about the consequences of pollution (Heberlein & Black, 1976; 1981) than when they lack this knowledge (Kromm, Probald & Wall, 1973). Similarly, Kallgren and Wood (1986) found that the more informed students were about environmental issues, the more consistent their behaviour towards the environment. These findings highlight the important role that communication and education can play in fostering more sustainable behaviours.

The salience of knowledge in predicting behavioural intentions may in part explain the low levels of energy conservation observed in the UK. While the public understands the main causes of climate change, including transport emissions, there is little knowledge of the contribution of domestic energy consumption to causing or potentially mitigating it. Consequently, people are not fully aware of the actions they could take to mitigate climate change, often suggesting policies and actions that are divergent from expert recommendations.

Yet it is clear that knowledge alone is not sufficient to foster energy reduction behaviour. There is more awareness of the role of transport than of domestic energy use in contributing to climate change; yet, when presented with a list of energy-reduction actions the public is more willing to reduce domestic consumption than to drive less. One study (Bibbings, 2004a) even found that motorists were *more* aware than non-motorists of the role played by driving in contributing to climate change, yet few chose alternative modes of transport. Deliberative focus groups that provide lay participants with expert information about climate change have been found to raise awareness of the need for low-energy futures, but *not* to foster willingness to change personal behaviours (Stoll-Kleemann et al., 2001). Other research into sustainable behaviour has found that environmental knowledge can be just as low among people who considered themselves 'environmentalists' as among 'non-environmentalists' (Kempton, Boster & Hartley, 1995). There is clear evidence of a "knowledge-behaviour gap" from both the climate change and broader environmental psychology literatures (Kollmuss & Agyeman, 2002).

2.3.2.2 Evaluation of climate change as a threat

It has been well-established in previous psychological research that how one evaluates and feels about an issue or object, as well as what one knows about it, will influence one's behavioural intentions towards it (see Section 2.3.3.3). Accordingly, intent-oriented environmental action depends on whether a particular issue is perceived to be a threat to oneself or to other valued individuals or objects (Lazarus & Folkman, 1984). This comprises the *motivational* component necessary for people to learn about and respond to environmental issues (Zimmermann, 1996). Based on Schwartz' (1977) 'Norm Activation Theory' of altruistic behaviour, Stern et al. (1993) have identified three distinct, but related, motivations for acting to protect the environment:

- Egoistic: self-interest;
- Social-altruistic: concern for the welfare of other people;
- Biospheric: concern for the welfare of the non-human world.

Naturally, the egoistic orientation tends to be the strongest motivation for action, followed by (where present) social-altruistic and then biospheric orientations. For example self-interest is the principal motivation underlying the widespread NIMBY (not-in-my-back-yard) phenomenon (Rayner & Rickert, 1988). Here, people express concern about a perceived environmental threat primarily because it is direct and local to them; they are not - at least initially - concerned with acting to eliminate the threat altogether, or "to bring about moral and political equality in larger society" (Rayner & Rickert, 1988, p.43; cf. Hajer, 1996; Slovic, 1986). This is consistent with much health behaviour research (Conner & Norman, 1995; Weinstein, 1988), which emphasises the centrality of perceived threat (of a particular condition), in terms of beliefs about personal susceptibility and severity of consequences, in determining protective health behaviour. Yet there is also evidence that people who are more at risk or threatened by environmental problems are more likely to hold pro-environmental attitudes (Arcury & Christianson, 1990) and to take action to reduce their impact on the environment (Baldassare & Katz, 1992). For example, where a person believes that air pollution affects their health (that is, it constitutes a genuine threat), they 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 problems can lead to action to protect others, as well as oneself.

As I argued in Section 2.2.3, few people see climate change as a direct or observable threat to their own well-being. Ungar (2000) argues that this is a major reason for the lack of public response to climate change; in contrast other issues, such as the hole in the ozone layer have given rise to a "sense of personal threat with everyday relevance" and resulted in widespread action (p.306). Indeed, surveys that have measured *perceptions of climate change as a risk* have found that this provides some explanation for public response to climate change (O'Connor et al., 1999). Bord et al.'s (2000) survey found that perceived societal risk of global warming moderates the relationship between knowledge and behavioural intentions to address global warming. Similarly, O'Connor et al.'s (2002) survey of Pennsylvanian residents found that belief that climate change will lower standards of living, bring more disease, and cause food shortages significantly predicts willingness to reduce greenhouse gases. A qualitative UK study also indicated that acceptance of mitigation policies is dependent on belief in the reality and severity of climate change as a problem (Shackley et al., 2004). In fact, the self-preservationist view of human behaviour has popular acceptance: focus group research on lay perceptions of climate change, found that participants explicitly expressed the view that without directly experiencing catastrophic and threatening impacts from climate change, such as droughts and floods, people will not respond to climate change (Darier & Schule, 1999).

2.3.2.3 Environmental values

However, self-preservation (or self-interest) is not the only motivation for action to mitigate environmental problems (Stern et al., 1993). The risks associated with climate change are diverse and distributed unevenly across human societies, other species, locations, and time. Consistent with Stern et al.'s framework, individuals who believe climate change threatens the non-human world, and who *value* it, show willingness to mitigate climate change. O'Connor et al. (1999) found that people with high environmental values (measured using the 'New Environmental Paradigm' scale; Dunlap & Van Liere, 1978) are more likely to express willingness to take voluntary and voting actions to mitigate climate change. Similarly, Poortinga, Steg and Vlek (2004) have found that concern about climate change, and general environmental values, strongly influence support for government regulation of energy use and acceptability of personal energy saving-measures. Other research conducted in Sweden compared 'self-transcendent' and 'self-enhancement' values, and found that willingness to accept climate change policies was determined only by the former (Nilsson, von Borgstede & Biel, 2004).

There are, in turn, a variety of influences on environmental values which have been the focus of a large body of psychological research. Kollmuss & Agyeman (2002) have reviewed much of this literature and point to childhood experiences of natural environments and experiences of environmental destruction (e.g., Chawla, 1999; Newhouse, 1990), followed by social and educational influences (Gardner & Stern, 1996; Rayner & Rickert, 1988; Slovic, 1986), as being the most salient determinants of environmental values. This is consistent with the empirical and theoretical evidence of the primacy of direct experience in learning and behaviour formation that I discussed in Section 2.2.3. *Despite this body of evidence, it is surprising that the influence of experiential variables on willingness to address climate change has received almost no attention.* One possible exception is the relationship noted by Bord et al. (2000) between perceptions of air pollution as a threat (which presumably relate in some way to experience) and perceived threat from global warming.

2.3.2.4 Costs associated with climate change action

As I suggested in Section 2.2.3, an important dimension of how risks are responded to, is how people evaluate the balance between the costs and benefits associated with the risk issue. To use Stern's language, intent-oriented environmental behaviour can involve a trade-off between egoistic and altruistic or biospheric motivations (Stern, 2000; Stern et al., 1993). While climate change itself is not considered overall to bring many benefits (Poortinga & Pidgeon, 2003), *responding to the risk* may be seen as more costly - and involve a greater threat to self-interest - than ignoring it. O'Riordan and Rayner (1991) point out:

> "Responding to the challenge of global warming implies behavioural changes involving higher institutional and personal expenditures and perhaps some personal inconvenience. This will be possible if the threats (i.e. the costs) are seen as real, and hence the sacrifices beneficial" (p.93).

This aspect of risk perception may also explain why there is little action in response to climate change, when this involves reducing energy consumption. As I have discussed, although most people claim they would be willing to 'change the way they live' to mitigate climate change (BBC, 2004), the actions they are willing to take and the policies they support involve no direct cost and little change to existing lifestyles. This suggests that the costs attached to mitigating climate change are perceived as greater than the risks associated with climate change. In fact, Berk and Schulman's (1995) US survey found that very large changes in climate would be required to influence willingness to pay for mitigation measures.

As I have shown, the British, European and US publics show much higher levels of support for policies to tackle climate change which do not financially penalise individuals. O'Connor et al.

(2002) found that the belief that environmental policies do not threaten jobs for people like the respondent, limit freedoms, or hurt the economy strongly predicts willingness to mitigate climate change and to support mitigation policies. Income was found to have a strong negative influence on willingness to drive less and reduce home energy use; that is, poorer people are more willing to drive less and to lower home thermostats. In essence, people are more likely to act to mitigate climate change when doing so does not threaten their economic security and when they will feel the financial benefits of doing so. As I will discuss in Section 2.3.3, there are also social costs associated with energy reduction.

2.3.2.5 Personal responsibility, self-efficacy and public trust

Other important influences on behavioural response to climate change are personal responsibility and efficacy; that is, the extent to which people believe they *should* and *can* mitigate the threat from climate change. The significance of this variable is evident primarily from qualitative studies of public response to climate change (Bibbings, 2004b; Darier & Schule, 1999; Stoll-Kleemann et al., 2001). For example, Bostrom and Fischhoff (2001) report on a deliberative focus group study of US participants' willingness to accept a proposed surtax. They found that most respondents accepted the tax if they felt it was part of an international effort to tackle climate change. Similarly, the wider environmental and social psychology literature highlights the importance of perceived self-efficacy (also 'perceived behavioural control' or 'internal locus of control') in determining action (e.g., Kollmuss & Agyeman, 2001; Ajzen, 1991). Schwartz' Norm Activation Theory of altruistic behaviour (1977) predicts that people not only need to be aware of (social) problems, but also to *feel responsibility* for solving them in order to act in response to them. This model has been successfully applied in predicting intent-oriented environmental behaviour (e.g., Stern et al., 1993).

As we saw in Section 2.2.5, few people believe that individuals are responsible for tackling climate change. Rather, responsibility tends to be placed with international and national organisations. Furthermore, many feel individual, and even national, action to tackle climate change is a waste of time without international agreement. Motivation to act on global environmental issues is inevitably lower than for local issues, because most people perceive individuals cannot influence large-scale issues: their efficacy and responsibility is bounded (Eden, 1993; Wynne, 1994; Jamison, 1996). This is despite global problems often being more *worrying*, precisely because people feel less able to control them (Uzzell, 2000). Findings from risk research also highlight the importance of personal control in willingness to respond to risk issues. People are more likely to take action if it effectively eliminates, rather than merely reduces, the risk (Slovic et al., 1979).

Perceived self-efficacy varies with particular risk issues and between individuals. People who believe that it is possible to do something about an environmental problem - and that their actions, as opposed to fate or others' actions, determine one's fate ('internal locus of control') - are more likely to take direct or political action to prevent it (Evans et al., 1988; Hines et al., 1986-7; McKenzie-Mohr & Smith, 1999; Newhouse, 1990). In general, people with a higher level of education believe they can do more to influence situations and political processes Curtice & Seyd, 2003).

Unlike many other types of risk, including health risks, the threat from climate change cannot be avoided through individual action alone. Thus, many people in the UK want government to impose regulations to make them act, because they consider only collective action to be effective in response to climate change (Darier & Schule, 1999). In the UK, there are low levels of perceived efficacy in relation to environmental issues generally: few people, especially amongst the 15-24 year old age group, believe that one person can make a difference (MORI, 2002). This lack of personal agency in relation to adopting particular sustainable actions is fundamentally related to trust in controlling institutions and other social actors. O'Riordan and Rayner (1991) explain the concept of *public trust*:

> "[It] operates through the cultural and political norms and institutions that frame a person's and a culture's relationships with everything else, including nature. These management systems function because people expect them to function properly. They do not need to know what others are doing. They simply have to feel confident that others are acting with the same sense that the system will work in such a way as to improve social well-being. That system could be a government, or a non-governmental organization, or a network of presumed similar behaviours" (p.98).

Recent research in Wales highlights the public's lack of trust in the motives and commitment of the UK government, and its impacts on individuals' willingness to act and their perceptions of individual efficacy (Bibbings, 2004b). Many feel that their concerns are not acknowledged by government and that they have no way of influencing policy. Perceptions of government-sanctioned inaction by industry, too, contribute to individual disempowerment. While there is a sense that responsibility is not being equitably accepted by larger institutions, individuals feel disinclined to make personal sacrifices.

McKenzie-Mohr and Smith (1999) argue that "sense of community" largely determines perceived efficacy: "if we feel that in concern with others we have an impact, we are likely to act. If however, we feel little common purpose, we are likely to perceive that there is little we can do personally" (p.92). Thus, a number of researchers have argued that the failure of environmental communication strategies is largely due - not to misunderstanding or ignorance - but to a lack of public resonance with messages that assume individual efficacy, responsibility and identification with policies (Hinchliffe, 1996; Bickerstaff & Walker, 1999; Wynne, 1994, p.170). The degree to which the public trusts particular organisations and institutions will determine both the acceptability of particular public policies and willingness to take personal actions (Shackley et al., 2004). Research has shown that people conserve more energy when information is given to them from a state regulatory agency than from a local utility, because the motives of the latter are more questionable (Craig & McCann, 1978). However, groups who do not trust the government will be suspicious about, or indifferent to, information campaigns that encourage behaviour change (Kollmuss & Agyeman, 2002). Provision of information will not overcome public apathy, distrust, and alienation from institutions (Burgess et al., 1998).

Public trust and its relationship to personal efficacy are central to the notion of *'social dilemmas'*. A social dilemma is characterised by two properties: the payoff to each individual is higher for a socially defecting choice (e.g., consuming all available energy) than for a socially co-operative choice (e.g., energy conservation), regardless of what other members of society do; but all individuals in society receive a higher payoff if everyone co-operates than if everyone defects (Dawes, 1980). Overpopulation, resource depletion and pollution are the most fundamental and ubiquitous forms of social dilemma, although examples can and do arise in a range of social situations. Hardin (1968) has analogously described the inevitable degradation of an unowned shared resource that arises out of a propensity for individuals to maximise their own gain, as the 'Tragedy of the Commons'. Although there is evidence of successful commons management (Gardner & Stern, 1996) and of individuals' consideration for others' payoffs (Dawes, 1980), the continued existence of dilemma-type problems suggests a tendency - at least under certain consitions - to defect when personal gain is greater. Climate change is a social dilemma or a 'global commons' problem, arising out of unrestricted energy use and associated emissions. Dawes (1980, p.170) explains the dilemma of resource depletion:

> "People asked to keep their thermostats low to conserve energy are being asked to suffer from the cold without appreciably conserving the fuel supply by their individual sacrifices; yet if all keep their thermostats high, all may run out of fuel and freeze".

However, in the present context, the problem with excessive individual energy consumption is no longer (only) depletion of fuel supplies but the impact of greenhouse gases on climate systems and, ultimately, human welfare. Where it is perceived that most individuals and institutions are defecting (to their own benefit but the collective detriment), there is less motivation for individuals to co-operate in mitigation efforts that rely on voluntary energy reduction. This tendency to defect is logically addressed through altering the social incentive structure - punishing defective behaviour and rewarding co-operative behaviour (e.g., Hardin, 1968) - or fostering values and norms that favour social co-operation (e.g., Dobson, 2003; O'Riordan, 1976; cf. Naess, 1989). Yet, the present UK strategy for mitigating climate change appears neither to provide adequate incentives for energy reduction, nor to address the lack of public trust and shared environmental values that discourages co-operative energy reduction behaviour.

2.3.2.6 Demographic variables

Studies have shown that demographic variables tend to explain only a small proportion of the variation in multivariate models of willingness to address climate change (O'Connor et al., 1999). One survey of public response to climate change found that gender did not predict willingness to act or support of policies (O'Connor et al., 2002). Yet in another survey, O'Connor et al. (1999) found that women were more likely to express willingness to take voluntary actions to mitigate climate change; while men were found to show more support for government mitigation policies than women (O'Connor et al., 1999). This is only partially consistent with the broader environmental psychology literature, which tends to show women to be more environmentally active than men (e.g., Stern et al., 1993).

In O'Connor et al.'s surveys (2002; 1999), a higher level of education was found to predict willingness to reduce greenhouse gases and, particularly, to support mitigation policies. This is consistent with higher levels of reported interest in environmental issues (Eurobarometer, 2001), higher levels of environmental concern and behaviour amongst more educated groups (Exley & Christie, 2002; Hines et al., 1986-7; Witherspoon & Martin, 1991). This relationship between educational level and environmental action may be related to higher perceived self-efficacy amongst those with a higher level of education (Curtice & Seyd, 2003; cf. Witherspoon & Martin, 1991).

These studies of intent-oriented action in response to climate change rely on measures of *willingness* to address climate change, that is behavioural intentions. While behavioural intentions can provide a useful proxy for measuring actual behaviours (Ajzen & Fishbein, 1980), a review of the 'environmental behaviour' literature highlights a number of 'situational' variables that can confound the relationship between intention and action, including physical infrastructure and habit (Hines et al., 1986-7). I will describe in Section 2.3.3 the contextual constraints and barriers to energy conservation behaviours that impact on the level of *actual* behaviours taken to mitigate climate change.

2.3.3 Prevalence and determinants of energy conservation behaviours

Behavioural researchers have been interested in energy consumption behaviours for decades. In the 1970s, US energy shortages prompted studies to determine the most effective methods for reducing the public's consumption (e.g., Stern & Kirkpatrick, 1977). More recently, research into the public's energy use has been driven by the need to respond to climate change. Research has included multivariate analysis of the determinants of energy use using quantitative survey data (e.g., Poortinga et al., 2004), as well as surveys and qualitative studies of the motivations for energy consumption and reduction (e.g., DEFRA, 2002; Layton et al., 1993). Types of energy behaviour examined in these studies encompass both domestic and travel domains and include: investment in efficient equipment (e.g., energy-saving light bulbs); using a renewable energy supplier; curtailment of personal energy use (e.g., using public transport, lowering thermostats); and requesting information or advice about energy conservation or efficiency. While some studies have involved taking readings of energy consumption (Brandon & Lewis, 1999; Poortinga et al., 2004), more often energy use and reduction has been measured using self-reports of behaviour. This represents a limitation for many of these studies, since self-reported actions do not necessarily reflect actual actions taken (Bamberg & Schmidt, 2003).

2.3.3.1 Prevalence of and reasons for energy-reduction action

As discussed earlier, energy consumption in the UK has actually risen in recent years. Most research indicates that energy conservation measures are taken by a minority of the public. Currently, around a third of the public regularly buys energy-efficient light bulbs (DEFRA, 2002; Norton & Leaman, 2004); 42% use alternatives to driving (DEFRA, 2002), and 26% specifically use public transport (Norton & Leaman, 2004). Poortinga and Pidgeon's survey (2003) found that *in the last year or two,* a higher proportion claimed to have used energy-saving light bulbs (51%) and used public transport instead of a car (42%). Furthermore, three in ten claimed to have asked their electricity/gas supplier for advice about energy efficiency. Overall, energy conservation is not as prevalent as recycling; around half the population regularly recycles household rubbish (DEFRA, 2002; Norton & Leaman, 2004).

Where the motivations for energy-reduction have been examined, this shows people claiming to reduce energy consumption generally do so for reasons unconnected to climate change or the environment. Of the 40% of the English public who claim to 'regularly cut down the amount of electricity/gas your household uses', 81% do so to *save money* and only 15% to *'help the environment/reduce pollution'* (DEFRA, 2002). Similarly, of the 39% claiming to cut down car use for short journeys, most (59%) do so for *exercise* or to *save money* (25%) and only 17% do so to *help the environment/reduce pollution*. Other research has also found that financial motivations most commonly underpinned energy conservation (Bibbings, 2004b; Brandon & Lewis, 1999).

When asked for the reasons why they are *not* reducing their energy consumption, non-conservers most commonly state that they *cannot* consume any less energy (DEFRA, 2002; also Kempton, 1991). This claim can be interpreted in a number of ways. Taken at face value, it may genuinely reflect an inability to consume less energy without impairing basic living requirements. Consistent with this explanation, older people are more likely to say they cannot consume less energy

(DEFRA, 2002) and tend to consume less energy overall (Poortinga et al., 2004), perhaps suggesting they are naturally more frugal as a result of wartime rationing (Boardman, 2004).

From a more sociological perspective, claims relating to 'needs' are understood as a product of social context. As Douglas, Gasper, Ney and Thompson (1998, p.259) conclude, "human needs and wants are generated, articulated, and satisfied in an institutionalized feedback system". Many people in modern societies view driving as a 'necessity' rather than a 'luxury' (Exley & Christie, 2002; Black et al., 2001). This justification for car use might be seen as a strategy to reduce cognitive dissonance between individual actions and environmental concern (Eden, 1993; Szerszynski et al., 1996; Festinger, 1957; see Section 2.2.3). Alternatively, it may indicate a genuine perceived lack of alternatives to driving, such as non-availability of public transport. More generally, the claim that one cannot consume less energy may be due to informational barriers, that is, a lack of awareness of how to effectively make energy savings.

2.3.3.2 Theoretical perspectives relevant to energy conservation

Bamberg and Schmidt (2003) suggest that the most relevant behavioural theories that may be applied to energy behaviours include the Theory of Planned Behaviour (TPB) (Ajzen, 1991), the Theory of Interpersonal Behaviour (TIP) (Triandis, 1977), and the Norm Activation Theory (Schwartz, 1977). The TPB, a widely-applied model of behaviour (Armitage & Conner, 2001), states that how one evaluates the outcomes of behaviour in terms of rewards and costs will determine one's intention to act. Considerations of social expectations, required resources and potential barriers form part of this rational decision-making process. Triandis' TIP similarly describes cost-benefit evaluations as central to conscious decision-making, but also incorporates a role for unconscious habit in determining regular action. These theories are referred to as 'expectance-value' theories, because they focus on the role of expected outcomes of behaviour, and the value placed on those outcomes, in motivating behaviour (Axelrod & Lehman, 1993).

Contrary to the assumptions of expectance-value theories, not all action is motivated in anticipation of tangible or social outcomes; some is motivated by 'internal' rewards associated with adhering to personal values (Axelrod & Lehman, 1993). Schwartz' (1977) Norm Activation Model of behaviour has been used to explain the moral influences on energy behaviour (e.g., Black, Stern & Elworth, 1985). However, Bamberg and Schmidt, 2003 found that energy behaviour is primarily determined by perceived personal costs and benefits, and by habit, while moral concerns are less influential (cf. DEFRA, 2002). Although environmental values and concerns increase *willingness* to conserve energy, these motivations are considered alongside competing motivations and between perceived costs and benefits of action (Ajzen, 1991; Heberlein & Black, 1976). Therefore, people with high pro-environmental values are more likely to conserve energy, if the threat to self interest (i.e., cost) is not considered too great (Clark, Kotchen & Moore, 2003; Poortinga et al., 2004; Black et al., 1985). In the following sub-sections, I discuss empirical findings relating to the psychological and social influences on energy consumption and reduction.

2.3.3.3 Costs and benefits of energy conservation

The tangible benefits of energy conservation include health benefits from walking or cycling, and financial benefits from lower energy bills (DEFRA, 2002). Economic self-interest is a particularly powerful motivation for behaviour. Changes to the structure of economic incentives and disincentives can foster energy reduction behaviour - at least in the short-term (Hayes & Cone, 1977; Stern & Kirkpatrick, 1977). The Durham road pricing scheme, for example, has resulted in a 90% reduction of car use in the city centre (Dobson, 2003). Accordingly, economic utility theories, which posit that individuals act to maximise their own economic or material gain (Simon, 1956), continue to play a central role in policy-making, including with regard to climate change (see Section 1.3.2).

However, as suggested by the low prevalence of energy reduction behaviours (see Section 2.3.1), energy conservation is more often associated with personal costs than with benefits. Firstly, there are *financial* costs associated with certain energy reduction behaviours, such as buying home insulation or energy efficient appliances. For car owners in the UK, driving is often a cheaper option than taking the train. Similarly, domestic energy from renewable sources generally costs more than from non-renewable sources (Clark et al., 2003). However, contrary to economic utility theories, individuals are not motivated *solely* by economic self-interest (Jacobs, 1994; Dobson, 2003). Research suggests that the introduction of lower road taxes for less polluting vehicles has had little impact on the type of cars purchased (Norton & Leaman, 2004). Economic (dis)incentives are not sufficient to change deeply-entrenched norms and cherished activities.

Many of the ‘costs’ associated with energy conservation relate to *personal values* and *physical infrastructure*. People highly value the convenience, independence, comfort, and safety afforded to them by car ownership; public transport suffers from a more negative image (Exley & Christie, 2003; 2002). An increasing motivation for driving children, even short distances, to school is for their personal safety (Black et al., 2001); conversely concern about safety is a major deterrent to cycling and train use (Davies, Halliday, Mayes & Pocock, 1997; Exley & Christie, 2003). Other factors affecting transport choice include journey distance, availability of parking, number of passengers, luggage, schedules, weather, and so on (e.g., Black et al., 2001). Thus, transport infrastructure and planning policies affect the options available for travel. The proportion using alternatives to driving is highest in London (52%) and major conurbations (49%) (DEFRA, 2002); and has been found to increase during major road closures (Fujii, Garling & Kitamura, 2001). Furthermore, certain domestic energy conservation measures, such as installing insulation or solar heating, will only be viable for home owners (McKenzie-Mohr & Smith, 1999). Thus, structural conditions of this kind have been found to determine intentions to adopt energy conservation actions (Black et al., 1985; Schwartz, 1977; Eden, 1993; McKenzie-Mohr & Smith, 1999; Gardner & Stern, 1996).

However, perceptions of physical constraints are subjectively defined, and arguments about inconvenience and costs associated with alternative behaviour choices can be used to justify preferred actions. For example Fujii et al. (2001) found that expected commute time by public transport was overestimated by commuters who drive to work, and to a higher degree amongst higher frequency drivers; but that this over-estimation was corrected once drivers experienced the journey by public transport. Similarly, Davies et al. (1997) noted that the dangers and inconvenience associated with cycling were sometimes overstated in order to rationalise car use. As I will discuss in Section 2.3.3.4, cultural context determines personal preferences and valid options for behaviour.

An important precondition for rational evaluation of the costs and benefits of energy conservation is *knowledge*. This was alluded to in Section 2.3.3.2: people may perceive they *cannot* reduce energy consumption because they are unaware of effective strategies for doing so; others may be unaware of the environmental costs of energy use, or the personal benefits associated with energy conservation. Much research has examined information provision as a means of prompting energy conservation (see Gardner & Stern, 1996). This highlights the salience of the *information source* in influencing behaviour change.

2.3.3.4 Social and cultural influences on energy use

Social outcomes are a core component of expectance-value decision-making (Axelrod & Lehman, 1993). Energy use in both transport and domestic contexts is fundamentally determined and constrained by social values and norms. The type of car one drives will reflect social status, identity and lifestyle. Income is one of the most salient predictors of domestic and transport-related energy consumption (Poortinga et al., 2004). For example, while bus users are typically from lower economic backgrounds, car users are more affluent (Exley & Christie, 2002). Domestic energy consumption - through heating, lighting and home appliance use - is also bound up with values and social identity and related to assumptions about quality of life and prosperity (Layton et al., 1993; Kollmuss & Agyeman, 2002; Poortinga et al., 2004). As Layton et al. (1993) show, the social roles adopted in relation to domestic energy consumption include investor, consumer, member of a social group, and expresser of personal values. Concerns underpinning energy choices may therefore include re-sale value of one's property, aesthetic qualities of energy equipment, self-image, status or personal comfort. Diverse concerns and social identities can result in energy consumption behaviour seeming inconsistent or 'irrational': someone might save electricity by cooking two meals at once, but keep the heating on 'for the cat' or open windows to 'air the house' (Layton et al., 1993; cf. Hallin, 1995).

Furthermore, many aspects of energy consumption, particularly driving, have become well-established social norms. The wider social psychology literature highlights how powerful social influences are on attitudes and behaviour; people learn through observing others' behaviour (Bandura, 1971) and seek to conform to accepted modes of behaviour (Brehm & Kassin, 1996; Gardner & Stern, 1996). These norms have been reinforced and sustained through transport and planning policies (see Section 1.2.6). Accordingly, changes to both physical and cultural infrastructures are necessary to change patterns of energy consumption. Policies can affect public attitudes by producing a 'demonstration effect', encouraging desired behaviour through the example set by government (Jones et al., 1998). As I discussed in Section 2.2.5, public beliefs about the need and efficacy of individual action, and their willingness to act, are currently undermined by distrust and perceived governmental inaction in relation to climate change. Finally, subscription to cultural beliefs about the vulnerability of nature to human intervention has been shown to influence *acceptability* of energy reduction measures, although actual behaviour was not examined (Poortinga et al., 2002).

2.3.3.5 Habit and energy use

As well as extrinsic barriers - such as financial costs, social values and physical infrastructure - *past behaviour* is one of the most intractable barriers to changing energy behaviours (van der Pligt, 1985; Kollmuss & Agyeman, 2002). Behavioural habits develop in response to a general set of circumstances, such as travelling by car in all circumstances, or using the dustbin for all waste. As Verplanken, Aarts, van Knippenberg and Moonen (1998, p.113) explain: "When behaviour is repeatedly and satisfactorily executed and becomes habitual it may lose its reasoned character… and be guided by the automaticity of stimulus response". Information about alternative behavioural options is then unlikely to be sought out. Car use in particular has been shown to be strongly influenced by habit (Fujii et al, 2001; Bamberg & Schmidt, 2003; Exley & Christie, 2003). Evidently, then, not all behaviour is preceded with conscious intention or a process of rational decision-making in relation to the options available (Jensen, 2002). In fact, individuals may carry out environmental actions *before* they develop conscious environmental attitudes (Hallin, 1995; Vogel, 1996; Bem, 1967). These findings point to the limitations of the 'rational actor' model of behaviour and the TPB.

2.3.3.6 Demographic influences on energy conservation

There are no clear divisions between 'energy conservers' and 'non-energy-conservers' along demographic lines. For example, those aged 18-24 are least likely to regularly cut down household electricity/gas (35%), but most likely to use alternatives to driving (47%). More men (33%) than women buy energy-efficient light bulbs; while more women (45%) than men use alternatives to driving (DEFRA, 2002). However, the *motivations* for energy conservation do vary according to certain demographic variables. Although social grade does not influence the proportion conserving household energy, environmental motivations are more prevalent amongst higher social grades (22%) than lower grades (13%) (DEFRA, 2002). Other research has indicated that participants in a premium-priced renewable energy program are more likely to be on higher incomes (Clark et al., 2003). These findings show some support for the theory of 'postmaterialism', which suggests that once basic material needs have been met, people are more likely to value, and act to preserve, the environment (Inglehart, 1990). Yet, contrary to these predictions, other studies show that total energy consumption increases with income (Poortinga et al., 2004; Brandon & Lewis, 1999). Thus, energy conservation and greenhouse gas reduction may be motivated more by environmental concern than economic gain amongst higher income groups, but these groups are likely to be consuming more energy in the first place.

Environmental motivations for reducing household energy and cutting down on short car journeys are also higher amongst the 25-64 age groups (DEFRA, 2002); the under-25 age group are least environmentally motivated in relation to energy conservation and other actions, such as recycling (DEFRA, 2002; Leaman & Norton, 2002; DETR, 1997). This group was also most likely to cite lack of desire or time as the reason for *not* reducing energy consumption (DEFRA, 2002). This reflects a lack of environmental concern amongst this age group reported elsewhere (MORI, 2002).

Women (21%) are somewhat more motivated than men (14%) to cut down car use for short journeys for environmental reasons, though there is no difference in motivations for reducing household energy consumption. This indicates the importance of identifying the motivations for energy reduction in different contexts, rather than viewing energy conservation as a uniform set of behaviours (cf. Jensen, 2002).

2.3.3.7 Summary

In summary, findings from research into energy reduction actions highlight the competing motivations and complex influences on behaviour. Energy reduction is influenced by external influences (economic incentives, penalties, information, physical infrastructure and cultural norms) and internal influences (egoistic, altruistic and biospheric values and habit) (Stern & Kirkpatrick, 1977; Clark et al., 2003). The 'rational actor' model of behaviour underpinning current climate change policies does not reflect the unconscious and 'irrational' aspects of behaviour. As Poortinga et al. (2004) conclude: "[energy] behaviour is not only dependent on motivational factors but is also determined by contextual factors, such as individual opportunities and abilities" (p.89).

Attempts to change energy consumption without an understanding of the context in which individuals act and the social meanings associated with energy use are likely to be ineffective.

2.4 PUBLIC PERCEPTIONS OF AND RESPONSE TO FLOOD RISK

As mentioned, flooding is understood by the majority of the UK public to be an impact of climate change. In 2004, the Environment Agency released new flood risk maps, which identify 5 million people as 'at risk' from flooding in England and Wales (Davis, 2004). The impacts of flooding are well-documented. Flood damage can be extensive, and lead people to move out of their homes for many months (Environment Agency, 2001). In addition to the dangers of injury and disease (e.g., Few, Ahern, Matthies & Kovats, 2005), there are significant psycho-social impacts associated with flood events, including trauma, relationship problems, isolation, loss of confidence in authorities, and loss of identity and memories (e.g., through damaged photos) (Environment Agency, 2001; Maltais, Robichaud, & Simard, 2001). Yet, despite efforts to raise awareness of the dangers of flooding, Environment Agency (2002) research shows low levels (5%) of people taking action to prepare for floods and poor understanding of appropriate actions to self-protect against flooding. Handmer (2000) notes that flood warnings often fail to elicit any response amongst communities at risk from flooding. These findings are consistent with studies conducted in the US. Lave and Lave (1991) report low awareness amongst interviewees (N=22) of strategies to prevent flood damage. Similarly, Kates (1976) found that, while many flood victims take action following a flood to reduce losses, a minority take preventive action to mitigate damage.

A number of factors have been found to influence perceptions of and response to flood risk. Firstly, those who have directly experienced flooding are more likely to accept that it poses a serious risk and to take preventive action (Payne & Pigram, 1981; Hansson, Noulles & Bellovich, 1982; Kates, 1962; de Man & Simpson-Housley, 1988). Recency, frequency and magnitude of past flooding, for example, have been found to affect perception of flood risk (Payne & Pigram, 1981; Kates, 1976). 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 risk from flooding (Gunter & Wober, 1983). The primacy of experience in flood hazard perception is consistent with the wider risk literature, reviewed in Section 2.2.3. The power of experience can evidently influence those in authority as well as the lay public: according to the Environment Agency (2001), seeing the 2000 floods “convinced” the Prime Minister to do more to prevent climate change. Indeed, Johnson, Tunstall and Penning-Rowsell (2003) found that flooding events commonly serve as catalysts for changing public policy.

On the other hand, while experience plays a major role in exposing the threat posed by flooding, it can also serve to desensitise people who are regularly flooded. Some studies have found that those who have been flooded in the past can habituate to the regular threat (Wong & Zhao, 2001) or deny that flooding will recur in order to reduce anxiety (Slovic et al., 1979). Kates (1976), for example, notes that the threats that are least experienced are the most feared. It may be that in order to reduce cognitive dissonance, residents are unwilling to acknowledge any association between their local area and environmental hazards (Evans et al., 1988). On the other hand, denial may be an emotion-focussed coping strategy for dealing with long-term exposure to flood risk (Lazarus & Folkman, 1984).

However, while experience is perhaps the most salient influence on perceptions of flood risk, the way in which people respond to flooding is determined by a wider range of personal and social factors. In particular, perceived control, responsibility and trust in agencies responsible for managing flood risk can influence response to flood risk (e.g., de Man & Simpson-Housley, 1988). Research indicates, for example, that people are more likely to be pro-active in social protest about flooding if they believe it to be in some way human-caused, rather than entirely natural (Rochford & Blocker, 1991). Studies of other types of hazard have similarly shown that having a clearly identifiable person or group to blame for an environmental threat can motivate public response (Harvey, 1996). However, information on flood risk tends to portray flooding as a natural and inevitable risk (see Section 2.5). Consequently, victims are often led feeling that "nothing can be done" (Wong & Zhao, 2001). This can justify displacement of responsibility for action on the part of both public bodies and individuals: while individuals rely on government organisations to ensure protective measures exist, these organisations emphasise that "it's up to individuals to take action to minimise the effects of flooding on their homes or businesses" (Environment Agency, 2001, p.25). Indeed, recent flood hazard literature (e.g., Johnson, Tunstall & Penning-Rowsell, 2003) highlights the role of political and institutional forces in 'creating' flood risk. Thus, wider social and institutional factors play an important role in determining individuals' vulnerability to flooding, their sense of self-efficacy, and their willingness and capacity to respond (Few, 2003; Benight, 2004). The results of the flooding interviews discussed in Chapter 4 confirm the salience of both individual and social influences on perceptions and behaviour in relation to flood risk.

2.5 CONCLUSIONS FROM LITERATURE REVIEW

Previous studies expose a range of contextual influences on the public's understanding of and response to climate change. Many of these influences are similarly evident in public perceptions of and response to flood risk. Contrary to the assumptions underlying current UK policies to change public behaviour, there is no straightforward relationship between information provision and either risk perception or individual behaviour; nor is behaviour motivated solely by economic self-interest. Rather there is a complex interplay of knowledge, perceived costs and benefits, moral considerations, cultural symbols and institutional relationships. In this chapter, insights were drawn from a number of disciplines to explain these relationships. Yet few previous studies of public understanding and response to climate change have integrated these theoretical insights or offer an interdisciplinary view on this area. One exception is Poortinga and Pidgeon's (2003) survey of public perceptions of climate change, which addressed many of the sociological and psychological dimensions of risk perception identified in this chapter. This thesis addresses the need for further inter-disciplinary studies of this kind.

Accordingly, the research described in subsequent chapters gives attention to psychological, social and cultural influences on public perceptions of and response to climate change. In particular, this thesis focuses on the role played by *experiential factors* in understanding, evaluating and responding to climate change. Experiential factors have been largely unaddressed in previous research on public understanding and response to climate change, but their central role in risk perception, learning and behaviour is highlighted in the wider psychology literature (see Sections 2.2.3.3 and 2.3.2.3). The primacy of experience represents an obstacle to perceiving global phenomena like climate change as serious risks to personal well-being, since these are primarily exposed and communicated through second-hand sources of information. Nevertheless, the *impacts* of climate change can be directly experienced. It is therefore hypothesised that experience of flooding - as one of the main risks to human settlements from climate change (IPCC, 2001b) - influences understanding and response to climate change. For example, experiencing flood damage might make someone more attentive to climate change information or change their perceptions of the reality or severity of the risk of climate change. Furthermore, if they feel their risk from flooding is increasing with climate change, it might encourage them to take personal action to mitigate climate change. Although flood risk is not solely attributed to climate change - changes in land use and local watercourse management, for example, can also contribute to flooding - it is projected to increase by up to 30 times over the next 75 years as climate change worsens (King, 2004).

Recent flooding has already been linked to climate change. In 2000, for example, severe flooding - the worst for over half a century - affected large parts of England, particularly in the South and South West, and led to a large injection of government funding to improve flood defences (Environment Agency, 2001a). The media increasingly links extreme weather events, including flooding, with climate change (Hargreaves et al., 2003). Yet while the role of climate change in increasing the amount of flooding is acknowledged in government information, flooding and climate change are viewed as largely separate problems and dealt with by different government departments. DEFRA's information campaigns (e.g., *AYDYB?*) aim to encourage individual action to prevent environmental damage, including anthropogenic climate change. Yet, the Environment

Agency (the government agency responsible for preventing, and limiting the damage caused by, flooding) refers to the *inevitability* of flooding and encourages only protective and adaptive (not preventive) actions. This is demonstrated by the slogan adopted by the Agency for their ten-year flooding awareness campaign: "Flooding: you can't prevent it; you can prepare for it". Despite flooding and climate change mitigation not being associated in government communication, it is hypothesised here that flooding may nevertheless be a local, directly experienced phenomena through which the public learns about the global issue of climate change. Other experiential variables are also examined in this research, including perceptions of changed weather, and the perceived effects of air pollution on personal health. These reflect the conceptual integration amongst the lay public of both weather and air pollution with climate change, noted in previous studies (e.g., Kempton, 1991).

This thesis also addresses the need for more qualitative and analytical studies of UK public understanding and response to climate change. Previous UK research in this area has tended to employ large-scale quantitative survey methods. While these provide a useful overview of the extent to which the public agrees or disagrees with predefined statements, they do not expose the context in which the public perceives the issue and potentially relates it to their lifestyle (Michael, 1996). In other words, while they describe the range of beliefs held by the public in relation to climate change, they do not reveal the reasons *why* they are held or *how* they are influenced. In relation to climate change, there is a need for research that examines inconsistencies and ambiguities in beliefs, values and actions. For example, how do people reconcile their awareness and concern about climate change with lifestyle choices and pressures? How do they perceive and deal with uncertainty about climate change? These type of questions need to be addressed for effective policy-making.

It is also clear from previous studies that quantitative and qualitative studies can elicit very different findings about public understanding and response to climate change. For example, surveys that present respondents with check-lists of possible causes or effects of climate change find high levels of agreement with most items; while, qualitative surveys have shown that people define and apply concepts (e.g., deforestation) in different ways, and reveal the way in which particular beliefs are constructed. This implies a need for less procrustean and more local, qualitative approaches to defining and researching public understanding and response to climate change. Although some US research (e.g., Kempton, 1991) has used qualitative methods to address these issues, the extent to which these findings can be transposed to a UK context is not yet known.

Furthermore, previous studies have focussed on the prevalence of certain personal energy reduction actions ('impact-oriented' behaviour), without identifying the actions (energy-related or otherwise) that are taken with the express intention of mitigating climate change ('intent-oriented' behaviour). This deficiency urgently needs to be addressed so that there is a clear picture of the level of public response to climate change, and to what extent this is likely to impact effectively on the issue. Again, in-depth research is also needed in the UK to identify the motivations and determinants of both intent-oriented and impact-oriented behaviours. To date, only US surveys have analysed the determinants of particular behavioural intentions in relation to climate change (e.g., O'Connor et al., 2002).

Thus, I apply both qualitative and quantitative approaches to examine the dimensions and determinants of public understanding of and response to climate change in the South of England. It is hoped that this study will provide more meaningful information for use in UK policy-making and communication than has so far been available. More generally, the study will contribute to our understanding of risk perception and communication, and of learning and behaviour in relation to the environment. In particular it will address a gap in the literature in understanding the role of *experiential* influences on perceptions of *global* risks such as climate change.

CHAPTER 3. METHODOLOGY

3.1 INTRODUCTION

This chapter describes the methodology and methods used to collect and analyse data for the purposes of this thesis. Based on the conclusions drawn from the literature review in Chapter 2, I argue that a mixed methodology approach is most appropriate in examining the contextual determinants and dimensions of public understanding of, and response to, climate change. I briefly describe an exploratory study conducted with a student sample, and then describe in detail the methods used in the qualitative and quantitative stages of the main climate change study.

3.2 RATIONALE FOR MIXED-METHODOLOGY

Qualitative and quantitative methods have come to viewed by many researchers as grounded in fundamentally incompatible philosophical paradigms (e.g., Blaikie, 1991). Quantitative methods are generally associated with a 'positivist' paradigm; while qualitative methods are more typically grounded in a 'constructivist' epistemology. However, while these associations are often present, they should not imply that qualitative and quantitative methods are *essentially* incommensurate (Bryman, 1988). Indeed, as Bryman (1988) shows, this distinction is misleading when we consider that the practice of natural science often does not conform to the positivist ideal. The 'humanness' of scientific inquiry - for example, in which scientists rely on tacit knowledge and embody institutional values - is most clearly exposed in sociological studies of scientists (Collins, 1982; Golinski, 1998). Similarly, I have argued that there is no value-free account of climate change; or indeed of any object of inquiry (see Section 1.2.3). Conversely, the use of measurement in social research does not automatically indicate a commitment to positivism (Bryman, 2001). Silverman (2001), for example, argues that quantification (ideally, based on respondents' own categories) can give greater confidence in the accuracy of conclusions derived from qualitative data.

> "Instead of taking the researcher's word for it, the reader has a chance to gain a sense of the flavour of the data as a whole" (Silverman, 2001, p.37).

Thus, the distinction between particular qualitative and quantitative methods can be understood as primarily technical, and not necessarily philosophical. Indeed, many social studies have combined qualitative and quantitative methods of data collection and analysis in different ways, and to achieve different ends (see Arksey & Knight, 1999, p.24-28; Fielding & Fielding, 1986; Creswell, 2003).

Qualitative and quantitative methods offer different insights into the social dimensions of climate change and each is better suited to answering *different types of research question*. Thus, the rationale for combining methods stems from "the basic and plausible assertion that life is multifaceted and is best approached by the use of techniques that have a specialized relevance" (Fielding & Fielding, 1986, p.34). Adopting a mixed methodology approach in this study provides both the breadth and depth of data required to address the aims of this thesis, which encompass both description and explanation of public understanding of and response to climate change. As discussed, previous research on the UK public's understanding of and response to climate change has largely relied on descriptive survey data and offers little insight into the contextual influences on perceptions and behaviour. This thesis addresses the need for more qualitative and analytical quantitative studies in this area.

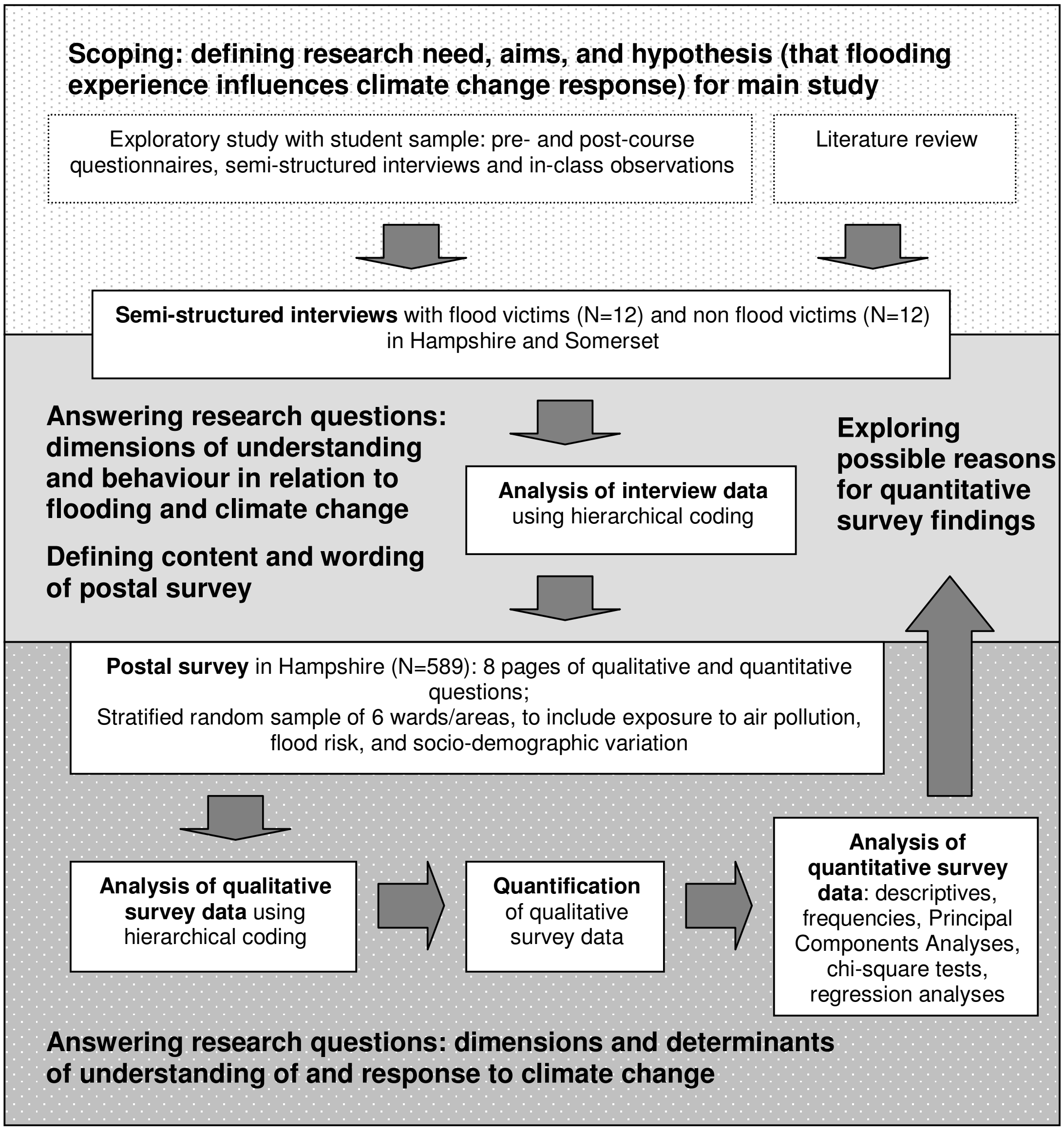
Furthermore, using multiple methods allows interesting lines of inquiry exposed through one method to be explored further through another. For example, the interview data indicated that experience of and beliefs about air pollution may be more salient influences on perceptions of climate change than flooding experience. Consequently, this relationship was explored further through qualitative and quantitative survey questions. Conversely, analysis of the quantitative survey data showed little influence of flooding experience on understanding of and response to climate change; the qualitative interview data allowed for exploration of the possible reasons for this surprising finding.

At the same time, however, it is not assumed that aggregating data sources can provide a complete or 'true' picture of the social world (Silverman, 2001). Indeed, "the differences between types of data can be as illuminating as their points of coherence" (Fielding & Fielding, 1986, p.31), for example leading to a re-examination of conceptual frameworks or assumptions (Tashakkori & Teddlie, 2003). Consistent with the philosophical position outlined in Section 1.4, both qualitative and quantitative methods are used in this thesis to explore multiple social realities and are grounded in a recognition of the "value-ladenness of inquiry" (Tashakkori & Teddlie, 1998, p.13). In this research, it is the research questions, rather than the epistemological foundation of this research, that determine the choice of methodologies. Tashakkori and Teddlie refer to this as the 'pragmatist' approach to mixing methods in which:

> "Specific decisions regarding the use of mixed methods or qualitative methods or quantitative methods depend on the research question as it is currently posed and the stage of the research cycle that is ongoing" (Tashakkori & Teddlie, 2003, p.21).

A visual model of the research cycle and the methods used is presented in Figure 3.1.

Figure 3.1. Visual model of research strategy, outlining the aims of each stage of the research process and the methods used to collect and analyse data.



The first phase of the research comprises a series of *semi-structured qualitative interviews*. These were conducted in order to explore the *dimensions* of understanding of and response to flooding and climate change. Furthermore, they provide insights into why certain relationships do, or do not, emerge in the quantitative phase; that is they can perform an *explanatory* function (Creswell, 2003). Qualitative research is eminently appropriate for exploring the range of beliefs, ideas and behaviours that exist in relation to a particular issue. Semi-structured interviews offer an in-depth and contextualised account of people's beliefs as expressed in their own language, embracing the contradictions and dynamism that exist in how people represent the world (Potter & Wetherell, 1987). Such contradictions include the common disparity between attitudes (e.g., awareness of the need to address climate change) and behaviour (e.g., refusal to drive less) discussed in Chapter 2. Thus, qualitative interviews expose how lay individuals 'construct' climate change by drawing on different forms of knowledge, values and experiences (e.g., Kempton, 1991). Qualitative methods also expose cultural assumptions and social and institutional relations (e.g., trust, norms) that cannot readily be quantified and measured in survey research (Steg et al., 2001). Finally, in addition to providing valuable information in its own right, the qualitative interviews also act as a basis for the subsequent, quantitative phase by determining the content and wording of the postal survey.

However, qualitative methods are not able to indicate the prevalence of particular beliefs or actions, or allow for statistical comparison of perceptions and behaviour amongst different groups across a representative sample. Consequently, a major *postal survey* was conducted to gather quantitative (as well as additional qualitative) data from a representative sample of Portsmouth residents. The advantages of self-completion questionnaires make them a very popular method of collecting social data (Sarantakos, 1998). For example, this method is less time-intensive than interviewing (Nachmias & Nachmias, 1982). Furthermore, the anonymity and time alone to consider answers provides survey respondents with more opportunity to be honest in expressing their opinions. In this study, the primary reason for gathering quantitative data through a postal survey is to explore correlations between responses to standardised questions, and to allow for multivariate analysis of the relative salience of factors influencing understanding and behaviour (Bryman, 1988; Oppenheim, 1992). In other words, quantitative methods are necessary to identify the *prevalence* and *determinants* of public understanding of and response to climate change.

Quantitative survey research suffers, however, from a number of limitations. Firstly, it tends to constrain the responses that people give. This limitation was partly addressed in this study by incorporating a number of open-ended questions and space for additional comments in the main postal survey. Secondly, survey methods tend to present attitudes and beliefs as decontextualised and static. In reality, as I have shown in Chapter 2, concern about climate change fluctuates with weather events, media coverage and in relation to competing concerns. This variation can be exposed by repeating a survey over a number of points in time, as in the case of regular government surveys. In this study, qualitative interviews provide a means of examining construction of attitudes in relation to contextual influences. Thirdly, there is no control over how postal questionnaires are completed, for example whether questions are answered in order. This can bias responses, for example by influencing respondents to express greater concern about climate change if they are aware of the ultimate aim of the questionnaire. Fourthly, postal questionnaires pose problems for completion by those with disabilities or who speak little or no English. By excluding such groups, the survey automatically contains some element of bias. A greater source of bias, however, is the inevitable self-selection of respondents to favour those with extreme views about climate change. Rigorous sampling procedures and statistical weighting can compensate for, but not entirely eliminate such problems of bias (Oppenheim, 1992). Finally, relying on self-reported measures of behaviour also represents a limitation in this design, since actual behaviours do not always accurately reflect self-reports. In the case of pro-environmental actions, people tend to over-report their frequency (e.g., Bamberg & Schmidt, 2003). Alternative methods of measuring behaviour, such as taking readings of domestic energy use, are costly and intrusive. For the purposes of this research, it was felt that the advantages of using self-reports of behaviour, particularly in relation to achieving an adequate sample size, outweighed the limitations.

3.3 EXPLORATORY STUDY

Initially, a small-scale exploratory study was conducted using a sample of undergraduate students. The primary aim of this study was to investigate factors influencing environmental behaviour change, including formal environmental education and social and experiential factors. In this section, I briefly describe the methods used to collect and analyse data for this exploratory study and discuss how the findings have been used to develop the rationale and research questions for the main climate change study.

Participants in the exploratory study were a group of final year university students, majoring in either Biology or Natural Sciences, who were enrolled on an optional environmental science course lasting one semester (approximately 4 months) entitled 'Life, Environment and People' (LEP). This course aims 'to explore the varied ways in which people and other life forms interact with one another and their surroundings as dynamic, responsive systems to produce the conditions for environmental and cultural stability and change'. The course also encourages students to 'think critically about the origins and underlying assumptions of various kinds of knowledge, value-judgements and assertions about the environment and environmental impacts'.

The research methods used in the exploratory study included:

- Pre-course (N=22) and post-course (N=34) questionnaires (see Appendix 3.1), comprising quantitative and qualitative questions largely used in previous environmental questionnaires (Thompson & Barton, 1994; Dunlap & Van Liere, 1978; Kaiser & Wilson, 2000; DETR, 1997). These questionnaires were intended to measure students' environmental attitudes, understanding and behaviour, in order that a comparison could be made between responses before and after the course. The questionnaires also gauged students' reasons for taking the LEP course (pre-course), and their responses to the course (post-course). The pre-course questionnaire was administered to students during the first lecture and post-course questionnaire during the final lecture. In order to determine whether changes in mean attitude and behaviour scores over time were significant, Mann-Whitney U tests for non-normal data were used. Open-ended survey responses were coded using hierarchical coding (Miles & Huberman, 1984).

- To gain more in-depth information about course outcomes and causes of environmental behaviour, semi-structured interviews (N=10) were conducted with several students at the end of the course. Informed consent was obtained for all interviewees. Interview data was again analysed using hierarchical coding. (The interview schedule can be found in Appendix 3.2).
- Informal observations of students during lectures were made throughout the course.

Analysis of the quantitative survey data over time shows no significant change in the attitudinal or behavioural measures between the start and end of the LEP course (see Appendix 3.3). However, the qualitative survey and interview data indicate that, after the course, students were more aware of alternative views of the environment and of the holistic, dynamic and integrated nature of human and non-human worlds (see Appendix 3.4). The interview data indicated that students' environmental values and behaviour were influenced by social and experiential factors, as well as by formal education.

Two main conclusions emerged from this study. Firstly, the interview data indicated that students' prior knowledge and beliefs affected how they perceived and responded to the course. The course leader often used examples from the field of Biology, and tended to assume students were unfamiliar with the cultural dimensions of environmental problems. Consequently, the Biology majors were most influenced by and enthusiastic about the course; the Natural Scientists (many of whom were specialising in Environmental Studies) tended to be unimpressed or confused by the lectures. Related to this finding, the course leader's use of images and analogies evidently facilitated students' learning by linking novel concepts to existing beliefs. This conclusion indicates support for the constructivist theories of education (e.g., Piaget, 1970; Scott, 1987) and interactive models of communication (e.g., Grunig, 1980) discussed in Chapters 1 and 2.

Secondly, the study suggested that environmental behaviour is influenced by a range of factors. The survey and interview data highlight a disparity between environmental knowledge and concern on the one hand, and environmental behaviour on the other. Although most interviewees regularly recycled or conserved energy, they pointed to barriers - in terms of cost and inconvenience - to taking other environmental actions; conversely, economic incentives often motivated 'environmental' actions. Environmental behaviour was influenced by direct experience of natural environments and of environmental degradation, as well as social influences, media and formal education. These findings are consistent with the literature reviewed in Chapter 2, which highlights the complexity involved in behaviour change. Furthermore, this data indicates the salience of experiential factors on environmental values and behaviour. This conclusion supports the need for a contextual and inter-disciplinary approach to studying behaviour, and justifies the focus on experiential factors in the main climate change study.

3.4 MAIN CLIMATE CHANGE STUDY

3.4.1 Stage 1 – Qualitative Interviews

3.4.1.1 Participants

Twenty qualitative interviews were initially conducted with a total of 24 people between February and April 2003. Several of the interviews were with couples, which provided an insight into the construction of beliefs about climate change in a dynamic, social context (Arksey & Knight, 1999). This is an advantage of the focus group method, often used in studies of lay understanding of scientific and environmental issues (e.g., Macnaghten & Jacobs, 1997; Stoll-Kleemann et al, 2001). On the other hand, individual interviews enable participants to discuss their beliefs and actions more openly, without fear of judgement or others dominating discussion (Arksey & Knight, 1999). Furthermore, focus groups can be more difficult to organise than individual or paired interviews, which can be arranged at a particular time and location that suits each interviewee or couple. Accordingly, the present study employed a combination of individual and paired semi-structured interviews.

Interview and respondent details are given in *Table 3.1*. Twelve interviewees had directly experienced flooding, and twelve had not; ten were male and fourteen female. The flood victims came from three areas, each of which has suffered differed forms of flooding. All but one of these interviewees was recruited through contact with the 'National Flood Forum', a national not-for-profit umbrella organisation of local flood action groups. This could have implications for the representativeness of this sample of interviewees, since there may have been more interviewees active on an individual or community level in relation to flooding. Nevertheless, under these inevitable constraints, interviewees from diverse backgrounds were recruited. The interviewees without experience of flooding were recruited through word-of-mouth from a heterogeneous, convenience sample to try and ensure, again, diversity of interviewees. The interviews ranged from 20 minutes to 2 hours 15 minutes, and averaged 56 minutes.

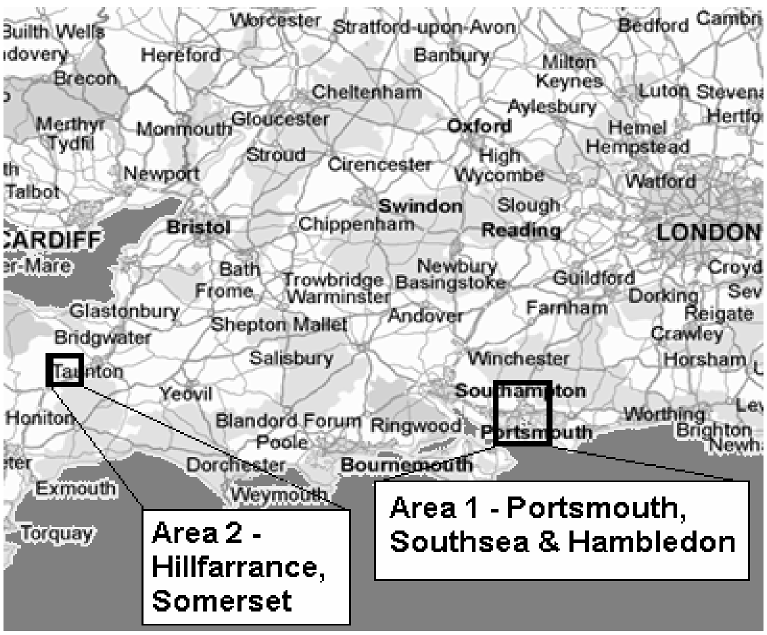
Table 3.1 Qualitative Interview and Participant Details

Int. No.	Date	Duration	Location	Gender of Interviewee(s)	Occupation of Interviewee(s)	Experience of Flooding & Flood Type
1	17/02/03	45 mins	Southsea, Hampshire	Female	Artist	Yes - urban, sewage flood
2	18/02/03	2 hrs 15 mins	Hambledon, Hampshire	Male	Retired	Yes - rural, groundwater
3	18/02/03	30 mins	Hambledon, Hampshire	Female	Retired	Yes - rural, groundwater
4	18/02/03	1 hr 15 mins	Hambledon, Hampshire	Married couple	Retired	Yes - rural, groundwater
5	09/03/03	55 mins	Hillfarrance, Somerset	Married couple	Company director (M); housewife (F)	Yes - rural, riverine
6	09/03/03	2 hr 15 mins	Hillfarrance, Somerset	Female	Housewife	Yes - rural, riverine
7	09/03/03	50 mins	Hillfarrance, Somerset	Female	Pub/ restaurant owner	Yes - rural, riverine
8	10/03/03	30 mins	Hillfarrance, Somerset	Female	Retired	Yes - rural, riverine
9	10/03/03	1hr 30mins	Hillfarrance, Somerset	Married couple	Retired	Yes - rural, riverine
10	11/03/03	25 minutes	Portsmouth, Hampshire	Female	Social researcher	No
11	11/03/03	40 mins	Portsmouth, Hampshire	Male	Social researcher	No
12	13/03/03	1 hr	Portsmouth, Hampshire	Male	Lecturer in economics	No
13	18/03/03	40 mins	Portsmouth, Hampshire	Female	Social researcher	No
14	17/03/03	1hr 15mins	Portsmouth, Hampshire	Couple	Marine environmental consultant (M); Social researcher (F)	No
15	21/03/03	35 mins	Portsmouth, Hampshire	Female	Retired teacher	No
16	21/03/03	50 mins	Portsmouth, Hampshire	Female	Housewife	No
17	25/03/03	25 mins	Portsmouth, Hampshire	Male	Social care inspector	No
18	25/03/03	20 mins	Portsmouth, Hampshire	Female	Unit manager	No
19	03/04/03	1 hr	Reading, Berkshire	Male	Academic	No
20	05/04/03	35 mins	Coventry, Warwickshire	Male	IT consultant	No

3.4.1.2 Study areas

Two main study areas in the South of England were selected for the qualitative stage of the research (see Figure 3.2). These sites were selected due to their recent history of severe flooding, and because of the willingness of local flood victims to participate in the research. Autumn 2000 was officially the wettest on record for over 270 years, and the South of England was worst affected by flooding during that period (Environment Agency, 2001b).

Figure 3.2 Study areas in the South of England selected for the qualitative interviews



The first site encompasses Portsmouth, a city on the south coast of England, and the surrounding area. Much of this region is already at risk from coastal and riverine flooding (Environment Agency, 2005). Furthermore, the South Coast is likely to be particularly affected by climate change in terms of severe storm impacts and sea level rise (Wade, Hossell, Hough & Fenn, 1999). Most of the flooding events recorded in the area tend to be located in surrounding towns and villages, which have suffered river and groundwater flooding, particularly in 2000 (Halcrow/ Environment Agency, 2002).

Four interviewees with experience of flooding were recruited from Hambledon, a village just outside Portsmouth, which suffers regular groundwater flooding. Since 2000, much of the village has suffered severe flooding. One interviewee came from Southsea, a low-lying seaside town adjacent to Portsmouth, which suffered a major sewage flood in 2000 as a result of the failure of the local pumping station. (Supporting information was drawn from the local newspaper, which featured considerable coverage of the flooding event, including interviews with flood victims.) Almost all interviewees without flooding experience were recruited from Portsmouth.

Consistent with the national picture, (DEFRA, 2002; Poortinga & Pidgeon, 2003), Portsmouth residents have been found to be more concerned about immediate social and financial issues than with environmental issues (Portsmouth City Council, 1999). In 1999, crime, jobs and education were the three most common priorities, followed by transport and environment. In terms of the local environment, the council found that 84% of residents "are satisfied with their area as a place to live", but would like less traffic, improved public transport, "clean air" and "open spaces" (Portsmouth City Council, 1999, p.12). Interestingly, flooding was not mentioned by residents as a concern in this survey. The council have taken steps to reduce car use at a largely organisational and structural level (i.e. developing Travel Plans with businesses and extending public transport systems), but communicates little with residents on environmental issues, with the exception of waste management (council newsletters regularly remind residents to use the kerbside recycling scheme).

The second main site was a village called Hillfarrance, near Taunton in Somerset, which suffers regular riverine flooding. Records show that the village has flooded since 1929, but that the frequency and severity has increased since 1999. As elsewhere, the most severe floods occurred during 2000, when most of the properties in the village were repeatedly flooded. Residents interviewed claim the village is the worst affected by flooding in Somerset. Perhaps indicating some support for this assertion, immediately prior to the interviewing period, Hillfarrance was awarded a grant from DEFRA for a flood alleviation scheme. Seven interviewees with experience of flooding were recruited from this area.

3.4.1.3 Interview style, content and analysis

The interviews were semi-structured, allowing participants to freely express their experiences and attitudes in their own language (Oppenheim, 1992). The broad topics covered in the interviews were:

- General environmental concerns
- Understanding of climate change (including causes and impacts)
- Responsibility for climate change
- Actions taken to mitigate climate change (e.g., reducing energy consumption), including motivations and barriers
- Sources of information about climate change, including evaluations of credibility

In addition, flood victims were asked about their:

- Experiences of flooding and what they had learnt from them

- Actions they had taken as a result of being flooded, on an individual or community basis
- Understanding and perceptions of flooding, including causes, responsibilities, blame, and trends in frequency

Following Banaka's (1971) advice, the interview structure for flood victims started from a broad based discussion of the participant's experiences, and subsequently drew on this information to elicit the respondent's views, feelings and actions in relation to these experiences. This approach "gives the interviewee confidence that the interviewer understands the realities he [sic.] has experienced" (p.8).

Interviews were confidential and interviewees gave written consent to be interviewed. (The interviewee consent form can be found in Appendix 3.5). The interviews were recorded, transcribed and analysed using a hierarchical coding procedure (Miles & Huberman, 1984; Robson, 1993). As suggested by Aronson (1994), the issue of validity was addressed by asking a number of interviewees to comment on the analysis.

3.4.2 Stage 2 – Postal Survey

3.4.2.1 Questionnaire design

The postal survey built on the findings from the qualitative interviews. It expands the scale and scope of the research to determine the range and salience of influences on understanding of, and behavioural responses to, climate change within a representative population. As I will discuss in Chapter 4, the interview data suggested that respondents did *not* readily relate flooding to the issue of climate change, and that experience of flooding may not be the most significant influence on understanding of, and response to, climate change. Flood victims interviewed tended to focus on the more immediate and local causes of flooding than on the causal role of climate change. Furthermore, their behavioural response to their experience of being flooded did not tend to extend beyond taking appropriate actions to minimise future flood damage.

However, the interviews suggested that perceptions of climate change were commonly related to experience and conceptions of *air pollution*, as well as to a number of other contextual factors (see Chapters 5 and 6). Therefore, the survey examined a range of variables which the interview data and previous research (reviewed earlier) indicated might influence understanding and response to climate change. Unlike the qualitative interviews, the quantitative survey allowed for statistical comparison of outcome variables across groups of respondents with different characteristics. These characteristics included experience of flooding, experience of being affected by air pollution, as well as other demographic and contextual variables (see Section 3.4.2.3 for details of measures).

The interview data was also important in determining the language used in the quantitative survey. In particular, interviewees seemed to hold different conceptions of ‘climate change’ and ‘global warming’. This suggests that terminology choice can bias survey responses. Indeed, previous research (DEFRA, 2002) has found that the UK public is more familiar with the term ‘global warming’ than ‘climate change’, the term preferred by scientists and policy-makers. Therefore, the survey examined whether using different terminology (‘global warming’/ ‘climate change’) affects the responses given. This was achieved through a split-sample survey design, whereby half the sample was given a ‘climate change’ questionnaire version, and the other half given a ‘global warming’ version. (In all other respects the two questionnaire versions were identical).

The survey design also draws on the methodologies and findings of previous, relevant research in this area (Poortinga & Pidgeon, 2003; Bickerstaff, 1999; DEFRA, 2002; Hargreaves et al., 2003; Joireman, Lasane, Bennett, Richards & Solaimani, 2001; Black et al., 2001). In particular, certain features of Poortinga and Pidgeon’s (2003) study of environmental risk perceptions were applied to this study. For example, similar to the Poortinga and Pidgeon study, my questionnaire started with more general questions about environmental concerns and moved onto a ‘risk specific’ section. This is known as a ‘funnel approach’, which gradually narrows the scope of the questions and includes filter questions to ensure respondents skip any questions or sections that do not apply to them (Oppenheim, 1992). In addition, as in the Poortinga and Pidgeon study, this survey included questions relating to broader social and environmental values and concerns, as well as risk-specific items. Addressing broader concerns allows beliefs about and responses to climate change to be examined in context, which is a key objective of this research. Some items were included verbatim from previous research (DEFRA, 2002; Black et al., 2001; Dunlap & Van Liere, 1978) in order to allow for direct comparisons with this survey (see below).

In addition, since interviewees’ uncertainty and ambivalence about climate change manifested in a dynamic construction of attitudes and understanding during interviews, qualitative data is also captured in this survey.

The questionnaire (see Appendix 3.6) comprised 8 pages of quantitative and qualitative questions grouped into 4 sections:

- *General environmental concerns and experiences.* This section asked respondents about the environmental issues that most concern them, about their perceptions of changing weather patterns, and about experiences of air pollution and flooding. These questions are deliberately placed before the climate change section in order to introduce and contextualise the general area of enquiry and to avoid biasing responses. In particular, asking a large number of questions about climate change prior to asking about perceptions of weather and relative environmental concerns could prompt responses that are socially desirable and intentionally consistent with views already expressed about climate change.

- *Awareness, knowledge, attitudes, and behaviour in relation to climate change.* This section is the largest and starts with general, open-ended questions about climate change and moves on to more specific, closed questions, including Likert-scaled attitude statements. Routing is applied to ensure respondents only answer questions that are relevant to them. The behavioural measure in this section is 'intent-oriented' (Stern, 2000). That is, it asks about action explicitly taken "out of concern for climate change".
- *Environmental values, worldview and actions.* This section includes measures of environmental values relative to other (financial, material) values, using items from other surveys (DEFRA, 2002, 1997; Black et al., 2001). It also measures environmental worldview as well as regular environmentally-relevant behaviours. Environmental worldview was measured using the 'New Environmental Paradigm' scale devised by Dunlap & Van Liere (1978) and widely-applied in this field (Stern, Dietz & Guagnano, 1995; Poortinga & Pidgeon, 2003; Bord et al., 2000; Poortinga et al., 2002; Dunlap, Van Liere, Mertig & Jones, 2000). Environmental behaviours examined in this section are 'impact-oriented' (Stern, 2000), in that they are widely recognised to benefit the environment but may not necessarily be motivated by environmental concern. In fact, the motivations for these actions are also elicited in this section. A question on perceptions of local public transport is also included.
- *Demographic measures*, including gender, age, highest qualification, highest scientific qualification, political affiliation, car ownership, annual car mileage, income, newspaper readership, membership of environmental organisation. Space is also provided for additional comments.

The questionnaire and survey methodology was piloted with around 20 people, including residents of sampled addresses. The pilot indicated several areas in which wording and content could be improved. For example, a number of people had difficulty interpreting nine of the fifteen NEP items[2], so these items were excluded from the final questionnaire. The pilot also indicated that the method originally proposed for distributing and collecting questionnaires was not the most practical. In order to achieve a higher response rate and to minimise postal costs, questionnaires were initially given in person to sampled residents and a return time arranged for collecting the

[2] Items excluded were: 'When humans interfere with nature it often produces disastrous consequences'; 'We are close to the limit of the number of people the earth can support'; 'Human ingenuity will ensure that we keep the earth liveable'; 'The earth has plenty of natural resources if we just learn how to develop them'; 'Despite our intelligence and creativity, humans are still subject to the laws of nature'; 'The so-called "ecological crisis" facing humankind has been greatly exaggerated'; 'The earth has only limited room and resources'; 'If there is no change in the world, we will soon experience a major environmental crisis', and 'Humans will eventually be able to control nature'. Several people commented, for example, that they would disagree with some of these items on the basis of timescale (e.g., that there is *already* an environmental crisis and humans can *already* control nature), rather than the rejecting the sentiment behind the statement.

completed questionnaire (see Bickerstaff, 1999). However, during the pilot it became apparent that residents were often not at home to arrange a return time, so return envelopes had to be left with the questionnaire. Conversely, where residents were at home when the questionnaire was delivered, the investigator's safety could be compromised by eliciting direct contact from people in their homes. The methodology was therefore revised and questionnaires, covering letters (see Appendix 3.7) and stamped, addressed return envelopes were hand-delivered to sampled addresses without direct contact with residents.

3.4.2.2 Sampling procedures

In total, 1771 questionnaires were distributed during September and October 2003 across 6 wards/areas using stratified random sampling. Stratified random sampling is commonly used in survey research because it offers the advantage over completely random sampling of ensuring all groups of interest to the researcher are adequately represented. At the same time, it maintains a high degree of external validity and minimises subjectivity in the sample selection (Robson, 1993). The sample population was restricted to residents in Hampshire for reasons of convenience and accessibility of data relating to past flooding events. The sample included different socio-economic groups within flood-prone areas, and areas not at risk from flooding; and different groups within areas with differing levels of exposure to air pollution.

- *Flood-risk areas.* Data on flooding in Hampshire during the floods of Autumn 2000 was obtained from the Environment Agency (Halcrow/ Environment Agency, 2002). The two areas with the greatest number of flooded properties were selected for inclusion in the survey. Questionnaires were distributed to homes that records showed had been flooded, and to surrounding properties. The issue of survey timing when researching flood experiences has been raised elsewhere (Penning-Rowsell et al., 1992; Slovic, 1986), and was considered when designing this study. Since very little flooding had occurred since 2000-2001, material flood damage had largely been repaired and the immediate trauma of the flooding experience is likely to have faded. Therefore, it was expected that these interviews should have been less intrusive and potentially upsetting than they might have been if conducted immediately following a flood event.

- *Non flood-risk areas.* The remaining areas were selected using 2001 census ward data and air pollution data (Sadak, 2003). The four selected wards reflect differing levels of pollution (in Portsmouth this is primarily due to road transport, and to a lesser extent shipping) and diverse socio-economic profiles (gender, age, income, economic activity, occupation, deprivation levels, health, education, car ownership, marital status, home ownership).

The census ward data for the 6 selected areas are given in Appendix 3.8. The main characteristics and number of questionnaires distributed for each area are summarised below:

Ward 'A' (St Thomas) – Urban, younger, single, high unemployment, professional/ part-skilled/ students, poor health, low-medium income, low car ownership, rented accommodation
196 questionnaires distributed (11.1% of total distributed).

Ward 'B' (St Jude) – Urban, younger, single, highly qualified, professional/ management/ students, high income, rented accommodation
310 questionnaires distributed (17.5% of total distributed).

Ward 'N' (Drayton & Farlington) – Suburban, older, married, high income, management/ technical/ clerical/ retired, good health, low deprivation, multiple car ownership, home ownership, includes areas with high exposure to air pollution due to proximity to motorway
363 questionnaires distributed (20.5% of total distributed).

Ward 'I' (Nelson) – Urban, deprived, younger, skilled-manual/ part-skilled, high employment, less qualified, low car ownership, includes areas with high exposure to air pollution due to proximity to motorway and international port
297 questionnaires distributed (16.8% of total distributed).

Flood area 1 (within Fareham West ward) – Suburban, all ages, management/ skilled-manual/ retired.
Fluvial flooding: in 2000, 45 homes flooded internally and a further 20 properties flooded externally (Halcrow/ Environment Agency, 2002)
330 questionnaires distributed (18.6% of total distributed).

Flood area 2 (within Soberton, Droxford & Hambledon ward) – Rural, management/ skilled-manual/ retired, older, multiple car ownership.

Groundwater flooding: in 2000, 124 homes affected by flooding (Halcrow/ Environment Agency, 2002)
275 questionnaires distributed (15.5 % of total distributed).

The Portsmouth electoral street index was obtained for each ward and a random sample of streets extracted. In addition, main roads - particularly those registering high pollution levels by

Portsmouth City Council air quality monitoring (Sadak, 2003) - were included to ensure an adequate sub-sample of properties with high exposure to pollution. Properties along each sampled street were then randomly sampled; and in the case of multiple dwellings in a property, random sampling was again applied. Since the samples were designed to ensure all main, polluted roads and flooded properties were included, the numbers of questionnaires distributed to each ward or area varied (see above for totals).

3.4.2.3 Data input and analysis procedures

All questionnaire data, including qualitative and quantitative responses, were initially input into SPSS. In order to ensure reliability, every 3rd questionnaire was checked for accurate data entry. Where appropriate, variables were recoded to facilitate analysis:

- Each respondent's annual mileage (question 34) was recoded as a quartile category.
- Income, which had initially been grouped into 8 categories (in question 35), was recoded into fewer categories with a more even distribution of respondents (Christie & Jarvis, 2001): annual income of up to £9,999 was classified as 'Very Low', £10,000 to £19,999 classified as 'Low', £20,000 to £29,999 as 'Medium', £30,000 to £39,000 as 'High', and £40,000 and above as 'Very High'.

Overall, there were few missing values (<10%), and Missing Value Analysis indicated these were randomly distributed. So as to ensure as few cases as possible were excluded from subsequent analyses, wherever possible missing data was rectified by substituting the variable mean. Thus, mean values were substituted for missing values in scaled-response questions since this does not alter the overall mean for a question (Donner, 1982). Mean substitution is not appropriate for dichotomous-response questions (e.g., yes=1; no=0); in the small number of instances where values were missing for dichotomous questions, cases were excluded from subsequent analysis.

The qualitative survey data was exported to NVivo for coding and analysis. NVivo is a qualitative data analysis tool, which was used:

- to code responses to the open-ended questions into discrete categories for subsequent re-input and analysis in SPSS; and
- to facilitate exploration and analysis of qualitative themes within the responses, using a hierarchical coding procedure (Miles & Huberman, 1984).

The coding structure generated through analysis of the qualitative survey data can be found in Appendix 3.9.

SPSS was used to produce descriptive and frequency statistics for all variables (including coded qualitative data), and to perform Principal Components Analyses, chi-square tests, and regression analyses.

Principal Components Analysis (PCA) identifies common patterns of responses to survey questions and therefore can suggest distinct dimensions in respondents' understanding or attitudes (Robson, 1993). PCA was applied to the two survey questions - questions 24 and 25 - which comprised a range of attitude statements. The aim of this analysis, in essence, was to determine whether the attitudinal data could be reduced to form reliable and uni-dimensional attitude scales (Oppenheim, 1992).

Appendix 3.10 shows the full results from the PCA. The PCA of question 24 (belief and attitude statements relating to climate change) produced 8 components (i.e. attitudinal dimensions) with eigenvalues over 1 (Kaiser, 1960, cited in Field, 2000) explaining 57.6% of the variance. However, the first component alone explained 28.8% of the variance. The statements comprising each component were then grouped into a scale and tested for reliability. This determines how consistent the scale is as a measure of attitudinal responses. The reliability measure used was Cronbach's alpha, which measures internal consistency of a scale, based on the average inter-item correlation. An 'alpha' statistic of 0.7 is considered good (Santos, 1999), although figures over 0.5 are often accepted (e.g., Poortinga & Pidgeon, 2003). Scaling all components suggested that only the first component formed a reliable scale (alpha=0.66). An examination of the 12 variables loading on this component suggests this dimension of understanding represents *uncertainty about the reality of anthropogenic climate change*. *Table 3.2* shows the attitude statements comprising the Uncertainty Scale and their factor loading (i.e. strength and direction).

Table 3.2 'Uncertainty Scale' derived from a Principal Components Analysis of question 24

Attitude statements (Q24) loading on Uncertainty Scale (a=0.66)	**Factor loading**
The effects of global warming are likely to be catastrophic	-0.55
Recent floods in this country are due to global warming	-0.54
Global warming is something that frightens me	-0.53
I do not believe global warming is a real problem	0.59
Flooding is not increasing, there is just more reporting of it in the media these days	0.59
Global warming is just a natural fluctuation in earth's temperatures	0.64
Claims that human activities are changing the climate are exaggerated	0.65
There is too much conflicting evidence about global warming to know whether it is actually happening	0.70
The media is often too alarmist about issues like global warming	0.71
The evidence for global warming is unreliable	0.75
I am uncertain about whether global warming is really happening	0.75
It is too early to say whether global warming is really a problem	0.76

The PCA of question 25 (environmental value and worldview statements) suggested a 3-factor solution, which explained 53.1% of the total variance. The results of this analysis are shown in *Table 3.3*.

Table 3.3 Results of Principal Components Analysis of question 25

Value/ worldview statements (Q25)	**Component with factor loadings**		
	1	2	3
Jobs today are more important than protecting the environment for the future	-.131	.749	
I am unwilling to make personal sacrifices for the sake of the environment		.779	
If my job caused environmental problems, I'd rather be unemployed than carry on causing them		-.466	.458
Having a car is part of having a good lifestyle			-.824
Humans have the right to modify the natural environment to suit their needs † (NEP)	.474		.481
Humans are severely abusing the planet (NEP)	.767		
Plants and animals have the same rights as humans to exist (NEP)	.626		.313
Nature is strong enough to cope with the impact of modern industrial nations † (NEP)	.563	-.382	.158
Humans were meant to rule over the rest of nature † (NEP)	.441		.443
The balance of nature is very delicate and easily upset (NEP)	.734	-.140	

† Scores reversed (as in Dunlap & Van Liere, 1978)

The first two components represented meaningful dimensions of respondents' values, and were found to be at least adequately reliable. The first comprises a positive loading of all the 'New Environmental Paradigm' items. When scaled, this 6-item factor was found to have an alpha rating of 0.72, confirming the reliability of this widely-used scale (e.g., Dunlap et al., 2000). The second component includes positive loadings of the two economic or material value statements, and a negative loading of the environmental value statement. When scaled, this factor proves to be moderately reliable (alpha=0.51). Scoring for all items was reversed to form a 'Pro-environmental Value' scale. The third component does not appear to represent a meaningful dimension of worldviews or values, and was therefore not used as a scale.

Respondents were scored on each of the scales defined by the PCA. Where attitude statements negatively loaded onto the scale, scoring was reversed. Scores on the Uncertainty Scale, New Environmental Paradigm (NEP) scale and Pro-environmental Value scale have been used in subsequent regression and chi-square analyses to determine their relationship with other variables (see Chapters 5 and 7 for results).

Finally, a scale measuring overall trust in climate change information (the 'Trust Scale') was calculated by summing the values for each of the individual trust items in question 12. (These items ask respondents how much, on a 4-point scale, they would trust information about climate change if they heard it from a number of sources, such as scientists, energy suppliers, and so on). This 6-item scale also proved to be reliable (alpha = 0.76).

Scale quartiles were then calculated for all 4 scales, and respondents' scores recoded as a quartile category (i.e. bottom, 2nd, 3rd, top quartile) to facilitate subsequent analysis.

Chi-square analysis was used to explore relationships between variables. This analysis determines whether different types of respondents (e.g., men and women) gave significantly different survey responses. The chi-square test compares observed and expected frequencies for categorical variables, and indicates where there is significant variation. It is used alongside the 'Cramer's V' statistic, which measures the strength of the relationship. (In general, relationships between measures in the social sciences are not strong; Cramer's V is rarely over 0.5.) There are, however, limitations of chi-square analysis. Firstly, the chi-square statistic may not be accurate where more than 20% of the expected frequencies are less than 5 (Field, 2000). Secondly, for groups of three categories or more, the chi-square result does not indicate where (i.e. between which groups) the significant difference lies.

Regression analysis was used to predict the probability that a particular respondent would 'understand' climate change, be concerned about climate change and 'act in response to climate change' given their background, experience, attitudes and so on (Afifi & Clark, 1997). The 3 dependent variables - understanding, concern and behaviour - are explained below. Regression analysis produces a model from the data, which can be used to predict the dependent variables from one or more known independent variables (Field, 2000). Although chi-square tests identify where significant relationships exist between two variables, regression analysis examines the inter-relationships between a large number of variables. In fact, the regression models described here typically involve over 100 variables, including quantitative and coded qualitative survey responses. Therefore, in some cases, significant relationships identified in the chi-square analyses are not found in the regression models, and vice versa.

Since the dependent variables (described below) are dichotomous, *logistic regression* was considered to be the most appropriate method of analysis. Unlike linear regression, logistic regression can be used for data where the relationship is non-linear (as with dichotomous variables). The logistic regression equation differs from the linear regression equation in that it transforms the data using a logarithmic transformation in order to overcome the problem of non-linearity (Field, 2000). This method has been widely used in large-scale social attitude surveys, such as the British Social Attitudes Survey (e.g., Christie & Jarvis, 2001).

The independent variables included in the regression analyses are:

- all demographic variables (gender, age, income, political affiliation, ward/area, car ownership, annual mileage, membership of an environmental organisation, newspaper readership)
- experience of flooding[3]
- experience of air pollution affecting own health[4]
- health of family/ friends affected by air pollution
- perceptions of changing weather patterns
- knowledge/ beliefs about the impacts of air pollution
- sources of climate change information
- perceptions of uncertainty in relation to climate change (scaled - see above)
- trust in climate change information (scaled - see above)
- pro-environmental values (scaled - see above)
- environmental worldview ('New Environmental Paradigm' scale - see above)
- environmental concerns (pollution, flooding, GM food, etc.)
- perceived individual efficacy and responsibility (coded from questions 19 and 21 and from qualitative data)
- perceived threat from/ impact of climate change on self
- personal importance of climate change issue
- education (highest overall qualification; highest science qualification)
- knowledge, beliefs, attitudes and action in relation to specific climate change (coded from qualitative data)
- perceptions of relevant facilities (i.e. quality of public transport)
- terminology used (i.e. 'global warming' versus 'climate change')
- regular environmentally-relevant behaviours, including energy reduction

All variables that were to be included in the binary logistic regression analyses were recoded into dichotomous variables. In other words, a variable with a number of categories (e.g., quartile numbers: 1-4) became several variables, each one distinguishing one category from all others (e.g., top quartile = 1; all other quartiles = 0). Standardising the form of the independent variables into dichotomous data facilities interpretation of the regression results since the co-efficients can be directly compared. In other words, variables with the largest regression co-efficients can be said to have the greatest influence in predicting the dependent variable (Christie & Jarvis, 2001).

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[3] Flooding can take various forms and encompass 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 ensure those affected by the major flooding during Autumn 2000 were included.

[4] The measure used for 'air pollution experience' is respondents' own evaluation of health impacts from air pollution, and so may not reflect the 'true' proportion affected by air pollution. However, knowing the 'actual' health impacts of air pollution is not necessary for the purposes of this research, which focuses on air pollution as *a subjective experience* and *perceived threat*.

A number of regression models using different combinations of independent variables were examined for each regression analysis, until a model was accepted based on the inclusion of as many significant variables as possible, while maintaining low standard error rates and high predictive value of the model. Since each dependent variable is predicted by different independent variables, not all variables have been included in every regression analysis.

The dependent variables predicted in the regression analyses are 'understanding', 'concern' and 'behaviour' in relation to climate change. These terms are defined as follows:

Operationalising 'understanding'. In order to determine the influences on understanding, an appropriate measure of "understanding" first had to be identified. Since this is a complex construct, a number of dimensions of respondents' understanding of climate change, incorporating both knowledge-based and affective components, were included in the binary logistic regression analyses.

- The first dependent variable examined distinguishes those respondents who stated, in question 15 (see Appendix 3.6), that 'carbon emissions' or 'CO_2' causes climate change. Since this is widely accepted amongst scientists and policy-makers as the main cause of climate change, it was felt to represent an important *knowledge-based* aspect of understanding. Here, 1 indicates a mention of carbon emissions/ CO_2 (N=36); 0 indicates no mention (N=552). The results displayed in Appendix 7.1 are based on an analysis of 588 cases, which represents 99.8% of the total sample. (0.2% of the sample was excluded due to missing data.) This model successfully predicts 98.5% of all cases: 83.3% of cases mentioning carbon emissions/ CO_2; and 99.5% of cases not mentioning this.
- The second dependent variable examined in relation to understanding identifies those respondents who stated, in question 10, that they know very little or nothing about climate change. This variable essentially represents an *absence of knowledge*, or ignorance, of the issue. Here, 1 indicates claiming to know very little/ nothing (N=98); 0 indicates all other cases (N=478). The results displayed in Appendix 7.2 are based on an analysis of 576 cases, which represents 97.8% of the total sample. (2.2% of cases were excluded due to missing data.) This model successfully predicts 93.2% of all cases: 72.4% of cases claiming to know little or nothing; and 97.5% of all other cases.
- The third dependent variable identifies respondents who, in question 17, agreed that climate change is affecting, or will affect, them personally. This variable represents a more affective component of understanding, indicating or not whether climate change is *perceived as a personal threat*. Here, 1 indicates an affirmative response (N=256); 0 indicates a negative or 'don't know' response (N=318). The results displayed in Appendix 7.3 are based on an analysis of 574 cases, which represents 97.5% of the total sample. (2.5% of cases were

excluded due to missing data.) This model successfully predicts 90.4% of all cases: 89.5% of affirmative cases; and 91.2% of negative and 'don't know' cases.

- The fourth dependent variable examined in relation to understanding identifies respondents whose scores on the 'Uncertainty Scale' (see Section 5.4.8.1) are in the top quartile, that is, respondents who are the *most uncertain about the reality of anthropogenic climate change*. This variable was selected because it emerged as a central feature of many people's understanding of the issue. Here, 1 indicates top quartile uncertainty score (N=149); 0 indicates all other scores (N=433). The results displayed in Appendix 7.4 are based on an analysis of 582 cases, which represents 98.8% of the total sample. (1.2% of the sample was excluded due to missing data.) This model successfully predicts 93.5% of all cases: 86.6% of cases in the top Uncertainty quartile; and 95.8% of all other cases.
- The final dependent variable examined in relation to understanding identifies respondents whose scores on the 'Trust Scale' (see Section 5.2.2.7) are in the top quartile, that is, respondents who are the *most trusting of information about climate change*. Again, trust was found to be an important feature of participants' understanding of climate change. Here, 1 indicates a top quartile trust score (N=146); and 0 indicates all other scores (N=430). The results displayed in Appendix 7.5 are based on an analysis of 576 cases, which represents 97.8% of the total sample. (2.2% of cases were excluded due to missing data.) This model successfully predicts 87.8% of all cases: 67.8% of cases in the top trust quartile; and 94.7% of all other cases.

Operationalising 'concern'. Binary logistic regression analysis was also used to determine the most significant influences on concern about climate change. The dependent variable distinguishes those respondents who, on question 1 (see Appendix 3.6), selected climate change as an environmental issue that concerns them. Here, 1 indicates concern about climate change (N=115); 0 indicates no concern (N=459). Appendix 7.6 shows the results of this logistic regression, which is based on an analysis of 574 cases (97.5% of the total sample; 2.5% of cases were excluded due to missing data). This model successfully predicts 88% of all cases: 51.3% of cases reporting concern about climate change; and 97.2% of all other cases.

Operationalising 'behaviour in relation to climate change'. "Behaviour in relation to climate change" can encompass a range of actions, including both intent-oriented and impact-oriented behaviour. Therefore, using the same approach as for predicting "understanding", a number of behavioural measures were used as dependent variables.

- Firstly, binary logistic regression analysis was conducted to determine the most significant influences on action *explicitly out of concern for climate change* (i.e. intent-oriented action). The dependent variable distinguishes those respondents who claim, in question 22 (see Appendix 3.6), to have taken, or to regularly take, action out of concern for climate change.

Here, 1 indicates action (N=182); 0 indicates no action or don't know (N=392). Appendix 7.7 shows the results of the final logistic regression, which is based on an analysis of 574 cases (97.5%; 2.5% of cases were excluded due to missing data). This model predicts 86.6% of cases (92.1% of 'no action/ don't know' cases, and 74.7% of 'action' cases).

Binary logistic regression analyses were then conducted to determine predictors of the five energy-reduction behaviours measured in questions 26 and 34 of the survey.

- The first energy-reduction dependent variable distinguishes those respondents who claim to *regularly turn off lights they are not using*. Here, 1 indicates regular action (N=551); 0 indicates no action (N=25). The results displayed in Appendix 7.8 are based on an analysis of 576 cases, which represents 97.8% of the total sample. (2.2% of cases were excluded due to missing data.). The model successfully predicts 97.9% of all cases: 99.5% of those regularly turning off lights; and 64.0% of all other cases.
- The second energy-reduction dependent variable distinguishes those respondents who claim to *regularly buy energy efficient light-bulbs*. Again, 1 indicates regular action (N=381); 0 indicates no regular action (N=193). The results in Appendix 7.9 are based on an analysis of 574 cases (97.5% of the total sample; 2.5% of cases were excluded due to missing data). The model predicts 88.9% of all cases: 92.7% of those regularly buying energy efficient light bulbs; and 81.3% of all other cases.
- The third energy-reduction dependent variable distinguishes those respondents who claim to *regularly walk or cycle to work*. Again, 1 indicates regular action (N=249); 0 indicates no regular action (N=325). The results in Appendix 7.10 are based on an analysis of 574 cases, which represents 97.5% of the total sample. (2.5% of cases were excluded due to missing data). This model predicts 88.7% of all cases: 86.7% of those regularly walking or cycling to work; and 90.2% of other cases.
- The fourth energy-reduction dependent variable distinguishes those respondents who claim to *regularly use public transport*. 1 indicates regular action (N=211); 0 indicates no regular action (N=363). The results in Appendix 7.11 are based on an analysis of 574 cases (97.5% of the total sample; 2.5% of cases were excluded due to missing data). This model successfully predicts 93.0% of all cases: 89.1% of those regularly using public transport; and 95.3% of other cases.
- The final dependent variable distinguishes those respondents who claim to *drive less than 5000 miles per annum* - calculated to be the lowest mileage quartile. Here, 1 indicates membership of the lowest mileage quartile (N=104); 0 indicates all other cases (N=476). The results in Appendix 7.12 are based on an analysis of 580 cases, which represents 98.5% of the total sample. (1.5% of cases were excluded due to missing data.) The model predicts 93.3% of all cases: 74.0% of those in the lowest mileage quartile; and 97.5% of all other cases.

3.4.2.4 Questionnaire limitations

General limitations associated with survey methods were discussed in Section 3.2. In addition to these, analysis of the returned questionnaires revealed that, despite extensive pilot work, some questions posed problems for completion. In particular, where certain questions (q1, q21) restricted responses to one choice (in the case of q21) or three choices (in the case of q1) from a pre-defined list of options, a number of respondents skipped the question or ticked more boxes than required. It was also clear that the survey questions did not account for all possible circumstances or meanings; this has implications for interpretation of results:

- q26a does not allow for people who are retired, or who are required to travel as part of their job or who work from home. Therefore not all those indicating they do not walk to work inevitably drive (or drive out of choice). However mileage is also recorded, which provides another means for ascertaining driving behaviour;
- q26c does not allow for those who grow (as opposed to buy) their own organic produce;
- q27 refers to 'quality' of public transport, which can be interpreted in a number of ways (e.g., to include reliability, availability, cleanliness or cost; as well as encompassing different forms of public transport). Two people wrote 'expensive' beside the question to clarify their response;
- q31 'science-related' may be interpreted in a number of ways, for example to include social sciences;
- q34 may include work mileage, in the case of those people who drive as part of their job.
- q24-25 'neither agree nor disagree' was not always felt to encompass 'don't know' as several participants indicated in their Additional Comments. This would explain why some participants omitted part or all of these questions;

These issues reflect the point made in Section 3.2 that quantitative research inevitably constrains responses, highlighting the need to explore multiple meanings and social realities. To compensate for this limitation, the questionnaire included a number of open-ended questions and space for additional comments to enable respondents to more freely express their views.

Although some survey respondents (9%) in the 'additional comments' section made some criticisms in relation to the questionnaire (e.g., concerns about length), more often (16.5%), respondents were positive about the survey. An unexpected outcome of the survey was its educational role: a number of respondents (1.4%) commented that completing the survey had raised their awareness of climate change and made them think more about related issues.

3.4.2.5 Response rate and demographic profile of survey respondents

Of the 1771 postal questionnaires distributed, 589 were returned (largely or fully) completed. This represents a total response rate of 33.3%, which is reasonable for an unsolicited postal survey (Oliver, 1990) and comparable to response rates for similar surveys. For example, Black et al.'s (2001) self-completion survey of travel behaviours in Hampshire and north-west England achieved a response rate of 36%. Oppenheim (1992) argues that response rate is not as important a consideration as whether the sample may be biased or unrepresentative of the population. As I will now discuss, analysis of the survey responses indicates that the sample is largely representative of the selected areas.

Response rate by area is shown in *Table 3.4*. From this we can see that the greatest proportion of responses was from Flood area 1 (22.9%), a somewhat higher proportion than was distributed to this area (18.6%). The smallest response was from Ward I (10.2%), the most deprived area sampled, reflecting a lower proportion of questionnaires than was distributed (16.8%).

Table 3.4. Response rate by ward

Ward/ Area	Distributed		Returned	
	N	%	N	%
Ward A	196	11.1	63	10.7
Ward B	310	17.5	115	19.5
Ward N	363	20.5	117	19.9
Ward I	297	16.8	60	10.2
Flood area 1	330	18.6	135	22.9
Flood area 2	275	15.5	83	14.1
Unknown	-	-	16	2.7
Total	1771	100	589	100

Details of the demographic profiles of survey respondents are given in *Table 3.5*. In relation to terminology, the proportion of 'climate change' (47%) and 'global warming' (53%) questionnaires returned was almost equal. Although in most respects the survey sample reflects the profile of the selected ward populations (see Appendix 3.8 for ward census data), there are some notable differences. The survey sample has a slightly lower proportion of males (47%) than the total ward populations (49%), and the survey respondents are typically older than the total ward populations. (This is despite several uncompleted questionnaires returned from elderly recipients who felt unable to complete them.) The survey sample is also more qualified than the total ward populations: 15% of the sample has no formal qualifications compared to 24% of the total population. A larger proportion of the survey sample (83%) than the total ward populations (72%) owns or regularly drives a car/ van.

As mentioned above, the aim of the sampling strategy adopted was to ensure adequate representation of a number of key groups in relation to the research questions, as well as to achieve a broadly representative sample of the total population. Since the distribution of questionnaires was not fully randomised (residences with higher exposure to pollution and those with a history of flooding were over-sampled), this reduced the likelihood of achieving a fully representative sample. Consequently, as Tables 3.4 and 3.5 show, the sample achieved is rather more affluent and well-educated than the total ward populations.

To improve the representativeness of survey data, cases can be weighted to account for under-representation of certain groups. However, this strategy for dealing with non-response "assumes that within each cell, the non-respondents have the same attributes or experiences as the respondents" (Oppenheim, 1992, p.106). Weighting cases, then, can involve biasing the survey data in a different direction (Gilbert, 2001). The limitations of data weighting suggest that weighted and unweighted data can both provide a valid basis for addressing the aims of this research. To investigate the effects of weighting the data, an aggregate weight was applied to each case to compensate for differences in educational level, age, car ownership and gender between survey respondents and the total ward populations. In fact, a comparison of the unweighted and weighted data indicated that responses vary very little (generally by no more than 1%) as a result of weighting. Since the weighting procedure did not significantly change the data, we can surmise that the under-representation of certain groups is not a biasing influence. The results discussed in the following Chapters are therefore based on the unweighted data.

Table 3.5 Demographic profile of survey respondents

		Total N	Total %	Ward A	Ward B	Ward N	Ward I	Area F1	Area F2
Total		**589**	**100%**	**11%**	**20%**	**20%**	**10%**	**23%**	**14%**
Questionnaire Version	Climate change	277	**47%**	41%	47%	48%	40%	50%	47%
	Global warming	312	**53%**	59%	53%	52%	60%	50%	53%
Air pollution affected own health		144	**24%**	29%	35%	18%	35%	21%	13%
Air pollution affected family/friends' health		210	**36%**	33%	43%	31%	50%	31%	31%
Experience of flood damage in last 5 years		149	**25%**	18%	32%	8%	12%	23%	65%
Gender	Female	320	**54%**	51%	57%	64%	60%	42%	54%
	Male	269	**46%**	49%	43%	36%	40%	59%	46%
Age	16-24	30	**5%**	13%	10%	1%	7%	3%	0%
	25-34	71	**12%**	13%	18%	9%	13%	8%	6%
	35-44	115	**20%**	13%	17%	24%	23%	18%	23%
	45-54	99	**17%**	13%	20%	18%	23%	16%	13%
	55-64	109	**19%**	19%	17%	15%	12%	26%	21%
	65-74	83	**14%**	14%	9%	12%	12%	21%	16%
	75-84	58	**10%**	13%	4%	15%	5%	8%	15%
	85 or over	7	**1%**	0%	1%	2%	0%	1%	4%
	Prefer not to say	6	**1%**	2%	4%	1%	0%	0%	0%
Income	Very low	88	**15%**	11%	17%	21%	23%	9%	12%
	Low	138	**23%**	25%	17%	27%	25%	25%	18%
	Medium	93	**16%**	13%	12%	13%	17%	22%	15%
	High	62	**11%**	13%	17%	6%	8%	10%	8%
	Very high	67	**11%**	10%	14%	8%	0%	14%	21%
	Unknown	141	**24%**	29%	22%	26%	27%	20%	27%
Political affiliation	None/ would not vote	73	**12%**	11%	10%	10%	32%	12%	5%
	Labour	79	**13%**	14%	17%	15%	12%	10%	12%
	Liberal democrats	126	**21%**	22%	25%	15%	7%	22%	37%
	Conservative	160	**27%**	19%	22%	33	18%	39%	22%
	Other	16	**3%**	5%	6%	0%	2%	3%	1%
	Unsure/ floating voter	21	**4%**	6%	4%	3%	5%	2%	4%
	Prefer not to say	94	**16%**	18%	13%	22%	18%	12%	16%
Highest qualification	No formal qualifications	86	**15%**	6%	12%	21%	25%	11%	15%
	GCSE/ O-Level	73	**12%**	16%	8%	17%	17%	11%	8%
	A-Level/ Higher/ BTEC	85	**14%**	13%	7%	17%	28%	14%	11%
	Vocational/ NVQ	50	**9%**	5%	5%	12%	5%	11%	8%
	Degree or equivalent	146	**25%**	30%	33%	15%	5%	30%	31%
	Postgraduate qualification	95	**16%**	27%	30%	6%	8%	9%	18%
	Other	37	**6%**	2%	4%	9%	5%	10%	4%
Highest science qualification	No formal qualifications	161	**27%**	22%	26%	32%	40%	24%	23%
	GCSE/ O-Level	173	**29%**	38%	24%	31%	30%	30%	28%
	A-Level/ Higher/ BTEC	64	**11%**	11%	10%	6%	10%	13%	13%
	Vocational/ NVQ	17	**3%**	2%	4%	3%	2%	4%	1%
	Degree or equivalent	75	**13%**	11%	16%	9%	3%	17%	16%
	Postgraduate qualification	31	**5%**	11%	8%	4%	2%	2%	7%
	Other	14	**2%**	2%	1%	4%	2%	2%	2%
Newspaper readership	Any tabloid	261	**44%**	30%	37%	53%	75%	42%	34%
	Any broadsheet	280	**48%**	65%	59%	31%	13%	52%	61%
Own or regularly drive a car/ van		482	**82%**	78%	74%	82%	62%	92%	93%
Member of environmental organisation		84	**14%**	11%	23%	9%	5%	16%	16%

CHAPTER 4. UNDERSTANDING AND RESPONDING TO FLOODING

4.1 INTRODUCTION

This chapter addresses the first research question posed in Chapter 1. Drawing on interview discussions with flood victims, it examines how flood victims understand and respond to flooding, and whether they relate their experience and understanding of flooding to climate change. The data discussed in this chapter provide an in-depth insight into the flooding experience in its own right, whilst also suggesting what role, if any, experience of flooding plays in understanding and responding to climate change. Chapter 5 includes more focussed, quantitative analysis of the role of flooding experience in understanding and response to climate change, based on the postal survey data.

4.2 THE FLOODING EXPERIENCE

Most of the interviewees who had experienced flooding had only been affected by it a small number of times, and generally only in the last few years. The level of damage sustained varied widely. In one case, floodwater had not risen above the interviewee's cellar, and so had not caused any damage. More commonly floodwater had entered interviewees' homes at ground floor and led to considerable damage.

4.2.1 Impacts of flooding

The impacts of flooding include psychological and physical health, social and financial effects and impacted across a range of time periods:

- *During flooding event*. Several flood victims spoke of the fear and trauma they experienced during the flooding events. Some interviewees referred to the more severe impacts of flooding on elderly neighbours, which according to one participant contributed to some deaths. One other couple interviewed described the strain it had put on their relationships and feeling like "pieces of elastic at full stretch".

- *Immediate aftermath*. The damage caused by the flooding led to considerable hassle and inconvenience for those affected. Disruption and often displacement was an inevitable consequence of extensive repair work, which included dehumidifying the house, replastering walls, and replacing flooring and furniture. One woman had not been able to resume her normal routine for two years after she was flooded. Organising and supervising the repairs was a considerable drain on time and finances. Several flood victims moved into temporary accommodation during this period, and some went on to engage in political activities (e.g., lobbying for individual compensation or community defences). The financial impacts of flooding were significant during this period, stemming from repairs, time off work, house devaluation, and increased insurance premiums. One interviewee had suffered losses of £63,000 excluding the devaluation of her property. At the same time, the flooding impacted on the community as a whole and fostered a community spirit amongst residents, who had not necessarily met one another before. As one interviewee pointed out: "it brings people together, sort of, disasters, doesn't it?"

- *Ongoing anxiety*. For most flood victims, the on-going worry and stress of the risk of flooding was a daily concern. Many talked about being unable to go away without worrying, and always watching the weather. One interviewee explained:

> "We live with the sword of Damocles hung above us… whenever we hear this [roof] resonating we know it's rain, and we know therefore we have that apprehension".

  Another, elderly interviewee had decided she could no longer cope with the stress of flooding and had decided to move out of the area.

4.2.2 The role of flooding experience in risk perception, communication and action

Consistent with previous research (see Section 2.2.3.3), this study highlights the role of experience in perceived risk from flooding. For most interviewees, the first time they were flooded came as a surprise, *even though* some were aware of a flooding risk in the area. This dissonance was explained in various ways. Three people explained they had overlooked this risk because they liked the house or the area. They argued that flooding was not an "issue" when they had bought their property; with increased availability of information and media coverage of flood events, it has now entered public consciousness. One interviewee argued that people face various risks and that he had been "unlucky" that the risk of flooding - as opposed to other potential risks - had manifested in a real problem. However for almost all those interviewed it was because they could not have *imagined* the risk or impacts of flooding before they experienced it, that they overlooked the potential threat. The second-hand information about flood risk had no meaning or significance until it had been experienced. As one interviewee explained:

> "I'd never experienced flooding before, um, because I came down from Guildford, which had no problem with flooding, and although Somerset- most of Somerset is under a flood plain, um, I wasn't- I didn't really know what to expect… you take your risk if you move to Somerset, but the pub is beautiful, you know what I mean, so I was prepared to take that risk, but I didn't imagine it would be that amount of water".

This *difficulty imagining flooding* without prior experience also posed a problem when interviewees tried to communicate their experience to others, including close friends and relatives, and even those with responsibilities for flood defences. Several explained the disbelief about the risk of flooding was because you could not *see* the cause, namely the river (in Hillfarrance, which is over half a mile away from the village) or the springs (in Hambledon, which regularly well up into cellars). As one interviewee recalled:

> "This reporter came one day and said 'well, where's the river?' There's no river!"

Similarly, one couple explained:

Wife:	… like my parents you see, I think they thought perhaps we might have been exaggerating a bit and they- then they actually were here with us for Christmas, and- and experienced it for themselves and they were, you know, really quite amazed and… um, I think we were a bit naïve like that, and I think you just are, aren't you, you don't-
Husband:	… we'd seen pictures of- on the television of you know flooded property, but that- those sort of photographs and those sort of images were just obviously never going to apply here, 'cause the water level clearly can't get up here 'cause there's you know- there's fields over that way and that's- that's never going to happen. But um, er, we just- we underestimated the- the er, well a) the likelihood of it happening, and b) the consequences of it …

In particular, the speed with which floodwater enters the property and starts causing damage was often surprising; also the smell and dirt left by the water, and its temperature ("freezing") were unexpected. Only once they had *experienced* flooding directly were interviewees aware of *the risk and impact* of flooding. One woman concluded: "I think it's one of those things, if you haven't actually experienced it, you don't quite realise how awful it is". Another commented that this lack of understanding is part of innate human selfishness - "an 'I'm alright, Jack' attitude". This pessimistic view of human nature was expressed more strongly throughout interviewees' discussion of climate change (see Section 6.6.1).

Commonly participants described worrying *when they see or hear forecasts for rain*, and in one case almost *forgetting* about the flooding problem when the weather is fine for a long period of time - “in the summer it’s just not an issue”. Thus, it is the real, tangible experience of rain that reminds people about the risk. As noted elsewhere, without this recent experience, concern about the risk of flooding begins to fade (Slovic, 1986). According to Kates (1976, p.415), for individuals to respond to the risk of flooding, “floods need to experienced, not only in magnitude, but in frequency as well”.

Experience of flooding also afforded interviewees *knowledge* of how to act in response to it and to prepare for future flooding. Only after the initial experience of flooding, were interviewees sensitive to early-warning signs of flooding. Subsequently, they took immediate action to protect themselves and their possessions, and to help others. For example, two interviewees replaced carpets with rugs to prevent further damage. One interviewee explained that she had not taken any notice of the two-hour flood warning prior to the first time she was flooded because:

> “[the warning] doesn’t mean [the water] will come in, it might go down- just down the road, or whatever, and as I say I had only been here six weeks then, I didn’t know what on earth to expect”.

When another flood warning was issued some weeks later, she took immediate steps to prevent damage to her property. This indicates a different response to uncertainty on the two occasions: while the warning indicates risk rather than certainty, the experience of flooding sensitised this interviewee to the consequences of not taking precautionary action.

Finally, experience of flooding led many interviewees to feel great empathy and concern for others in *worse* situations who had experienced flooding.

4.3 SOURCES OF EVIDENCE, INFORMATION AND ADVICE

4.3.1 ‘Informal’ sources of information and support

As noted above, *experience* of flooding was fundamental to learning about the best methods of preventing damage. Most interviewees had found they intuitively worked out appropriate measures, such as putting ice cream cartons under furniture legs, using a silicon gun instead of sandbags to keep water out, clearing or widening their ditches, and so on. As one interviewee pointed out: “we just did it, I think we sort of worked it out for ourselves really”; and another stated: “we’ve learnt it the hard way”. In contrast to this, many found the advice of the Environment Agency on appropriate protective measures obvious or irrelevant (see below).

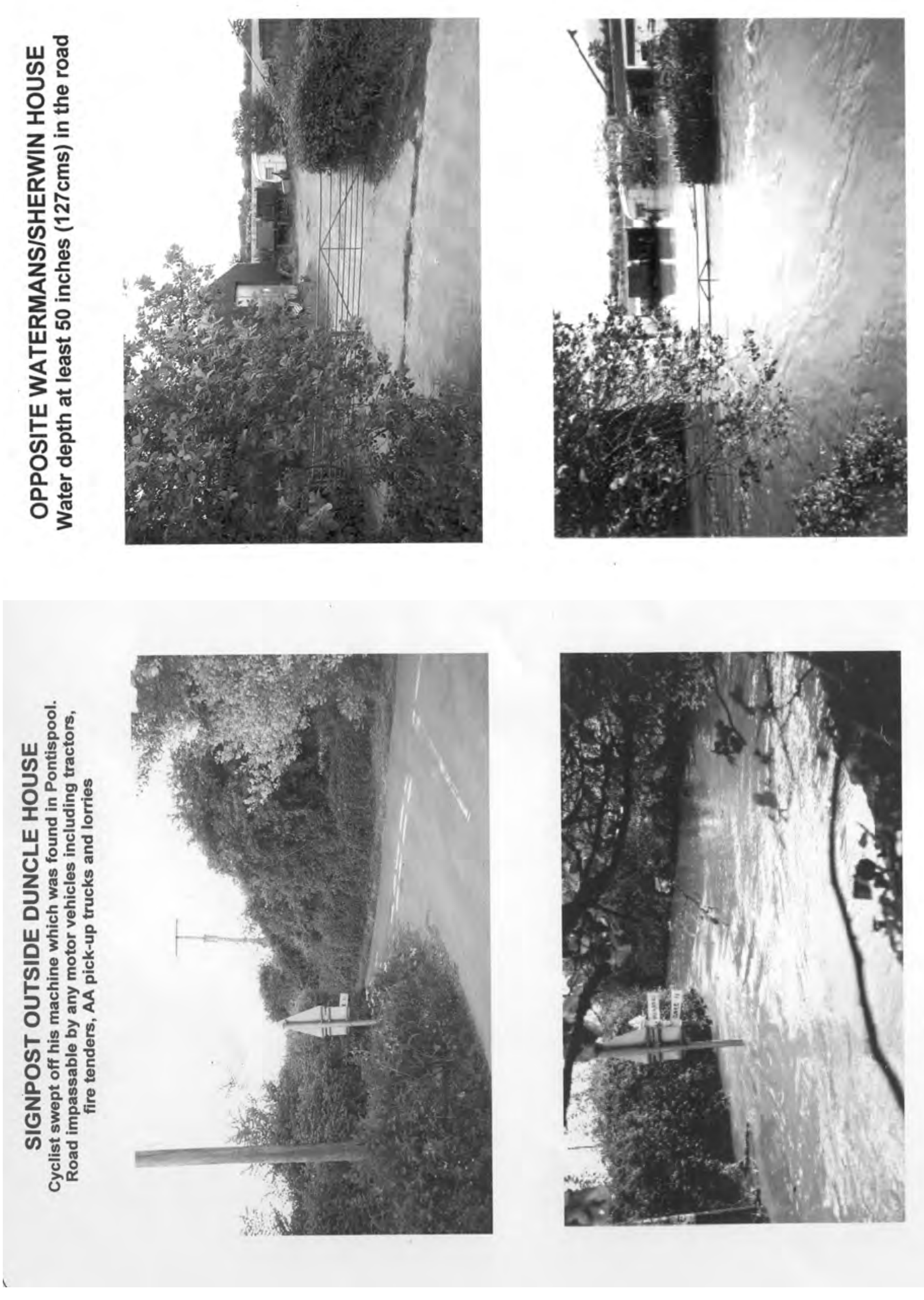
On the whole, immediate, local causes were identified for flooding more readily than global climate change. Often these were readily *observable* sources of the problem (blocked ditches and drains, removal of hedges, road resurfacing, and local development). Other causes were also identified, such as building on floodplains, changing farming practices, watercourses and defences not maintained. This relates to the prevalent perception of human *general* disrespect for the environment and poor planning by authorities as a cause of increasing flooding (see 4.4, below).

Many interviewees - unprompted - referred to "changing weather patterns" as an additional cause of flooding, and something that was likely to make their situation *worse.* (In one case, this led to a decision to move away from the area). In many cases though, flood victims expressed doubt about whether there are human causes for these changes in rainfall (see Section 5.4.8.1). It is perhaps understandable that flooding experiences are not automatically linked with global issues, since the disruption and devastation associated with flooding demands immediate attention. Consequently, flood victims focus on immediate causes and solutions to their flooding problem. One interviewee, who headed a Flood Action Group, explicitly stated that the group had only looked into climate change because it bolstered their case for the increasing need for a flood relief scheme.

> "We know we get flooded, if the- if the- because of the problem of climate change then we're going to get flooded more, but at the end of the day, we need the scheme so, um, as far as the Hillfarrance flood action group was concerned climate change was only- has to be um put into the equation for building a scheme, so that there's extra capacity, if- if it's true that there's going to be a major problem with climate change, but there was no particular benefit to- for this particular project, there was no reason to go down that avenue really".

Some interviewees had evidently given considerable thought - often based on their observations and knowledge of local history - to the reasons for the flooding in their area, and had become quite knowledgeable about the factors influencing flooding. Some participants gathered their own data about rainfall and flooding (which was sometimes considered more relevant than 'official' data) and kept considerably detailed records of their flooding experiences and related issues (see Figure 4.1). They were often happy to share their 'flood files' with me. In many cases they had gained a lot of knowledge through researching the extent and causes of flooding (and rainfall), local political and environmental factors, and so on. To this extent, these individuals had effectively become "lay experts" (Wynne, 1991; Irwin, 1995) about their unique flooding situation. This adaptive expertise has also been observed amongst flooded communities in developing countries (Few, 2003). One interviewee noted that their community's insights were beginning to be exploited and valued by government bodies. She cited the example of a recent DEFRA conference on flooding, which had incorporated flood victims' perspectives (see below).

Figure 4.1 Extracts from a 'flood file' showing evidence and measurements of flooding events. This was used to support the Flood Action Group's case for a flood alleviation scheme



Since flooding was very much a shared, community experience, the role of informal *social networks* as a source of information and help was crucial. As others have noted (e.g., Katz & Lazarsfeld, 1964; Rayner & Rickert, 1988), social networks are prolific, credible and authentic sources of information. Interviewees tended to rely on other local residents as sources of information about the causes of flooding (although one person called this "hearsay") and for advice on potential solutions and action. These figures were trusted as credible sources of information due to either their *experience or expertise*. Some had lived locally for many decades and knew the area's flooding history; others were viewed as having some relevant professional knowledge or skills, such as in engineering, law or politics.

Furthermore, neighbours acted as a source of support from people who shared the same problems. As one interviewee explained:

> "I talked to various neighbours, because we did a lot of networking- it was the only way we could stand up to it really".

In Hambledon, the flood group co-ordinator made considerable use of naval contacts for advice about solutions and manpower in erecting temporary defences. One interviewee who co-ordinated a flood action group explained the importance of social support and local expertise:

> "The cohesion of the [flood action] group's also crucial because you know it's not something that's easily undertaken as an individual. People- people take note of you more if they know that you're a group. Um, and also you get the support of other members of the group and you, you know, you can have a discussion about the best way forward and different people have different ideas and it's very supportive to, um, get feedback from- from other people, and also they're coming from different perspectives so that's been very positive as well, but I mean it's- it's not something I believe one individual can take- really take forward."

Neighbours, friends and family also offered practical assistance to flood victims, for instance offering accommodation and assistance with removing furniture. In some cases, those involved in flood action groups developed networks of influential or skilled contacts outside their community to support their campaign. The efforts and resourcefulness of local communities was striking. Activities included contacting UK academics and Amsterdam water resource managers in seeking out solutions to their local flooding problems. However, although flood action groups had been involved in gathering information via the Internet and libraries, more often they found the role of personal networks more valuable. During their campaigning, members of one flood action group realised the crucial role of individuals (and their political motivations) within agencies and government in determining the success or failure of funding for flood defence schemes. Accordingly, they employed similar tactics of one-to-one contact to influence decision-makers:

> "I suppose really individuals in all these agencies sort of I think probably the most helpful thing is- is the developing a personal relationship with them so that you know that there's some kind of rapport…"

The importance of personal contact in fostering co-operation in response to environmental issues has been highlighted elsewhere (Rayner & Rickert, 1988).

4.3.2 Official sources of information

As mentioned, many people had learnt how to respond to the risk of flooding from their own experience. A minority acknowledged flooding information from the Environment Agency or Parish Council could be useful and reassuring:

> "I knew what to do… it was all down in the [Parish Council's] flood warning sheet".

> "It puts your mind at rest… when you know you can get through [to the Environment Agency's information service, *Floodline*] straight away for information".

Most, however, viewed such information as *common sense, obvious,* or *of little practical value*. One interviewee who had taken the initiative and installed extensive protection measures to his home, pointed out:

> "It's a good job I didn't wait for someone from the Environment Agency to advise me, isn't it? I would have floated off down the road!"

Elsewhere, residents were similarly forced to respond immediately to the flooding, without waiting for assistance or advice from authorities:

> "We had already sussed it out and were getting on with it".

One couple pointed out that information about flooding seems *irrelevant*, and will be ignored, unless you've experienced it:

> "[the information] is useful to us 'cause we know, you know, we know and understand the consequences of not doing it, but if you don't and I'm sure this happens time and time again, people just- you know people who get flooded for the first time, I can guarantee

> they didn't put any measures in place to protect themselves 'cause they just don't- not expecting it and not you know don't understand the, um, consequences of it".

One couple felt the Environment Agency's advice about putting insurance documents in a plastic pouch was of little practical use in relation to the extent of damage they were experiencing:

> "Telling you what to do, which always amuses me, 'put everything in a plastic bag…' which I thought was a little bit pathetic, to be quite honest, in reality. It's not reality, that's why it's sort of play-acting".

They felt funding for *Floodline* and information campaigns would be better spent on building defences for flooded communities.

Some pointed out that advice and information from the Environment Agency and construction experts was *too general* for their specific area or type of flooding. This was particularly felt to be the case with groundwater flooding, as one interviewee explained:

> "I haven't managed to find an expert, somebody who really knows what the- what the answer, and what the best measures to be taken, 'cause when you get down to it, when you enquire, they don't know, you know, it's beyond their experience what the best way of handling the groundwater flooding in this village is… I mean the Environment Agency haven't found anybody- you can get generalised advice and generalised pamphlets, but it's actually- I think, is a more- is a much more serious problem than that and you've got to build sumps in the right place and electrical supply points that are waterproof…"

Others mentioned the limited use of flood warnings because of their inherent lack of certainty about whether a flood event will occur, or its severity. Only being indicative of the possibility of flooding, rather than offering certainty, they could not help you decide about the appropriate level of action (e.g., returning early from holiday). Similarly, one interviewee pointed out that the flood risk maps produced by the Environment Agency defined flood risk areas too generically.

4.4 RESPONSIBILITY, BLAME AND TRUST

A major theme throughout the interviews with flood victims was the sense of *alienation from, and lack of faith in, institutions* responsible for flooding. This includes flood defence committees, local authorities, national government, the fire service, and to a lesser extent the Environment Agency. In terms of both their contribution to causing flooding and their responsibility for alleviating it, authorities were described as being short-sighted, wasteful, inefficient, politically- and financially-motivated, bureaucratic, and lacking in common sense. Some interviewees spoke about the issue of development on floodplains, for example:

> "I think the, um, the planning issues are a major problem. I mean they are talking about building in Taunton Deane eleven hundred houses on the floodplain, um, which to me is just grossly irresponsible".

Two interviewees spoke about the lack of forward thinking by authorities, who only respond to problems when things become catastrophic - and ultimately have to spend more to fix them. One interviewee pointed out that, due to cost-cutting, authorities had become "negligent":

> "If you'd asked me if they'd still paid the people to dig the ditches and rivers out over the past thirty years, whether they'd need to have spent two million now, that might be a different question, do you know what I mean, cost-effective I don't- I'm not sure. If they'd still kept that all going through the countryside, I don't know".

There was a perception that communities - particularly if they are small, rural communities - are ignored by authorities. For example:

> "Winchester [council] don't like spending money on Hambledon."

> "[Hillfarrance] has been sidelined."

It was evident that the lack of effective action on the part of authorities to deal with the flooding problem had motivated interviewees to take action themselves. The persistence and resourcefulness of communities was impressive, and the lesson many interviewees drew from their flooding experiences was that individuals and communities must take action themselves to solve problems. There was a sense that communities could not rely on authorities to work for them. As one interviewee concluded: "the community has to look after itself". In Hambledon, this involved residents setting up a flood information centre, co-ordinating support, and disseminating information throughout the village. The flood co-ordinator concluded: "as a community, again helping itself, recording what it is in order to promote your position to the outside world".

Similarly, in Hillfarrance, those involved in the flood action group explained their frustration at the inaction and seeming unreasonableness of the authorities:

> "We thought [the flooding problem] might be solved here with a certain amount of reasoning and discussion… And then we realised we were up against the system and… that unless you had a profile, you were forgotten".

> "I think it's a very sad reflection but I think that's the only way to get things done, really, is just to fuss and fuss and fuss… Whoever shouts the loudest gets-".

Community flood action groups found their campaigning was often an arduous struggle, dealing with the complex internal workings of organisations involved in flood defence, and the convoluted, time-consuming, legal and bureaucratic aspects of the process of seeking funding for flood defences. In addition, the problem of political motivations and influences was mentioned as a factor in determining the success of finding funding. This bureaucratic and political framework within the flooding authorities is juxtaposed against the raw and immediate difficulties faced by the communities devastated by flooding (see Section 4.2.1).

In particular, the way in which potential flood defence schemes were evaluated or prioritised by authorities was considered arbitrary ("points schemes") and very distant from the qualitative experiences of flooded communities. A number of interviewees noted that authorities dealing with flooding have a largely financial perspective on the problem: "it's all cost-benefit analysis"; "it's all the bureaucratical system"; "everything is so heavily costed". One interviewee explained the ridiculous consequences of this bureaucracy:

> "They keep changing the points system and we had enough points at one time, and then we dropped off the list because we didn't have enough points, and then um, we finally had enough again and then we didn't, and you know it went on like this… it sort of all seems quite irrelevant when you get flooded, whether you've got points or not, really. You know, and it's quite difficult to get your head round the fact that you've got to go with the system, because at the end of the day if you don't nothing will ever be done".

The politics of the flood defence system was another source of frustration for flood victims. One interviewee described the wastage and arbitrary decision-making by politicians:

> "…there's several different layers of um bureaucracy and ultimately the decision is political. Um, and you know the Environment Agency are busy spending money looking into different schemes, and the benefits of um- of um- the merits of different schemes um, only ultimately for a local politician to say 'oh actually no, I'd prefer it went there rather than there'. I mean Hillfarrance as we've said has only happened um in the last couple of years, and part of that, I mean we're guessing but we've guessed that they've spent at least quarter of a million pounds on aborted work, which- well, I mean it- this scheme that they've done, they've now spent at least another quarter of a million, so they've spent probably half a million pounds on- on, you know, consultants' fees, design, all the rest of it, which, if it hadn't been for our lobbying and for the support we did get ultimately, would have just you know disappeared, been totally wasted money. And that happens time and time again. I know- I know of other schemes that have failed, um so there's,

> yeah there's definitely more that could be done to reduce the um- the risk of flooding".

The role of politics in determining the success of flood defence schemes was highlighted by two other interviewees:

> "I mean politics obviously comes into it, in a fairly sort of major way as well, you have to- you know individuals- individual politicians can make a huge difference to success or failure, um, which doesn't seem right really. You sort of feel that um… well politics is in everything really".

> "I think [our MP] did try to help, because she was Liberal, and the land- this is the political side which is so disconcerting, and he was- the chairman of the flood defence committee, he was Liberal too… You know, it's the political side that also came into it and I felt that it's not a political issue, as I said it's a social issue that needs to be addressed".

Several felt that communities' expertise about their own flooding problem was ignored by authorities and engineers, resulting in a sense of alienation from decision-making. One interviewee explained his frustration at this situation: "you've got to throw a thousand pounds at consultants to tell you the obvious, because you can't rely on the simple man's common sense, you see".

Several felt the local authority or flood defence committee had no interest in, or understanding of, community problems. For example, when flood defence committee members were invited to Hillfarrance to see the extent of the flooding, one couple were struck by their *ignorance*:

> "And what was so interesting was none of them realised what flooding is, and one of them said, 'oh does it come through the walls?' and I said, 'oh yes', because that's what happens".

Many felt there is a *lack of understanding by authorities and 'experts' for communities' local circumstances or for different types of flooding*. One interviewee described a local flood defence scheme that had had detrimental impacts elsewhere in the catchment, and concluded that engineering decisions must have been based on "guesswork". Another highlighted a lack of sensitivity to local circumstances with reference to advice sent by the council:

> "[The council] sent us a letter a few weeks ago [saying] 'you must not pump your flood water onto the road. You can be fined £1,000'… but I mean there's nowhere else I can put it, I haven't got a garden, it couldn't go out the back or anything. Ridiculous."

Another resident suggested that the council had less understanding of their circumstances and needs as a community because it had changed from a local, rural council - with "the responsibility close at hand" - to a more distant, city-based council. Another referred to "a petty regulation from London town" that prohibited the community from closing their roads during flooding episodes to reduce the risk to pedestrians and homes.

As mentioned in the previous section, official information was often viewed as too generic to be of practical benefit in a range of flooding experiences. One Hambledon resident felt that the models to predict damage from groundwater flooding are "fallacious", since they are based solely on river flooding. In Hillfarrance, one resident described the different speeds with which flooding can occur, according to local conditions: "locally, it is different".

There were, however, encouraging signs that flood victims' knowledge of their flooding problem is beginning to be considered by flooding authorities, specifically the Environment Agency:

> "I think they realised that, um, information is a two-way thing and it can come from above and below. Very often information from below is just as useful as the information from above… so um, that's why we were invited [to the DEFRA conference] because you know they wanted sort of input from people who'd actually suffered flooding".

The sense that individuals were struggling against an arbitrary and unfair system continued into discussion about insurance. It was felt that insurance companies add to the problems caused by flooding, by denying liability, raising premiums and excesses and even withdrawing insurance making properties unsellable. Some pointed out that insurers and the Environment Agency identified flood risk over too broad and disparate an area with little consideration to individual circumstances. Similarly, surveyors, builders and domestic flood protection salesmen were in some cases viewed as taking advantage of flood victims' situation: "money for the boys", "opportunists", "they cash in on this" - and yet, like authorities, being unaware of the specific, local flooding situation.

As discussed, flood victims tended to identify a number of *local observable* causes to 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. *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). This divergence in perceived causes of flooding highlights a disconnection in the priorities of flood victims and those of policy-makers responsible preventing flooding.

Interviewees often found it difficult to establish the roles and responsibilities in relation to flooding. One commented that different bodies were denying their responsibilities ("one said the other was responsible"). In the context of filling in ditches in Hambledon, one interviewee remarked that although the council were to blame, "they wouldn't admit it!" The issue of blame and alienation was particularly strong following the Southsea sewage flood, and a major focus of local news coverage. The local water company, Southern Water, denied responsibility for the pumping station failing, labelling it "an Act of God" due to freak weather conditions (Levy, 2000). However, residents affected by the flooding blamed pumping station failure and blocked drains (Bardsley, 2001). The interviewee affected by the Southsea flooding argued that, contrary to Southern Water's claims, there had not been an unusual amount of rainfall immediately prior to the flood. Despite allegations of negligence, the water company had made no effort to compensate or help victims. She recalled:

> "All the official information was just… um, people in- men in power trying to cover themselves for what had gone wrong".

This alienation from authority and distrust in political institutions was evident throughout the discussions, including in relation to government response to climate change (see Section 6.6.2). Interviewees also gave evidence of authorities as bureaucratic, financially-motivated, short-sighted and inefficient based on their experiences in other areas, such as applying for planning permission.

Interestingly, this lack of faith in authority was often related to a more general cynicism and concern about people's motives and abilities to manage or respect the environment. Some felt increasing flooding was symptomatic of "modern man's" increasing neglect of the environment and loss of a simple, practical "common sense" or "wisdom" that used to exist in humans' (harmonious) interaction with nature. Several referred to humans upsetting the balance/ equilibrium of nature in the context of the causes of flooding. Two examples are:

> "I think it's an accumulation of things that modern man has done and it's just- it's almost blatant disregard for the environment. To me those- they are just common sense issues, and we're just- people just blatantly disregarded them… they had common sense in those days [in the 1600s, when the village was built], well they had to to survive… we're losing the ability to deal with simple practical problems".

> "We the human, the inhabitants of this community have- have- are out-of-synch with nature, have abused, um, our custodianship, because- and unwittingly, unwittingly, er it would seem to me, but um a hundred years ago- I kept on saying we must move the clock

> back a hundred years, because a hundred years ago we had a much better means of managing this- this floodwater that we have today… we've become too clever, too sophisticated"

These views about the issue of flooding and definitions of appropriate actions in relation to the environment are based on broader beliefs about the human-nature relationship that are culturally grounded (this theme is discussed in Section 6.3).

A number of findings therefore highlight the stark divergences between institutional and public views of flooding. There was a real sense that authorities were not working for the victims of flooding: authorities had little understanding of specific local flooding problems; information and advice about protection from flooding was too general; communities had to take the initiative to get flood defences; and there was not a shared view of the responsibility for causing flooding.

4.5 PERCEIVED SELF-EFFICACY AND INDIVIDUAL ACTION

The interviews suggested, in accordance with previous research (Slovic, 1986; Rochford & Blocker, 1991), that different levels of individual action were linked to perceptions of responsibility and controllability of flooding. All interviewees who had been flooded had taken measures of some kind to reduce the impact of future flooding. These actions varied considerably, though, from pumping out the top of the flood water in their cellar to ensure it stayed below ground level; to installing complex, costly home flood defence mechanisms. Others formed flood action groups to lobby for a village flood defence scheme.

Although it is beyond the remit of this qualitative study to draw conclusions about the determinants of response to flooding, it is possible to identify implicit and explicit reasons for interviewees' responses. What most differentiated people in their responses seems to have been whether they felt flooding could be controlled, as opposed to being uncontrollable, inevitable and "natural". People who identified *human activities* as the principal cause of the flooding they had experienced (e.g., failure to clear watercourses, floodplain development, farming practices), were typically more active in protecting their home and engaging in community action for flood defences. These people evidently felt that flooding could be controlled, because they could identify human causes for the problem. However two interviewees who had been the least active in response to flooding, felt no-one could be blamed for flooding because it is inevitable: "because water, we all know it's got to go somewhere, hasn't it?"; "You can't stop it. It's nature, so they say". The latter, an elderly women, felt the only way of dealing with flooding was to move away from the area.

Other research has similarly found that people are more likely to be pro-active in social protest about flooding if they consider it to be in some way "unnatural" (Rochford & Blocker, 1991). If flooding is perceived as a human-caused problem, blame can be apportioned and the issue becomes one of social injustice (Douglas, 1992). The wider risk literature also suggests *unfamiliar and 'unnatural'* risks tend to be more unacceptable (Otway & von Winterfeldt, 1982; Slovic et al., 1980). Yet, it is interesting to note that the Environment Agency states: "Flooding is a natural process. It cannot be prevented but the damage caused can be reduced" (Environment Agency, 2001a, p.23). Although they make reference to the increasing risk of flooding due to climate change, they do not establish any causal connection between human behaviour and climate change. The same assumption - that flooding is *natural and inevitable* - underlies advice from the Portsmouth City Council emergency planning representative. He commented on the Southsea flooding in 2000: "It was a one in 200 year event, but the weather is changing - not just in Portsmouth but all over the world… It's a natural phenomenon, you can't stop it" (Hogg, 2003). This disparity in the perceived causes of flooding reinforces the point made earlier about the gulf in understanding between flooded communities and flooding authorities. Furthermore, the findings from this and other research suggest casting flooding as inevitable and natural in official rhetoric may undermine flood victims' motivation to act.

Respondents' personality and experience evidently also influenced their response to flooding. Several interviewees described their responses to flooding as typical of their responses to other life challenges, describing themselves as "practical", "optimistic". One explained "I don't take things lying down"; and another, "I cope with what life throws at me". As Fazio and Zanna note (1981, p.196) "the extent to which an individual possesses the self-image of a 'doer' appears to be a determinant of attitude-behaviour consistency". Equally, it was evident that responses to flooding were often based on past experience, skills and knowledge, for example military training or engineering knowledge. In one case, a couple explained they were limited in the action they could take to protect their home because, unlike some of their neighbours, they *lacked* appropriate skills (e.g., DIY).

Perceived individual efficacy and a desire to be in control of their environment and life were particularly salient qualities that influenced responses to flooding. One interviewee explained: "I don't like being out of control". Another interviewee, who had been very active in protecting his home from further flooding, described this feeling of control:

> "I feel as though we've got some sort of control over our own environment… I think the woman down the road, but she's on her own, she's getting on a bit, she feels that- I guess some people feel they can't control the situation, and I guess when you feel that, you're- you would be reluctant to stay I should think".

Previous research has similarly highlighted the role played by both individual and collective self-efficacy in determining action and coping responses to flooding and other traumatic experiences (e.g., Benight, 2004; Few, 2003; Bandura, 1971).

Some interviewees described a feeling of satisfaction or reassurance in having taken actions to protect their home, such as putting in floodgates or pumps - even though, as in one case, they were unsure whether it would make much difference. This mirrors similar discussion relating to climate change about intrinsic satisfaction with individual pro-environmental behaviour, such as recycling, *even though it may impact minimally on environmental problems* (see 5.5.2). There were differing views about what kinds of action are most effective in protection against flooding. Some felt individuals should focus on protecting their own homes, while others viewed individual measures as inadequate and that a community defence scheme was more appropriate. As mentioned, some individuals made incredible efforts to co-ordinate community action and support in response to flooding, which effectively became full-time occupations. Two interviewees had cleared the ditches around their properties and, having not been flooded since that time, considered this to be an effective measure to limit future flooding. One interviewee observed that until the flood scheme is implemented "it's every man for himself", although measures to protect individual properties could increase the flooding experienced by others. However, one couple who were very involved in lobbying for a village defence scheme, explained:

> "You've got to try and convince people that in actual fact digging out the ditches is not going to solve the problem for them, because they think it is".

Another couple felt many villagers had become apathetic and "resigned" to the problem of flooding. Together, both coping styles and perceptions of the causes of flooding will determine how flood victims respond to their situation (Rochford & Blocker, 1991).

4.6 CONCLUSION

The findings discussed in this chapter relate to the experiences of three contrasting flooded communities, and therefore do not provide a nationally representative picture of flood victims' understanding and response to flooding. Nevertheless, three key themes emerge from these interviews that support previous research in this area:

- *Central importance of direct experience in understanding and responding to flooding.*

These interviews underscore the importance of *direct experience* in determining risk perception and behaviour in relation to flood risk. Interviewees explained that, *despite being aware of the risk of* *flooding from second-hand information,* they had overlooked the potential threat because without having experienced it they could not *imagine* the risk or impacts of flooding. Interviewees relied on immediate, direct sensory evidence (i.e., excessive rain, proximity to a river) in identifying the risk of potential flooding. Experience also informed participants' responses to flooding. Only after the initial experience of flooding, did interviewees take protective actions in response to early-warning signs of flooding and *know how to* prepare for future flooding. This finding supports previous studies which has highlighted the primacy of experience in determining perceptions of and responses to flooding (Kates, 1976; Hansson et al., 1982) and other risks (see Section 2.2.3.3). In the following chapters, I will show how experience of conceptually *similar* issues is central in determining perceptions of climate change.

- *The source of flooding information is central to its acceptance - direct experience and social networks are more useful, specific and relevant than official information.*

Interviewees tended to rely on their own experiences, observations and local knowledge as well as on informal, social networks for sources of information and help with regard to flooding. Since flooding is very much a shared, community experience (Few, 2003), neighbours became key sources of information about the causes of flooding and potential solutions, as well as providers of social support. As others have noted (e.g., Katz & Lazarsfield, 1965; Rayner & Rickert, 1988), social networks are prolific and *credible* sources of information. Furthermore, through community action, some interviewees felt able to achieve more than they could on an individual basis. The implications of this for fostering public action in response to climate change are discussed in Chapter 8.

This study exposes the way in which lay expertise can develop in the context of flooding. In many cases, interviewees had gained considerable knowledge through monitoring rainfall levels, researching the extent and causes of their flooding problem, and learning about local political and environmental factors. In contrast to direct experience and local information, official flooding information, advice and warnings (e.g., from the Environment Agency) were often perceived to be too generic, obvious, and of little practical value. Wynne (1991) has similarly argued that lay expertise can be *more* valid than scientific expertise in the context of local risk issues precisely because it is specific to the local situation; by contrast, scientific knowledge strives to distinguish itself from its context and to provide abstract and generalisable facts.

- *Understanding of and response to flooding is determined by institutional and cultural context*

Interviewees often expressed a lack of faith in the institutions responsible for flooding to truly understand or address local needs. In terms of both their contribution to causing flooding (e.g., due to development on floodplains) and their role in potentially alleviating it, authorities were often described as irresponsible, short-sighted, inefficient, and politically- and financially-motivated. In dealing with flooding authorities, those involved with community groups perceived a dramatic contrast between their unique, qualitative experiences of flooding and the generic financial and political framework in which authorities (and insurance companies) defined and responded to flooding. Several felt they were struggling against an arbitrary and unfair system and that local authorities and flood defence committees did not understand or want to accept responsibility for local, flooding problems. There was often disparity between flood victims and institutions in their understanding of the causes of flooding, and consequently who they considered responsible for tackling it. The lack of faith in authority demonstrated by interviewees was often related to a more general cynicism and concern about humans' dysfunctional relationship with the environment, which was felt to manifest in problems like flooding. As I will show in the following chapters, these moral and cultural dimensions to interviewees' perception of flooding are also central features of public perceptions of climate change.

The development of local expertise and community action was largely in response to perceived institutional inaction. Yet, interviewees felt that the expertise they had developed with regard to their flooding problem was often ignored by authorities and engineers. This resulted in a sense of alienation from decision-making and a lack of identification with official information. These findings reflect those of Wynne (1991) and others who have exposed the knowledge hierarchy that has tended to detrimentally exclude lay expertise in understanding and responding to environmental risks. There were, however, encouraging signs that flood victims' knowledge of their flooding problem is beginning to be considered by flooding authorities, particularly the Environment Agency.

The research described in this chapter provides some understanding of the everyday world of people affected by flooding, of their unique circumstances and experiences (Grove-White, 1996), and of the personal, social and institutional context in which flooding is understood and responded to. Overall, the findings highlight the disparity between institutional/expert and public/lay constructions of flooding. Such divergences in perceptions of environmental risk indicate a disconnection and lack of understanding between the priorities of decision-making bodies and those of the public, undermining the respect and legitimacy of these controlling institutions (Grove-White, 1996). Implicitly, communication of flooding information must give greater sensitivity to the local context in which people perceive, understand and potentially act on it. Information is not passively received or responded to in a vacuum, but actively interpreted, evaluated and adapted within the context of experience, skills and knowledge, social influences and institutional relationships. In particular, involving local communities in decision-making processes and policies relating to flood defence will go a long way towards overcoming public distrust and alienation from institutions that claim to address flooding.

As I will now move on to discuss, many of the findings and implications discussed in this chapter on flooding have direct parallels with the public's understanding of and response to climate change.

CHAPTER 5. DIMENSIONS OF PUBLIC UNDERSTANDING OF AND RESPONSE TO CLIMATE CHANGE

5.1 INTRODUCTION

In this chapter, I address the second research question posed in Chapter 1: to describe the dimensions of public understanding and response to climate change. 'Understanding' here is defined broadly in terms of people's knowledge, attitudes and level of concern in relation to climate change. Building on the findings of previous research, sources of, and trust in, information were also addressed in this study. Furthermore, this chapter examines the prevalence of both intent-oriented and impact-oriented action in response to climate change. Motivations and barriers to individual action are also addressed. The data used in this chapter derives from both the qualitative interviews (with flood victims and non-victims) and postal survey.

As I described in Chapter 3, responses from people with different characteristics (experience, values, knowledge and demographic variables) were compared for significant differences using the chi-square test. The main findings from these tests are discussed in this chapter. The abbreviations *, **, and *** are used to indicate where differences are significant at 0.05, 0.01, and 0.001 levels, respectively. Although the postal questionnaires differed in terms of terminology (half referring to *climate change*; half to *global warming*), the term 'climate change' is used throughout this chapter, apart from in cases where *global warming* questionnaires produced different responses.

5.2 SOURCES AND TRUSTWORTHINESS OF INFORMATION ON CLIMATE CHANGE

The study investigated from which sources people hear and learn about climate change; and which sources are considered most trustworthy. It was expected that perceptions of the source of information would be central in influencing whether people accept, reject or ignore information on climate change (Rayner & Rickert, 1988). The interview data indicated that sources of climate change information include *direct* sensory evidence of changed weather patterns and *indirect* sources of information. These indirect, second-hand sources include government, environmental NGOs, energy suppliers, the media and scientific sources (e.g., journals) and more 'informal' channels - via friends, family and colleagues. The prevalence and trustworthiness of these sources are discussed in this section.

5.2.1 Direct, sensory evidence of climate change

Virtually all interviewees referred to sensory evidence of climate change, such as needing to cut the grass until later each year, changes in average monthly rainfall, less snow, more extremes of weather, such as El Nino, and so on. For example, one retired couple explained:

Man:	… the pattern of weather has changed, visibly changed.
Woman:	More rain.
Man:	More rain…
Woman:	Wetter winters, wetter and warmer winters. We don't get snow now, do we, like we used to.

Interviewees tended, above all, to **equate climate change with recent changes in weather**. While conceptually similar, climate technically refers to the average or expected weather over a period of months or years, and weather to observed changes in conditions. It is unsurprising then that 'weather' is discussed more than 'climate' by the public. Weather is visible and immediate, and often the context in which climate change is discussed in the media (Hargreaves et al., 2003), as some interviewees also noted. A number of interviewees mentioned "warmer and wetter winters". This reflects the coverage in the media which tends to focus on (more benign) potential changes in British climate than on the more devastating effects on the developing world (Hargreaves et al., 2003). Some, though, had also heard about changes in weather from friends living in other countries (e.g., Florida, the Maldives, and the Alps).

Within the survey, too, respondents most commonly identified sensory evidence for climate change. As I discuss in Section 5.4.3, when asked what the impacts of climate change are or will be, the most popular response (by 22.6% of respondents) was changes or extremes in weather.

However, while most respondents could identify changes in weather as evidence for climate change, this was not to say they necessarily agreed that climate change is caused by humans. As I will discuss (Section 5.4.8.1), uncertainty about the reality of *anthropogenic* climate change emerged as a salient feature of respondents' understanding of the issue.

5.2.2 Second-hand sources of information on climate change

While most interviewees were aware of changing weather patterns as evidence of climate change, there was **much more variation in terms of their exposure to second-hand information and, consequently, the degree to which they felt informed about the issue**.

The most informed interviewees had learnt about climate change through their work (or to a lesser degree through involvement in flood action groups), suggesting that people are unlikely to seek out information about this issue unless it is required. There was an acknowledgement by some that the information is out there *if* you want it:

> "There is a lot of information out there that you wouldn't go looking for unless you were involved in it". [Male, marine environmental consultant]

At the same time, others felt under-informed about the issue. In one case, an interviewee who repeatedly expressed her lack of confidence in authorities concluded that information about climate change is being kept from the public:

> "If the government's got the evidence, they're not saying it, are they, because it would probably cost a lot of money, which is what it all boils down to again". [Female, pub/ restaurant owner]

Similarly, there were different perceptions about how much attention the media was currently giving global warming: one arguing "it's just flavour of the month"; while another claimed "I haven't seen much on the news or in the papers recently".

The survey sought to investigate in more explicit terms where people most commonly hear about and learn about climate change, and the degree to which climate change information is trusted.

Figure 5.1, below, shows the most common sources of information about climate change. Chi-square analysis of responses from questionnaires using different terminology indicates that sources of information about *global warming* were generally more popular than *climate change* information (see Appendix 5.1 for details). As I will discuss later (see 5.4.8.2), this reflects a greater awareness amongst respondents of the term *climate change.*

Figure 5.1 Sources of information about climate change

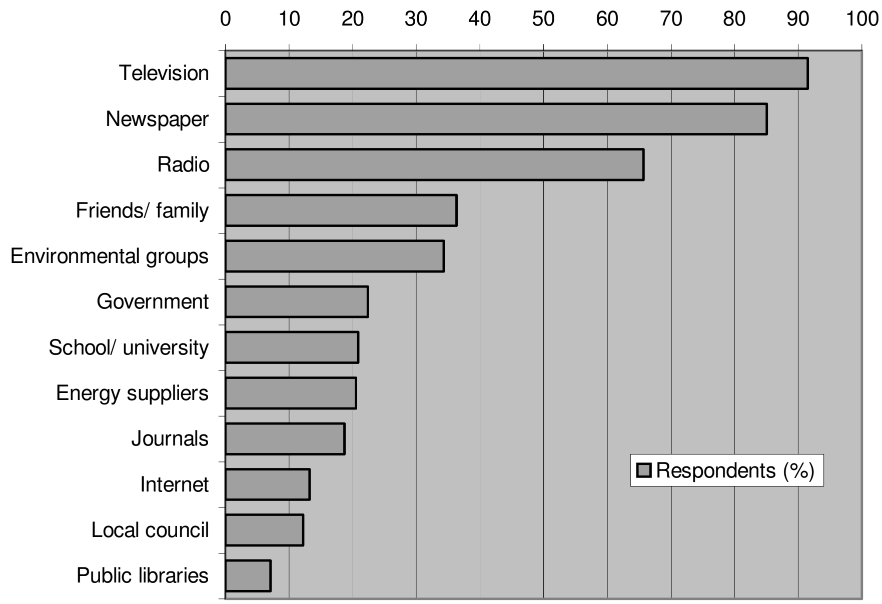
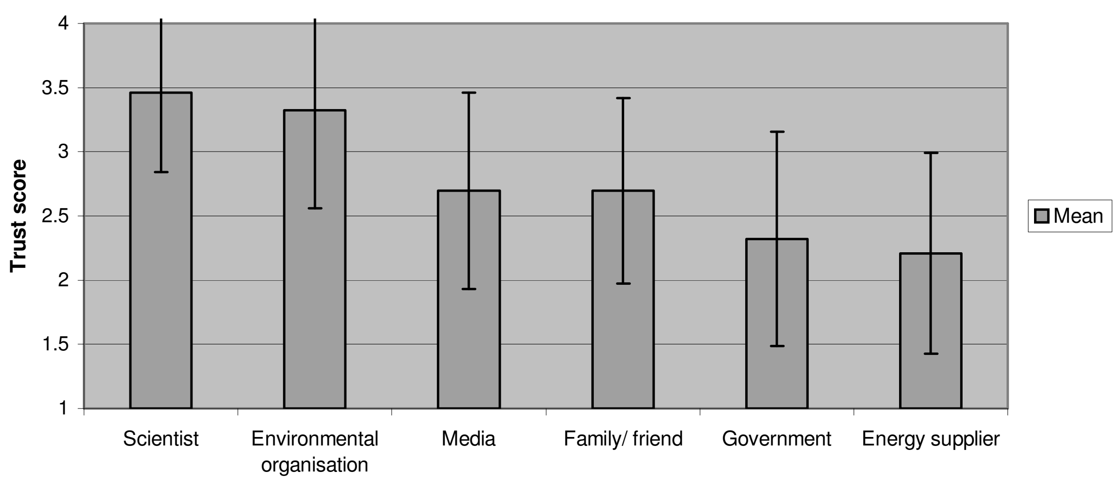


Figure 5.2 shows the mean trust scores on a 4-point scale (1=not at all; 4=a lot) and standard deviations (represented by the black line dissecting each bar) assigned by respondents to certain sources of information.

Figure 5.2 Trust in sources of climate change information



5.2.2.1 Media

The interview and survey data indicate that **by far the most common second-hand source of information on climate change is the media**, particularly television news reports and documentaries. Television is a source of information for 91.5% of survey respondents, newspaper for 85.1%, and radio for 65.7%. This is consistent with the public's use of television as the primary source of information about scientific issues (Eurobarometer, 2001).

Chi-square analysis indicates that a significantly smaller proportion of respondents aged 16-24 have heard about the issue through television (76.7%**), newspaper (63.3%**) or radio (43.3%***). In contrast, a much higher proportion of this age group has heard about it though *formal education* - school or university (63.3%***) - than the total sample (20.9%***). More graduates (34%***), people affected by air pollution (27.8%*), people whose family/friends have been affected by air pollution (26.7%**) and respondents with top quartile New Environmental Paradigm (NEP) scores (30.1%**) have also heard about it through formal education. (The NEP scale is explained in Section 5.3.2).

Significantly more men have heard about climate change through television (95.2%**), radio (74.0%***) and newspapers (91.8%***). Graduates and broadsheet readers are significantly more likely to hear about it through the radio (73%* and 75.7%*, respectively) and from newspapers (90%* and 95%*, respectively). More respondents on 'high' or 'very high' incomes (76.7%**), those living in Ward B (70.4%*), Flood Area 1 (77.0%*) and Flood Area 2 (74.7%***), and members of environmental organisations (77.4%**) have heard about the issue from the radio.

Unlike libraries, the Internet or journals, which are amongst the least common sources of information for survey respondents, the media is a **passive** source of information. One interviewee's comment illustrates this:

> "I don't actually seek [climate change information] out. I mainly see the media - TV and newspapers". [Female, social researcher]

Media sources are evidently the most **accessible** means of being informed about climate change and are generally easy to understand (news reports, more so than some documentaries). This is consistent with the finding that the most informed interviewees only sought out information about climate change when they had to, notably for their work.

As mentioned, the media tends to discuss climate change in the context of the weather (Hargreaves et al., 2003) and interviewees were often evidently alerted to changing weather patterns, such as "warmer and wetter winters", from the media - even though some doubted whether these were genuine trends (as I will discuss later):

> "Well, I'm only going on what they say on the, you know, television and things, weath- it's getting wetter and warmer, and they keep telling that on the weather and things, don't

> they, every now and again". [Female, retired]

However, despite being prolific, we can see from *Figure 5.2* that **media information only inspires a moderate amount of trust** (2.7 on a 4-point scale). In fact, previous research has tended to record a greater degree of distrust in the media (Worcester, 2001; Hargreaves et al., 2003; Eurobarometer, 2001). A number of interviewees in this study were sceptical about what they read or hear in the media, describing it as "scare-mongering"; "propaganda"; "alarmist"; "hysterical" or "sensationalist". Others pointed out that "stories have to be made newsworthy" and "there has to be an angle". One interviewee explained:

> "I feel like the media in general portray any- any seemingly you know catastrophic event as being a hundred times worse than it is. So in my opinion, no, I'd say that they, not glamorised it, but created a darker picture than is actual reality". [Female, social researcher]

Another interviewee pointed out that messages of doom can be depressing and disempowering, which discourages her from watching programs about environmental problems. Several interviewees pointed out that they evaluate the credibility of a media report by examining its "scientific basis" (discussed in Section 5.2.2.6).

A couple of interviewees specified the BBC as being a trustworthy media source; one also mentioned the Guardian as trustworthy. Interestingly, the BBC and the Guardian have been found in previous research to give the greatest coverage of climate change of all media sources; radio, followed by TV, are the media reporting the most stories about climate change (Hargreaves et al., 2003).

Although significantly more men than women have heard about climate change through the media, more women (68.4%*) than men (61.9%*) *trust* the media for climate change information. Similarly, a significantly higher proportion of respondents on 'very low' incomes (74.7%*) *trust* climate change information in the media, compared to the total sample (65.3%*).

5.2.2.2 Friends and family

After the media, friends and family are the next most common source of second-hand information on climate change (for 36.3% of survey respondents). The proportion is significantly higher (48.8%**) only for respondents with the top quartile Pro-environmental Value (PEV) scores (this measure is explained in 6.3.2). Consistent with the survey data, a minority of interviewees mentioned friends and family as sources of information about climate change. It is clear from the survey and interview data that social networks do not play a central role in learning about climate change. This is in stark contrast to the fundamental role that informal social networks play in interviewees' understanding of and response to flooding, which I discussed in Chapter 4.

However, **the interview data does seem to indicate that friends and family influence people's *attitudes* and *behaviour* in relation to climate change (and other environmental issues) to a greater degree than their *knowledge* of the issue**. One interviewee, for example, trusted her father's sceptical views on the issue; while another was concerned about the issue because he has friends living in the Maldives, which are likely to be seriously affected by sea-level rise. Two interviewees described the influence of friends or family on them adopting environmental actions, including recycling and buying 'green' goods. One interviewee pointed out that only through seeing and speaking to friends do you "make the link" between environmental issues, such as climate change, and your own action. These findings are supported by previous psychological research on the role of social influence in attitude and behaviour formation (Katz & Lazarsfield, 1964; Bandura, 1971).

Rather surprisingly, this source inspires only a moderate amount of trust (2.7 out of 4) amongst survey participants. Compared to the total sample (60.4%) who stated they trust (a little or a lot) friends and family, chi-square analysis shows that the proportion of women (66.3%*) who trust friends and family is significantly higher.

A number of survey respondents made comments beside this question indicating that the degree of trust would depend on who the friend or family member was, highlighting the importance of personal or professional characteristics in determining trustworthiness. By contrast, Poortinga and Pidgeon's (2003) survey found that friends and family scored highest (4.12 out of 5) as a trusted source of information on climate change.

5.2.2.3 Environmental groups

Environmental groups are also a source of information on climate change for around a third (34.3%) of survey respondents. Chi-square analysis of responses indicates that the proportion is significantly higher amongst graduates (40.9%**), broadsheet readers (40.7%**), members of environmental organisations (67.9%***), respondents with top quartile NEP scores (49.7%***) and top quartile PEV scores (42.9%*), and those living in Ward B (40.0%*), Flood Area 1 (40.0%*) and Flood Area 2 (37.3%*).

Environmental organisations are rated almost as trustworthy as scientists (3.3 out of 4). Unsurprisingly, compared to the total sample who trust environmental organisations a little or a lot (86%), the proportion is significantly higher amongst members of environmental organisations

(66.7%**) and respondents with top quartile NEP scores (95.5%***) and top quartile PEV scores (93.5%*). Women (91.7%***) and those on 'very low' incomes (64.6%*) are also significantly more trusting of these groups.

However, the interviews indicate that some people doubt the trustworthiness of these organisations because of their perceived vested interests. A few interviewees pointed out that these groups could be politically- or financially-motivated and sensationalist like the media. Previous research indicates environmental organisations are highly trusted to provide information about environmental issues (Worcester, 2001; Poortinga & Pidgeon, 2003).

5.2.2.4 Government

Less than a quarter of survey respondents (22.4%) have heard about climate change from national government and only 12.2% have heard about it from local councils. Chi-square analysis of responses from different groups shows that men (26.4%*) and car owners (24.3%**) are significantly more likely to have heard about climate change from national government; significantly fewer respondents with no formal qualifications (11.6%***) have heard about it from this source. Only one interviewee referred explicitly to the *Are You Doing Your Bit?* government information campaign, but considered it **unlikely to be effective** in changing people's behaviour because the issue is not seen to directly impact on them:

> "…There's a lot of talk going on, sort of surrounding climate change and you don't always see a lot of actions and that, but I mean obviously there's encouragement for people to do their bit, in their own little world you know, kind of turning the tap off, and turning the lights off and all that kind of thing… I think unfortunately a lot of people won't bother because there's the whole you know, cost. Because I suppose climate change, global warming, it's something 'cause you can't really- I mean really see it, it is a long-term issue that's going to be- and a lot of people say 'well, look it's not going to be in my lifetime, it's not necessarily going to affect us'. So I suppose you get into society where people kind of- it's a throw-away society, don't you, and a lot of people are not really interested, so- so there are- I mean I think there are some quite- government initiatives, but 'Doing your Bit', or whatever it's called, and um lots of kind of awareness groups and sort of education and things that go on". [Female, social researcher]

Several other interviewees used the expression "doing your bit" in the context of (the limited impact of) individuals' environmental actions, without explicitly referring to the government campaign. Low levels of awareness of government environmental information campaigns are also a finding of the government's own research (DEFRA, 2002).

As anticipated, the survey found that **government is not considered a trustworthy source** of climate change information (2.3 out of 4). However, the standard deviation of the scores for trust in government is higher (0.84) than for any other source indicating that **views about government credibility vary widely**. Chi-square analysis of survey responses from different groups indicates that, compared to the total proportion who trust government a little or a lot (43.2%), **Labour voters** (66.2%*) **and 'very low' income groups** (48.4%*) **are significantly more trusting of government information; and non-voters** (37.9%*) **are significantly less trusting of government information**.

The wide variation in trust in government was also evident in the interviews. As I mentioned earlier in Section 5.2.2, one woman felt the government is hiding information about climate change in order to save money. Other recent qualitative research found similar concerns amongst certain sections of the public about government secrecy in relation to risks (MORI, 2005). However, two interviewees in my research described government websites as very credible sources of information. This appears inconsistent with the prevalent institutional alienation and distrust suggested in interviewees' discussion about government responsibility and (in)action in response to climate change, described later (Section 6.6.2). However, there appears to be an overriding faith in the *science* funded and communicated by government, which may not be associated with whether or how the government is responding to this research:

> "I'm not advocating everything that the government said is read, but um on issues like that the government have spent an awful lot of money into thinking about climate change, to do the research". [Female, social researcher]

This attitudinal **distinction between government-funded research and government policy** is supported by recent research. Scientists are considered far more trustworthy than other professionals, particularly politicians (Worcester, 2001; Eurobarometer, 2001); and climate change information provided by scientists working for government is trusted more than information from the government itself (Poortinga & Pidgeon, 2003). One survey also found that few people (8%) feel the government provides the public with all relevant information about climate change (Norton & Leaman, 2004).

5.2.2.5 Energy suppliers

As expected, **energy suppliers are the least trusted source** of climate change information (scoring an average of 2.2 out of 4), although one in five survey respondents have received information from them. Previous research highlights perceived vested interests as central in determining people's distrust in sources of information (Hargreaves et al., 2003; Poortinga &

Pidgeon, 2003; Craig & McCann 1978). Thus, people are naturally suspicious of the motives of energy suppliers who provide climate change information and even advice about energy conservation. Chi-square analysis of responses indicates that significantly more women (39.1%*), 'very low' income respondents (46.3%*) and unqualified respondents (49.3%*) trust energy suppliers a little or a lot, compared to the total sample (36.0%).

5.2.2.6 Scientists and scientific information

Both interview and survey data reveal that, as expected, **scientists are seen as the most trusted sources** of information on climate change, rated on average 3.5 out of 4. This is consistent with widely-reported trust in scientists (Eurobarometer, 2001; Worcester, 2001). Scientists' scores also have the lowest standard deviation (0.62), indicating that **there is little variation in perceptions of scientists' trustworthiness**. Chi-square analysis reveals little significant variation in responses from different groups, although more women than men said they trust scientists 'a lot' (60.1%***, compared to 44.4%***).

The scientific method was identified in the interview data as the most reliable means of gathering evidence of climate change. One interviewee, for example, referred to the credibility of the scientific method in collecting rainfall data:

> "[My neighbour] is a scientist so he obviously went about it in a very scientific fashion, it wasn't just somebody- wouldn't have been collecting rain in a jam-jar". [Female, housewife]

A few interviewees **contrasted the objectivity of scientific sources to the alarmism of the media**. It was felt that scientific evidence "can put [climate change] in perspective", offering a more balanced and "rational" view of climate change by placing the issue in the context of natural climate fluctuations and the resilience of the environment. These interviews indicated that a scientific perspective tends to reduce fear and concern about climate change. For example, one interviewee explained:

> "I think if I didn't- I hadn't studied it as much I'd be a lot more concerned than I actually am. With things like climate change and things, um, although I understand that it's a problem but recognising that it may be a cyclic thing as well, and not just like you know massive accumulation of, um, you know what's going on, do you know what I mean, recognising that there's more behind it than just it's spiralling into the end of the world kind of thing." [Female, social researcher]

Other research has similarly noted that people who are ('irrationally') fearful of environmental problems become less concerned and personally engaged as a result of exposure to non-emotional and scientific statements of 'fact' (Finger, 1994; Henriksen & Jorde, 2001). The implications of this for communicating climate change are discussed in Chapter 8.

Although credible, scientific information is often seen by interviewees as inaccessible or difficult to understand. As mentioned above, **scientific sources are sought out only where it is necessary, particularly for interviewees' jobs**. Similarly, the survey shows that the **Internet, libraries and journals are the least popular sources of climate change information, presumably because they involve people actively seeking out information rather than passively receiving it through prolific media sources**. This is consistent with other research that shows the media to be more important than formal education, journals or the Internet in providing scientific information (Eurobarometer, 2001; Hargreaves et al., 2003). This indicates a natural preference for the most accessible sources of information and a prevailing belief that scientific information is too "difficult", confusing or specialised to understand (Eurobarometer, 2001; Hargreaves et al, 2003; Office of Science and Technology & The Wellcome Trust, 2000). Society has seen a rapid expansion in the quantity and complexity of information available, so only people sufficiently motivated to learn about a scientific issue will select it over competing informational demands on our attention (Ungar, 2000). People prioritise information that addresses what they *want* to know in their particular circumstances, rather than information which external authorities or experts consider they *need* to know (Ziman, 1992).

Chi-square analysis of survey responses indicates that a significantly **higher** proportion of:

- **Men** hear about climate change from the Internet (16.7%*) and journals (26.4%***);
- **'Very high' income** respondents hear about the issue from the Internet (25.4%***) and journals (35.8%***);
- **Broadsheet readers** hear about it from the Internet (16.8%*) and journals (25.4%**);
- **Postgraduates** hear about it from the Internet (26.3%***) and **graduates** hear about it through journals (27.9%***);
- **Postgraduates in science subjects** hear about it from the Internet (35.5%***) and **graduates in science subjects** hear about it journals (47.7%***);
- **Members of environmental organisations** hear about it from the Internet (20.2%*) and journals (29.8%**);
- **Respondents who feel their health has been affected by air pollution** hear about it from the Internet (18.1%, 0.05), journals (27.1%**) and public libraries (11.1%*);
- **Respondents whose family or friends' health has been affected by air pollution** hear about it from journals (23.3%*); and
- Respondents living in Wards B (23.5%**), Flood Area 1 (21.5%**) and Flood Area 2 (25.3%**) hear about it from journals.

We can surmise that these groups have a greater personal or professional interest in climate change because they actively seek out information about the issue. Chi-square analysis also indicates that 16-24 year-olds are most likely to hear about climate change through the Internet (30%***). However, since this group tends to prefer the Internet as a source for scientific information more generally (Eurobarometer, 2001), this finding may not necessarily indicate greater personal or professional interest in climate change.

Most interviewees classed themselves as non-scientists, and as such felt **unable to understand the science behind climate change**. One, for example, felt he didn't have the "intellectual toolkit" to grasp the science. Most therefore felt their lack of technical knowledge left them with ***no choice but to trust*** **what scientists say**:

> "I've got to believe the scientists; I'm not scientifically-minded myself". [Female, retired teacher]

However, while the majority of interviewees and survey respondents trust scientists and scientific information, there is also evidence that **this trust is not unconditional**. Several survey respondents commented in the questionnaire margin that their trust would depend on who the scientist is. A few interviewees suggested that there is a need to evaluate the validity and credibility of scientific information since, like any other source of information, the information could be manipulated or exaggerated. Furthermore, one interviewee pointed out that different studies produce different, conflicting results - therefore scientific information is not straightforward 'truth' (as will be discussed in Section 5.4.8). These findings are consistent with previous studies that emphasise the importance of institutional and social context in the public's trust in scientists. Credibility is judged according to scientists' affiliation, track record and perceived competence, objectivity, independence, consistency, and transparency (Hargreaves et al., 2003; Worcester, 2001; Brehm & Kassin, 1996). Furthermore, as I will discuss in Section 6.4, trust in scientific *knowledge* is related to expectations about whether it can provide certainty.

5.2.2.7 The 'Trust Scale'

We have so far discussed evidence from the interview and survey data that trust is related to the source of climate change information, and often whether the information has a "scientific basis". The interviews also revealed, however, that trust in information varies from person to person. Two interviewees could not see what motive there would be to mislead people over the issue, so concluded information must be trustworthy. A number of other interviewees, especially those "coming from an academic background" talked about the importance of critically judging any information they read, regardless of source.

In order to determine whether different groups of people are generally more trusting than others on a representative level, a 'Trust Scale' was devised from the survey data (this measure is described in Chapter 3). *Table 5.1*, below, shows statistically significant differences (using the chi-square test) in the level of trust in climate change information between different groups of survey respondents.

Table 5.1 Variation in trust in information between sub-groups of survey respondents

	Proportion of total sample (%)	*Trust score quartile (%)* **1** (bottom)	**2**	**3**	**4** (top)	*Cramer's V* ***(strength of relat.)***
All respondents (%)	**100**	**21.1**	**25.3**	**28.7**	**25.0**	
Sub-groups with significantly <u>higher</u> trust scores						
Women***	54.3	37.9	55.0	58.0	63.3	0.18
Labour party voter*	13.9	6.9	11.6	15.8	19.9	0.132
Regularly read any tabloid newspaper**	44.4	32.5	41.6	46.7	54.4	0.154
Concerned about climate change (q1)***	19.9	12.1	16.1	18.9	31.3	0.176
Issue of climate change rated 'very important' (q13)***	24.2	14.5	18.4	29.6	32.0	0.216
Believe the pattern of weather is generally changing (q7)**	80.8	73.4	76.5	83.4	88.4	0.145
Believe changing weather patterns due to ozone depletion (q8)*	10.5	6.5	6.7	11.8	16.3	0.131
Believe changing weather patterns due to global warming (q8)***	29.0	15.3	25.5	42.0	29.3	0.21
Believe climate change caused by CFCs/ aerosols (q15)*	4.4	1.6	2.7	4.1	8.8	0.132
Believe climate change caused by cars/ traffic fumes (q15)**	11.0	7.3	7.4	10.1	19.0	0.152
Believe climate change caused by pollution (general) (q15)*	22.8	14.5	21.5	27.2	25.9	0.114
Belief that something can be done to tackle climate change (q19)***	64.3	52.4	56.4	69.8	76.2	0.198
Regularly walk to work to protect the environment (q26)***	14.2	4.1	11.6	21.4	17.1	0.182
Regularly turn off unused lights to protect the environment (q26)***	41.0	27.0	38.8	42.9	52.7	0.179
Regularly buy energy-efficient light bulbs to protect the environment (q26)***	36.4	27.0	27.9	41.7	46.6	0.175
Regularly recycle (other than glass) to protect the environment(q24)**	72.4	59.0	75.5	75.6	76.7	0.154
Sub-groups with significantly <u>lower</u> trust scores						
Rate quality of local public transport 'very poor'**	10.1	19.8	8.2	7.3	6.9	0.131
Believe changing weather patterns due to natural weather variations (q8)***	15.3	29.8	14.1	12.4	7.5	0.22
Believe there are contradictory views/debate about climate change issue (q10)***	5.3	12.1	4.0	4.1	2.0	0.163
Doubt about reality/causes of climate change (q10)***	16.5	29.8	13.4	13.6	11.6	0.187
Believe climate change caused by natural variation in climate (q10)**	6.3	12.1	6.7	5.3	2.0	0.142
Believe climate change caused by earth's cycles, natural weather patterns (q15)***	10.5	21.8	10.7	6.5	5.4	0.2
Unsure about impacts of climate change (q16)**	4.2	8.9	4.7	3.6	0.7	0.139
Top quartile score on 'uncertainty scale' (q24), i.e. most uncertain about reality of anthropogenic climate change***	25.6	50.0	27.5	17.8	12.2	0.213

* Significant at 0.05 level
** Significant at 0.01 level
*** Significant at 0.001 level

We can see that the **most trusting** respondents are: **women, labour voters and tabloid readers**. They are significantly more likely to consider climate change very important and **concerning**; to believe changing weather patterns and climate change are due to **human activities**; to believe something can be done to tackle climate change; and to take actions to protect the environment. **It is interesting to note that trust in climate change information does not necessarily indicate agreement with expert/ official conceptions of the issue.** The most trusting respondents are, in fact, significantly more likely identify CFCs and other forms of pollution as causes of global warming, and to associate ozone depletion with changing weather patterns. Nevertheless, this group is differentiated from less trusting respondents by their belief that changing weather patterns and climate change have human rather than simply natural causes.

It is clear from this analysis that **trust in information and certainty about the reality of anthropogenic climate change are closely linked. People who trust information about climate change tend to believe that anthropogenic climate change is a real and concerning issue that can be tackled with appropriate action. Naturally, people who do not believe anthropogenic climate change is a real problem tend not to trust information about it.** This will be discussed further in Section 5.4.8.1.

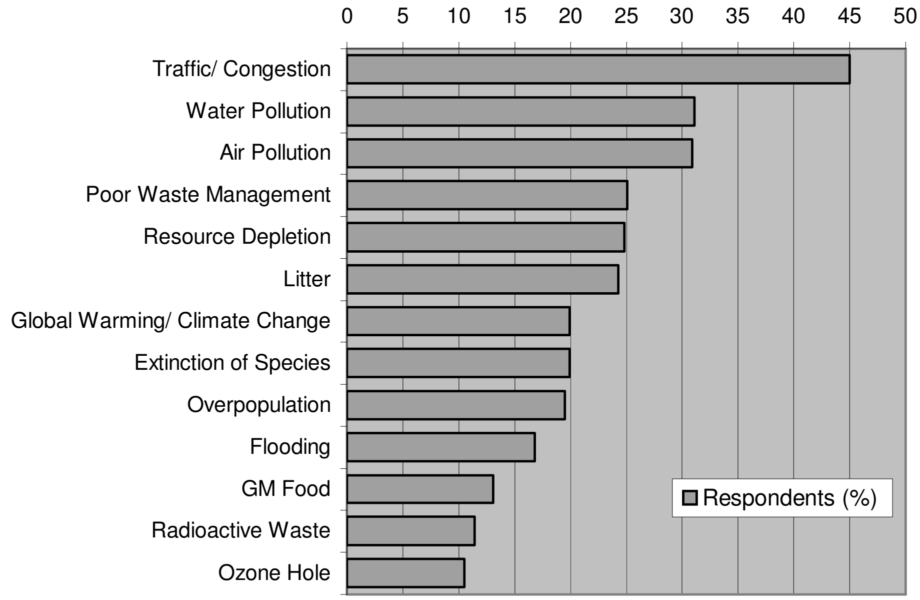
5.3 RELATIVE IMPORTANCE OF CLIMATE CHANGE

5.3.1 Relative environmental concerns

Previous research has indicated that in surveys the majority of people claim to be concerned or worried about most environmental issues (DEFRA, 2002; Bord et al., 2000). In isolation, then, measuring concern about a particular issue is unlikely to produce much differentiation between respondents. More revealing results have been found from measuring particular environmental concerns in the broader context of a range of environmental, personal and social issues (e.g., Poortinga & Pidgeon, 2003; Norton & Leaman, 2004). This research therefore examined concern about climate change relative to concern about other environmental issues. Question 1 of the postal survey asked respondents to select the three environmental issues that concerned them most from a list of thirteen.

Figure 5.3, below, shows the proportion of all respondents selecting each of the environmental concerns listed. The most popular environmental concern, selected by 45.0% of respondents, is *traffic/congestion*. The proportion who selected this concern is significantly higher amongst car owners (46.9%*) and men (50.9%**), and is lower amongst members of environmental organisations (26.2%***) and respondents with top quartile NEP scores (35.0%***) and top quartile PEV scores (27.4%***).

Figure 5.3 Relative environmental concerns



As anticipated from previous research (e.g., DEFRA, 2002), *water pollution* (31.1%) and *air pollution* (30.9%) are also popular environmental concerns. Women are significantly more concerned about air pollution (36.3%**). As income increases, there is a significant decrease in concern about air pollution (40.9% of those on 'very low' income, compared to 19.4% of 'very high' income*). This is likely to correspond to the increased exposed of low income groups to air pollution (see below). Members of environmental organisations (21.4%*) and broadsheet readers (24.6%**) are also less concerned about air pollution.

Climate change/global warming is ranked mid-way: 19.9% of respondents listed it as a concern. However, the wording of the questionnaire significantly influenced responses: the term *global warming* evoked concern amongst 23.1% of respondents, while *climate change* was only rated a concern for 16.2%*. **In contrast to most previous studies (see Section 2.2.2), concern about climate change was not found to be significantly associated with any demographic variables.** This disparity may be due to the wording of this question, which forced people to select three environmental concerns from a list; respondents not selecting climate change may still have been concerned about it. **However, consistent with Poortinga et al.'s findings (2004), environmental values and worldview were shown to significantly influence concern (see below).**

One in five respondents (19.9%) is also concerned about *species extinction*, although the proportion is higher amongst members of environmental organisations (35.7%***), respondents with top quartile NEP scores (35.6%***) and top quartile PEV scores (32.1%***), respondents aged 16-34

(35.5%**) and broadsheet readers (23.6%*). Members of environmental organisations and broadsheet readers are also significantly more concerned about *resource depletion* (34.5%* and 30.0%**, respectively), than the total sample (24.8%).

Men are significantly more concerned about *overpopulation* (27.1%***) than the total sample (19.5%). Compared to the total sample (24.3%), concern about *litter* is significantly lower amongst respondents with top quartile NEP scores (16.0%***) and top quartile PEV scores (10.7%**). Broadsheet readers are significantly less concerned about *GM food* (9.6%*) than the total sample (13.1%).

Ozone depletion (10.5%) and *radioactive waste* (11.4%) were the least common concerns. Women are significantly more concerned about ozone depletion (13.4%**) and radioactive waste (14.1%*), while broadsheet readers are significantly less concerned about ozone depletion (7.5%*) and radioactive waste (7.9%**). As income increases, there is also a significant decrease in concern about radioactive waste (20.5% of those on 'very low' income, compared to 7.5% of 'very high' income*).

The overall low ranking of *radioactive waste* is somewhat **surprising**, since 'disposal of hazardous waste' was rated the top environmental concern amongst the UK public in 2001 (DEFRA, 2002; cf. Poortinga & Pidgeon, 2003) and the second-highest environmental concern in Scotland in 2002 (Hinds et al., 2002). Other research shows that nuclear power has long been seen by the public as an unacceptable and highly feared risk (NSF, 2002; Slovic et al., 1980).

We can see from the survey results as a whole (Figure 5.3) that **concern about *local* environmental issues is generally higher than for *global* issues**. The interview data is consistent with the survey data in this respect. Local environmental issues, particularly air and water pollution, were the most commonly mentioned concerns amongst interviewees. Several explained their concern about pollution relates to it being a *visible* and experienceable environmental threat, in some cases affecting their own health or that of friends. For example:

> "[Pollution] is the one that I see affecting me most personally… there's all sorts of factors as well, many different ways we're screwing up the world, but pollution is the direct one, because it's the one that you can see most directly". [Male, IT consultant]

Conversely, another interviewee explained that she was not concerned about air pollution because she was unaffected by it (not having asthma) and did not contribute to it (by driving). In fact, chi-square analysis of survey responses shows that those who feel their health has been affected by air pollution are significantly more concerned (48.6%***) about air pollution than those who feel their health has not been affected (25.2%***). Those with friends or family whose health has been affected by air pollution are also significantly more concerned about air pollution (41.9%***). Similarly, respondents living in the most deprived ward (Ward I), which is affected by high levels of air pollution (Portsmouth City Council/ Sadak, 2003), are significantly more concerned about air pollution (46.7%*).

Some interviewees explained that concerns over health were also the basis for concern about pesticides in food and poor waste management. As one interviewee put it, her concern about poor waste management encouraging vermin is based on an interest in "personal preservation". However, while poor waste management is a relatively high concern amongst survey respondents (25.1%), GM food ranked much lower (13.1%). This is somewhat surprising given the well-established primacy of health concerns (Poortinga & Pidgeon, 2003; DEFRA, 2002). However, previous research (DEFRA, 2002) has also found concern for GM foods is low, perhaps because they are not perceived to be a health threat. Interviewees also indicated that recreation, as well as health, could be affected by environmental issues; sewage and litter were raised as concerns where they ruined participation in water sports.

Flooding did not rank high amongst survey participants' environmental concerns: only 16.8% selected it as one of their top three concerns. Unsurprisingly, a comparison of survey responses shows that respondents with experience of flooding are significantly more concerned about flooding (40.3%***) than those without flood experience (8.9%***). Similarly, concern about flooding is significantly higher amongst respondents living in Flood Area 2 (39.8%***) and Flood Area 1 (17.8%***) than amongst respondents living elsewhere. Concern about flooding was also much higher amongst interviewees aware of being at risk from flooding (including those who had already been flooded). For some, it was even a daily concern.

While the survey shows that **people with experience of flooding and air pollution are significantly more concerned about these issues, respectively, they are no more concerned about climate change than anyone else.** When asked if they were concerned about climate change, two interviewees with experience of flooding 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]

As described in Chapter 4, flood victims see flooding as an immediate and pressing problem that demands 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 was considered by most interviewees to be a long-term issue, it seemed that flood victims felt future projections of worsening flooding would not affect them.

From both the interview and survey data, it is apparent that **people generally do not believe that climate change will impact directly on them or their family.** This is consistent with previous studies, reviewed in Chapter 2. When interviewees were asked whether they are concerned about climate change, several acknowledged it as an issue of "concern" though few felt it was something that "worries" them - a more emotive term suggesting a direct threat. (This relates to the point noted at the start of this section about appropriate survey design to measure environmental concern.) For interviewees who said they were concerned about climate change, the reasons given were often in terms of its *future* impacts on humans, habitats and "the planet" in general. Similar reasons were given by survey respondents when asked why the issue was personally important (see Section 5.3.3). In a few cases, interviewees were concerned because of the *emerging* threat of climate change to their current leisure activities, such as skiing and diving.

> "If there's a lot of global warming, I won't be able to ski in the Alps, in Europe. And that is a real- to me that's quite a big deal because I love skiing". [Female, social researcher]

Implicit in the survey data and explicit in the interviews is the conclusion that **environmental concerns are defined in terms of issues and experiences that pose direct threats to individuals**. In fact, on a number of occasions, it was evident that interviewees *defined* "concern" in terms of issues affecting them directly - and that these were less likely to be environmental issues than personal and social concerns. This is consistent with previous research that shows environmental issues are not significant everyday concerns (DEFRA 2002; Portsmouth City Council, 1999); and environmental issues of greater concern are often local issues, like pollution (e.g., DEFRA, 2002; Witherspoon & Martin, 1992; Bibbings, 2004b). This is consistent with Stern et al.'s (1993) contention that egoistic value orientations most commonly influence environmental concerns, such as through NIMBY-ism.

Yet, we can see from the survey that many respondents are also concerned about global issues, particularly resource depletion (24.8%). The interview data is consistent in this respect: several interviewees cited global environmental issues that concern them, including ozone depletion, climate change and resource depletion. The chi-square analysis of responses seems to indicate that environmental values play an important role in determining whether or not an individual is concerned about global environmental issues. **Those with higher PEV and NEP scores and members of environmental organisations are significantly more concerned about global issues,** such as species extinction and climate change, and less concerned about local issues, including flooding, litter, and traffic/congestion.

We can therefore conclude from the survey and interview data that direct experience of, and threat from, flooding and air pollution are not significant influences on concern for climate change. Environmental values and worldviews, however, are significantly related to concern for climate change. These relationships are explored further in Chapter 7.

A common theme that emerged from the interviews - and which linked understanding about local and global environmental issues - was **a more general and moral concern about human disregard for the environment**. As I will discuss in Section 6.3, this discourse was common throughout interview and survey data. Examples include:

> "Generally the fact that I do realise that we're not doing too good a job of looking after the place." [Male, IT consultant]

> "Pollution, global warming, rising sea levels, um, I suppose ultimately the possibility that we'll finish ourselves off. I mean not in my generation, but perhaps in two hundred years, or something like that, or five hundred years, that we've just chopped down all the trees and put in place so much that the planet will die, or die as it is at the moment". [Male, social care inspector]

When respondents discussed climate change, it was often with specific reference to concern about US inaction over the issue. This seemed to be linked to a sense of control and individual efficacy: people felt worried about US inaction over climate change because this was something out of their control. This is consistent with the finding, discussed in Chapter 4, that interviewees who felt in control of the risk of flooding (having implemented preventative measures) described being less worried about it. This also relates to previous research which links control and risk perception (e.g., Barnett & Breakwell, 2001). The theme of self-efficacy is discussed further in Section 6.6.

5.3.2 Environmental values

In order to place beliefs and concerns about climate change in the context of broader values, the questionnaire examined respondents' environmental values. As described in Chapter 3, the value statements in question 25 were analysed using Principal Components Analysis (PCA) to form two scales that measure environmental values:

1. A shortened version of Dunlap and Van Liere's (1978) *'New Environmental Paradigm' (NEP) scale*. This distinguishes between a *technological* worldview where progress, abundance and faith in science and technology are the highest values; and a *pro-environmental worldview* in which the environment is delicate, resources are limited and

non-human life has intrinsic value. People with high scores on the scale hold a more pro-environmental worldview;

2. *A 'Pro-environmental Value' (PEV) scale*, which comprises three statements measuring environmental values in relation to financial and material values formed.

The PCA of question 25 indicated that an item measuring the symbolic value of car ownership does not form part of the two scales. Responses to this statement are therefore analysed separately to the NEP and PEV scales.

Table 5.2 Environmental values (question 25)

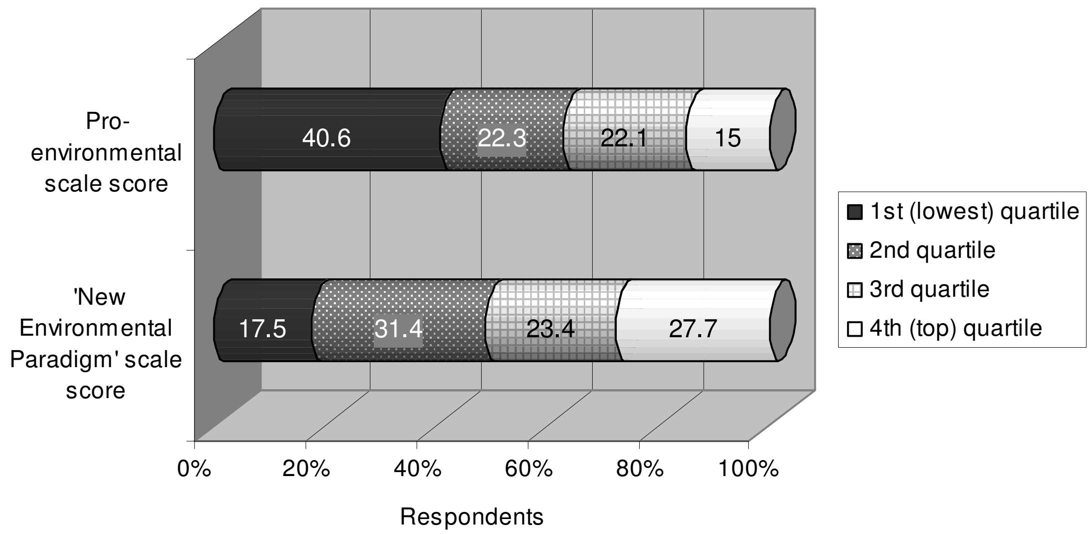
	Value statement	Disagree strongly (%)	Disagree (%)	Neither agree nor disagree (%)	Agree (%)	Agree strongly (%)	**Total agreement (%)**
'New Environmental Paradigm' scale	The balance of nature is very delicate and easily upset	0.9	3.1	13.3	52.4	30.4	**82.8**
	Humans are severely abusing the planet	1.2	5.8	15.4	51.7	25.9	**77.6**
	Plants and animals have the same rights as humans to exist	1.4	7.4	14.4	48.5	28.3	**76.8**
	Nature is strong enough to cope with the impact of modern industrial nations †	14.9	52.1	23.5	8.6	0.9	**76.8**
	Humans have the right to modify the natural environment to suit their needs †	9.2	40.1	29.4	19.3	2.0	**21.3**
	Humans were meant to rule over the rest of nature †	22.5	38.9	24.8	10.9	2.8	**13.7**
Pro-environmental scale	If my job caused environmental problems, I'd rather be unemployed than carry on causing them	4.7	34.8	43.6	14.5	2.3	**16.8**
	Jobs today are more important than protecting the environment for the future †	7.9	46.5	32.5	10.9	2.3	**13.2**
	I am unwilling to make personal sacrifices for the sake of the environment †	8.9	59.5	18.7	11.7	1.1	**12.8**
	Having a car is part of having a good lifestyle	3.6	19.7	22	48.9	5.8	**54.7**

† Scores reversed for scaling

Table 5.2, above, shows the proportion of respondents that agrees and disagrees with the value statements.

Participants were given a score on each scale by summing the values of their responses to each statement (1=disagree strongly to 5=agree strongly). Where the PCA identified statements that are negatively related to the cluster, the scoring is reversed to allow a direct comparison of values. The range of scores on the PEV scale and the NEP scale is represented in *Figure 5.4*.

Figure 5.4 Survey participants' NEP and PEV scale scores



We can see that the majority of respondents (62.9%) have PEV scores in the bottom two quartiles, while slightly under half (48.9%) have NEP scores in the bottom two quartiles. *Thus, more respondents accept an NEP worldview than reject it. However, in relation to other personal values (financial, material), most respondents do not place environmental values higher.* Most respondents also agree that 'having a car is part of a good lifestyle' (*Table 5.2,* above), suggesting that car ownership is associated with particular social values. The higher scores on the NEP scale may be related to the use of less personal and more abstract language compared to the PEV scale. In other words, respondents found it easier to agree with broad cultural concepts of the human-nature relationship than with more direct statements describing personal beliefs and actions. Nevertheless, the two scales are significantly related. People who score highly on one scale tend to score highly on the other (see Appendix 5.2 for details of chi-square tests): for example, compared to the proportion of the total sample with top quartile NEP scores (27.7%), there is a significantly higher proportion of respondents with top quartile PEV scores (63.1%***). People who agree that 'having a car is part of having a good lifestyle' tend to have low scores on both the PEV scale and the NEP scale: 65.9%* of bottom quartile NEP scorers and 59.1%* of bottom quartile PEV scorers agreed with this statement, compared to 54.7% of the total sample.

The prevalence of the NEP worldview was also evident in the interviews and open-ended survey responses, indicated by a moral concern for human disregard of the environment (see Section 6.3). Furthermore, these findings are broadly consistent with previous research into the UK public's environmental worldviews and values. Poortinga & Pidgeon (2003) found that the mean NEP score (using the full 15-item scale) was 3.58 on a 5-point scale; this compares with 3.72 in my research. In 2002, DEFRA found that 55% of the public disagreed that 'Prices and jobs today are more important than protecting the future for the future', virtually the same proportion (54.4%) that disagreed with a modified version of the statement in this study (see *Table 5.2*). Black et al.'s

(2001) survey found that most respondents disagreed (4.89 on a 7-point inverted scale) 'If my job caused environmental problems, I'd rather be unemployed than carry on causing them', which is consistent with my survey (2.75 on 5-point scale). However, the same survey found that more people disagreed that 'Having a car is part of having a good lifestyle' (4.11 on 7-point inverted scale), while the proportion agreeing with this statement is higher in my survey (3.34 on a 5-point scale).

Chi-square analysis of survey responses shows that **environmental values and worldviews are significantly related to demographic and experience variables**. Compared to the total sample, of which 14.3% have top quartile PEV scores and 27.7% have top quartile NEP scores, a significantly **higher** proportion of:

- **Members of environmental organisations** have top quartile PEV scores (26.2%**) and top quartile NEP scores (51.2%***);
- **Women** have top quartile PEV scores (18.4%***) and top quartile NEP scores (29.7%**);
- **Younger** age groups (16-44) have top quartile NEP scores (34.6%*);
- People who feel their **own health has been affected** by air pollution have top quartile NEP scores (29.9%*);
- People whose **family or friends' health has been affected** by air pollution have top quartile PEV scores (17.1%*) and top quartile NEP scores (30.5%*).

A significantly **lower** proportion of:

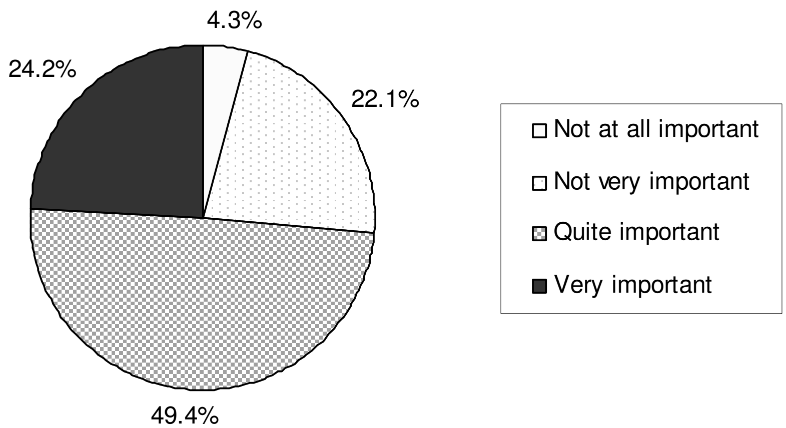
- Respondents on **'very high' incomes** have top quartile NEP scores (16.4%*);
- **Conservative voters** have top quartile PEV scores (and higher economic and material values) (18.8%*);

The chi-square analysis also indicates that, unsurprisingly, significantly more car owners (59.6%) than non-car owners (31.1%***) agree that 'having a car is part of having a good lifestyle', although annual mileage is unrelated to agreement with this statement. Significantly fewer people whose health has been affected by air pollution (50.7%*) agree with this statement.

5.3.3 Personal importance of the climate change issue

Despite only a minority (19.9%) of survey respondents selecting climate change amongst their priority environmental concerns (in question 1), most respondents (73.6%) consider the issue to be personally important (mean score = 2.9, on a 4-point scale) (question 13; see Figure 5.5).

Figure 5.5 *Personal importance of climate change issue*



Chi-square analyses indicate that, of the 24.2% of respondents who stated they consider climate change to be personally 'very important', a significantly **higher** proportion are:

- People with top quartile PEV scores (51.2%***) and top quartile NEP scores (40.5%***);
- Members of environmental organisations (43.4%***);
- People living in Ward B (35.1%*);
- People whose own health has been affected by air pollution (34.7%**) or whose family/friends' health has been affected by air pollution (32.4%***);
- People affected by flooding (32.4%*);
- People aged 16-64 (26.6%*);
- Women (25.4%**).

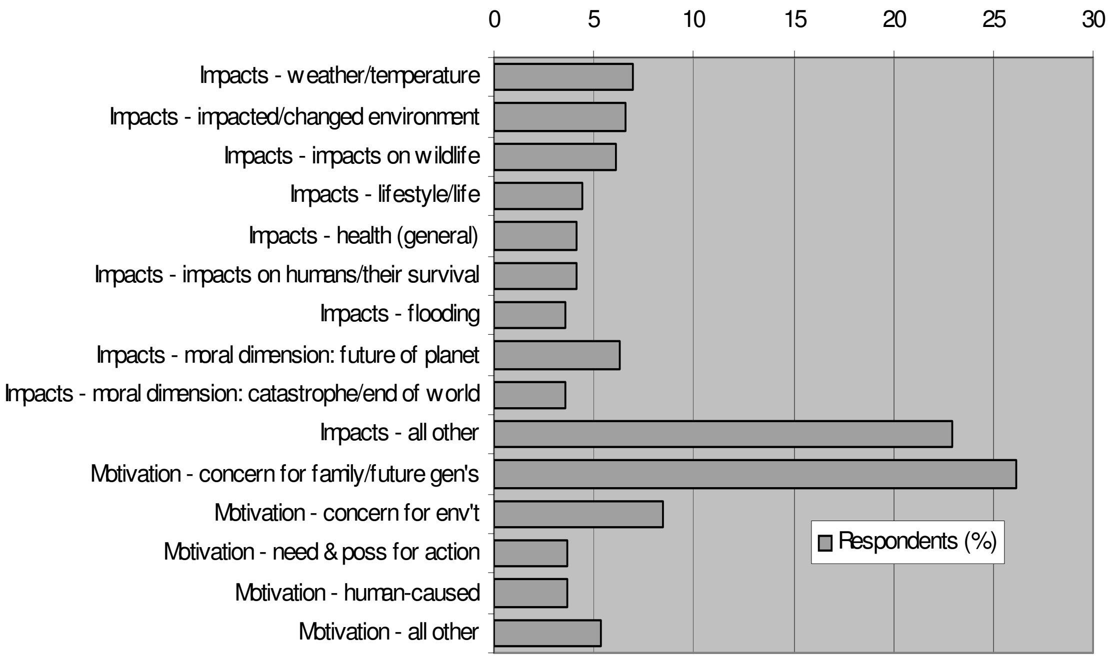
Consistent with responses to question 1, a significantly higher proportion of respondents rated the issue as personally 'very important' where the term *global warming* (28.5%) was used rather than *climate change* (19.3%***).

In explaining *why* they feel climate change is important to them (question 14) hierarchical coding suggests two main categories of responses:

- the motivations or values that underpin the personal importance of the issue (this category accounted for 38% of coded responses); and
- climate change impacts (60% of coded responses).

The average number of coded responses per respondent was 1.3. *Figure 5.6* shows the proportion of respondents mentioning each coded response.

Figure 5.6 Why is climate change an issue of personal importance to respondents?



Most responses related to climate change impacts, particularly weather/ temperature (7% of respondents), impacts on the environment (6.6% of respondents), wildlife (6.1% of respondents) and the future of the planet (6.3% of respondents). Consistent with their concern for global environmental issues evident in question 1, a larger proportion of members of environmental organisations mentioned impacts on the environment (13.1%**, compared to 5.6% of non-members), and on wildlife (13.1%**, compared to 5% of non-members), and catastrophe/ end of the world (10.7%***, compared to 2.4% of non-members) in question 14. Similarly, more respondents with top quartile NEP score (11.7%**) and top quartile PEV scores (15.5%***) cited impacts on wildlife.

Of the 4.1% who mentioned health impacts in explaining why they feel climate change is important to them, significantly more are women (6.3%), those affected by air pollution (7.6%**), people whose family/friends' health has been affected by air pollution (6.2%*) and non-car owners (9%**).** Women and people whose own health or family/friends' health has been affected by air pollution would seem to be generally more concerned about health impacts of environment issues, since they were also more concerned about air pollution in question 1.

Only a small number of respondents (3.6%) mentioned flooding as a reason why climate change is important to them, and surprisingly the proportion does not vary significantly with experience of flood damage.

In terms of respondents' *motivation* for considering climate change to be personally important, **over a quarter of respondents (26.2%) stated concern or responsibility for future generations as the reason for considering the issue important**. A significantly higher proportion of this group were women (30%*), people with family/friends whose health has been affected by air pollution (31.9%*), those with top quartile NEP scores (33.7%**) and those aged 25-54 (32.3%*).

Fewer respondents (8.5%) stated concern or responsibility for the environment as their reason. A significantly higher proportion of this group were respondents with NEP scores in the top 2 quartiles (12%*), respondents with top quartile PEV scores (15.5%*), respondents aged 16-34 (14.4%**), members of environmental organisations (14.3%*), those affected by air pollution (13.2%*), and - surprisingly - those with top quartile annual mileage (15.8%**). The lower proportion of respondents who cited concern or responsibility for the environment than cited concern or responsibility for future generations seems to indicate that social-altruistic value orientations are more prevalent than environmental value orientations (cf. Stern et al., 1993). Kempton (1991) similarly found that concern for future generations was a common framework around which interviewees argued for climate change mitigation. **Yet, what is most revealing from these responses is that they do not explicitly refer to *personal* threat from climate change as a reason for considering the issue important. This further illustrates the common perception that climate change is a future problem, rather than an immediate risk.**

Other responses indicated a sense of responsibility and efficacy as a motivation for action: 3.7% stated the issue is important because of its human cause; and a further 3.7% referred to the need and possibility for action. The proportion of respondents referring to the need and possibility for action here is higher amongst members of environmental organisations (11.9%***) and broadsheet readers (6.4%***). The proportion citing climate change as being caused by humans is also higher amongst members of environmental organisations (10.7%***) and respondents with top quartile PEV scores (13.1%***).

5.4 UNDERSTANDING AND ATTITUDES ABOUT CLIMATE CHANGE

This section discusses survey respondents' and interviewees' understanding and attitudes towards climate change. The data reveal both considerable diversity in understanding climate change and a number of common themes, which will be discussed further in Chapter 6.

5.4.1 Unprompted understanding of climate change

Before examining understanding and attitudes about particular aspects of climate change, the survey first elicited respondents' unprompted perceptions of the issue as a whole. Question 10 asked respondents very broadly to state what they know about climate change. Using structured coding (codes detailed in Appendix 3.9), the main categories that emerged from an analysis of responses were:

- *Impacts* of climate change, which accounted for 44% of *all coded responses*;
- *Causes* of climate change, accounting for 21% of responses;
- The *process* of climate change - 16% of responses;
- *Uncertainty and ignorance* about climate change - 17% of responses;
- *Sources of information* about climate change - 2% of responses.

The average number of coded responses given by each respondent was 3.3.

Respondents' understanding of the impacts, causes and process of climate change is discussed in Sections 5.4.2, 5.4.3, and 5.4.5, in combination with responses to follow-up questions about causes and impacts. Uncertainty and ignorance about climate change will be discussed in Section 5.4.8.

Table 5.3 summarises the most popular responses given to this open-ended question (in terms of the proportion of *respondents* selecting it) and where responses vary according to the terminology used in the questionnaire (*climate change* versus *global warming*).

As we can see, the choice of terminology significantly affects how respondents understand the issue. The term *global warming* is more often associated with:

- *Heat-related* impacts - in particular, temperature increase and melting icebergs and glaciers;
- *Human* causes - in particular pollution, carbon dioxide and other greenhouse gases;
- *Ozone depletion* and increased UV penetration of the atmosphere;
- Trapping of heat or gases within the atmosphere and the "greenhouse effect".

The term *climate change* is more readily associated with:

- A *range* of impacts on climate and the weather, including hotter summers, wetter winters, increased rainfall and drought;
- Impacts that have *already* been observed;
- *Natural* causes.

These findings validate the use of a split-survey design and highlight the significance that questionnaire wording can have for survey findings.

Furthermore, the column totals show that *global warming* questionnaires evoked a higher proportion of responses overall. This suggests that respondents feel they know more about *global warming* than about *climate change*. This is consistent with findings from DEFRA (2002) and MORI (Norton & Leaman, 2004).

Table 5.3 Unprompted understanding of climate change by survey respondents

Responses to question 10: 'What do you know about climate change/ global warming?' (open-ended)	**% of TOTAL survey respondents†**	**% of survey respondents by Questionnaire Version†**	
		Climate change	**Global warming**
Temperature increase	23.6	16.2***	30.1***
Weather/seasons change	21.6	24.5	18.9
Melting icebergs/glaciers	19.9	13.7***	25.3***
Ozone depletion/hole	19.9	13.7***	25.3***
Don't know much/anything	17.1	19.1	15.4
Doubt about reality/causes	16.5	17.0	16.0
Pollution	11.9	6.9***	16.3***
Global impacts	10.0	8.7	11.2
Rising sea levels/land loss	9.7	8.7	10.6
Pollutants - other	9.2	3.2***	14.4***
Flooding	8.8	9.0	8.7
CO2	7.8	4.7**	10.6**
UV penetrating/reduced protection from sun	7.6	2.2***	12.5***
Impacts on climate	6.5	8.7*	4.5*
Natural variation in climate	6.3	7.9	4.8
Human caused (unspecified)	6.1	5.1	7.1
Summers hotter, winters wetter	5.3	10.1***	1.0***
Impacts already observed	5.3	7.2*	3.5*
Drought/less rainfall	5.3	7.6*	3.2*
Contradictory views/debate	5.3	4.0	6.4
Unsure/self-doubt	5.1	4.0	6.1
Greenhouse effect	5.1	2.9*	7.1*
Media	*4.6*	*5.8*	*3.5*
Trapping of heat/gases; 'blanket' analogy	4.4	1.8**	6.7**
Deforestation	4.2	4.0	4.5
Natural causes - other	4.1	5.8*	2.6*
Greenhouse gases	3.9	1.4**	6.1**
'Climate change' differentiated from 'global warming'	3.9	5.1	2.9
Cars/ vehicle emissions	3.7	2.2	5.1
Increased rainfall	3.7	5.4*	2.2*
Impacts - all other	18.0	19.1	17.0
Process - all other	10.0	7.6	12.2
Causes - all other	9.2	5.1***	12.8***
Uncertainty - all other	7.5	5.8	9.0
Column Total	**311**	**274.2**	**343.6**

Key

Causes
Impacts
Uncertainty
Process
Source of information

† Respondents typically gave several responses, so column totals are greater than 100%
* Difference significant at 0.05 level
** Difference significant at 0.01 level
*** Difference significant at 0.001 level

Chi-square analysis reveals that unprompted understanding about climate change/ global warming also varies according to *respondent characteristics*. *Table 5.4,* below, shows how the most common responses to the open-ended survey question (question 10) differ according to demographic variables, experience and values.

Table 5.4 Variation in unprompted understanding of climate change between sub-groups of survey respondents

Most popular responses (>4% of respondents) to: 'What do you know about climate change/ global warming?'	% of TOTAL survey respondents†	Sub-groups with significantly higher proportion of responses†	
		%	
Impacts of climate change			
Temperature increase	23.6	34.4	Educated to degree or above***
		33.4	Ages 16-44***
		33.3	Very High/ High/ Medium incomes***
		30.9	Degree or above in science subject***
		34.5	Top quartile Pro-environmental Value score*
		27.9	Broadsheet readers*
Weather/seasons change	21.6	27.6	Top quartile NEP score**
Melting icebergs/glaciers	19.9	27.0	Top quartile NEP score***
Rising sea levels/land loss	9.7	14.1	Top quartile NEP score**
		17.9	Top quartile Pro-environmental Value score**
		15.1	Members of environmental organisations*
Flooding	8.8	12.9	Top quartile NEP score**
		11.6	Women**
Impacts on climate	6.5	8.6	Broadsheet reader*
		7.7	No experience of flooding*
Summers hotter, winters wetter	5.3	10.7	Members of environmental organisations*
Impacts already observed	5.3	7.0	No formal qualifications***
		7.1	Broadsheet reader*
Impacts - all other	18.0	21.3	Women*
		26.4	Own health affected by air pollution**
		23.8	Family/friends' health affected by air pollution**
		22.1	Broadsheet readers**
Causes of climate change			
Pollution	11.9	15.2	Ages 25-64*
CO2	7.8	13.9	Very high/ High income*
		12.0	Educated to degree or above*
		11.9	Men***
		11.4	Broadsheet readers**
Natural variation in climate	6.3	15.4	Degree or above in science subject***
		9.7	Educated to degree or above*
		8.9	Men*
Human caused (unspecified)	6.1	11.6	Very high/ High income**
		10.1	Educated to degree or above**
		9.7	Own health affected by air pollution*
		8.2	Broadsheet readers*
Deforestation	4.2	6.1	Broadsheet readers*
Natural causes - all other	4.1	6.3	Men**
		5.0	Car owners*
Causes - all other	9.2	19.7	Ages 25-34*
Uncertainty/ ignorance			
Don't know much/anything	17.1	41.3	Ages 75+***
		34.9	No formal qualifications***
		23.0	Very Low/ Low income**
		20.1	Broadsheet non-reader*
Doubt about reality/causes	16.5	26.7	Degree or above in science subject**
		21.9	Educated to degree or above*
		20.7	Broadsheet readers**
		20.4	Men*
		18.2	No experience of flooding *
		18.3	Car owners**
Contradictory views/debate	5.3	9.3	Broadsheet readers***
Unsure/self-doubt	5.1	6.8	Broadsheet non-readers*
Uncertainty - all other	7.5	15.1	Non-voters*
		11.5	Men***

Table 6.4 cont.

Process of climate change

Ozone depletion/hole	19.9	28.0 27.0	Ages 35-54* Top quartile NEP score *
Trapping of heat/gases; 'blanket' analogy	4.4	11.6	Educated to postgraduate level**
Process - all other	10.0	13.2	Educated to A-Level/Vocational qualification or above**

Source of information

Media	*4.6*	*8.1* *6.7*	*Experience of flooding** *Men**

† Respondents typically gave several responses, so column totals are greater than 100%
* Difference significant at 0.05 level
** Difference significant at 0.01 level
*** Difference significant at 0.001 level

From this analysis, we can see that significantly more women and people with high environmental values understand climate change in terms of its impacts. A significantly higher proportion of men and those with degrees cited more causes - both anthropogenic and natural. **Respondents with experience of flooding were no more likely to mention flooding unprompted in their understanding of climate change.** The proportion describing the mechanism of climate change in terms of heat or gases being trapped in the atmosphere is significantly higher amongst those with postgraduate qualifications. In contrast, significantly more respondents with the highest NEP scores (that is, having a pro-environmental worldview) understood climate change in terms of ozone depletion. **Education, then, rather than environmental values has a stronger association with acceptance of expert conceptions of climate change.**

Education and broadsheet readership is also significantly related to *uncertainty* about climate change. In particular, the highest proportion of respondents who expressed uncertainty about the reality of climate change has a degree in a science-related subject. Significantly more broadsheet readers referred to uncertainty in the form of contradictory views and debate that surround the issue. Men were also significantly more uncertain than women about the reality of climate change. **The proportion stating they know little or nothing about climate change is significantly higher amongst those aged 75 or over, people without formal qualifications, lower income groups and those who do not read broadsheet newspapers.** Consistent with previous studies (Witherspoon & Martin, 1991; DEFRA, 2002), older interviewees seem to have less knowledge about climate change.

After this broad, open-ended question (question 10), the survey subsequently sought to elicit more specific responses about participants' knowledge of the causes (question 15) and impacts (question 16) of climate change. As we can see from *Tables 5.5* and *5.6,* below, the responses to these specific questions closely mirror those from the preceding open-ended question (*Table 5.3,* above*)*.

5.4.2 Understanding about the causes of climate change

As we saw in *Table 5.3*, by far **the most common cause of climate change mentioned unprompted by survey respondents was pollution** (11.9% of respondents). Survey respondents also mentioned unprompted a number of other anthropogenic causes, including CO2 (7.8%), deforestation (4.2%), greenhouse gases (3.9%) and vehicle emissions (3.7%). *Natural variation in climate was only cited by 6.3% of respondents, and 4.1% mentioned other natural causes.*

When specifically asked about the causes of climate change (question 15), **more than 4 in 5 (81%) of responses relate to anthropogenic causes, compared to only 10% relating to natural causes.** The average number of coded responses given by each respondent was 1.9. *Table 5.5* shows the responses to this question and the proportion of respondents mentioning each one.

Table 5.5 Perceived causes of climate change

Responses to question 15: 'What do you think causes climate change/ global warming?' (open-ended) (Categories with 20 or fewer responses are excluded)	**Respondents (%)**
Pollution (general)	22.8
Ozone layer depletion	15.4
Cars/traffic/exhaust fumes	11
Natural - earth's cycles/weather patterns	10.5
Industry/factory emissions	9.8
Fossil fuel consumption/burning	9.2
Destruction of rainforest/trees	8.3
Human activities (undefined)	7.6
CO2/carbon emissions	6.1
CFCs/aerosols	4.4
Emissions/fumes/waste gases (general)	4.2
Chemicals	4.1
Description/explanation of process	3.9
Greenhouse gases (undefined)	3.6
Blame of other people/organisations/countries (all other)	3.4
Moral dimension - overuse/misuse of natural resources	5.3
Uncertainty - unsure/self-doubt	5.3
Confusion with impact/terminology	4.4
Moral dimension - all other	15.8
Human activities - all other activities	6.6
Uncertainty/ ignorance - all other	6.5
Natural - all other	6.1

Key
Human causes
Natural causes
Uncertainty

Again, the largest proportion of respondents (22.8% of respondents) cited pollution (in general) as a cause of climate change. Particular sources of emissions or pollutants were also mentioned, including cars/ traffic (11%) and industry/ factories (9.8%). A number of respondents were aware of the connection between climate change and fossil fuel consumption (9.2%), carbon emissions (6.1%), (non-specific) greenhouse gases (3.6%), and deforestation (8.3%). Other recent research (e.g., BBC, 2004; DEFRA, 2002; Hargreaves et al., 2003) has similarly found that the majority of the public (around two-thirds) identifies human causes for climate change. These previous studies have found that, when given a list of possible causes, deforestation and various sources of emissions are selected by the majority of respondents. The research reported here, however, suggests that deforestation is not mentioned unprompted by as many respondents as emissions.

The interview data reveals the way in which the public understand the impact of human activities on the global climate. The following extract highlights the link that was commonly drawn by interviewees between **air pollution** and climate change. This is discussed further in Section 6.2.

> "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..."

Other researchers (e.g., Kempton, 1991) have similarly identified air pollution as central to the public's understanding of climate change. Hargreaves et al. (2003) found that the highest proportion of respondents (72%) selected 'air pollution' from a list of possible causes of climate change, which also included carbon emissions (selected by 66%).

While understanding the contribution of 'air pollution' to climate change largely reflects expert views in relation to the role of emissions, there is clear divergence from expert conceptions in other senses. In particular, **ozone depletion** was commonly mentioned (15.4%) as a cause of climate change and some respondents referred to CFCs/ aerosols[5] (4.4%) and 'chemicals' (4.1%). This shows a tendency, also identified in other research (e.g., Hargreaves et al, 2003; cf. BBC, 2004; Norton & Leaman, 2004; Bord et al., 2000; Eurobarometer, 2001), for the public to **integrate** environmental issues and their causes into a conceptual whole. This will be discussed further in Sections 6.2 and 6.3.

Furthermore, these results show that respondents tend not to identify causes for climate change with their own actions, with only 0.5% mentioning domestic energy consumption as a cause. This tendency to identify others as responsible for climate change is consistent with

[5] Although CFCs are a 'greenhouse' gas, their contribution to climate change is smaller than carbon dioxide. Furthermore, CFCs are the main cause of the depletion of ozone - another greenhouse gas - so emissions of CFCs into the atmosphere is partially offset by the reduced greenhouse effect of ozone (Houghton, 2004).

previous research. DEFRA (2002), for example, found that - given a list of possible causes of climate change - only 20% of the UK public identified domestic energy use as a contributor.

Moreover, some responses (14%) to this question carried a *moral or normative dimension* in describing the causes of climate change. Overuse or misuse of natural resources account was mentioned by 5.3% of respondents. Others talked about over-population, injustice, abuse of nature, the 'modern' way-of-life, selfishness and greed. This relates to the moral concern for human disregard about the environment that emerged from interviewees' discussion about environmental concerns (Section 5.3.1) and elsewhere in the interview and survey data (see Section 6.3 for a full discussion of this theme).

As in the previous unprompted question about understanding (question 10), a category of responses (accounting for 6% of responses) emerged relating to uncertainty and ignorance about climate change. Most often this uncertainty was in terms of self-doubt (5.3% of respondents).

Chi-square analysis of responses to this question shows that, again, **terminology influences understanding of the causes** of climate change/ global warming. Where *global warming* is referred to, a significantly higher proportion of respondents cite human causes: CFCs (6.4%**), fossil fuel consumption (11.5%*), cars/ traffic fumes (15.1%***) and overuse or misuse of earth's resources (7.1%*).

Respondent characteristics (demographic variables, experience and values) also significantly influence understanding of the causes of climate change.

The proportion citing pollution as a cause is highest amongst those aged 25-54 (30.7%**) and respondents whose highest qualification is A-Level or Vocational (41.4%***). The proportion stating that industrial/factory emissions cause climate change is significantly higher amongst Labour voters (20.3%*) and members of environmental organisations (17.9%**). Those with the highest NEP scores (19.6%***) and Trust scores (19%**) were more likely to cite cars/ traffic as a cause of climate change. Consistent with the tendency to dissociate causes for climate change from one's own actions, **respondents who do not own a car were also significantly more likely to cite cars/ traffic as a cause of climate change** (18%**). Significantly more respondents whose health has been affected by air pollution referred to humans' overuse/ misuse of earth's resources as a cause for climate change (11.1%***).

Respondents educated to postgraduate level (15.8%***), particularly in a science subject (25.8%***), were significantly more likely to mention carbon emissions/CO2 as a cause of climate change. Broadsheet readers were significantly more likely to mention carbon emissions/CO2

(8.2%*) and other greenhouse gases (6.4%***). Significantly more broadsheet readers (12.1%*) and respondents on high/very high incomes (17.8%**) mentioned fossil fuel consumption.

Respondents most trusting of climate change information were significantly more likely to state that CFCs/ aerosols cause climate change (8.8%*); while significantly more women (5.6%*) and respondents with top quartile PEV scores (9.5%*) indicated that chemicals were a cause. Similarly, significantly more respondents with the highest PEV scores stated that ozone depletion (23.8%*) causes climate change.

As in the previous unprompted question, the proportion of respondents citing natural causes (earth's cycles/ weather patterns) for climate change is significantly higher amongst men (14.9%) and respondents educated to degree level (16.9%**), as well as amongst broadsheet readers (15%***), car owners (12.7%***) and respondents with bottom quartile Trust scores (21.8%***).**

In contrast to the chi-square results for the previous question, analysis of responses to this question shows that broadsheet readers are significantly more personally unsure of the causes of climate change (7.1%*). Those aged 75 or over are, as before, also significantly more uncertain or ignorant about climate change (21.2%*), as are non-members of environmental organisations (7.3%*), respondents with bottom quartile NEP scores (13.6%***), respondents with bottom quartile Trust scores (15.3%***), and respondents whose own health (7.6%*) or whose family/friends' health have not been affected by air pollution (8.2%*).

Again we can conclude from these differences that a high level of education, and not environmental values, is significantly associated with expert understanding of the causes - both human and natural - of climate change. Uncertainty about the reality of climate change is here associated with those who value the environment least, who trust climate change information least, and who have not been affected by air pollution. The implications of these findings are discussed further in subsequent chapters.

The survey sought to investigate further the conceptual integration of air pollution and climate change by asking respondents about what effects of air pollution (apart from to human health) they are aware of (questions 4 and 5). Half the sample (49.6%) claimed to know of effects of air pollution other than to human health. Chi-square analysis of responses shows that the proportion is higher amongst:

- Respondents whose own health (61.8%***) or whose friends'/family's health (58.1%**) has been affected by air pollution;
- Those on very high incomes (73.1%***);

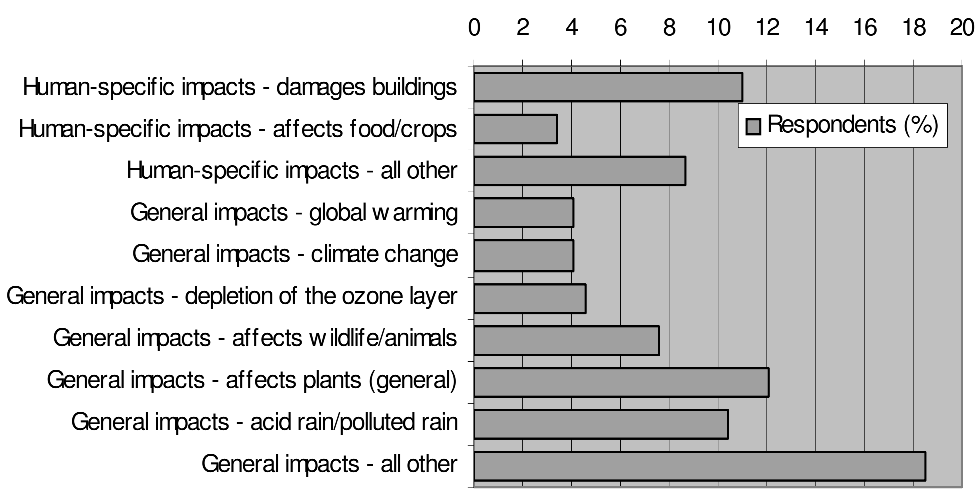
- Respondents educated to degree or above (65.6%***);
- Broadsheet readers (63.6%***);
- Members of environmental organisations (64.3%***);
- Those with higher NEP scores (60.7%**);
- Men (56.1%**); and
- Car owners (52.5%**);

A significantly lower proportion of those aged 75 or above (34.7%***) and non-voters (32.9%***) said they were aware of other effects of air pollution.

As shown in *Figure 5.7,* below, the effects of air pollution mentioned by respondents include both human-specific and other, more general impacts. Human-specific impacts most commonly mentioned were damage to buildings (11%) and impacts on food/crops (3.4%). Of the other human-specific impacts mentioned, most were sensory effects - reduced visibility, smog, unpleasant smell, loss of taste, and dirt/ grime (cf. Bickerstaff, 1999; Bibbings, 2004b). Other, general impacts of air pollution mentioned included effects on plants (12.1%) and other wildlife (7.6%).

Of the secondary environmental problems associated with air pollution, acid/ polluted rain (10.4%) was a much more popular response than global warming (4.1%), climate change (4.1%) or ozone depletion (4.6%). So, while we have seen that air pollution is widely blamed for causing climate change, these results show that climate change is not the most commonly identified effect of air pollution.

Figure 5.7 Perceived impacts of air pollution (other than to human health) - categories of 20 responses or fewer are excluded



Chi-square analysis of responses indicates that broadsheet readers identified significantly more effects of air pollution overall. Significantly more men identified global warming (5.9%*) as an effect of air pollution; and climate change was mentioned by significantly more members of environmental organisations (9.5%**). A higher proportion whose own health (7.6%*) or whose family's/friends' health (7.1%*) have been affected by air pollution cited ozone depletion as an effect of air pollution. Acid rain was mentioned by a higher proportion of men (14.5%**), those aged 25-34 (22.5%*), respondents educated to degree or above (17.1%***), those with top quartile NEP scores (14.1%*).

5.4.3 Understanding about the impacts of climate change

As we saw in *Table 5.3,* the most commonly-mentioned impact of climate change in response to the unprompted understanding question was temperature increase (23.6% of respondents), although this was significantly higher amongst respondents of *global warming* questionnaires. Change in weather/ seasons (21.6%) was the next most popular response overall, and the most commonly-mentioned impact amongst respondents of *climate change* questionnaires. Melting icebergs/ glaciers (19.9%), sea level rise (9.7%), flooding (8.8%), impacts on climate (6.5%), drought/ less rainfall (5.3%), and increased rainfall (3.7%) were also mentioned.

Overall, there is a greater bias towards global impacts than local impacts: 10% of respondents explicitly referred to the effects as global/ worldwide, while only 0.4% referred to locally-specific effects and 3.2% to UK- or Europe-specific impacts. A minority (5.3%) used the popular media and government style of describing UK weather changes, such as "warmer and wetter winters" or "hotter summers, wetter winters", although the actual beliefs about how the UK weather is changing or would change varied (e.g., some thought winters are getting colder, others milder). As mentioned in Section 5.2.2.1, this was also a way in which several interviewees described climate change impacts. Some (5.3%) referred to personal observations in their understanding of climate change, suggesting a belief that it is a current and very real environmental issue (not theoretical or future). Others described being 'told' about climate change and sometimes explicitly referred to a mediated source of information (media - 4.6%; scientists - 2.1%) from which they had learnt about the issue.

When specifically asked what they thought the impacts of climate change are or will be (question 16), survey respondents also more readily identified large-scale global impacts that would potentially affect all life, rather than local or human-specific impacts (see *Table 5.6*, below).

Table 5.6 Perceived impacts of climate change

Responses to question 16: 'What impacts, if any, do you think climate change/global warming may have?' (open-ended) (categories of 20 responses or fewer are excluded)	**Respondents (%)**
Changes/extremes in weather	22.6
Flooding	21.6
Sea level rise/loss of land	21.2
Impact on agriculture/food supply	13.6
Melting ice caps/icebergs	10.9
Climatic impacts	9.7
Impacts on wildlife/vegetation/flora & fauna	8.8
Human health/spread of disease	8
Temperature increase/heat	7.8
Extinction of species	7.3
Drought/water shortages	7.1
Catastrophe/destroy earth	4.9
Long-term/future impacts	4.6
Uncertainty - unsure/self-doubt	4.2
General impacts - all other	18
Human impacts - all other	14.4
Non-human impacts - all other	7.1
Uncertainty - all other	5.9

Key
Human-specific impacts
Non-human impacts
General impacts
Uncertainty

Over 6 out of 10 responses could be considered general/ global impacts, compared to 11% relating to other organisms specifically, and 19% to humans specifically. The average number of coded responses given per respondent was 2.1. Most commonly, and as expected from other research (DEFRA, 2002; BBC, 2004; Bibbings, 2004a; Kempton, 1997; Bostrom et al., 1994), respondents associated climate change with changes in *weather* (22.6% of respondents). Flooding (21.6%) and sea level rise (21.2%) were also commonly-cited impacts. The most common human-specific impacts mentioned were to agriculture/ crops (13.6%) and health (8%). As elsewhere, some answers (4.8% of responses) suggested uncertainty about climate change impacts, particularly in terms of self-doubt (4.2% of respondents).

It is interesting to note that 'temperature increase' was a much less common (7.8%) response when participants were asked specifically about impacts of climate change than for the earlier unprompted question (question 10). As noted, respondents of *climate change* questionnaires were significantly less likely than respondents of *global warming* questionnaires to mention temperature increase for the unprompted question. However, there is *no significant difference* between questionnaire versions in the proportion mentioning temperature increase for the specific impacts question. This may indicate that temperature increase is *equated* with *global warming*, but that it is not seen as an *impact* of global warming/climate change in the same way as extremes of weather, flooding, sea level rise and so on.

The tendency to conceive of climate change in terms of large-scale global impacts was also evident from the interview data. Sea level rise, melting ice caps, and changes in population and habitats were amongst the most common impacts identified by interviewees. They evidently saw these impacts as long-term and more likely to affect *future generations*. For example:

> "Nothing detrimental's going to really happen in their lifetime, so it's kind of a, you know, not in my backyard, but not in my lifetime kind of thing". [Female, social researcher]

> "It's going to creep up on us, that's going to be the problem is these processes are going to take thirty, fifty, a hundred years to- to really become evident, then it's very easy to ignore, you know". [Male, economics lecturer]

Some interviewees associated climate change impacts with other *locations* (e.g., coastal communities).

> "I think I am lucky because I am in an unaffected area. So, you know, when you're seventy miles away from the sea, then rising sea levels aren't something that you're particularly worried about; and we're not on a floodplain, and so I'm a lot less worried".
> [Male, IT consultant]

In fact, even those at risk of flooding tended to associate flooding with other areas: one interviewee living by the coast understood flooding in terms of fluvial flooding; and one victim of fluvial flooding only associated climate change with coastal flooding. This characteristic of participants' understanding - dissociating oneself from the impacts of climate change - will be discussed further in Section 6.5.

When beliefs about the impacts of air pollution (question 5) are compared with beliefs about climate change impacts, a higher proportion of air pollution responses refer to human-specific effects (28% of responses, compared to 19% for climate change). Climate change is considered a more diffuse, and often long-term environmental issue, affecting the environment in general much more than simply humans or local environments: when asked about the impacts of climate change, only 1.4% of responses explicitly referred to UK-specific impacts. In addition, some people (2.6%)

believed there could be beneficial impacts to climate change, whereas this was not the case with air pollution.

As mentioned in Chapter 3, Portsmouth and rest of the South Coast of England is likely to be at particular risk from sea level rise and flooding associated with climate change. However, the results from this research indicate that residents in Portsmouth are in fact *less* aware of these impacts that are most likely to affect them. In 2002, DEFRA found that 44% of the UK population mentioned ‘flooding from rainfall’ and 34% mentioned ‘sea level rise/coastal flooding’ when asked about the impacts of climate change (open-ended). This compares to the 21.6% mentioning flooding and 21.2% mentioning sea level rise is my research. In fact, a chi-square analysis of responses (detailed in Appendix 5.3) indicates that those *who have already been flooded* in the Portsmouth area were no more likely than those who have not been flooded to mention flooding as an impact of climate change. There is also no significant difference in responses from residents of different areas of Portsmouth - despite some being more at risk of flooding from rainfall or from sea-level rise than others. **There is therefore no increased awareness of the risk of flooding and sea-level rise amongst those most likely to be affected by these climate change impacts or indeed those already affected.**

Other variables, however, do affect awareness of climate change impacts. Men (26%**), those educated to degree level or above (30.6%***), broadsheet readers (26.8%**) and those on high or very high incomes (29.7%*) are significantly more likely to cite sea level rise. Significantly more broadsheet readers also mentioned impacts on agriculture/ food supply (18.6%***), other human impacts (17.9%*), climate impacts (13.9%***) and other general impacts (22.5%**). Impacts on wildlife/ vegetation were mentioned by a significantly higher proportion of respondents educated to postgraduate level (18.9%***) and Liberal Democrat supporters (15.1%*). Members of environmental organisations were significantly more likely to mention species extinction (14.3%**) and impacts to agriculture/ food supply (21.4%*).

Significantly more respondents **aged 16-54** (27.5%**) and with **top quartile NEP scores** (31.9%**) mentioned changes in weather - potentially a more localised and immediate impact of climate change.

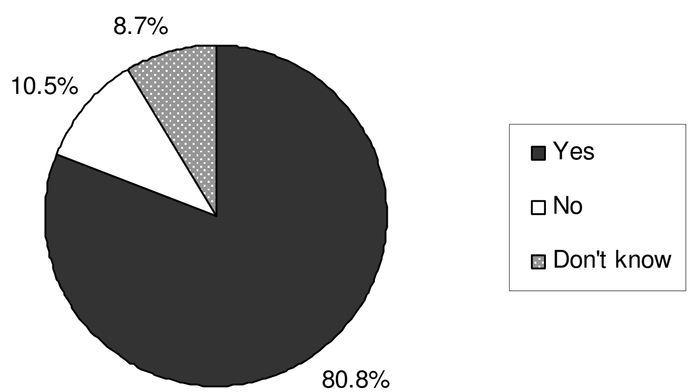
Respondents affected by air pollution and those with high environmental values are more pessimistic about the impacts of climate change. Those whose own health (10.4%***) or family/friends’ health (8.1%**) has been affected, and those with the highest NEP scores (8%*), are more likely to describe catastrophe or the destruction of the earth; car owners are less likely to state this (3.9%**).

Self-doubt about climate change impacts is higher amongst broadsheet readers (6.1%*). Other forms of uncertainty (scepticism, lack of knowledge) is higher amongst men (8.2%*), those with the lowest NEP scores (11.7%*) and those least trusting of climate change information (13.7%***).

Consistent with the difference in responses to the earlier unprompted question, chi-square analysis again indicates that the **impacts of *global warming* and *climate change* are understood differently**. The proportion of respondents mentioning impacts on agriculture/ food supply (18.1%**) and climate impacts (14.7%***) is higher amongst respondents of *climate change* questionnaires. Significantly more respondents of *global warming* questionnaires (14.1%**) cited melting icebergs.

The survey sought to investigate further the conceptual integration of weather and climate change by asking respondents about their perceptions of the weather. The vast majority of respondents (81%) feel that the pattern of weather is generally changing (question 7; see Figure 5.8).

Figure 5.8 Do respondents feel the pattern of weather is generally changing?



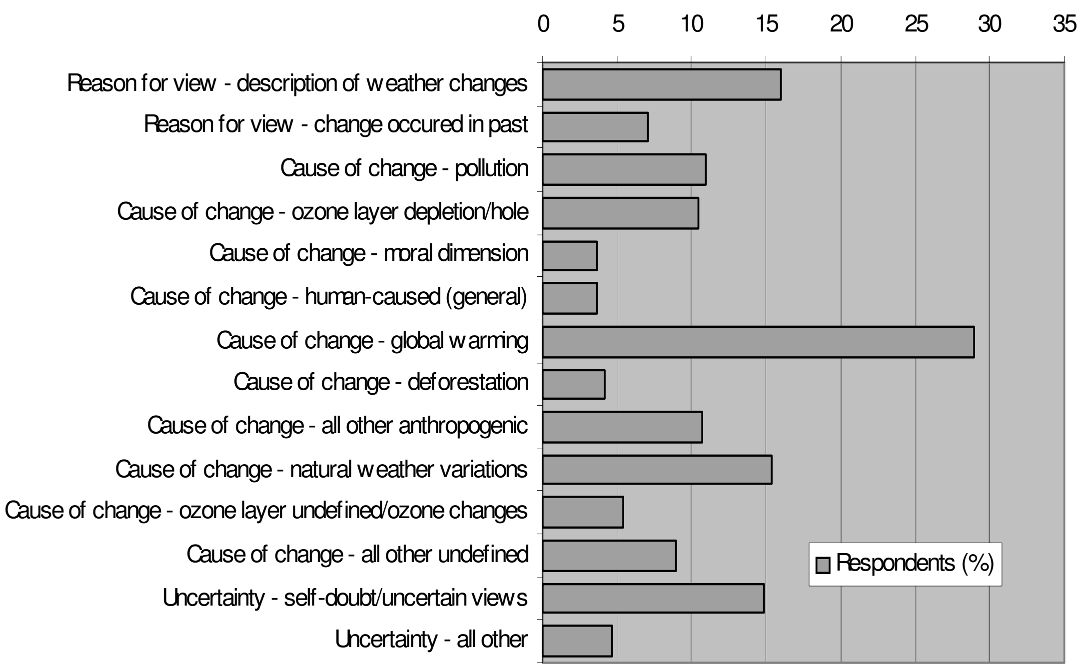
Chi-square analysis shows this proportion is significantly higher amongst:

- Those who feel their own health (89.6%**) or family/friends' health (87.6%**) has been affected by air pollution;
- Those most trusting of climate change information (88.4%**); and
- Those with the highest NEP scores (84.7%*).

It is particularly interesting to note the relationship between belief in changing weather and trust in climate change information, since this seems to indicate that information is more credible where it is congruous with one's experience.

When asked *why* they feel the weather is changing (question 8), respondents not only described what they believe to be causing the changing weather, but - as in the interviews - constructed arguments and weighed up evidence to support their beliefs. As shown in *Figure 5.9,* below, a number of respondents (16%) justified their previous response that the weather is changing by describing evidence of changes in weather. As in the question about climate change impacts, respondents often used similar language to government and the media in describing UK-specific changes, such as "hotter summers, wetter winters". Consistent with the question on climate change impacts, the proportion describing the changes in weather here is higher amongst the 16-54 age group (24.5%**) and those with top NEP scores (23.3%*).

Figure 5.9 Beliefs about why weather patterns are changing - categories of 20 responses or less are excluded



For respondents believing the cause of changing weather patterns to be natural weather variations (15.3%), some (7.1%) justified this belief by referring to past changes in weather or climate. Consistent with their understanding of the causes of climate change, significantly more men (20.1%**), broadsheet readers (21.4%***), car owners (16.6%*) and those with the lowest NEP scores (22.3%*) and Trust scores (29.8%***) cited natural weather variations as the cause of current weather changes. The proportion referring to past changes is higher amongst broadsheet readers (11.1%***) and those with the lowest NEP scores (13.6%*) and Trust scores (13.7%*).

A larger proportion, however, cited anthropogenic causes for the changing weather. **By far the most popular reason given for changing weather was *global warming* (29% of respondents).**

This compares to 3.4% who mentioned *climate change*. As we saw in Sections 5.4.1 and 5.4.2 *global warming* is more commonly understood as an anthropogenic environmental problem, and *climate change* is considered a more natural phenomenon. Consistent with their understanding of the causes of global warming, respondents also referred to pollution (11%), ozone depletion (10.5%), changes in ozone (5.4%) and deforestation (4.1%) as reasons for changing weather patterns. **Anthropogenic causes of changing weather patterns were stated by a significantly higher proportion of respondents affected by air pollution.** Pollution was mentioned by 21%*** of those affected by air pollution and 14.8%* of those with family/friends affected. Ozone depletion was cited by 16.7%** of those affected by air pollution and 16.2%*** of respondents with family/friends affected. Ozone depletion was also mentioned by significantly more women (14.4%***), and those most trusting of climate change information (16.3%*).

Again, the language used to describe human causes of changing weather sometimes reveals a *moral* dimension of respondents' understanding (3.7%), for example relating changing weather to human "abuse" of the planet or "mismanagement" of natural resources.

Responses to this question show a considerable level of uncertainty, largely in terms of self-doubt (14.8%). The proportion is significantly higher amongst respondents aged 16-25 (33.3%*) and broadsheet readers (19.3%**).

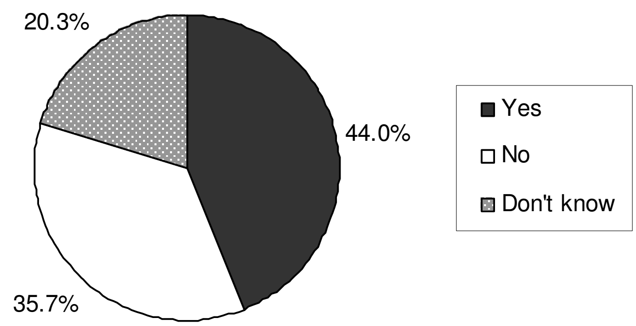
We can conclude from this analysis that respondents' understanding of current changes in the weather is very closely linked to their understanding of the causes and impacts of climate change. This supports the theme - discussed further in Section 6.2 - that climate change and weather are conceptually integrated.

5.4.4 Perceived threat from climate change

Despite respondents' tendency to understand the impacts of climate change in global rather than local terms, the greatest proportion of respondents (44%) considers they are, or will be, personally affected by climate change (question 17; Figure 5.10). This perhaps indicates that different outcomes occur when asking open-ended versus closed questions: respondents may not associate, unprompted, climate change impacts with their lives, but when explicitly asked, find it easier to *agree* that they are or will be affected. This type of acquiescence bias is well-known in survey research (Ray, 1990). Nevertheless, over a third of respondents (35.7%) feel climate change does not or will not affect them, and a significant minority feel they do not know (20.3%). This further illustrates the uncertainty surrounding the issue of climate change - a recurring theme, which will be discussed further in Sections 5.4.8 and 6.4.

These results largely reflect divided perceptions of perceived threat from climate change amongst the public evident in other studies. The BBC (2004) found that around half of Britons (52%) think climate change will have little or no effect on them. Poortinga and Pidgeon (2003) found that the public rated the risks of climate change for themselves as moderate, but the risks for the environment and society as somewhat higher (Poortinga & Pidgeon, 2003; cf. Bord et al., 2000).

Figure 5.10 Do respondents believe they are being affected, or will be affected, personally by climate change?



Chi-square analyses show that the proportion which feels they are being, or will be, affected by climate change is significantly **higher** amongst:

- Members of environmental organisations (60.7%***);
- Respondents with top quartile NEP scores (54.6%***) and top quartile PEV scores (57.1%**);
- Graduates (55.5%***);
- Residents in Wards A and B (53.7%**);
- Broadsheet readers (49.6%**);
- Respondents whose own health has been affected by air pollution (66%***) or whose friends/family's health has been affected by air pollution (58.6%***). This relationship was also noted by Bord et al. (2000).

The proportion is significantly **lower** amongst:

- Respondents aged 65 and above (26.3%***);
- Residents in Ward N (higher proportion of retirees) (31.6%**);
- Those on 'very low' and 'low' incomes (36.5%*);
- Non-voters (28.8%**).

Evidently, younger age groups, respondents with higher environmental values and those affected by air pollution feel more threatened by climate change. A significantly higher proportion of these groups also rated climate change as personally very important (Section 5.3.3). In addition, as noted elsewhere (Norton & Leaman, 2004) perceived threat is significantly related to education, income and political engagement.

The differences in age we see in response to this question are consistent with participants' belief that climate change is a long-term issue, most likely to affect future generations. This is despite the tendency amongst young people to underestimate levels of personal risk (Eurobarometer, 2001) and generally to be less concerned than older age groups about environmental issues (DEFRA, 2002; Christie & Jarvis, 2001).

When asked *how* they feel climate change does or will affect them (question 18), the majority of responses (75% of responses) referred explicitly to *adverse* effects of climate change. Only 1.7% of responses related to perceived beneficial impacts, including warmer weather and lower heating bills. The average number of responses per participant is 1.

As shown in *Table 5.7,* below, the most popular responses related to the weather in general (15.3%), flooding (11.7%), health (7.5%) and sea level rise (5.8%). This closely mirrors respondents' understanding of climate change impacts in general (Section 5.4.3). A minority of respondents (12.1%) used much more personal language that demonstrated an awareness of being at high risk of direct impacts of climate change.

Table 5.7 How do respondents feel they are being, or will be, affected by climate change? (open-ended)

Most common responses (categories of over 20 cases)	**Respondents** (% of total sample)
Weather	15.3
Flooding	11.7
Health	7.5
Sea level rise	5.8
Climatic changes	3.7
Agriculture/food supply	3.7
Lifestyle changes	3.6
Personal finances	3.6
Adversely - all other	15.3
Uncertainty - self-doubt	6.8
Personal threat/direct impact/hi-risk	12.1

Despite being no more likely to cite flooding as an impact of climate change (Section 5.4.3), there is a significantly higher recognition amongst flood victims that flooding impacts from

climate change do, or will, directly affect them (19.5%*). Similarly, the proportion claiming their health is being, or will be affected, by climate change, is higher amongst those who feel their own health has been affected by air pollution (16.7%***) or whose family/friends' health has been affected (12.4%***).** The proportion of respondents using more personal language to describe direct personal impacts is higher amongst members of environmental organisations (26.2%***) and those affected by air pollution (22.9%***) or with friends/family affected (20.5%***). Sea level rise was mentioned by significantly more respondents with highest quartile PEV scores (11.9%*) and NEP scores (9.8%*), and those educated to degree level or above (10.3%**).

5.4.5 Understanding about the process of climate change

As we saw in *Table 5.3,* the most common process through which respondents understand climate change to be occurring is ozone depletion (19.9%) and (related to this) increased penetration of the sun's rays (7.6%). This finding - that climate change and ozone depletion are equated by the public - has been found in previous research (Hinds et al., 2002; DEFRA, 2002; Henriksen & Jorde, 2001; Hargreaves et al., 2003; Kempton, 1991; Bord et al., 2000; Eurobarometer, 2001). Hargreaves et al. (2003), for example, found that the largest proportion of the public (54%) selected 'thin the ozone layer' from a list of possible explanations for how greenhouse gases affect climate. The interview data from my study reveals how people link the two issues. The following explanation was typical of interviewees' explanation.

> "Well, um, cutting down trees and the rainforests affects the sort of gaseous balance around the earth. Also, um, you know car emissions, emissions from factories, you know, polluting gases are somehow affecting the ozone layer of which there is meant to be a hole. And as far as my understanding is, there will be more powerful sunrays get through, and, er, the temperature on earth is rising gradually and possibly the polar ice cap is- is melting. This is my limited understanding of what global warming is about". [Female, housewife]

As will be discussed in Section 6.3, this conception of the process of climate change is divergent from scientific definitions. These delineate climate change - caused primarily by carbon dioxide emissions - from the problem of ozone depletion - caused by CFC emissions.

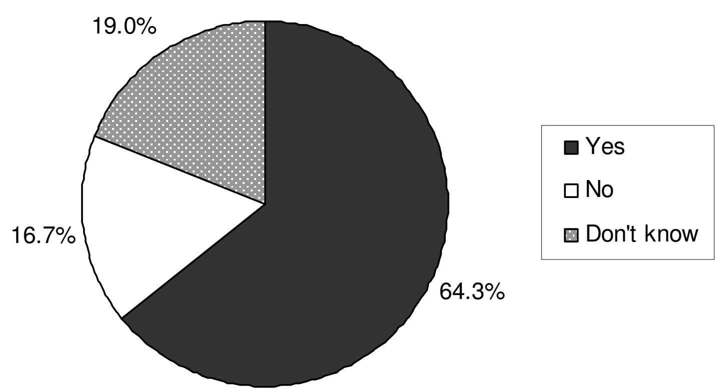
There was explicit evidence that some (3.9%) understood global warming and climate change as different phenomena, for example one causing the other. This is consistent with the finding (discussed in Section 5.4.1) that *global warming* and *climate change* are understood in different ways by respondents.

Only a small proportion of survey respondents (4.4%) referred to the trapping of heat or gases acting like a 'blanket', or to the 'greenhouse effect' (5.1%), in describing their understanding of climate change. These suggest a more scientifically 'accurate' understanding of the process of climate change. However, since the survey did not explicitly ask respondents about the mechanism through which climate change occurs, the proportion aware of these explanations may be greater. Nevertheless, it is significant that few respondents offered mechanistic explanations of the process of climate change, while most identified isolated features - causes or effects - in their understanding. Bostrom et al. (1994) suggest that this may result from hearing these discrete 'facts' from media accounts, while not learning about the underlying mechanism of climate change.

5.4.6 Beliefs about tackling climate change

When asked whether they believe anything can be done to tackle climate change (question 19; Figure 5.11), nearly two-thirds of survey respondents (64.3%) answered in the affirmative, although a significant minority (19%) stated they do not know.

Figure 5.11 Do respondents think anything can be done to tackle climate change?



According to chi-square analyses, the proportion which feels it is possible to tackle climate change is significantly higher amongst:

- Respondents whose own health has been affected by air pollution (77.8%***) or whose friends/family's health has been affected (75.7%***);
- Members of environmental organisations (75%*);
- Respondents with top quartile NEP scores (74.8%***) and PEV scores (77.4%***);
- Graduates (73.4%**);
- Broadsheet readers (71.8%***);
- Respondents who are most trusting of climate change information (76.2%***).

Those stating they *do not know* whether it is possible to tackle climate change are significantly more likely to be:

- Non-voters (30.5%*);
- Those without formal qualifications (29.9%*);
- Those on 'low' or 'very low' incomes (23.9%*);
- Women (23.7%**).

Here, then, we see that belief in effective climate change mitigation is particularly related to environmental values, education and experience of air pollution. Respondents who are more disadvantaged or politically disengaged are more uncertain about the possibility for tackling climate change. This may be because these groups are generally sceptical about the efficacy of action to effect change or simply because their knowledge of the issue is lower.

When asked what they thought could be done to tackle climate change (question 20), the main response categories that emerged were:

- Actions that should be taken; and
- Those responsible for taking these actions.

As shown in *Table 5.8*, respondents tended to identify responsibility for tackling climate change with international organisations (11.4%) or government (8.1%). **Consistent with respondents' dissociation of causes of climate change with their own actions (Section 5.4.2), few respondents (5.3%) identified individuals as responsible for tackling climate change. Also consistent with respondents' understanding of the causes of climate change, the most common suggested action for mitigating climate change, by nearly one in five (18.7%) respondents, was reduction of pollution/ emissions. Other suggestions include both technological and behavioural solutions**. **Consistent with respondents' conceptual association of climate change and other environmental problems, some suggested fixing the ozone hole/ reducing CFCs (3.9%) or recycling (5.3%) as strategies to tackle climate change.** These findings are only partially consistent with previous studies. While pollution reduction is a common suggestion for tackling climate change (Kempton, 1997; Bostrom et al., 1994), reducing deforestation, banning aerosols and cutting car use have also been amongst the most popular responses (Kempton, 1997; Lofstedt, 1996; Read et al., 1994). **Consistent with previous studies, reducing domestic energy consumption was explicitly mentioned by very few respondents in this study (0.9%). This again highlights the low awareness of domestic energy use as a contributor to climate change.**

A small number of survey responses (2%) indicated limited efficacy of action; and 8% of respondents indicated some level of *uncertainty* relating to tackling climate change. The interview data indicates that people who believe changes in climate and weather are natural may assume there is no way of controlling or mitigating them. As one (older) woman commented:

> "I don't know, I can't think of anything [to tackle climate change]. You can't interfere with the weather". [Female, retired]

Table 5.8 What do respondents feel can be done to tackle climate change? (open-ended)

Most common responses (over 20 respondents)	**Respondents** (%)
Responsibility for action - international (general)	11.4
Responsibility for action - government	8.1
Responsibility for action - industry	5.9
Responsibility for action - individuals/public	5.3
Responsibility for action - USA	4.6
Responsibility for action - all other	7.5
Actions - reduce pollution/emissions	18.7
Actions - renewable/clean energy	7.3
Actions - education/information/awareness	6.5
Actions - reduce fossil fuels	5.8
Actions - change attitudes/behaviour/lifestyle	5.6
Actions - recycle/improve waste mgt	5.3
Actions - reduce carbon/greenhouse gas emissions	5.1
Actions - reduce car use	4.9
Actions - reduce deforestation/plant trees	4.6
Actions - energy efficiency/conservation	4.2
Actions - fix ozone hole/reduce CFCs	3.9
Actions - all other	24.4
Uncertainty	8

Chi-square analysis of this question indicates that responsibility was more likely to be placed at international level amongst those on 'high' or 'very high' incomes (20%**). A significantly higher proportion of men (6.7%*) and respondents with top quartile NEP scores (8%*) identified the USA, in particular, as responsible. **Significantly more respondents with PEV scores in the top two quartiles (9.9%**) and those with top quartile Trust scores (9.5%*) identified responsibility with individuals.**

Broadsheet readers were significantly more likely to identify fossil fuel reduction (8.6%**); carbon/ greenhouse gas emissions reduction (7.5%**) and energy efficiency/ conservation (7.1%***), and to be uncertain (11.4%**); they were significantly less likely to say reduce CFCs (2.1%*). Uncertainty was also significantly higher amongst those with top quartile PEV scores (15.5%*).

Women were more likely to suggest education/ awareness (8.8%**) and reducing car use (6.6%*). Men (7.8%**), members of environmental organisations (9.5%*) and those with postgraduate qualifications (14.7%**) were significantly more likely to mention reducing carbon/ greenhouse gas emissions. Significantly more respondents aged 16-34 mentioned recycling (11.4%*).

Consistent with respondents' tendency to displace responsibility, car owners (4.1%*) were significantly *less* likely to suggest reducing car use. This reflects the British Social Attitudes survey findings that fewer regular drivers agree that the number of cars on the road should be reduced, compared to those who use other forms of transport (Exley & Christie, 2003).

Respondents were then asked to choose, from a list of 7 options, which organisation or group they feel has the main responsibility for tackling climate change (question 21). As *Table 5.9* demonstrates, by far the largest proportion of respondents (40.9%) believes responsibility for tackling climate change lies principally with international organisations. Again, **a minority (6.5%) consider individuals to have the main responsibility**. Even fewer (4.6%), however, place the main responsibility with business/ industry. These findings are consistent with other research into the public's views on tackling climate change (BBC, 2004; Norton & Leaman, 2004).

Table 5.9 Who do respondents feel has the main responsibility for tackling climate change? (closed question)

	Respondents (% of total sample)
International organisations	40.9
National government	12.6
Individuals	6.5
Business and industry	4.6
Environmental organisations/ lobby groups	3.1
Local government	0.7
Other	10.5
Missing	21.2

Chi-square analysis suggests that there are few significant variations between respondents. More broadsheet readers chose international organisations (56.7%*) and national government (18.5%*). Of those who feel business/ industry have the main responsibility, a significantly higher proportion does not own a car (17.1%***).

It is noteworthy that a considerable 21.2% of respondents skipped this question or gave multiple (and therefore invalid) responses. Where people made comments beside the question, or selected the 'Other' category, they often suggested that *everyone* should be involved in tackling climate change. This suggests that many respondents were uncomfortable selecting only one organisation or group as responsible for tackling climate change, instead viewing responsibility as shared equally amongst many or all groups involved.

5.4.7 Attitudes to climate change

Based on themes that emerged during the interviews and in previous research, the survey sought to elicit respondents' attitudes in relation to climate change (question 24). *Table 5.10* shows the total proportion of survey respondents selecting 'agree' or 'agree strongly' to each attitude statement, as well as the mean and standard deviation for each item (1=disagree strongly; 5=agree strongly).

Table 5.10 Survey respondents' attitudes to climate change

Attitude statement (survey question 24)	**Total agreement** (% of total sample)	**Mean** (1-5 scale)	**SD from mean**
The government should provide incentives for people to look after the environment	89	4.22	0.73
Industry and business should be doing more to tackle climate change	86.5	4.16	0.75
We can all do our bit to reduce the effects of climate change	83.3	4.21	0.83
People should be made to reduce their energy consumption if it reduces climate change	80.9	3.99	0.87
If I come across information about climate change I will tend to look at it	75.8	3.75	0.66
Radical changes to society are needed to tackle climate change	72	3.84	0.93
Climate change is a consequence of modern life	70.7	3.73	0.82
People are too selfish to do anything about climate change	68.9	3.74	0.93
The government is not doing enough to tackle climate change	68.5	3.79	0.82
I feel a moral duty to do something about climate change	61.4	3.62	0.83
Experts are agreed that climate change is a real problem	56.3	3.48	0.88
Climate change is inevitable because of the way modern society works	55.3	3.39	1.09
Leaving the lights on in my home adds to climate change	54.9	3.46	0.83
Pollution from industry is the main cause of climate change	52.9	3.47	0.90
The effects of climate change are likely to be catastrophic	49.4	3.48	0.91
The media is often too alarmist about issues like climate change	49	3.3	1.03
Recent floods in this country are due to climate change	40.4	3.26	0.88
The United States should take most of the blame for climate change	35.1	3.13	1.08
There is too much conflicting evidence about climate change to know whether it is actually happening	35.1	3.05	0.93
For the most part, the government honestly wants to reduce climate change	35	3.09	0.89
Climate change is something that frightens me	26.3	3.09	0.98
The evidence for climate change is unreliable	24.7	2.82	0.96
It is too early to say whether climate change is really a problem	23.3	2.72	0.94
Climate change is just a natural fluctuation in earth's temperatures	21.3	2.74	1.03
I would only do my bit to reduce climate change if everyone else did as well	19.7	2.38	1.07
I am uncertain about whether climate change is really happening	19.7	2.5	1.00
Climate change will improve the British weather	19.4	2.73	0.95
Developing countries should take most of the blame for climate change	18.3	2.49	1.08
Flooding is not increasing, there is just more reporting of it in the media these days	15.9	2.57	0.89
Claims that human activities are changing the climate are exaggerated	15	2.55	0.92
Nothing I do on a daily basis contributes to the problem of climate change	9.8	2.35	0.82
I do not believe climate change is a real problem	9.6	2.26	0.89
Nothing I do makes any difference to climate change one way or another	9.4	2.32	0.81
I tend to consider information about climate change to be irrelevant to me	7.9	2.26	0.77
It is already too late to do anything about climate change	7.5	2.18	0.88
Human activities have no significant impact on global temperatures	7.3	1.98	0.95
There is no point in me doing anything about climate change because no-one else is	6.4	2.15	0.79

Overall, respondents most strongly agree that the government should provide **incentives** for pro-environmental action. Furthermore, the standard deviation for this statement is the second lowest of all statements, indicating that there was little variation in the level of agreement. **Respondents evidently feel that environmental actions should have some direct, tangible benefit to the individual.** This finding is consistent with DEFRA's (2002) research, which shows the UK public opposes policy measures in which individuals have to pay for environmental improvements and tend to support policies that improve facilities or invest in alternative technologies. Furthermore, this indicates support for both expectance-value theories of behaviour (e.g., Ajzen, 1991) and Stern et al.'s (1993) contention that egoistic concerns most commonly motivate environmental action.

A number of other statements which attracted a high level of agreement relate to notions of **responsibility, trust and social justice**. Consistent with their tendency to displace blame in relation to climate change (see earlier in this section), respondents agree that industry, business and government should do more to tackle climate change. While, they agree that **everyone** can 'do their bit' to tackle climate change, they also support the idea that the nature of human beings and modern society means that action should be **equitably enforced, rather than left up to individuals.** As the interview data indicates (see Section 6.6), perceptions of other people, organisations and countries doing little to tackle climate change undermines perceived efficacy of individual action. There seems to be a strong recognition by respondents that climate change represents a 'social dilemma', described in Chapter 2 (Dawes, 1980). Evidently, as noted elsewhere (e.g., Darier & Schule, 1999), public perceptions of climate change are related to **moral** concerns, for example about social justice.

Yet despite a widespread tendency to place responsibility for tackling climate change with industry and government, over half the sample (54.9%) agrees that individual activities (e.g., leaving the light on) contribute to climate change. It seems most respondents acknowledge the role of domestic energy consumption in causing climate change once prompted, though very few identify it unprompted (see Sections 5.4.1, 5.4.2 and 5.4.6). Similarly, although most respondents have little faith in other people to tackle climate change, a majority (61.4%) claim to feel a moral obligation to do something about climate change and very few (6.4%) feel there is no point in doing anything about the issue. **This indicates that, for most people, there is an awareness of the need to act and a willingness to do so, but that the perceived efficacy of individual action is compromised by social distrust.** This theme is discussed further in Section 6.6.

It is interesting to note that attitudes, like understanding, differ according to terminology. Chi-square analysis indicates that there was significantly higher agreement with '*Global warming* is inevitable because of the way modern society works' (59.4%**) than with '*Climate change* is inevitable because of the way modern society works' (50.2%**). Significantly more respondents agreed that *climate change*, rather than, *global warming* 'is just a natural fluctuation in earth's temperatures' (27.9% compared to 16%**). These differences relate to the finding, discussed in Section 5.4.1, that **more respondents see *global warming* than *climate change* as a human-caused problem**.

Chi-square analysis (detailed in Appendix 5.4) also highlights where attitudes differ significantly between individuals with different characteristics. The possible reasons for these differences are discussed in Section 6.7.

Overall, *men* hold more pessimistic and uncertain attitudes in relation to climate change and tend to believe individual action to be of limited efficacy. *Women* tend to agree more that climate change is frightening, that society should change, that more action should be taken by others (industry, business, government) to tackle climate change, and to feel a moral obligation for tackling climate change. *Younger age groups* (16-44) tend to believe individual action is efficacious, to feel the government is not doing enough to tackle climate change, to be less sceptical and more frightened about climate change. More *educated* respondents tend to acknowledge that human activities and daily actions impact on climate. Respondents with *no or few qualifications* are more likely to blame developing countries and industrial pollution for climate change, and to consider climate change information to be irrelevant to them. Those without formal qualifications are most likely to feel their actions do not contribute to climate change and there is no point in taking action since no-one else is.

Consistent with their earlier responses (Section 5.2.2), *broadsheet readers* claim they are more interested in climate change information. However, they are more uncertain about the reality of climate change and, accordingly, are less likely to agree that industrial pollution and developing countries are the main causes, or that the impacts will be catastrophic. Nevertheless, while they disagree that radical changes are needed in society, they are less likely to feel there is no point in taking individual action because no-one else is and that people are too selfish to do anything about climate change. *Car owners* hold very similar attitudes to broadsheet readers, doubting that anthropogenic climate change is a real problem. Yet car owners (particularly those with higher annual mileage) are more likely to disagree that nothing they do on a daily basis contributes to the problem. Respondents on '*very low' incomes* are more likely to agree that 'We can all do our bit to reduce the effects of climate change'; those on '*medium', 'high', or 'very high' incomes* are more likely to disagree that 'Experts are agreed that global warming is a real problem'.

Relating to their trust in climate change information (Section 5.2.2.7), more *Labour voters* say that they are interested in information about climate change. *Conservative voters* are more sceptical about claims relating to anthropogenic climate change and are least likely to agree strongly that industry/ business should do more to tackle climate change. *Non-voters* are more likely to feel there is no point in taking individual action because no-one else is.

Consistent with their use of a range of sources of climate change information (Section 5.2.2), *members of environmental organisations* say they are more interested in climate change information. They tend to believe individuals can 'do their bit' to reduce climate change and to feel a moral duty to act; they are more certain that climate change is happening and is human-caused. Consistent with their understanding of climate change impacts (Section 5.4.3), they are less likely to think climate change will improve the British weather, more likely to say the impacts will be catastrophic, and are more frightened about the issue. Moreover, members of environmental organisations are more likely to disagree that they would only act if everyone else did and that there is no point in taking action since no-one else is, while also agreeing that changes to society should be made. Respondents with *higher NEP and PEV scores* hold very similar attitudes to members of environmental organisations

Those who have *experience of flood damage* are more likely to be interested in information about climate change. Unsurprisingly, they are more inclined to disagree that 'Flooding is not increasing, there is just more reporting of it in the media these days'. Similarly, *respondents whose health has been affected by air pollution* are interested in climate change information. They are also more certain about the reality of anthropogenic climate change and more likely to find it frightening. They are more likely to agree that individual action makes a difference to climate change and to feel a moral duty to act. Moreover they accept the need for social measures: radical changes to society, and people made to reduce their energy consumption. They also feel that government, industry and business should do more to tackle climate change. The attitudes held by respondents whose *family/friends' health has been affected by air pollution* very closely mirror the views of those whose health has been directly affected.

Respondents with the *highest Trust scores* (i.e., the most trusting of climate change information) are more interested in climate change information and more likely to trust that government wants to reduce climate change. They tend to believe anthropogenic climate change is a real and frightening problem with catastrophic impacts. They agree that we can all 'do our bit' to reduce climate change, feel a moral duty to act, and disagree that there is no point acting because no-one else is. By way of measures to tackle climate change, they believe industry and business should do more, that radical changes to society are needed, that government should provide incentives and make people reduce their energy consumption.

5.4.8 Uncertainty and ignorance about climate change

Probably the most unexpected finding from this research is the importance of uncertainty - in various forms - in participants' understanding of climate change. In general, previous research show a minority of the UK and US publics doubt the reality of climate change (see Section 2.2.4.4). However, little attention has been given to the dimensions of, or reasons for, uncertainty amongst the UK public. One exception is Poortinga and Pidgeon's survey (2003), which found some *ambivalence* (moderate agreement with the statement 'I have mixed feelings about climate change') amongst the public in relation to climate change. Other European research suggests the public generally believes mitigation measures should be taken despite scientific uncertainty, indicating support for the precautionary principle (Kasemir et al., 2003a). Researchers have also examined uncertainty in media reporting of climate change (e.g., Zehr, 2000).

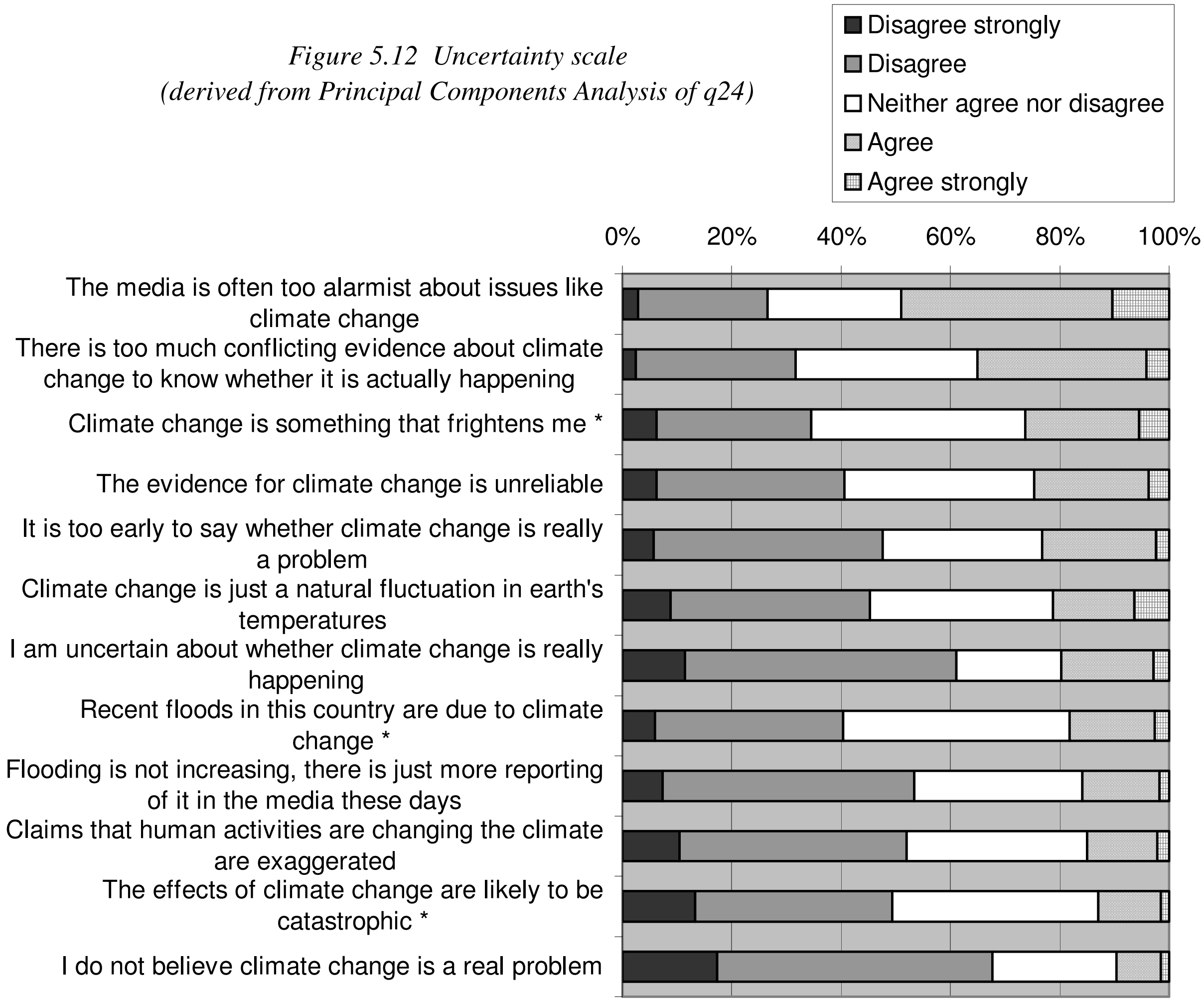
This section examines the themes of *uncertainty* (in particular, doubt about the reality of anthropogenic climate change) and *ignorance* (lack of knowledge) about climate change. These themes emerged from the interview data, the open-ended survey questions, and the quantitative survey question on attitudes (question 24). As we saw in Section 5.4.1, when respondents were asked what they know about climate change, a sizeable 17% of responses related to uncertainty or ignorance. Furthermore, uncertainty and ignorance was evident in responses to the other open-ended questions relating specifically to causes, impacts, tackling and perceived threat (Sections 5.4.2, 5.4.3, 5.4.4, and 5.4.6). This suggests that uncertainty and ignorance are salient, unprompted dimensions of public understanding.

5.4.8.1 Uncertainty about climate change

In this section, I will first discuss the *dimensions* of uncertainty that emerge from an examination of the survey and interview data. Subsequently, I will use the survey data to determine the *prevalence* of these different types of uncertainty.

The most detailed and revealing information about survey respondents' uncertainty in relation to climate change emerges from analysis of the attitudinal measures. As described in Chapter 3, Principal Components Analysis (PCA) was used to determine distinct patterns of responses to the attitude statements in question 24. Only one clear pattern emerged, relating to *uncertainty. Figure 5.12,* below, represents the proportion of respondents agreeing and disagreeing with the statements that formed the *Uncertainty Scale* (alpha = 0.66). (Where the PCA identified statements that are negatively related to cluster, the scoring is reversed to allow for a direct comparison of responses.)

Figure 5.12 Uncertainty scale
(derived from Principal Components Analysis of q24)



* Scores reversed

We can see that this scale comprises a number of dimensions of uncertainty in relation to climate change. These dimensions comprise:

- *Uncertainty arising from the data itself*: conflicting, unreliable or partial scientific evidence;
- *Uncertainty arising from the information medium*: exaggerated, misleading or untrustworthy information (especially from media sources);
- *Personal uncertainty*: self-doubt or ambivalence - which can arise as a result of the first two sources of uncertainty.

Respondents' uncertainty in relating recent flooding to climate change indicates an awareness of factors other than climate change that can contribute to increasing flooding, and perceptions of increasing flooding. This uncertainty arises from both the data itself (identifying the causes of flooding) and from the information medium (increased media reporting and perceptions of flooding).

(It should be noted that this uncertainty scale does *not* measure uncertainty in the sense of *ignorance or lack of understanding* of climate change, something that was evident in responses to other survey questions. Lack of knowledge is discussed in Section 5.4.8.2, below.)

These dimensions of uncertainty also arose in the interviews. *Uncertainty arising from the scientific data* was perhaps the most common source of interviewees' sense of uncertainty around the climate change issue. Many interviewees - particularly those with more knowledge of the science of climate change - argued that the evidence does not determine whether observed changes are anthropogenic or the result of natural fluctuations:

> "Undoubtedly humans sort of add to the speed with which climate change will occur, but then equally, climate change will occur naturally, you know regardless of whether you know we're here or not, really, it's a natural phenomenon". [Female, social researcher]

Some interviewees referred to contradictory evidence:

> "There's, um, talk that the ice caps are actually getting thicker". [Female, artist]

One interviewee referred to the inaccuracy of measuring equipment:

> "I've heard recently that, um, the indicators they use and the machinery they use to measure you know certain things, I don't know like- like rainfall and all the basics, have changed so much over the years that it's not a hundred per cent accurate as well". [Female, researcher]

In particular, interviewees often referred to the limited timescales and short-term perspective from which evidence of an inherently long-term problem was being drawn:

> "It's too early to say and maybe give another fifty years and see what the changes are then". [Female, social researcher]

> "From what, kind of, I can gather I'm not sure whether we're at that stage where we can wholeheartedly say, yes, there is sort of global warming". [Female, social researcher]

> "It's just like, I mean, the ice age came. You know, weather patterns change, because, after all, our lifetime, even a century, you had miniscule little drop in the evolution of time and the whole world and everything". [Female, retired]

In some cases, uncertainty lay around the impacts of climate change - whether they would be beneficial or detrimental, and how climate change impacts can be distinguished from short-term changes. A few interviewees pointed out that there may be some beneficial impacts of climate change, a view sometimes expounded in the media (Hargreaves et al., 2003):

> "We'd have a nice seaside property with a Mediterranean climate, which is very nice, but- if- if the predictions are right it's a very frightening scenario". [Male, marine environmental consultant]

> "I mean I don't know, in some senses maybe global warming might- might help plants… maybe you can get more harvests, I don't know, I mean maybe it might be beneficial for a while, but I- I don't know, I'm not sort of a farmer". [Female, housewife]

Some were also sceptical about whether recent flooding and other extreme weather events could be attributed to climate change. One interviewee with experience of flooding was very sceptical about whether human activities influence climate change, but acknowledged: "All I know is *from clear observation*, the pattern of weather has changed".

Uncertainty arising from the information medium was also raised by interviewees. Firstly, second-hand information was called into question, particularly where exaggerated or dubious claims were felt to be made by the media (or scientists). A number of interviewees were sceptical about recent reporting of global warming, which had linked the issue to a variety of phenomena such as unusual weather and changes in patterns of animal migration. They were distrustful of "journalistic sources" (see Section 5.2.2.1). One interviewee, for example called climate change: "just flavour of the month"; others used terms like "scare-mongering" to describe media reporting. Another explained:

> "Any slight change in the weather seems to be attributed to sort of global warming, which I'm a bit sceptical about some of the research you know, if it's a hot day, it's global warming; if it rains, it's global warming; if it's cold, it's global warming". [Male, social care inspector]

Ubiquitous media was felt to contribute to the impression of increasing weather-related problems like flooding. Some pointed out that there may simply be more media coverage about flooding, which gives 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]

A few also pointed out that other factors, such as building on floodplains, explain this increased flooding - even in places that had never previously experienced flooding. As one interviewee pointed out, with flooding "we haven't made scientific links to the global warming".

To a lesser degree, uncertainty was related to a belief (discussed in Section 5.2.2) that information about climate change is not (easily) accessible. For example, one interviewee was suspicious about the government covering up evidence of climate change; others simply acknowledged that they could not understand or evaluate the scientific basis for some claims. Lack of knowledge about climate change will be discussed further in Section 5.4.8.2.

Whilst there was more uncertainty associated with second-hand sources of information, a number of interviewees recognised that *direct experience* of changing weather and flooding is not a reliable indicator of long-term climate change. Several interviewees pointed out that human memory is fallible and short-term, whereas scientific records of weather are better able to determine whether there is a genuine trend. For example, one interviewee explained:

> "The pattern of rainfall seems to be different in as much as it falls much more heavily over a shorter period of time. But whether that's just a perception or whether that's a fact, I really don't know". [Female, housewife]

Several flood victims pointed out that, while there have been severe flood events recently, flooding may not necessarily be getting worse over time. There was, or may have been, considerable flooding in the past:

> "I think flooding did go on, and I think- you'd need to go into the history of it to see the actual pattern of rainfall". [Male, retired]

> "I'm sure there's probably in the last, um, twenty or thirty years there's probably been worse floods than we've seen in the last three years, but of course time's a great healer isn't it, people forget about it". [Male, company director]

This cause of uncertainty is particularly interesting because it calls into question the direct sensory evidence that tends to be more persuasive than second-hand sources of information (e.g., Bickerstaff & Walker, 1999; Fazio & Zanna, 1981).

Uncertainty from both the scientific data and the information medium contributed to interviewees' *ambivalence* about the reality of anthropogenic climate change. Typical remarks included:

> "It may be real, it may not be. I don't know". [Male, company director]

> "I have a bit of a question mark over whether or not it's just a natural fluctuation in, you know, the global processes". [Female, social researcher]

Interestingly, uncertainty seemed to lead some people to dismiss the problem:

> "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]

> "I've heard both views, I've heard for and I've heard others say it might not be so, you know and, er, I suppose I'm a sceptic". [Male, retired]

Yet, while many interviewees indicated some level of uncertainty about anthropogenic climate change, they typically also gave reasons why they also felt climate change might be real. As mentioned in Section 5.2.1, interviewees were influenced significantly by what they felt to be *sensory evidence* of climate change, namely changing weather patterns: some were persuaded that the changing weather signified human causes. This was also evident from the survey data: as discussed in Section 5.4.3, the largest proportion of respondents (29%) identified global warming as the cause of changing weather patterns.

Several interviewees were also convinced by the weight of *expert evidence* of the reality of climate change:

> "We *know* that we're pumping loads of CO2 and greenhouse gases into the atmosphere, we know that overall world temperatures are going up, and the weather's changed. So to kind of turn round and say 'oh, they're completely unrelated' is bollocks, really". [Male, IT consultant]

> "There must be something in it if, um, you know environmentalists are talking about [it]". [Male, retired]

Ambivalence - acknowledging evidence for anthropogenic climate change, while also expressing doubt - was revealed most clearly through the interview data. In some cases, participants developed their attitudes through discussion, weighing up the arguments for and against anthropogenic climate change and sometimes making contradictory statements. The following response (from a flood victim) was quite typical of how arguments about climate change are weighed up:

> "I mean all of those conferences we've been to about climate change, they've talked about a possible twenty per cent increase in flood- in rainfall. Um, whether that's an actuality or

not, I don't know. I- I don't know where they're getting their figures from, and I haven't seen any data to back it up, so I- I couldn't really comment on that. Um… I mean certainly the pattern- the pattern of rainfall seems to be different in as much as it falls much more heavily over a shorter period of time. But whether that's just a perception or whether that's a fact, I really don't know". [Female, housewife]

And two similar responses, which combined a number of arguments, were given from respondents without direct experience of flooding:

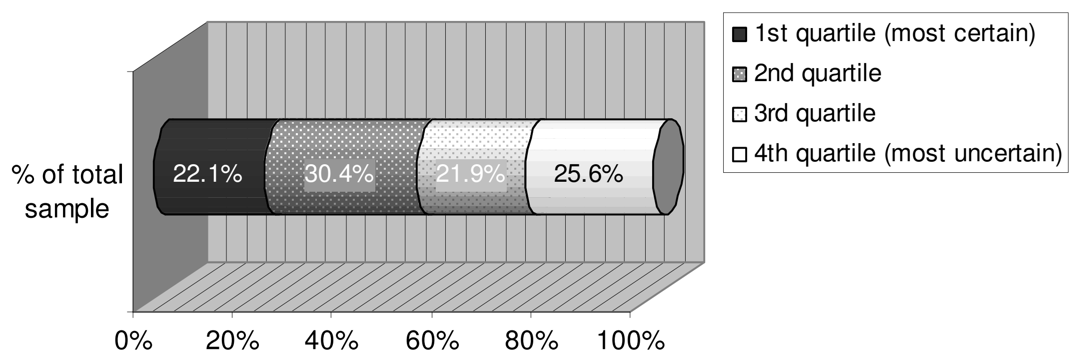
"I think you can see differences in seasonality, um, in this part of the world: spring comes earlier, autumn, winter comes later, very much shorter. Um, they're less- winter is less cold, and summer it's drier and hotter, um and well, it may actually be wetter, I'm not sure. But certainly I think we can see changes, whether they are part of some longer term cycle, fluctuation in climate which is natural or whether it's in fact some- some- part of some gradual trend, I certainly don't know whether that's the case. It's a degree to which you are relying on pop-science to try and inform you of this. But I think there certainly are changes because it does seem that the disaster stories are more regular, and whether that's increased reporting of that, I don't know, but when you hear about things such as there's maybe less pack ice on the- at the North Pole, and there's open water at the North Pole, the North-West Passage, people are seriously talking about the ability to open the North-West Passage, um, between the North Atlantic and the North Pacific. Now that- that for is kind of well- that for me is worrying, those figures for me are indicative of the fact that it's beyond just the normal cycle of change, long-term cycle of change, but I don't know the extent to which that's true. It's impossible for the lay person to piece together an accurate assessment of what's happening on a global scale from lots and lots of little scare stories, um, which may be true, but it's- the ability for us within- you know the average person, the ability to actually comprehend the problem, the extent of it, and amass sufficient evidence to reach a decision on it is very difficult." [Male, economics lecturer]

"I don't understand all of the science… I haven't read any of the papers, and coming from a research- you know an academic background it makes me question the basis from which they're making their claims. From a lay person's point of view in that sense I do know there is so much discussion and debate and eminent people are sticking their necks above the wall and saying, 'we need to talk about this, we really need to think about this problem', but from that point of view I respect their opinions and I would say that there must be some substance behind the noises that are made about climate change, and um I think I agree with the argument that- I agree with my Dad's argument that change is a natural thing, but I also feel the same way as Steve [interviewee's partner] that maybe it's happening too quickly, and therein lies the problem". [Female, social researcher]

As the preceding discussion has shown, the issues of trust in sources of information and of uncertainty about the reality of anthropogenic climate change are overlapping. Distrust of one's own sensory experience of changes in weather patterns, or of mediated reports of evidence of climate change, impact upon the certainty with which the issue is perceived. Similarly, while scientific information is given the greatest credibility, it too is limited. It cannot be directly understood or evaluated by most people, nor can it offer certainty or unambiguous evidence of the reality, nature or severity of climate change. Uncertainty and trust are discussed further in Section 6.4.

These dimensions of uncertainty were evident in both the interview and survey data. However, although statements about uncertainty form a coherent pattern of survey responses (in the form of the Uncertainty Scale), they do not elicit agreement amongst the majority of respondents. The mean score for the Uncertainty Scale as a whole is 2.72 on a 5-point scale (1=disagree strongly; 5=agree strongly). *Figure 5.13* represents the spread of Uncertainty Scale scores amongst the total survey sample. From this we can see that just over half the sample falls into the bottom two quartiles (i.e. are more certain about climate change).

Figure 5.13 Spread of scores on the Uncertainty Scale



Statements relating to media alarmism (49%) and conflicting scientific evidence (35.1%) elicited the greatest total agreement, although a higher proportion (56.3%) feels that experts are agreed that climate change is a real problem and only 7.3% agree that human activities have no significant impact on global temperatures (see *Table 5.10,* earlier). Uncertainty was also a feature of a *minority* of respondents' answers to the open-ended survey questions. When asked about what they know about the issue (Section 5.4.1), doubt about the reality of climate change was mentioned, unprompted, by 16.5% of respondents. A further 5.3% specifically referred to contradictory views and debate as a source of their uncertainty.

Consistent with my research, previous surveys suggest that the majority of the UK public accept anthropogenic climate change is real (DEFRA, 2002; BBC, 2004; Hinds et al., 2002; Bibbings, 2004a). However, in their 2001 survey, DEFRA (2002) found that two-thirds of the public blamed recent UK flooding on climate change. This compares to only 40.4% of respondents in my survey who agreed that 'recent floods in this country are due to climate change'. Conceivably this difference is due to the time lag between the major flood events of 2000-1 and my survey, whereas these events were very recent when DEFRA conducted their survey. This conclusion is consistent with risk perception research which shows hazards are considered more likely if they have recently occurred (Kates, 1976). Furthermore, the flooding of 2000-1 focussed government and media attention on the issue of climate change, which is likely to have influenced public perceptions of a link between flooding and climate change (cf. Ungar, 1992).

While my research shows that most people do accept the reality of anthropogenic climate change, it sheds light on the characteristics of those people who remain unconvinced. Chi-square analysis of respondents' scores on the Uncertainty Scale suggests there is an identifiable sub-set of respondents that can be classified as more 'uncertain' about climate change. This analysis indicates that, compared to the total sample (25.6%), the proportion with top quartile Uncertainty Scale scores is significantly **higher** amongst:

- **Men** (35.3%***);
- **Broadsheet readers** (30.7%*), in particular **Times/Sunday Times readers** (35.8%**);
- **Car owners** (28.2%**).

The proportion is significantly **lower** amongst:

- **Those aged 16-34** (12.3%**);
- **Respondents whose own health has been affected by air pollution** (15.3%***) **or with family/friends whose health has been affected** (19%***);
- **Members of environmental organisations** (17.9%**);
- **Respondents with top quartile NEP scores** (12.9%***) **and PEV scores** (13.1%***);
- **Respondents who are most trusting of climate change information** (12.2%***).

Uncertainty Scale scores do not vary significantly with experience of flood damage or education.

These differences are broadly consistent with responses to earlier open-ended 'understanding' questions. In Section 5.4.1, I noted that gender and broadsheet readership (though also science education) are significantly related to uncertainty about the reality of climate change. I also noted, in Sections 5.4.2 and 5.4.3, that doubt and scepticism about the causes and impacts of climate change is higher amongst those who value the environment least, who trust climate change information least, and who have not been affected by air pollution.

My research also indicates that uncertainty about climate change is related to other beliefs and attitudes. Chi-square analysis shows that many of the survey responses of the most 'uncertain' group (i.e. those with top quartile Uncertainty Scale scores) and the least 'uncertain' group (i.e. those with bottom quartile Uncertainty Scale scores) differ significantly.

Unsurprisingly, those *most uncertain* about the reality of anthropogenic climate change are less concerned about climate change (6%***, compared to 19.9% of the total sample). They are also less concerned about air pollution and ozone depletion; and more concerned about litter and waste management. Respondents in this uncertain group who accepted that weather patterns are changing were significantly more likely to assign natural causes to this. When asked what they know about climate change (question 10), a significantly higher proportion stated that it is caused by natural variations in climate and that they doubt climate change is real. Yet they were also more likely to state they know little/nothing about the issue (22.5%**, compared to 17.1%). When asked about the causes of climate change, again significantly more of this group stated earth's cycles/weather variations (25.8%***, compared to 10.5% of the total sample) and referred to uncertainty about the reality of climate change (13.9%***, compared to 6.5%). When asked about impacts, this group was again significantly more uncertain in their responses. The most uncertain respondents are significantly more likely to hear about the issue from newspapers, but also less likely to indicate (in the attitudinal section) that they have an interest in the issue. It is worth noting that the validity of the Uncertainty Scale is supported by its significant correlations with the other expressions of uncertainty that emerged from the open-ended survey questions.

As mentioned, the *least uncertain* respondents are more likely to state their health or friends/family's health has been affected by air pollution. Furthermore, they are more likely to state they know of other effects of air pollution (70.8%***, compared to 49.6% of the total sample), including ozone depletion and acid rain. This group is more likely to believe that weather patterns are generally changing (96.9%***, compared to 80.8%) and that this is due to human activities. **This highlights the significance of direct observation of changed weather to belief in anthropogenic climate change.**

When asked what they know about climate change (question 10), a significantly higher proportion of certain respondents cited changing weather, flooding, sea level rise, melting icebergs and personal observations of impacts. When asked about the causes of climate change, this group were more likely to identify human causes and to give **moral** judgements about human disregard for the environment. The least uncertain are significantly more likely to hear about the issue from friends/

family, school/ university environmental groups, the Internet and public libraries. **They are more likely to consider the issue to be personally 'very important' (54.6%***, compared to 24.2% of the total sample) and to believe that they are or will be personally affected by it (83.8%*, compared to 44% of the total sample). This group is also more likely to believe climate change can be tackled (93.1%***, compared to 64.3% of the total sample) and to have taken personal action in response to it (48.5%***, compared to 31.4% of the total sample).** The attitudinal responses of the least uncertain respondents similarly indicate that they believe individual action to be effective and that social measures should be introduced to change behaviour. They tend to agree that climate change is frightening and will have catastrophic impacts, and to feel a moral obligation to do something about it. This group is also significantly more likely to be taking a range of environmentally-relevant actions specifically to protect the environment.

Perhaps a rather obvious conclusion of this analysis is that belief in the reality of anthropogenic climate change is a necessary precursor to believing climate change to be a concerning issue, which poses a personal threat and can be tackled. These relationships will be examined in more detail in Chapter 7.

5.4.8.2 Lack of knowledge about climate change

Although only 2.9% of the total sample said they had not heard of climate change (question 9), a notable 12% did not answer the subsequent open-ended question that asked about what they know. This is likely to suggest that many of those people who did not answer were unable to do so for lack of knowledge. This would be consistent with the sizeable proportion of responses (17.1%) to the same question, which indicated a lack of knowledge about climate change (Section 5.4.1). A number of interviewees also indicated that they knew little or nothing about the issue. One interviewee admitted: "I know the overall topic, but I don't know the details". Other responses included very vague and uncertain responses: "something about gases"; "the weather pattern is totally different, but who's causing it and why I've no idea". Some interviewees found they remembered more about the issue when prompted.

Choice of terminology was particularly significant in relation to awareness of the issue. While 6.2% of respondents said they had not heard of *climate change*, **no respondents claimed not to have heard of *global warming***. A further 1.4% said they 'don't know' whether they had heard of *climate change*, compared to only 0.6%*** in relation to *global warming*. This is consistent with the finding, mentioned in Section 5.2.2, that a significantly higher proportion of respondents had heard about *global warming* from a number of sources than had heard about *climate change*.

Similarly, as mentioned in Section 5.4.1, *global warming* questionnaires evoked a higher proportion of responses overall to the question about what they knew (question 10).

Since the proportions of respondents who had not heard and did not know whether they had heard of climate change/global warming are overall very low, chi-square analysis can only be used where sub-groups are sufficiently large (i.e. expected frequencies exceed 20). Gender and broadsheet readership are two such cases where this test can be applied because there are only two sub-groups. From this we see that significantly higher proportions of **women** (4.4%*) and **broadsheet non-readers** (5.5%***) have not heard of climate change. DEFRA's (2002) survey similarly found that awareness of *climate change* is lower (78%) than awareness of *global warming* or *the greenhouse effect* (99%), and that a higher proportion of men (86%) have heard of *climate change* than women (69%).

As discussed in Section 5.4.1, the proportion subsequently stating they know little or nothing about climate change is significantly higher amongst those aged **75 or over, people without formal qualifications, lower income groups and broadsheet non-readers.**

The interview data reveals how ignorance about climate change is 'constructed'. People's confidence in their own knowledge of climate change was often related to how they *identified* themselves in relation to science (cf. Michael, 1996). As mentioned in Section 5.2.2, the interviewees who were most confident about their knowledge of climate change had often learnt about it through work. Some interviewees who defined themselves as 'scientists' felt their knowledge of the issue was proficient. Others were confident of their knowledge from their choice of media:

> "I'd say my knowledge today is fairly much that of a general- general well-informed person who looks at what's available from the sort of conventional broadsheet media". [Male, economics lecturer]

Others, however, felt they could not expect to understand the issue because they classified themselves as "not being scientifically-minded", or as another interviewee put it:

> "I'm not a boffin, I don't know about these things. I'm a normal humble being!" [Female, retired]

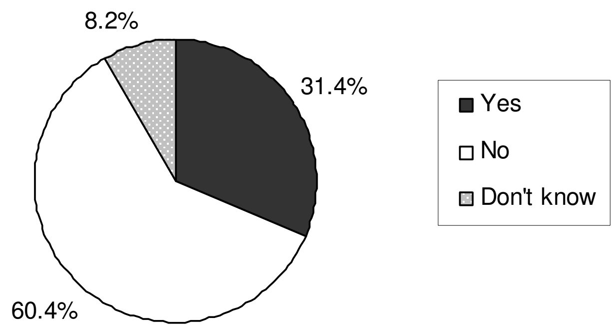
5.5 BEHAVIOURAL RESPONSES TO CLIMATE CHANGE

5.5.1 Personal actions taken

As discussed in Chapter 2, this survey distinguished between intent-oriented action (action out of concern for climate change) and impact-oriented action (energy reduction behaviours) (cf. Stern, 2000).

Less than a third of survey respondents (31.4%) state they take, or have taken, action explicitly out of concern for climate change (question 23; Figure 5.14).

Figure 5.14 Have respondents ever taken, or do they regularly take, any action out of concern for climate change?



Chi-square analysis indicates that the proportion is **higher** amongst:

- Respondents with top quartile NEP scores (41.1%***) and PEV scores (51.2%***);
- Members of environmental organisations (46.4%***);
- Those most certain about the reality of climate change (48.5%***).
- Residents in Ward B (44.3%***);
- Graduates (40.6%**);
- Broadsheet readers (39.3%**);
- Respondents whose health has been affected by air pollution (39.6%*); and
- Car owners (33.4%*).

Consistent with their concern and perceived threat in relation to climate change, and their belief that it can be tackled, respondents with higher environmental values and those affected by air pollution are most likely to say they take action in response to climate change. Consistent with their perceived threat and belief that climate change can be tackled, broadsheet readers and the most educated respondents are also more likely to take personal action. Previous studies similarly highlight the role of environmental values and education on ‘willingness’ (though not necessarily personal action) to mitigate climate change (O’Connor et al., 2002; 1999; Poortinga et al, 2004).

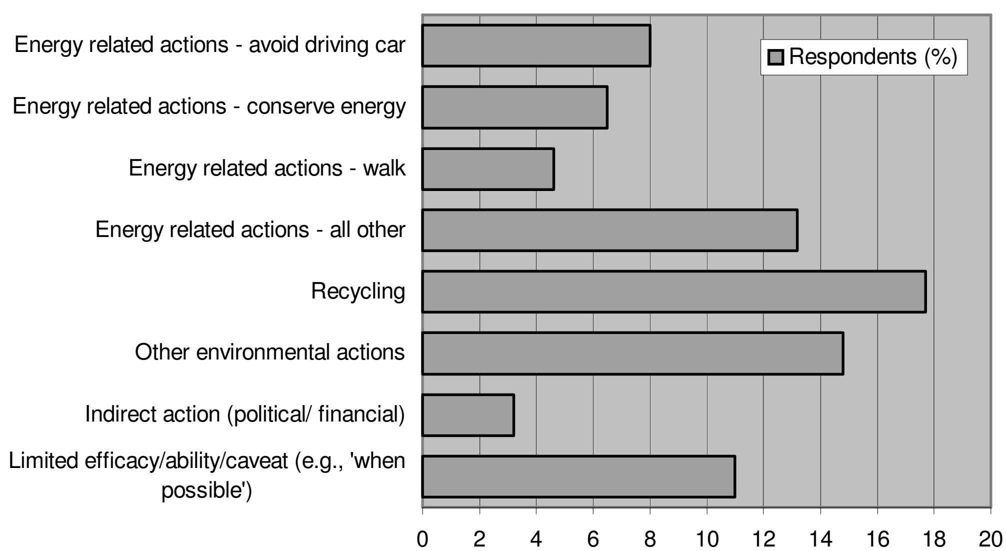
Consistent with their doubt about whether climate change can be tackled, the proportion which claims to be tacking personal action out of concern for climate change is significantly **lower** amongst:

- Non-voters (17.8%**).

A few (8.2%) responded ‘don’t know’ to this question; a higher proportion of whom were women (11.9%***).

Respondents claiming to be taking, or have taken, action out of concern for climate change were then asked what action this was. As *Figure 5.15* shows, actions include both **energy-related behaviours** and **other environmental actions**. The energy-related actions include avoiding driving (8%), conserving energy (6.5%) and walking (4.6%). Avoiding driving is higher amongst women (10.3%*) and broadsheet readers (12.1%***). Only 3.2% claim to be taking indirect (political, financial) actions out of concern for climate change, although this proportion is higher amongst members of environmental organisations (14.3%***) and those affected by air pollution (6.3%*).

Figure 5.15 Actions taken by survey respondents “out of concern for climate change”



However, a much greater proportion of respondents state they recycle (17.7%) or conduct other (not energy-related) actions (e.g., using CFC-free products) (14.8%) out of concern for climate change. This again suggests the relationship between energy consumption and

climate change is not clearly understood. In addition, it may be that commonly-practised environmental behaviours like recycling (DEFRA, 2002), are readily cited by respondents as actions that represent their concern for climate change. Education does not positively influence the proportion taking energy-related actions. Those educated to degree or above are, in fact, significantly **more** likely to say that they recycle and take other non-energy-related actions out of concern for climate change. Recycling out of concern for climate change is significantly lower amongst those aged 65 and above (5.3%*).

A notable proportion of respondents (11%) indicated some constraint on acting out of concern for climate change (e.g., qualifying their response with "when possible" or "I try to..."), suggesting perceived barriers or constraints on environmental behaviour. These will be discussed further in Section 5.5.3.

The survey then examined a number of impact-oriented environmental actions, including energy conservation behaviours[6], and the reasons for these actions (question 26). As *Table 5.11* shows, the majority of respondents claim to **turn off lights** they are not using, to **recycle** and to **buy energy-efficient light bulbs**. In addition, over a third of respondents regularly buys organic food, walks or cycles to work, and uses public transport. Overall, this indicates a **greater willingness to take domestic actions than to change travel behaviours**, also noted in previous surveys (e.g., BBC, 2004; Bord et al., 2000; O'Connor et al., 2002; O'Connor et al., 1999; Fortner et al., 2000).

Consistent with these findings, Portsmouth City Council (2002) found that 40% of residents regularly walk rather than drive. Half of Portsmouth residents also claimed to 'conserve energy', although private car use in the city is increasing and there is no change in levels of alternative means of transport. Other national surveys have found lower levels of environmental action. DEFRA (2002) found that only 52% of the UK public regularly recycle paper, 42% recycle glass, 40% cut down electricity/gas usage in the home, 31% use low-energy light bulbs and 18% buys organic food. In 2002, MORI (2004) similarly found that 58% recycle, 37% use energy-saving light bulbs, 26% use public transport, and 19% buy organic food. A higher proportion of respondents in Poortinga and Pidgeon's survey (2003) claimed to use energy-saving light bulbs (50.5%) and to use public transport instead of a car (41.7%). The difference between previous surveys and my research in the proportion of recyclers may be explained by the availability in Portsmouth of kerbside recycling facilities, which are not available in some UK locations. The variation in self-reported energy-related behaviours is more difficult to account for, although energy conservation is generally higher amongst those living in the South East (DEFRA, 2002). With regard to *surveys in general,* however, it should be remembered that respondents often claim

[6] Survey respondents were also asked about whether they own or regularly drive a car and, if so, their annual mileage (questions 33-34). More than 4 out of 5 respondents (82.8%) say they own or regularly drive a van. The median annual mileage is 8000.

to be more environmentally responsible than they actually are (Resource Recovery Forum/Brook Lyndhurst/MORI, 2001).

Table 5.11 Regular environmentally-relevant actions and variation between respondents

Action – regularly taken	**Total** (%)	**Groups with significantly different proportions** (%)	
Turn off lights I'm not using	**95.7**	-	-
Recycle items other than glass	**93.1**	98**	Aged 55-84
Recycle glass	**85.6**	89.3*	Top quartile Pro-environmental Value scores
		74.2*	'Very high' income †
		75.3***	Non-voters †
Buy energy efficient light bulbs	**66.2**	73.6*	Air pollution affected own health
Buy organic food	**43.7**	67.9***	Members of environmental organisations
		67.9***	Top quartile Pro-environmental Value scores
		55.2***	Top quartile NEP scores
		56.2**	Bottom quartile Uncertainty score
		51.9*	Residents in Wards A and B
		51.4*	Educated to degree or above
		51.4**	Air pollution affected friends/family's health
		50.4**	Broadsheet readers
		48.1*	Women
Walk/cycle to work	**43.6**	80***	Aged 16-24
		69.7***	Car non-owners
		60.3***	Residents in Wards A and B
		51.4*	Air pollution affected own health
		49*	Air pollution affected friends/family's health
		50.3**	Top quartile NEP scores
		50*	Top quartile Pro-environmental Value scores
Use public transport	**36.9**	81.8***	Car non-owners
		66.7**	Aged 16-24
		43.9**	Aged 75 or above
		47.7***	Residents in Wards A, B and I
		47.9*	Non-voters
		43.5*	Experience of flood damage
		46.5**	Air pollution affected own health
		45.7***	Air pollution affected friends/family's health
Take part in a campaign about an environmental issue	**17.5**	41.7***	Members of environmental organisations
		31.3***	Air pollution affected own health
		27.4*	Top quartile Pro-environmental Value scores
		25.2**	Experience of flood damage
		25.2**	Top quartile NEP scores
		24.5***	Air pollution affected friends/family's health
Do NOT own/regularly drive car	**17.2**	56.7***	Aged 16-24
		50.6***	Aged 75 or above
		38.8***	'Very low' income
		38.1***	No formal qualifications
		36.2***	Residents of Ward I
		22.6***	Women
		22.4***	Broadsheet non-readers
		22.2*	Air pollution affected friends/family's health
Bottom quartile mileage (0-4,500)	**22.0**	55***	Aged 75-84
		38.5***	No formal qualifications
		33.3***	'Very low' income
		25.5*	Women
Top quartile mileage (12,000-100,000)	**24.9**	54.5***	'Very high' income
		31.6***	Aged 25-64
		29.7*	Men

Key
* Difference significant at 0.05 level
** Difference significant at 0.01 level
*** Difference significant at 0.001 level
† Groups with significantly *lower* proportions

Chi-square analysis indicates that environmental actions differ amongst different groups of respondents. *Table 5.11* summarises these differences. Consistent with their previous responses,

respondents with higher environmental values and those affected by air pollution are more environmentally active.

Demographic variables also influence environmentally-relevant actions taken. Older (55-84) respondents are the group most likely to recycle items other than glass; those on 'very high' incomes and non-voters are significantly *less* likely to recycle glass. Younger people and those without access to a car are most likely to walk, cycle or use public transport. Women and those on 'very low' incomes are likely to drive little or not at all. Flood victims are amongst those most likely to take part in an environmental campaign.

These findings are only partially consistent with previous surveys. DEFRA (2002) found that older participants, but also those with degrees and in higher social classes, were the most likely to say they regularly recycle. They also found that people aged 45-64 were the most likely to cut down the use of electricity or gas, and those in the highest social class were the least likely. As with my survey, women and 18-24 year-olds were slightly more likely to regularly choose walking, cycling or public transport instead of driving. A higher proportion of graduates, though also 25-44 year-olds, bought organic food; more older respondents bought low-energy light bulbs. Consistent with my findings, O'Connor et al.'s US survey (2002) found that income had a strong negative influence on willingness to drive less. Overall, higher income groups tend to consume more energy than those on lower incomes (Poortinga et al., 2004; Brandon & Lewis, 1999).

These findings, and previous studies, suggest that those on the highest incomes (or in the highest social class) are less likely to conserve energy. This may be because, unlike others, they have the *means* to consume more (desirable) energy-based products. This is inconsistent with the predictions of post-materialism (Inglehart, 1990), that suggests environmental concern and action increases with income and economic security. This theory is more likely to be relevant where sustainable behaviours are financially costly, thereby constraining action amongst economically deprived groups. Yet energy conservation is often financially rewarding, making it more attractive for those on lower incomes. These findings caution against considering 'environmental behaviours' as a homogenous category. The relationship between energy consumption and income is explored further in Chapter 7.

5.5.2 Motivations for action

Respondents were asked about the reason or reasons for regularly taking the actions listed in question 26. Several pre-defined categories were included (based on interview data and previous research), as well as space for respondents to write in other reasons. From *Table 5.12* we can see that protecting the environment is either the most popular or second most popular reason for all actions except walking/cycling to work. However, the reasons vary according to the particular activity, and are often multiple.

Table 5.12 Reasons for environmentally-relevant actions

Action – regularly taken	Total (%)	**Reason(s) for action** (% of total respondents)						
		To protect the environment	Convenience	To save money	For my health	Habit	Moral obligation	Another reason
Turn off lights I'm not using	**95.7**	41	4.8	72.2	0.3	32.6	11.1	0.4
Recycle items other than glass	**93.1**	72.4	6.9	2.1	1.4	12.7	37.6	2
Recycle glass	**85.6**	66.4	6.5	1.4	0.7	12.2	34.8	2
Buy energy efficient light bulbs	**66.2**	36.4	3.1	46.7	0.2	1.5	9.6	0.4
Buy organic food	**43.7**	12.9	0.5	0.2	38.3	1.2	6.3	1.7
Walk/cycle to work	**43.6**	14.2	16.6	12.7	35.2	5.3	2.7	4.5
Use public transport	**36.9**	6.9	28	4.8	1.7	1.7	2.7	2.5
Take part in a campaign about an environmental issue	**17.5**	10.1	0.3	0.3	0.7	0	10.1	0.4

Key	
	Most popular reason
	Second most popular reason

Recycling, for example, is most commonly done to protect the environment, and to some extent out of moral obligation. Turning off unused lights and buying energy efficient bulbs are more often motivated by a desire to save money; to a lesser extent they are due to environmental concern. This is consistent with DEFRA's (2002) research, which found that 80% of respondents who conserved energy did so to save money; only 15% did so to help the environment or reduce pollution. Research in Wales also found that financial motivations most commonly underpinned energy conservation (Bibbings, 2004b).

The reasons for buying organic food and walking/cycling to work are most commonly health-related (cf. DEFRA, 2002); and using public transport is more likely to be for reasons of convenience. Although habit was identified as a reason for turning off unused lights by almost a third of respondents, this was not generally a popular motivation for action.

The motivation 'moral obligation' deserves some discussion. Where respondents identified moral obligation, this typically accompanied 'environmental protection' as a motivation for action. This may suggest that the moral obligation that they identify is an obligation to the environment. However, the interview data suggests that other values underpin many 'environmental' actions. Interviewees discussed concern for other people and for their own leisure interests (skiing, diving), as well as concern for habitats and the environment, as reasons for limiting their environmental impact. Altruism (concern for future generations) was also the most popular reason for viewing climate change as an important issue (Section 5.3.3). Furthermore, there was a sense of moral obligation that they should recycle to avoid being "wasteful" and contributing to landfills. Some described a sense of intrinsic satisfaction that resulted from taking regular environmental actions and of relieving feelings of guilt about unsustainable activities:

> "I enjoy riding [my bike], but it- it makes me <u>feel a bit good</u> that it- I'm also not congesting Portsmouth and using- you know burning unnecessary petrol fumes." [Female, social researcher; emphasis added]

> "We recycle our bottles, we get through an awful lot of bottles, but I don't know whether that actually makes a difference or whether it just makes you <u>feel better</u> about the fact that, at the same time, <u>you ought to</u> in terms of other things we misuse." [Male, IT consultant; emphasis added]

The importance of intrinsic satisfaction, or 'warm glow' effect, in environmental behaviour has been highlighted in previous research (De Young, 1996). When one interviewed couple consciously examined the motivations for their sustainable actions, they emphasised the strong moral motivation behind them, despite admitting doubts about their efficacy and the husband's scepticism about the reality of anthropogenic climate change:

Woman:	Well, I don't know, it's just something that- there's actually very little you can do as an individual really, isn't there, but we do [inaudible] obsessively recycling!
Man:	No, I mean I think it's right to do it, but… it's whether global warming will have any… any real effect on us.
Woman:	Yes… I know, but I do think beyond that actually. I do think beyond just us
Man:	Yeah, fine.
LW:	You think because it's so far in the future it'll-
Woman:	Yeah, I do worry about the future even though it won't directly affect us, and possibly not even our children, but it's still- I don't like the idea of um [tape change]… you know that we don't use a washing machine or anything like that, but we are quite… I mean here we are sitting with lights on, but I mean we do try quite hard, don't we, to be energy efficient.
Man:	Yeah, yeah we do.
LW:	You said there was a limit to what individuals can do.
Woman:	Well, I sometimes feel we're wasting our time, 'cause so many other people don't do things- recycle their bottles and things. You know, I sometimes wonder if it's worth it, but I just can't stop myself from doing it.

This last comment: "I just can't stop myself from doing it", highlights how some behaviours become internalised norms (Schwartz, 1977) even though they may have no immediate benefit (or no benefit at all). Some spoke of the initial "trigger" (e.g., family influence) that alerted them to an alternative behaviour, such as recycling instead of throwing everything into the waste bin - which then subsequently became unconscious action, a habit (cf. Verplanken et al, 1998). Others were unsure of the initial motivation for recycling: “I think it’s just something that, you know, I just do”.

Chi-square analysis (see Appendix 5.5) indicates where motivations for these actions differ according to respondents’ background. Certain groups are particularly likely to be motivated to act out of environmental concern. Unsurprisingly, respondents with high **environmental values and members of environmental organisations** are significantly more likely to take all actions out of concern for the environment, and most actions out of moral obligation. A significantly higher proportion of **broadsheet readers** also state their motivations as environmental protection and/or moral obligation for most activities. As mentioned in Section 5.4.8.1, respondents who are **most certain about the reality of climate change** are also more likely to regularly take all actions out of concern for the environment. Respondents who are most **trusting of climate change information** are more likely to turn off lights (52.7%***) and to buy energy efficient bulbs (46.6%***) to protect the environment. Respondents with ‘high’ or ‘very high’ **incomes** are more likely to walk/cycle to work to protect the environment (22%*); while those without formal qualifications (3.5%*) are *less* likely to say this. Those without formal qualifications are also the least likely to recycle glass to protect the environment (48.8%**). The proportion turning off unused lights to protect the environment is higher amongst **16-44 year-olds** (55.3%***), those on ‘medium’ to ‘very high’ incomes (53.8%***), those **educated** to degree level or above (49.7%***), and car owners (43.4%*). **Women** are more likely to be motivated to recycle glass (73.2%***) and other items (77.4%**) out of concern for environmental protection.

Financial concerns are greater amongst other groups. **Men** are more likely to be motivated to use public transport (7.8%**) and buy energy efficient bulbs (53.5%**) in order to **save money**. **Car owners** are more likely to turn off lights to save money (74.4%*).

Those affected by air pollution are significantly more likely to turn off lights out of **moral obligation** (16.7%*). Respondents on ‘very high’ incomes are significantly more likely to turn off lights (22.7%*) and buy energy efficient light bulbs (22.7%**) out of moral obligation.

This variation in the motivations for environmental actions is partially consistent with previous research. Women are more often motivated by environmental concern, while men tend to be financially motivated to cut car use (DEFRA, 2002; cf. Haste 2004a). Financial concern motivates those in lower social classes to cut car use, while those in higher social classes are more often motivated by environmental concern (DEFRA, 2002). **These findings suggest postmaterialism operates at the level of motivations, but not (as we have seen) in relation to the prevalence of environmental actions.** In other words, energy conservation may be motivated more by environmental concern than economic gain amongst higher income groups, but these groups are likely to be consuming more energy in the first place and no more likely to be conserving energy than others.

We can see, then, by looking at Table 5.12 and Figure 5.15 **that concern for climate change and for environmental protection in general is only one type of motivation for energy conservation and other environmentally-relevant actions**. In many cases, environmental considerations are *less* salient than other factors, such as health or money, in motivating behaviour. This consistent with previous research into energy conservation (DEFRA, 2002; Bibbings, 2004b; Brandon & Lewis, 1999), and validates the distinction used in this survey of intent-oriented and impact-oriented behaviour. This also supports Stern et al.'s (1993) contention that environmental concern is *least* likely (compared to egoistic and altruistic motivations) to be the primary influence on most people's behaviour.

The interview data similarly highlight that behaviour defined as 'environmental' is often motivated to a greater degree by more tangible, financial benefits:

> "[turning off lights] is a financial thing as much as a save the planet thing". [Male, IT consultant]

> "I mean if I do actually think, 'well I better not put too much water in the kettle', it's really to save money". [Female, housewife]

> "I do take action sort of, do do the little things because- you know, in terms of, trying to cut down on energy consumption and all that kind of stuff. But I wouldn't say it kind of drastically concerns me sort of on a day-to-day level… responsible living I suppose, isn't it, sort of saves you money at the same time, so- in some ways". [Female, researcher]

The interview data also reveals how people 'construct' post-hoc rationalisations of their behaviour. In some cases, where interviewees claimed to be taking actions to protect the environment, such as not driving, subsequently they admitted - *when asked* - that there were other reasons:

Interviewee:	… and if I do walk rather than drive, I don't consciously say that I'll do it, but subconsciously, I suppose I'm thinking 'yeah, it's only a very small part, but if other people do it as well, it should make a different. It certainly should'. And if you can get people to do that worldwide, it would make a big difference.
LW:	And is it really for environmental reasons that you choose to cycle and walk, as opposed to drive?
Interviewee:	Um, no. Slightly- partly for my health as well, so it does have a secondary, um, reason. [Female, retired teacher]

The previous extracts indicate that environmental concern may automatically be given as a reason for action because it is more socially desirable. This may account for survey respondents' tendency to select environmental concern as a reason for taking the actions listed. It is clear from both the interview and survey data, however, that behaviour is motivated and rationalised in a number of ways. The determinants of behaviour are examined more fully in Chapter 7.

5.5.3 Barriers to action

Although the survey did not explicitly address barriers to behavioural response to climate change (or to 'environmental' action in general), this was a topic raised by a number of interviewees. Furthermore, the survey data clearly demonstrates that the proportion claiming to take action out of concern for climate change (31.4%) is much lower than the proportion who considers it an important issue (73.6%) or who accept that climate change is caused by human activities (Sections 5.4.2 and 5.4.8.1). **Clearly, neither concern nor knowledge of climate change necessarily translates into personal action to mitigate it**. The knowledge-action gap is well-established in environmental psychology (Kollmuss & Agyeman, 2002). One interviewee in my research explained the reason for her knowledge-behaviour gap:

> "I think it is a big concern, because I work in the same sort of field, but I don't always translate that into my day-to-day activities, which is different isn't it… Like kind of you're aware of the issues, but you don't always do anything about it. We won't always buy environmentally-friendly energy-saving light bulbs or things like that, 'cause those cost more". [Female, social researcher]

Cost and inconvenience were the barriers most commonly cited by interviewees. Likewise, interviewees felt there were few incentives for environmentally sustainable behaviour. As such, action was seen as a sacrifice, and inaction the easiest and most individually beneficial option. As discussed in Section 5.4.7, survey respondents strongly supported the idea that government should incentivise environmental behaviour. Similarly, interviewees argued for legislation and incentives to encourage and enforce environmentally-responsible behaviour:

> "I'm willing to do my little bit as long as it doesn't cost me too much [and become] grief…I think I want to be better but I want someone to tell me to". [Male, IT consultant]

Like this man, several other interviewees felt they *should* be doing more, reflecting the social norm to express environmental concern. However, as one interviewee put it, the sacrifice and inconvenience involved in environmental action meant their environmental concern was "hypocritical". It is clear from this survey and previous research (DEFRA, 2002; Bibbings, 2004b) that the actions most commonly taken to protect the environment are those that require little effort and no cost (or, better, provide financial *benefits).* As a recent report from MORI (Norton & Leaman, 2004) concludes: the key to engaging people … is to 'make it easy' and to show 'what's in it for them'. Inconvenience - inadequacy of recycling facilities - was the most popular unprompted reason the UK public gave for not recycling in DEFRA's (2002) survey. It is also likely that as environmental actions become easier and more widespread (through provision of kerbside recycling facilities, for example), there is more social pressure for individuals to conform to the majority behaviour (Bandura, 1971).

Interviewees who admitted taking little action to protect the environment justified this by arguing for the inefficacy of individual action or by denying responsibility for environmental problems. One interviewee pointed out that private car use is a far lesser evil than motor sports (an "unnecessary" use of fuel); others blamed factories and power stations for producing the most pollution. This denial of personal responsibility and displacement of blame for environmental problems has been noted in previous research (Evans et al., 1988; DEFRA, 2002; Stoll-Kleemann et al., 2001), and will be discussed further in Sections 6.5 and 6.6.

Several people spoke about how it would be very difficult, even impossible, to give up their car. Several described using a car as a 'necessity': because they have a "large" or "young" family; because of unreliable or expensive public transport; or because of a lack of adequate cycle paths. The survey specifically asked about perceptions of local transport facilities. Only 19.1% rated them 'good' or 'excellent' and 15.6% said they did not know. The proportion rating it 'good' or 'excellent' rises significantly to 30.9%*** amongst people who do not own a car; while only (2.1%) of this group say they 'don't know'. Car owners evidently perceive public transport as worse than non-car owners, or do not have enough experience of using it to be able to judge it. This finding is explored in Chapter 7.

As Douglas et al. (1998, p.259) note, human needs and wants are culturally and socially determined. Thus, as O'Riordan (1976) suggests, inaction can be due to a genuine perceived lack of alternative courses of action - something which is suggested by interviewees' sense of being locked into a culture which constrains options for behaviour:

> "[Driving] is inevitable just to exist in this world at the moment with a young family".
> [Male, economics lecturer]

This was also found in DEFRA's (2002) survey: most people (60%) who said they do not cut down energy consumption said this was because they "could not use any less". Similarly, the most common reason why people said they do not cut down the use of their car for short journeys was because they felt they "could not use the car any less" (37%). This dependence on car use in particular, makes transport the most intractable challenge for climate change policy (Norton & Leaman, 2004).

However, tackling car dependency is made harder by prevailing social norms. As discussed earlier, driving is not just the most convenient and often the cheapest form of transport, it is also tied to social values and identity (e.g., Steg et al, 2001). A minority of respondents (23.3%) in this survey disagreed that 'having a car is part of having a good lifestyle'. The majority of people are "determined to retain car use in the face of virtually any barrier - excessive cost, tighter legislation, vehicles banned from urban centres etc." (Norton & Leaman, 2004, p.9). While the tide of opinion may be turning to favour recycling, car ownership remains an unquestioned social good.

The questionnaire provided space for respondents to make additional comments related to climate change or to the survey in general. **Many of these comments reiterate the survey findings already discussed, particularly in terms of perceived barriers to action, denial of responsibility, and uncertainty about climate change.** A number of respondents (8.7%) suggested measures (e.g., improving recycling facilities or public transport) that would make climate change mitigation easier for individuals. Others (6.6%) described limitations to effective, individual action (pressures of modern living; no alternatives to behaviour) and a lack of faith in others, particularly in government. (A number of people similarly remarked beside question 32 that they do not trust any political party.) Other comments (3.5%) indicated displaced blame, such as responsibility for mitigation lying with governments and business, other countries (e.g., USA), other 'types' of people (e.g., two-car families) or others' activities (e.g., motor racing, industry). Some respondents (4.3%) expressed doubt about the anthropogenic nature of climate change, but a few (0.9%) stressed that action to mitigate climate change should be taken despite uncertainty.

That both motivations and barriers to action were very often linked to finances provides support for interviewees' own recommendation that government should incentivise environmental behaviour in order to appeal to people's "selfish" and "money-oriented" nature. In this sense there is public support for the economic concept of human behaviour and for government measures to foster appropriate behaviour. As well as financial barriers to climate change action, however, other barriers - relating to knowledge and beliefs, environmental values, social norms, institutional relationships, and physical infrastructure - were also evident in this research. Furthermore, although this was not something that was examined in my research, barriers to environmental action have been found in previous studies to vary according to demographic background (DEFRA, 2002). Policy measures therefore need to be wide-ranging and versatile enough to respond to the complexity of the social environment. Suggestions for appropriate measures are discussed in Chapter 8.

CHAPTER 6. DIFFERENCES IN PUBLIC AND EXPERT UNDERSTANDING OF CLIMATE CHANGE

6.1 INTRODUCTION

This chapter draws together a number of themes that emerged from the findings discussed in Chapter 5. These themes characterise the public's understanding of climate change, while distinguishing this 'lay' understanding from expert or official conceptions of climate change. Thus, Chapter 6 deals with the third research question posed in Chapter 1, namely how public understanding and response to climate change differ from scientific conceptions, official rhetoric and prescribed actions. As I will discuss later, highlighting the divergences in lay and expert understanding can expose the ways in which non-experts build knowledge about technical or scientific issues from a range of sources. Furthermore, it can suggest ways in which experts and officials can more effectively communicate with the public and incorporate the public's needs and concerns into policy-making (House of Lords Select Committee on Science and Technology, 2000). However, as I will also show, it is important to consider the commonalities that exist in lay and expert ways of thinking and communicating in order that valuable public perspectives are not excluded from democratic debate and decision-making.

6.2 UNDERSTANDING CLIMATE CHANGE IN TERMS OF THE FAMILIAR

The interview and survey data demonstrate a tendency amongst participants to understand (and justify belief in) global climate change in terms of familiar concepts and experiences, particularly *ozone depletion, air pollution* and *weather*.

One of the most consistent findings from previous studies of public understanding of climate change is the prevalent belief that *ozone depletion* causes climate change (see Section 2.2.4.2). As we saw in Section 5.4.5, the findings of this study also show this association. As others have noted (Eurobarometer, 2001), this connection is made even amongst those with high levels of formal education. However, this conception of the process of climate change is divergent from "expert" definitions. Scientific models identify carbon emissions and other 'greenhouse gases' as the main causes of climate change, while holes in the ozone layer are caused specifically by CFC emissions. Although CFCs are a greenhouse gas, their contribution to climate change is smaller than that of carbon dioxide, and they are increasingly being replaced by less potent greenhouse gases that do not destroy ozone (Houghton, 2004).

In Chapter 2, I reviewed previous research that provides some explanation for the public's conceptual integration of ozone depletion and climate change. While the media plays a role in reinforcing this connection (Hargreaves et al., 2003), other studies indicate that this association results principally from the process of learning about new concepts. Kempton's (1991) study shows that, even after being given a presentation about climate change (that did not mention ozone), respondents referred to ozone when recalling the information. This suggests that the public learns about climate change by assimilating new information into existing concepts, a process known as syncretism (Kempton et al., 1995) or constructivism (Piaget, 1970). The ozone layer framework is relatively well-understood and consequently information about climate change is 'grafted on' to this familiar concept in order to make sense of it (Ungar, 2000). The primacy of the ozone concept in public consciousness may be explained by the perceived relevance of information about ozone depletion: the direct threat to health from ozone depletion "was solidified and concretized by the widespread belief that the thinning of the zone layer holds everyday relevance for curbing exposure to the sun" (Ungar, 2000, p.306). There has therefore been a greater *motivation* to understand ozone depletion than climate change, which is a less direct threat to health or well-being. Furthermore, while climate change is a complex and uncertain issue, the concept of ozone depletion is more readily understood because it fits into familiar experiences of sunburn and metaphors of the earth's protective "shield" being damaged (Ungar, 2000).

Direct experience and perceived threat also explain the prevalent concern about *pollution* amongst the public that this research and previous studies have exposed (e.g., DEFRA, 2002). Pollution is a well-established concept, with powerful cultural connotations (Douglas, 1992). As we saw in Sections 5.4.1 and 5.4.2, by far the most common *cause* of climate change mentioned by survey respondents was pollution. This has also been established in previous studies (Hargreaves et al., 2003; Kempton, 1991). In the interviews, too, climate change and air pollution were conceptually linked, with most interviewees identifying car fumes and industrial emissions as the main causes of climate change. In the following extracts, I have highlighted the different ways in which the interviewees referred to air pollution in explaining climate change:

> "I suppose there's the production from cars, isn't there, car <u>fumes</u> which can cause it, I understand, and just generally the atmosphere can get hotter from the amount of <u>pollutants</u> 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 <u>breathing mechanism</u> 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" seems to connect 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 the impacts of climate change on air quality. These examples reveal the way in which people's understanding of familiar (experienced) processes, like breathing and air pollution, is applied to understand unfamiliar (unexperienced) phenomena, like climate change. Kempton (1991; 1997) also notes that respiration and photosynthesis are commonly discussed in the context of climate change. He found that the majority of the US public are concerned that deforestation will lead to difficulties in breathing because of a reduction in oxygen. It is also probable that by linking climate change to pollution, respondents in my study are implicitly locating blame for the issue with identifiable "polluters" (cf. Douglas, 1992). Recasting the global environmental issue of climate change in terms of social justice is another way in which they are drawing links with previous experience and knowledge. This theme will be discussed further in Section 6.3.

As discussed in Section 5.4.3, the most common *impact* of climate change identified by survey respondents related to changes in weather. Furthermore, the largest proportion of respondents identified global warming as the cause of current changing weather patterns. It is not difficult to understand why climate change is readily associated with weather, since weather is a local manifestation of climate. Weather is visible and immediate, and often the context in which climate change is discussed in the media (Hargreaves et al., 2003). In fact, 'climate' is not directly observable at all, since it refers to the *average* weather over a period of time. Particular weather events, therefore, cannot causally be linked to anthropogenic climate change since climate is a variable and probabilistic system (Allen, 2003). Yet, the identification of weather and climate noted here and in other studies (e.g., Kempton, 1991) may indicate a tendency to generalise from specific cases to long-term patterns. This is consistent with research in cognitive psychology that shows people often learn by applying experience in particular contexts to general cases (Marshall, 1995), and is well-established as the basis for social stereotypes (Brehm & Kassin, 1996). Risk researchers have similarly described the 'availability heuristic', in which risks are perceived to be more probable if they have been experienced (e.g., Slovic, 1986; see Section 2.2.3.3).

Studies in cognitive and educational psychology has demonstrated that people learn about novel and unfamiliar concepts by *relating* them to the familiar and understood (Marshall, 1995; Gentner & Gentner, 1983). Analogy and metaphor offer effective means of conveying novel ideas and scientific concepts in terms of existing knowledge and everyday experiences (Claeson et al., 1996). Through metaphor we "transfer experience in one realm to another" (Kates, 1976, p.417). Thus, respondents discuss climate change in terms of weather and air pollution because these are *spatially and temporally closer to people* than climate change. They are phenomena that *impact* on individuals directly, for example where there are health effects from extreme weather conditions and air pollution. As one interviewee explained:

> "Global warming doesn't really affect me very much, as an individual in my own life. It's- it's no more than a nuisance factor, in the local pollution and things like that… It is purely the pollution bit that does get to me on a regular basis, and that I'm made aware of regularly. The other [environmental] things, I have to have them drawn to my attention, really, because they're not here; they don't impact upon me directly". [Female, retired teacher; emphasis added]

This focus in participants' minds on issues that directly impact on them was also evident from their environmental concerns (question 1).

These findings are supported by previous research that highlights the role of everyday personal experience, or "rampant empiricism", in providing evidence of environmental risks (e.g., Bickerstaff & Walker, 1999; Gooch, 1996; Kempton, 1991). However, the public's reliance on their own experience contrasts with official, scientific understanding of climate change, in which "scientific measurement and modelling displace the evidence provided by the senses of necessarily localised human agents" (Benton, 2001, p.138). Pearce (2004) expresses this disparity by juxtaposing the way in which scientists and non-scientists "see" climate change:

> "Canada's Inuit see it in disappearing Arctic ice and permafrost. The shantytown dwellers of Latin America and Southern Asia see it in lethal storms and floods. Europeans see it in disappearing glaciers, forest fires and fatal heat waves. Scientists see it in tree rings, ancient coral, and bubbles trapped in ice cores. These reveal that the world has not been as warm as it is now for a millennium or more".

Furthermore, climate change modelling presently shows little variation and a high degree of uncertainty in terms of regional impacts. However, as I have shown public concerns are primarily focussed on the local level. As Berk and Schulman (1995, p.32) conclude: "insofar as global climate change occurs, it will be experienced and evaluated locally". This local perspective that determines and constrains lay risk perception and public concern contrasts with the scientific focus on abstract principles and decontextualised knowledge (Bruner, 1986; Irwin & Wynne, 1996). This disparity underlies most of the themes in this chapter.

This theme has significance for improving communication about climate change. It is well-documented that communicating global risks is difficult as people find them hard to relate to or imagine (Lewis, 2003; Adams, 2004; Burgess et al., 1998; Hinchliffe, 1996; Slovic et al, 1978; Hallin, 1995). Since weather and air pollution are how people relate to climate change on a local level, climate change information should build on this understanding. In particular, the public's understanding and concern about air pollution can be used to highlight the relevance of climate change to people's lives. Conversely, "attempts to separate risk issues from the social landscape which gives them meaning are likely to be dismissed as an everyday irrelevance" (Irwin et al., 1999, p.1324).

6.3 CULTURAL AND MORAL DIMENSION OF UNDERSTANDING

In the previous section, I described how participants in this research associated and even integrated climate change and other environmental issues, particularly ozone depletion and air pollution. Indeed, these are not the only environmental issues that the public associates with climate change. Surveys that provide a list of possible causes for respondents to choose from have found a tendency for respondents to link environmental issues (e.g., Bord et al., 2000). DEFRA (2002), for example, found that 10% of the UK public selected mobile phone use from a list of possible causes of climate change; in Scotland, the proportion rises to 15% (Hinds et al, 2002). Similarly, when presented with a list, the BBC (2004) found that as many as 29% of respondents identified aerosols and 13% intensive farming. In part, these findings may be a result of acquiescence bias - where respondents tend to agree with whatever options or statements are presented to them (Ray, 1990).

However, my research shows that, even without prompting, the public makes connections between climate change and a range of other environmental issues. Although mobile phone radiation and intensive farming were not mentioned, survey respondents spontaneously referred to ozone depletion, aerosols or CFCs, and chemicals as causes of climate change. One interviewee (quoted earlier) included "things we send into space" as a cause of climate change. Another suggested that climate change would "mutate plant life" and "contaminate us, or prevent us from living as we should do", signifying a conceptual connection with issues such as nuclear radiation or genetic modification. As Hargreaves et al. (2003) note, "environmental issues", such as nuclear power, climate change, holes in the ozone layer, organic food and so on, tend to be linked in people's minds and often "associations may be standing in for causal relationships" (p.38). These connections can best be summarised in terms of detrimental effects of human activities on the environment, or the encroachment of the "unnatural" into the "natural". This narrative was commonly used by participants to weave their beliefs about climate change - and flooding - into a coherent discourse about the human-environment relationship.

The tendency to draw links and make generalisations with regard to environmental issues was most apparent in interviewees' discussion about their environmental concerns. The following extract exemplifies the way in which interviewees often responded to the question of their environmental concerns:

> "I'm worried about what man is doing to the planet, basically. The pollution that we are creating, the resources that we are using so rapidly that some of them will be depleted, and not necessarily with others to take their place… Maybe some of these scientific- these, not scientific, these science fiction stories from, um, decades ago are going to be right. Maybe we are bringing about the end of the world, maybe we are setting- we have already set in motion an Armageddon, I don't know". [Female, retired teacher]

Yet, concern for human degradation of the environment continued through discussion of both flooding (see Chapter 4) and climate change:

> "I think man's messing around with a lot of things that he doesn't know what he's doing. And I don't think he realises the consequences of what they are doing. Um, in the weather pattern it- it just seems so freakish that one day you can have a beautiful day, and the next day it's like a torrent. Well it never used to be like that, so somebody's doing something with something, but whether that's global warming or whether it does something else chemical, I don't know". [Female, pub/ restaurant owner]

> "[Climate change is] the effect of too many cars on the planet, carbon dioxide in the ionosphere… I think that civilisation and man has had an effect on the world environment, you know, the layers of cloud and all the rest of it… and as a result we do get these awful- more awful extremes… and I do think that, um, the gases that we now produce, um, affect the earth's climate". [Female, artist]

The cause of climate change was summed up by some interviewees as "modern life" or "technological change". In a few cases, some described humans as increasingly being out of "balance" with nature.

> "In terms of- in terms of sort of global warming… I tend to think of it in sort of I suppose a fairly holistic sense, in the way which the natural environment is affected by humanity, which scientists call anthropogenic factors, particularly the way in which we sort of interact with natural existence, and the extent to which human interaction affects the equilibrium of natural systems". [Male, economics lecturer]

> "The nature was created certain things, you know, in proper balance… this balance is disrupted now. On the other hand we put in like emissions- vehicle emissions, on the other

> hand, which is- we didn't have a couple of hundred years, or hundred and fifty years ago, so it is one worse thing increasing, one good thing is going down". [Male, social researcher]

Some survey respondents similarly drew on ideas about human "misuse" or "overuse" of natural resources in response to the question of the causes of climate change, and suggested the impacts would include "catastrophe" or "the end of the world". This dramatic language contrasts with the typically less emotive scientific descriptions of climate change, and also illustrates a prevalent awareness of environmental damage. In a few cases, interviewees explicitly described how they understand the human-environment relationship - their environmental worldview - in terms very similar to those used by cultural theorists (Douglas, 1992; see also Chapter 1, Box 1). The following two examples present contrasting descriptions of the environment that were used by interviewees to explain their understanding of climate change:

> "My knowledge of the environment tells me that the environment is a fairly robust beast and it will adapt to change given the chance… I'm not a believer in catastrophe; it's all relative. I mean change happens all the time, there's a lot of evolution and that's how the environment works" [Male, marine environmental consultant]

> "I see [the environment] as a sort of ball rolling down the middle of the road; you've only got to hit one small stone and it's deflected, and it just keeps on that deflected course, and I'm pretty sure we can have triggered changes like that" [Female, retired teacher]

The latter extract is more typical of respondents' cultural understanding of the environment. This survey and previous surveys (e.g., Pidgeon & Portinga, 2003) have found that the majority of the UK public accepts a 'New Environmental Paradigm' worldview (Dunlap & Van Liere, 1978). Furthermore, the public commonly expresses concern about the impacts of technology, consumerism, economic growth (Kasemir et al, 2003a; Eurobarometer, 2001) and development (Macnaghten, 1993) on the environment. In other words, a majority believe that the environment is delicate and resources are limited, and implicitly reject many values that are central to a modernist perspective. Furthermore, there seems to be support from my research for cultural theorists' contention that beliefs about the vulnerability of nature in relation to human intervention influence behaviour (e.g., Poortinga et al, 2002). This survey indicates that respondents who hold a 'New Environmental Paradigm' worldview are significantly more concerned and active in response to climate change.

Another moral dimension to participants' understanding, also identified elsewhere (Darier & Schule, 1999), is their concern about social inequality that arises where climate change is tackled through voluntary reduction of energy. (This is discussed in Section 6.6). Finally, the identification of climate change with ‘pollution’ is also likely to be drawing on existing cultural associations of identifying blame for environmental problems with particular ‘scapegoats’ (Douglas, 1992), such as negligent corporations (Harvey, 1996; Jasanoff & Wynne, 1998). In the case of climate change, blame is located not only with industry, however, but also with the US and ‘other people’ (see Section 6.6). Public discourses of blame and social justice are readily transferable from other risk issues to discussions about climate change. This again locates climate change within a larger set of social and environmental issues in the public’s mind.

Thus, in contrast to narrow ‘scientific’ discourse on climate change, public discourses draw on broader, cultural beliefs and moral concerns. As discussed, the public often make connections with familiar concepts and experiences - such as ozone depletion and pollution - in order to understand climate change. As I have shown in this section, this relational process is also evident in the links made with cultural beliefs about modern society’s dysfunctional relationship with the environment. Other researchers have similarly noted a tendency for the lay public to conceptualise climate change as part of a larger set of environmental issues, rather than as a discrete entity (Henriksen & Jorde, 2001; Bulkeley, 2000). The integration of climate change information into familiar conceptual and value frameworks - such as air pollution, ozone depletion, and broader social and environmental values - form ‘cultural models’ of climate change (Kempton, 1997). Through these models, the public “tacitly renegotiates” science to form taken for granted knowledge and shared social meanings (Wynne, 1995, p.365; cf. Levy-Leblond, 1992).

This injection of values and cultural symbols into scientific concepts is evident in media construction and communication of climate change (McComos & Shanahan, 1999; Peters & Heinrichs, 2004). For issues like climate change that are relatively non-intrusive (compared to immediate, tangible, social and economic issues), media information can translate a science “issue” into a meaningful and dramatic “story” in order to engage with the public (Trumbo & Shanahan, 2000). Narratives become meaningful by incorporating shared social symbols and values to produce a cultural version of a scientific story (Wilkins, 1993). Hargreaves et al. (2003) argue that scientific communication for its own sake does not foster understanding or engagement. Rather, connections must be made with broader public concerns and interests, and information presented in the form of a consistent narrative with a storyline and actors. Featuring non-expert members of the public (as in MMR coverage), as well as scientists, as sources in media reports enables the public to engage on a personal and emotional level with the story (Hargreaves et al., 2003). Furthermore, the personal involvement of well-known political figures or celebrities can provide human protagonists for the story. For example, the ozone depletion “story” achieved greater public engagement with the coverage of President Reagan’s concurrent skin cancer operations (Ungar, 2000). These findings point to the importance of communicating climate change in terms of meaningful narratives and in relation to broader public concerns. As Newhouse (1990) explains, "The learner must grasp how a topic is related to other things he or she values if the new information is to be integrated into the cognitive or affective domains in a manner sufficient to influence behaviour" (p.29).

The public's intuitive understanding of the inter-connection between climate change and other social and environmental issues suggests that they are well able to contribute valuable insights to climate change policy debates (Querol et al., 2003). Similarly, deeply-ingrained public concern about the detrimental human impact on the natural environment is promising for the introduction of environmental protection policies. As Hargreaves et al. (2003, p.50) point out: "Most people *are* able to make links between a range of human activities that have a negative environmental impact. If past generations happily embraced industrial consumerism in blissful ignorance of the environmental consequences they no longer do so with quite the same disregard".

However, where many people equated climate change with other environmental problems, such as ozone depletion and pollution, they confused measures to solve these problems. For example, one interviewee described EU regulations on disposal of fridges and asbestos, and a number of survey respondents suggested banning aerosols or fixing the ozone hole. Recycling was commonly cited by survey participants and interviewees as an effective approach to climate change mitigation. Other researchers (Bohm, Nerb, McDaniels & Spada, 2001; Kempton, 1991; Bord et al., 1999) have similarly found that beliefs about appropriate actions to mitigate climate change are based on (mis)understanding of the causes of the problem. Clearly where lay understanding of climate change is vague or divergent from expert understandings, this will impede authorities' attempts to advocate what they believe to be "appropriate" behaviour.

In such cases, Kempton (1997) argues it is necessary to explicitly highlight where lay conceptions are 'wrong', before imparting 'correct' information. Indeed, there is evidence from educational psychology that prior beliefs must be addressed before effective learning of novel concepts can take place (Henrikson & Jorde, 2001; McCloskey, Caramazza & Green, 1980). As previous studies have shown, information about climate change is often grafted onto existing models of ozone depletion (Kempton, 1991). Individuals are not 'empty vessels' into which information can be poured, but active in the learning process (Scott, 1987). This suggests a justifiable case for exposing divergence from expert conceptions in order to inform the public about which actions are effective mitigation measures and which (e.g., reducing aerosol use) are not.

However, it is also important to identify the information that the public *needs* in order to make informed decisions about climate change and how this may be integrated into cultural models of climate change. Rather than dismissing the value of the air pollution framework, I have suggested that public awareness and moral concern about pollution might be used to highlight the importance of taking action to address climate change. At the same time, the distrust of industry implicit in this association must be addressed if information is to be viewed as credible and individual action believed to be part of a wider concerted effort to tackle climate change (Jasanoff & Wynne, 1998). As well as building on existing knowledge, communication about the environment must resonate with individuals' values, cultural concerns, and perceived agency (Hinchliffe, 1996).

6.4 UNCERTAINTY AND TRUST

As I discussed in Chapters 1 and 2, climate change is a global and long-term issue that has principally been exposed and defined by scientific measurement, and communicated through second-hand media sources to the public. Since climate change cannot be directly 'seen' or experienced, the credibility of sources of second-hand information fundamentally influences whether climate change is perceived as a genuine and serious risk. The interview and survey data expose the criteria that the public apply in interpreting and validating information about climate change. The resulting perceptions of the issue are often divergent from mainstream scientific and political conceptions. In particular, this research has exposed the extent to which uncertainty about the reality and human causes of causes characterises public understanding of the issue. As I described in Chapter 1, while there remains scientific uncertainty and political disagreement over climate change the majority of scientists and governments have accepted the IPCC's conclusion that human activities are significantly affecting climate. The interview data highlights the way in which the public draws on evidence and arguments for and against the reality of anthropogenic climate change in constructing their understanding.

On one hand, sensory evidence of unusual weather and the weight of expert opinion indicated to respondents that anthropogenic climate change is a reality. As I have discussed, weather tended to be equated with climate. Media coverage and personal experience of extreme weather events contribute to a widespread acceptance that climate is changing. A recent survey in Wales found that 85% of the public believe changed weather patterns are "proof of a changing climate" (Bibbings, 2004a, p.ii). However, my research shows that a significant proportion of respondents are uncertain about whether these observed changes in weather are the product of human activities or simply naturally-occurring fluctuations. Thus, while sensory evidence is a highly credible source of evidence for changes weather patterns, it remains the privilege of science to expose the causes of these changes.

Yet, although scientists are considered trustworthy, science is inherently uncertain. Furthermore, media reporting of disagreement about the causes and severity of climate change both from within the scientific community and the broader political world seems to have fundamentally influenced the public's perceptions of the issue. Previous research has shown that uncertainty about climate change is magnified through media communication, which tends to emphasise - intentionally and unintentionally - scientific and political controversy surrounding the issue (see Section 2.2.3.5). Yet, others have suggested that the public may perceive controversy in more polarised terms than it is reported (Hargreaves et al., 2003). This study has shown that a significant proportion of the public is sceptical about anthropogenic climate change because they perceive the scientific evidence to be contradictory, unreliable or partial, and media reporting to be exaggerated, misleading or untrustworthy. Indeed, many are well aware of scientific debate concerning the reliability of climate indicators and models. This suggests a more critical awareness amongst lay audiences of the credibility and validity of different sources of climate change information than has previously been indicated.

This research has shown that trust is fundamental in determining how climate change information is perceived. People who trust information about climate change are more likely to believe climate change is a real and serious issue. While scientists and scientific evidence are generally considered trustworthy, few people have direct access to scientific information or feel they can understand it. The media is the most common source of information on climate change, and yet is viewed by many as unreliable and untrustworthy. These findings are consistent with previous research on public trust in information (Worcester, 2001; Hargreaves et al, 2003). MORI (2005) very recently noted that 72% of the UK public think the media sensationalises science issues.

However, public uncertainty in relation to climate change is not simply a product of divergent or sensationalised messages presented in the media. Indeed, this research highlights the various ways in which uncertainty is constructed and used by different social actors. Analysis of survey responses suggests that uncertainty about climate change is related to environmental worldviews and to preferred strategies for responding to the issue. This is consistent with cultural theory, as outlined in Chapter 1 (O'Riordan & Rayner, 1991). This study shows that respondents who hold an NEP worldview, seeing nature as fragile, are more likely to deny uncertainty about climate change and to see a need to take *preventive* action to mitigate the threat. Corbett and Durfee (2004) similarly note a significant correlation between pro-environmental values and certainty about the reality of climate change. Meanwhile, the most uncertain respondents in my study were less likely to take action in response to climate change, indicating a rejection of the precautionary principle and preventive strategies. This approach to dealing with uncertainty may reflect a valid preference for *adaptive* strategies for dealing with environmental uncertainty, and for maintaining economic development regardless of potential environmental costs. In other words, uncertainty may be used to justify a preferred course of action. Whether this preference entails economic progress or environmental protection, uncertainty effectively provides "mental space for self-serving bias" (Fortner et al, 2000, p.139). As I described in Chapter 1, there is also evidence of the mobilisation (and denial) of scientific uncertainty by different political actors to support their agendas (e.g., Day, 2004; Phillips, 2004).

An alternative interpretation of the relationship between uncertainty and inaction draws on psychological theories of cognitive dissonance and coping (Festinger, 1957; Lazarus & Folkman, 1984). Since climate change poses a challenge to developed countries' attitude to consumption, it may be easier to deny that the issue is real than to admit such uncomfortable truths (cf. Slovic, 1986; Slovic et al., 1979). Furthermore, the physical threat to the well-being of oneself and one's family from climate change is likely to be a source of anxiety that individuals deal with through denial (Hillman, 2004). At the level of the individual, this denial may seem appropriate in view of the US position of not introducing mitigation policies until further research has been carried. It is therefore unclear whether doubt about the reality of climate change is a *post-hoc* rationalisation of personal energy use, or a scientifically-informed opinion that *leads to* the conscious decision not to act. This distinction is an issue of *causality*, and therefore cannot be elucidated by the data.

The public's ambivalence about climate change contrasts with the position and rhetoric adopted by most governments and environmental NGOs on the issue. In response to predictions made by the IPCC, the UK government and others have developed a range of policy measures to tackle climate change. Government exhortations for the public to reduce energy consumption refer to scientific 'consensus' and the 'facts' of climate change. For example, the Energy Saving Trust's energy conservation guide states: "the world's scientific community is now agreed that climate change represents a calamitous threat to our environment" (EST, 2002, p.1). However, the credibility of this government information is undermined because it conflicts with public perceptions of scientific uncertainty and political disagreement over the reality and severity of anthropogenic climate change. Even terminology differs between official rhetoric and public discourse. While the public is more familiar with the term *global warming*, scientists and policy-makers more commonly refer to *climate change* (cf. DEFRA, 2002). Other research has similarly noted that the notion of "sustainable development", which has proved very popular amongst local and national governments, does not resonate with the public (Macnaghten & Jacobs, 1997). This parallels the theme discussed in Chapter 4 relating to the disconnection and lack of understanding between flooding authorities and flood victims. This divergence serves to undermine trust and legitimacy of decision-making bodies.

Others have also noted that controversy over risks can exacerbate divergences between expert and public evaluation and erode experts' credibility and confidence in the risk decision process (Kasperson et al., 1988). A recent UK survey found that BSE, Foot and Mouth, and GM food - and to a lesser extent climate change - were identified by the public as issues that have undermined their trust in science (Hargreaves et al., 2003). As Wynne (1992) observes, there can often be "issue overspill" whereby emerging risk issues are perceived in the context of previous controversies and authorities' ability to manage them. These scientific controversies effectively erode the popular 'myth of science' (Midgley, 2004), which assumes that science provides certain and indisputable knowledge on which political and personal decisions can reliably be made. This is an unrealistic expectation of what science can offer, as studies in the history and sociology of science have demonstrated (e.g., Collins & Pinch, 1993). In the case of climate change, there remain major gaps in understanding and margins of error in predictions (Houghton, 2004). The evidence for climate change is correlational; the impacts cannot be identified deterministically, only probabilitistically. A deliberative focus group study found that participants exposed to the scientific and political uncertainties surrounding climate models and policy options were initially surprised to discover that climate change models and "experts" could not provide clear-cut policy solutions (Kasemir et al., 2003a). There is clearly considerable disparity between public expectations and scientific capacity to provide certainty.

This expectation that science provides objective certainties about the world is promulgated by science education that focuses on teaching science as a body of unchanging 'facts'. As a result, the public is ill-equipped to deal with media reports of difference of scientific opinion. A recent survey found that around two-thirds of the UK public feel 'there is so much conflicting information about science, that it is difficult to know what to believe' (Poortinga & Pidgeon, 2003). The public are more likely to be able to deal with contradictory information if they understand the inherent uncertainty of scientific evidence and instability of scientific theory (Office of Science and Technology and The Wellcome Trust, 2000). This highlights a need for a science education that exposes the social dimensions of scientific knowledge construction. This is a particular focus of the Nuffield 21st Century Science GCSE program, which has recently been piloted (Science and Education Group, University of York & Nuffield, 2004). Demythologising science in this way, by revealing that experts are "only human", may effectively reduce the lay-expert divide and encourage public engagement in science.

There is similarly a need in government communication for greater transparency about the degree of uncertainty of scientists' conclusions. In many of the recent scientific controversies, like BSE, the government has tended to present scientific information as being undisputed, unchanging 'fact'. However, the Jenkin Report (House of Lords Select Committee on Science and Technology, 2000) warns that suppressing uncertainty diminishes public trust and respect. The public wants to be given information about risks to enable them to make informed decisions, even where there is uncertainty over the existence or extent of a problem (Frewer et al., 2002; Eurobarometer, 2001). They object to dishonesty, incompetence and inaction on the part of government in relation to potential threats to public health and well-being (e.g., Kasemir, et al., 2003). As the Jenkin Report concludes, "admitting to uncertainty does less harm than trying to conceal it", since it prepares the public for a shift in scientific consensus and consequent changes in policy. Similarly, there is a need for more responsible journalistic practices in reporting of risk and uncertainty. Corbett and Durfee (2004) found media reporting of controversial scientific findings (e.g., of thickening ice sheets) is less likely to produce audience uncertainty if it provides a *context* for the story (i.e., that more studies have found ice is melting). Recent guidelines on science communication produced by a number of scientific institutions similarly highlight the need for journalists to indicate the wider significance of scientific findings (SIR/RS/RI, 2001).

Yet, many argue that the scientific uncertainty that characterises climate change demands a more central role for public debate about policy *options*. As I have indicated, scientific uncertainty is interpreted and mobilised in different ways according to cultural and personal preferences. It is therefore questionable - both democratically and scientifically - whether decisions based on uncertain assessments should be made without involving a range of social perspectives. Research shows that, contrary to what many science communicators assume, the public is used to dealing with uncertainty in everyday life (Wynne, 1992; Gough et al., 2003). There are indications that deliberative focus groups involving experts and lay participants provide an appropriate forum for scientific uncertainty and moral ambivalence to be exposed and examined (Kasemir et al., 2003b). Lay participants were able to use complex and uncertain scientific information as heuristics in their discussion and decision-making (Gough et al., 2003). In fact, scientific uncertainty was not as problematic in decision-making as moral ambivalence about alternative types of social development, ranging from business-as-usual to major energy reduction scenarios. Participants realised that climate change challenges social values and lifestyles, and that responding to it involves trying to balance positive and negative outcomes for present and future generations (Kasemir et al., 2003b). Findings from these groups indicate that ambivalence about tackling climate change may not necessarily be resolved, but extending the debate to include a broader range of perspectives will result in more democratic and transparent policy-making.

6.5 DISSOCIATION OF ONESELF FROM CAUSES, IMPACTS AND RESPONSIBILITY IN RELATION TO CLIMATE CHANGE

As expected from previous research (e.g., DEFRA, 2002), very few participants identified domestic energy consumption as a cause of climate change. This may well be because this contributor to climate change does not have the visible, experienceable presence of vehicle and industrial pollution, which were most commonly cited. It may also reflect a commonly observed tendency to deny one's own responsibility for environmental problems (e.g., Evans et al., 1988). This is consistent with other findings from this survey, for example that car owners are significantly less likely to identify vehicle pollution as a cause for climate change. As I will discuss further in

Section 6.6, this research has found that individuals tend to emphasise the responsibility of others for both causing and tackling climate change.

The research also suggested that the public's understanding of the risks from climate change is biased towards global and future impacts. When asked why they felt the issue was personally important, respondents most often cited concern for future generations. Similarly, interviewees explained that climate change was not a priority concern because it posed no direct threat to them. This supports the findings of previous studies that show the public tends not to see climate change as a direct or serious risk (see Section 2.2.3).

Thus, the public not only dissociates themselves from the causes of climate change, they also tend to dissociate themselves - both temporally and spatially - from the main *impacts* of climate change. This was also a finding of a recent survey by the Energy Saving Trust (2004): 85% of UK residents believe that the effects of climate change will not been seen for decades. In Chapter 2, I reviewed the main reasons why climate change is not perceived as a direct threat. The characteristics of climate change - a complex, uncertain, global, long-term risk embedded in familiar and natural cycles - conspire against the issue being rated as a threat. Alternatively, under-rating the risk of climate change may be a psychological defence mechanism of denial in the face of stressful or threatening information (Hillman, 2004a). Indeed, there is some support from other research that the belief that climate change is a future-oriented issue has a greater emotional than rational basis. A survey in Wales (Bibbings, 2004a) showed no difference in concern or beliefs about the consequences of climate change between respondents with dependent children and those without. This apparent inconsistency warrants further research (Section 8.4).

There appears in some respects to be a paradox: on one hand, we saw in Section 6.2 that respondents conceptualise climate change in terms of the familiar and experienceable; yet on the other hand, they do not identify themselves as affecting climate change or as being affected by it. This paradox may be an inevitable characteristic of global issues like climate change. As discussed, global issues are difficult to conceptualise. As disparate, global phenomena, they can only be experienced *indirectly* through certain localised impacts (e.g., changes in weather). Primarily, people learn about them second-hand through scientific measurement and (third-hand) media reporting. Familiar concepts and experiences are applied to explain unfamiliar phenomena like climate change in terms that are meaningful.

However, with any large-scale social or environmental problem, the link between individual action and aggregate consequence is dislocated (Rayner & Malone, 1998): people cannot see the consequences of their actions. Without receiving 'feedback' on the impact of one's actions, people may not be aware that they are damaging (Bandura, 1971). On the other hand, this research indicates that most people are aware of the role of human activities, including car use, in causing climate change. Although these activities do not have an immediate and observable impact on climate, they are also difficult to sacrifice. Where people highly value the freedom, independence, comfort and status afforded to them by their car, for example, they will be unconvinced by arguments to give up such a central part of their identity and lifestyle. Thus, personal dissociation from the causes of climate change may be a strategy to reduce the cognitive dissonance that arises from awareness of climate change and the desire to continue using energy freely. In sum, there is little to motivate people to mitigate a problem that poses no certain, immediate or obvious threat; and which involves sacrificing what have come to be considered essential and highly symbolic aspects of our high-consumption lives. This highlights the role of social and institutional context, particularly beliefs about personal freedom and perceived equity of consumption, in determining the public's response to large-scale problems like climate change (see Section 6.6). As I will discuss in Chapter 8, policies must address these social and cultural barriers to individual energy reduction, and highlight the ways in which climate change both results from and threatens present standards of living.

6.6 THE ROLE OF SOCIAL AND POLITICAL CONTEXT IN DETERMINING AND CONSTRAINING INDIVIDUAL RESPONSE

The survey found that an overwhelming majority of respondents (83.3%) agreed that 'we can all do our bit to reduce the effects of climate change' and most (61.4%) claim to feel a moral obligation to do something about climate change. Awareness of the need to act and willingness to do so has also been found in other studies. A BBC (2004) poll, for example, found that 85% of the British public say they 'would be prepared to change the way they live in order to lessen the impact of global warming'.

Yet, despite these positive findings, there is a prevailing sense that individual action has a limited impact on climate change. Interview data from my research highlight this:

> "Well sometimes I feel we're wasting our time [recycling], 'cause so many other people don't do things, recycle their bottles and things." [Female, housewife]

> "I still get the feeling that the man in the street can't do very much himself. Okay, I'm one of those people who says 'I won't use my car if I don't have to. I will walk; I will cycle, in preference'. That's my little bit, but I don't know that my little bit does very much". [Female, retired teacher]

The BBC poll (2004), similarly, found that little over half the population (54%) agreed that changing their own behaviour would have any impact on climate change. As I have already discussed, the public tends not to acknowledge responsibility for causing climate change. **Yet, this research has shown that another major cause of individuals' doubt about the efficacy of their own action is social, political and institutional distrust.** As Bibbings (2004b) notes, the public accepts in theory that responsibility for environmental problems should be shared between society, business, industry and government but perceives that, in practice, "nobody is living up to their side of the bargain" (p.103). Here we can see parallels with many of the issues that were raised in discussion with flood victims about perceived responsibility, blame, trust and self-efficacy.

6.6.1 Social context

Overall, there was a sense amongst participants that controls should be put in place in order to ensure that responsibility is accepted equitably and the system is made fairer. This was because they implicitly acknowledged that environmental problems are collective, but evidently had little faith in other people to share responsibility for them. The following extract highlights the way interviewees generalised about other people's apathy in relation to climate change:

> "Unfortunately <u>a lot of people</u> won't bother because there's the whole you know, cost. Because I suppose climate change, global warming, it's something 'cause you can't really, I mean really see it, it is a long-term issue that's going to be- and <u>a lot of people</u> say 'well, look it's not going to be in my lifetime, it's not necessarily going to affect us'. So I suppose you get into a society where people kind of- it's a throw-away society, don't you, and <u>a lot of people</u> are not really interested". [Female, social researcher; emphasis added]

Some interviewees described "human nature" as inherently selfish, apathetic or money-oriented, and argued for the need to provide incentives for behaviour change. Over two-thirds of survey respondents agreed that 'people are too selfish to do anything about climate change'. Interviewees suggested that people will inevitably or "naturally" do whatever is the easiest and cheapest option, and that therefore structures need to be changed (as in other European countries) to make environmental actions beneficial (or at least less costly) to individuals:

> "I don't think the incentives are there… many people will not make what they regard to be a sacrifice". [Male, economics lecturer]

Of all attitude statements, the highest proportion of survey respondents (89%) agreed that the government should provide incentives for pro-environmental action. Consistent with this, two interviewees pointed out that the appeal to "altruism" won't work, for example:

> "I mean if you can make, um, helping attractive by saying you're helping yourself, as well as you know the rest of humanity, then I think you er know, appeal to people's selfish nature, they're more likely to do things than if you say you know 'do it for someone else'". [Female, housewife]

Similarly, most survey respondents agreed that radical changes to society are needed to tackle climate change (72%) and that people should be *made* to reduce energy consumption (80.9%).

Overall, it was clear that individual efficacy in relation to climate change was limited by perceptions of inaction, selfishness and cynicism across society. In other words, where there is a prevailing social norm to freely consume energy and regularly drive a car, this deters individuals from changing their behaviour. The influence of social norms has been established in other environmental behaviour research (see Section 2.3.3.4). Bibbings (2004b), for example, notes that people admit to being more likely to add to existing litter than to litter in clean areas.

There was some evidence of what Grove-White (1996, p.269) has referred to as "mounting fatalism" amongst the public, since several interviewees described being unhopeful about the possibility of mitigating climate change. Some felt it might already be too late to take any effective action:

> "…is the reaction sort of come too late? Is there- there's already too much carbon emissions and stuff, in the atmosphere?" [Female, social researcher]

> "We'll never be able to sort it out unless we take some action right now, and maybe we are too late even now." [Male, social researcher]

There was a sense that we are locked into a system which is very difficult to change. As one interviewee described it, changing society is like trying to turn round "a supertanker". Another described the social constraints on options for climate change mitigation:

> "Sadly I see it as, um, it's like a sort of inevitable cycle that we're caught under. I don't know what- what we can do about it without completely restructuring society. And I think it's linked in with… the way economies work and the way societies work". [Male, social care inspector]

In terms of communicating climate change, there is evidently an argument for providing more empowering and practical messages of hope about the possibilities for mitigating climate change. More generally, however, perceived inequality and apathy in society's response to climate change can only be addressed through implementing bold and equitably-enforced policy measures. Certainly there seemed to be a clear acknowledgement of the social dilemma underlying environmental problems (Hardin, 1968; Dawes, 1980) and the role played by cultural context in determining valid options for behaviour. In Chapter 8, I will discuss how equitable enforcement of climate change mitigation policies might be balanced against the need for more democratic and participatory approaches to policy-making.

6.6.2 Political and institutional context

This research and other studies (BBC, 2004; DEFRA, 1997) show that the public tends to believe international organisations, followed by national government, are best placed to tackle climate change.

> "It is an international problem… you've got to work globally". [Male, social researcher]

Again, however, survey respondents and interviewees had **little faith in the efficacy or equity of international and national action.** In particular, there were two common issues that interviewees raised in relation to international inaction and inequity: US rejection of Kyoto; and difficulties enforcing Kyoto in developing countries. The following extracts point to interviewees' concerns about global equity - a theme also identified in other research on public perceptions of climate change (Darier & Schule, 1999):

> "In order to have any great effect, you've got to have all the countries of the world involved, um, and it's all very well we in the West tidying up our- tidying up our act… um, but I- we take advantage of the Third World countries… we've got to take responsibility, more responsibility and not just, er, sweep it off to another part of the world". [Male, retired]

> "You know, when America sells its share of pollution to a country that doesn't create much, and says 'oh we can create more, because that counter-balances what you don't create'. Things like that strike me as very unfair. I wouldn't know how to sort it, but it's got to be a fairer way of going about it, I'm sure". [Female, retired teacher]

Several interviewees also referred to the unrealistic or unfair expectation for developing countries to conform to international agreements to reduce emissions. One called it a "double standard", because the West ought to be leading the way. Although developing countries are producing considerable emissions, they "haven't got the resources" to transfer to renewable energy sources while concentrating on "feeding the poor". One interviewee explained:

> "You can understand when there's developing countries and sort of emerging countries

> like India and China and places like that turn around and say ‘well, why should we give a shit; look at what Britain- well look at what Europe and the Americans have been like for the last hundred years, why should we do anything?’” [Male, IT consultant]

A recent survey (Norton & Leaman, 2004) found that 50% of the British public have never heard of the Kyoto Agreement. This low awareness may account for the high proportion (35.1%) of survey respondents in my study who chose ‘neither agree nor disagree’ to the statement ‘the United States should take most of the blame for climate change’. However, the interview data suggests that for people who do know about the US rejection of the Kyoto Protocol their perceptions of the efficacy of their own action is likely to be affected:

> “I’m impotent in a way because, like, America didn’t sign up to the Kyoto Agreement and they just seem to be so stupid about it, so self-interested, so unwilling to co-operate that it makes you want to bang your head against a wall. It makes me feel impotent in that sense. And therefore maybe that points to why I don’t buy the products that I should be buying”. [Female, social researcher]

There was considerable blame placed on the US for being very environmentally damaging, particularly when some interviewees pointed out they should be leading the way in mitigating climate change. One even called it: “probably the most corrupt regime in the world”, because of the influence of “big business” in policy-making, including the non-ratification of Kyoto. There was also a more general criticism of the US lifestyle as being decadent and hypocritical:

> “It does annoy me that, you know, there’s one country that’s responsible in the world for most of it. You know, obviously we create a lot as well, but the United States is very wasteful”. [Male, social care inspector]

> “In America they talk about- too much on environment but they do, you know, very little about the damage… they prefer to have, you know, comfortable life, say, at the expense of somebody they don’t know”. [Male, social researcher]

Participants’ perceptions of international inaction also included the UK government. Most survey respondents agreed that ‘the government is not doing enough to tackle climate change’ (68.5%). Interviewees and survey respondents evidently felt the approach to mitigating climate change should be top-down. Although some interviewees did acknowledge that it is risky for politicians to introduce environmental measures when there are pressing social issues, it was agreed that there needs to be “the political will to make difficult decisions”. Here, some felt “pressure groups” could encourage government to act.

In general, interviewees felt the government should be encouraging the public to mitigate climate change in three main ways: incentives and penalties; infrastructure and facilities; and education. The recently introduced congestion charge in London was mentioned as an effective way of changing behaviour, because "people respond to [dis]incentives". Others pointed out that improving public transport and recycling facilities will "make it easy for people". Finally, some interviewees argued that the government needs to raise awareness about the problem of climate change, the impact of individuals' behaviour, what they should be doing, and how they will benefit:

> "If you don't know there's a problem, it's not going to change your behaviour, are you? … But I think government can inform and suggest ideas that perhaps might not occur to, er, some people." [Female, housewife]

> "The message that probably needs to be got out more is, you know, save the planet and save money." [Male, IT consultant]

In fact this message is precisely the focus of the Energy Saving Trust's recent campaign *Save Energy, Money, Environment*. Whether or not interviewees were aware of this campaign, several suggested there is a need for more public information of this kind.

However, the survey and interview data also highlight the *lack of trust in national government*. Only a third (35%) of survey respondents agreed that 'for the most part, the government honestly wants to reduce climate change'. One interviewee commented:

> "Eighty per cent will tell you that Blair's not doing the right thing at the moment, so I mean what chance do we have with global warming?" [Female, pub/ restaurant owner]

Another interviewee described politicians as hypocritical, referring to John Prescott's two Jaguars, which undermines the government's credibility with regard to environmental policies.

There was a sense amongst interviewees that governments and individuals alike will always avoid change, and that they will focus on more immediate, short-term concerns. They felt environmental issues would only be acted upon once there are undeniable and catastrophic impacts, and often without any "genuine commitment". The view that financial concerns were always central in institutional decision-making was raised here, as well as in discussions about flooding (Chapter 4). Several interviewees talked about the government "buying their way out of trouble" over the climate change issue, for example trading carbon emissions, exporting pollution to developing countries, relying on technology to provide solutions, and only acting if climate change was "made profitable". This lack of trust in government was evident in survey respondents' views about trustworthy sources of climate change information (see Section 5.2.2.4). Other research has also demonstrated the UK public's distrust of government and politicians, and their lack confidence in the government to tackle climate change (see Section 2.2.5.2).

Business and industry were also criticised by participants. Most survey respondents (86.5%) agreed that ‘industry and business should be doing more to tackle climate change’. Some interviewees evidently had little trust in business and were cynical about “green” products, which exploit environmental concern and offer little environmental benefit:

> “…where it says, ‘this cup-holder’s made from 100% recycled fibre and uses half the fibre a second cup would take’. Wow, gosh! I have saved the planet, by using this! You know, it’s just- I think a lot of the time, the environment is used as a marketing gimmick, and I’m quite cynical about companies and their green… sort of credentials… when all is said and done it’s cost first, and all other considerations second”. [Male, IT consultant]

As discussed earlier, blame was often placed on business and industry for causing climate change. Over half the survey respondents agreed that ‘pollution from industry is the main cause of climate change’. One interviewee also blamed industry for selling high-energy goods to individuals: “*they* sold us these products”. At the same time, however, some interviewees viewed technology, for example less polluting vehicles or other products and alternative sources of energy, as offering solutions to climate change.

6.6.3 Deflecting personal responsibility

The interview data reveals the way in which blame is used to deflect personal responsibility for climate change. As this section has highlighted, survey respondents and interviewees identified a number of other parties - government, the US, business, ‘other’ people - who they felt are responsible for causing and tackling climate change. For example, one interviewee defended his own car use by pointing to emissions from other countries, industry and public transport:

> “I could certainly stand and argue with someone that cars aren’t the big polluting evil that bike-riding hippies say they are… they’re not the only culprit. I mean you know power stations are probably doing a pretty good job, industry does a fantastic job of polluting the world, um, and when all is said and done, you know, everybody used to make out it’s Britain being worse, the ‘bad man of Europe’, but it’s more global than that, and when all is said and done our cousins in the colonies are doing a very good job of- I mean you go to the States and it’s quite scary… [they say]‘you know, you should take the trains’ but trains are powered by electricity and power stations, you know, so…”

He concluded:

> "…you don't beat yourself up over how awful we are, because you know there's a lot of people who are a lot worse". [Male, IT consultant]

This shifting of blame to culturally agreed scapegoats, such as the US and industry, reflects a concern for justice in relation to risk creation, and simultaneously differentiates oneself from morally culpable parties (Douglas, 1992). This strategy for justifying personal energy consumption by denying or displacing personal responsibility was also evident in Stoll-Kleemann et al.'s (2001) Swiss focus group study. They found that respondents denied their actions were significant in contributing to climate change, highlighted impediments to taking energy reduction action, or pointed to other ways in which they protected the environment, in order to defend their energy-dependent lifestyles.

I have also described interviewees' tendency to talk about "people" as an abstract concept in relation to the environment, without including themselves in the same category. This is another strategy to distinguish personal from social responsibility, which has been observed elsewhere. For example, the Scottish Executive's survey (Hinds et al., 2002) found that, while a majority (77%) agreed that 'most people in Scotland today need to change their way of life so that future generations can continue to enjoy a good quality of life and environment', the proportion agreeing that they *personally* need to change their way of life fell to less than half (46%). O'Riordan (1976) describes the distinction individuals often draw between personal responsibility and social morals or norms. While someone might accept the need within society to reduce population, they may personally choose to have more than two children. This denial and displacement of personal responsibility serves to reduce the evident dissonance between attitudes and behaviour in relation to climate change and allay feelings of guilt and threats to self-interest (Stoll-Kleemann et al., 2001; cf. Festinger, 1957).

6.7 HETEROGENEITY IN UNDERSTANDING AND RESPONSE

Analysis of the survey results and interview data highlights the variation that exists in the public's understanding of and response to climate change. Although the participants in this research live within a relatively small area of the country, a range of personal and social factors nevertheless significantly affected how they perceived, understood and responded to climate change.

6.7.1 Demographic factors

6.7.1.1 Age

Age evidently influences both level of knowledge and affect in relation to climate change. Younger survey respondents (those aged 16-24) are more likely to have learnt about climate change through formal education and the Internet. This is unsurprising since recent school and university leavers will have benefited from inclusion in the curriculum of environmental education; and younger people are the most likely to access the Internet (Eurobarometer, 2001). Furthermore, 16-24 year-olds are significantly more likely than any other age group to consider the issue to be personally 'very important'. Younger age groups (ages 16-44) tend to believe individual action to be efficacious, and to be less sceptical and more frightened about climate change. This may suggest that younger people are aware that they are more likely than older generations to experience the increasingly severe (future) impacts of climate change. Consistent with this interpretation, respondents aged 65 or over were shown to be significantly less likely to feel they are being, or will be, affected by climate change. Similarly, of those respondents aged 25-54 who rated the issue as very important, significantly more said this was due to concern for future generations. These findings seem to contrast with other studies that indicate younger people are *less* concerned about climate change, and less likely to feel individual action can make a difference in mitigating environmental problems, than older people (e.g., Bibbings, 2004a; MORI, 2002). This discrepancy highlights a need for further research in this area (Section 8.4).

Consistent with previous studies (Witherspoon & Martin, 1991; DEFRA, 2002), older respondents (those aged 75 or over) are significantly more likely to say they know little or nothing about climate change. Behavioural patterns were shown to vary amongst different age groups: older (55-84) respondents are the group most likely to recycle items other than glass, while younger people are more likely to walk, cycle or use public transport. These findings are consistent with findings from other recent surveys (DEFRA, 2002; MORI, 2002) and remind us that motivations for 'impact-oriented' pro-environmental actions are often unrelated to environmental concern.

6.7.1.2 Gender

Gender also plays in role in knowledge, concern and response to climate change. Consistent with previous research (e.g., DEFRA, 2002), men are generally more informed and more knowledgeable about climate change. For example, the proportion of women who have not heard of climate change is significantly higher than amongst men; while men are more aware than women of the causes of climate change. Women, however, are more likely than men to *trust* information about climate change and to consider the issue to be personally 'very important', particularly because of health impacts and out of concern for future generations. In general, men are more pessimistic about climate change and tend to believe individual action to be of limited efficacy. Women tend to feel that climate change is frightening, that they have a moral obligation for tackling climate change and that more action should be taken by others (society, industry, business, government) to tackle it. While women are more often motivated by environmental concern to take certain actions, men are more often motivated by financial concerns.

These findings are consistent with the wider psychology literature, which show women tend to be more concerned about environmental and risk issues (e.g., Barnett & Breakwell, 2001; Hampel et al., 1996). While there is widespread agreement that such gender differences are likely to arise from socialisation (Gustafson, 1998), how this contributes to greater environmental concern is less well-understood. Some research suggests that women tend to be more emotional in their reactions to environmental problems (Grob, 1991, cited in Kollmuss & Agyeman, 2002). Stern et al. (1993) suggest that women do not necessarily value the environment more than men do, but they are more likely to make connections between environmental conditions and their values. Other researchers (e.g., Gustafson, 1998) argue that gender differences in risk perception may also arise from differences in power relations with, and trust in, risk-producers and risk-handlers.

This study also shows that men are significantly more doubtful about the reality of anthropogenic climate change than women. Men are similarly amongst those identified in previous research as being the least convinced that climate change is real or anthropogenic (DEFRA, 2002). Interestingly, this may be related to a greater capacity amongst women for dealing with ambiguity and uncertainty noted elsewhere (Haste, 2004a).

6.7.1.3 Income

'Very high' income respondents are more likely to hear about climate change from the Internet and journals than those on lower incomes. Those on 'low' and 'very low' incomes are more trusting of climate change information from government and energy suppliers than those on higher incomes. Significantly more respondents on higher incomes mentioned fossil fuel consumption as a cause of climate change, while lower income groups are more likely to know little or nothing about climate change and to feel they are not, and will not be, affected by climate change. This calls into question Bibbings (2004a) contention that those in higher social classes are simply more confident about their knowledge of climate change, and not necessarily more knowledgeable. **Yet, there seems to be a discrepancy between knowledge and action:** those on 'very high' incomes are significantly *less* likely to recycle glass, while lower income groups are least likely to drive. However, motivation is relevant here. Higher income respondents who take environmentally-relevant actions more often do so out of concern for environmental protection or moral obligation (cf. DEFRA, 2002). As already discussed, this suggests partial support for the theory of postmaterialism.

6.7.1.4 Education and newspaper readership

Education and newspaper readership influence a number of dimensions of understanding and response in relation to climate change. Graduates and broadsheet readers are generally more informed and interested in climate change, while tabloid readers are more likely to trust information about the issue. Graduates and broadsheet readers are more aware of the causes of climate change, including carbon emissions, and to believe climate change will affect them. The proportion describing the mechanism of climate change in terms of heat/ gases being trapped in the atmosphere is significantly higher amongst those with postgraduate qualifications. When asked how climate change could be tackled, significantly more broadsheet readers mentioned reducing fossil fuels, carbon/greenhouse gas emissions, and energy use; they were significantly less likely to identify CFC reduction. In contrast, the proportion stating they know little or nothing about climate change is significantly higher amongst people without formal qualifications and those who do not read broadsheet newspapers. These findings are consistent with previous studies that show education positively influences knowledge about climate change (see Section 2.2.1). Yet, this research shows that while highly educated respondents are more knowledgeable about climate change, education (particularly in science subjects) and broadsheet readership are also significantly related to doubt about the reality of anthropogenic climate change. The implications of this are discussed in Chapter 8.

Self-efficacy and responsibility is also shown to be related to education. For example, those without formal qualifications are most likely to feel that their actions do not contribute to climate change and that there is no point in taking action since no-one else is. Graduates and broadsheet readers, on the other hand, are significantly more likely to say that climate change can be tackled, that they take actions to protect the environmental, and that they act specifically out of concern for climate change (though generally these actions do *not* relate to energy-reduction). This is consistent with previous research that shows people with a higher level of education believe they can do more to influence situations and political processes (Curtice & Seyd, 2003) and are more likely to take environmental action (e.g., Hines et al., 1986-7).

6.7.1.5 Political affiliation

Previous studies have not examined *political affiliation* in relation to public perceptions of climate change, despite evidence of widespread public distrust and perceived governmental inaction in relation to the issue (Section 2.2.5.2). However, this study has shown that political affiliation plays a role in how climate change is perceived. Labour voters, for example, are more trusting of and interested in information about the issue. Conservative voters are more sceptical about claims relating to anthropogenic climate change and are least likely to agree strongly that industry/

business should be doing more to tackle climate change. Non-voters are more likely to feel there is no point in taking individual action because no-one else is. This group is also significantly more likely to say that they are not, and will not be, affected by climate change and that they do not know whether climate change can be tackled. Consistent with this, they are also significantly less likely to be taking personal action out of concern for climate change and to recycle glass. This supports Witherspoon and Martin's (1991) finding that political engagement relates to environmental action. Together, these findings highlight the influence of institutional relations on public response to climate change.

It should be noted that the survey did not elicit *ethnicity or nationality*, which may also have influenced understanding and response to climate change. However, international surveys have indicated remarkable similarity, at least amongst most developed countries, in public perceptions of climate change (Dunlap, 1998; Bord et al., 1998).

6.7.2 Experiential factors

The survey sought, in particular, to examine the influence of relevant experience on understanding and response to climate change. A quarter of survey respondents (25.3%) had experienced flood damage, and the same proportion (24.4%) claimed their health has been affected by air pollution. Over a third (35.7%) said that air pollution has affected the health of family members or friends. There is a large overlap between this group and those who said their own health has been affected: 83.3% of respondents whose friends/family have been affected said they have been affected themselves (Cramer's V = 0.57***). 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.

The data indicate that experience of the health effects of air pollution relates to a number of dimensions of understanding and response. Firstly, respondents whose health or whose family/friends' health has been affected by air pollution are generally more informed about climate change and more likely to consider the issue to be interesting and personally 'very important'. They are more likely to feel the issue is important because of the health impacts, and to be more pessimistic about the impacts of climate change in general. Similarly, they are more likely to believe they are, or will be, personally affected by climate change, and that this is/will be in terms of impacts on their health. Bord et al. (2000) similarly noted a significant relationship between perceived risk from air pollution and perceived risk from global warming. Since air pollution is commonly understood as the main cause of global warming, it may be that **experience of local**

pollution enables people to more readily accept the risks associated with 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.

In contrast to respondents with experience of air pollution, the survey found that flood victims generally do not differ from others in their understanding and response to climate change. Even flood victims who indicated in the survey that climate change is an issue of personal importance were no more likely than other people to say this was due to increased flooding from climate change. As I will discuss further in Chapter 8, flooding and climate change are viewed by flood victims as largely distinct issues.

6.7.3 Values and beliefs

6.7.3.1 Environmental values

It is perhaps not surprising that respondents who value the environment most, and members of environmental organisations, are generally more informed about, and interested in, climate change. They are also significantly more concerned about global environmental issues, including climate change, and more likely to consider climate change to be personally 'very important'. This group is significantly more likely to feel certain that anthropogenic climate change is a reality, and that weather patterns are already changing. They are more likely to feel the issue is important because of concern for the environment and a sense of responsibility to act. Consistent with this they are more likely to believe climate change can be tackled, particularly emphasising the role of individual responsibility. They feel a moral duty to take individual action, but also believe in the need for social, political and organisational measures. Furthermore, they are more likely to believe that climate change is affecting, or will affect, them personally; and to be taking actions to protect the environment and action specifically out of concern for climate change. These findings are consistent with the literature reviewed in Chapter 2, which shows environmental values positively predict concern and willingness to mitigate climate change. However, as in the case of gender, **this study has shown some disparity between affect and knowledge in relation to climate change.** In contrast to expert conceptions, those with the highest environmental values tend to understand climate change in terms of ozone depletion. The implications of this for climate change education and policy are discussed in Chapter 8.

6.7.3.2 Trust and certainty

As I discussed in Section 6.4, this research exposes the importance of trust and uncertainty in public perceptions of climate change. Trust in climate change information and certainty about the reality of climate change are closely interlinked and also affect other beliefs and response to the issue. The most trusting and certain respondents are significantly more likely to consider climate change very important and concerning; to believe changing weather patterns are due to human activities; to believe something can be done to tackle climate change; and to take actions to protect the environment. Yet, trust in climate change information does not equate to alignment with expert conceptions: respondents who are most trusting of climate change information are significantly more likely to state that CFCs/ aerosols cause climate change. Furthermore, those most uncertain about the reality of anthropogenic climate change are also more likely to state they know little or nothing about the issue. As I will discuss in Chapter 8, these findings have important implications for policy-makers and educators.

6.7.4 Terminology

The split-sample survey design allowed for a direct comparison of understanding and response in relation to *climate change* and *global warming.* The results show that awareness, affect and knowledge differ significantly according to terminology. Consistent with previous surveys (DEFRA, 2002; Norton & Leaman, 2004), respondents know more about *global warming* than about *climate change*. More significantly, this research has shown that choice of terminology affects *how* the public understands and evaluates the issue. *Global warming* is more often believed to have human causes and tends to be associated with ozone depletion, the greenhouse effect and heat-related impacts, such as temperature increase and melting icebergs and glaciers. The term *climate change* is more readily associated with natural causes and a *range* of impacts. Furthermore, the term *global warming* evoked significantly more concern, and was rated as 'very important' by more respondents, than the term *climate change.* The implications of these findings encompass both methodology and policy. Firstly, researchers must be aware that questionnaire wording will affect the responses given. Secondly, public information about *climate change* may evoke a different, perhaps lower, response than information referring to *global warming*.

This section has highlighted the ways in which understanding and response to climate change vary according to a range of contextual factors. These findings are consistent with previous studies of the public's engagement in science and risk issues (e.g., Wynne, 1991; Pidgeon & Beattie, 1998). Quantitative survey research conducted by the Office of Science and Technology and The Wellcome Trust (2000) and Haste (2004a), for example, highlight the attitudinal variation amongst adults and young people in relation to scientific issues. Attitudes and beliefs differ according to gender, age, education and other factors, such as trust in government and environmental worldview. Qualitative studies also point to the diverse ways in which people's understanding of environmental and 'scientific' issues is grounded within the context of their existing knowledge and experience (Claeson et al., 1996). Wynne (1991), in particular, has argued that this heterogeneity accounts for the failure of many science communication strategies. Since there are many 'publics' representing a range of diverse perspectives, communication strategies should be tailored to appeal to different target audiences.

The next chapter examines this range of personal and social influences more closely in order to determine their relative salience in determining understanding of and response to climate change.

6.8 CONCLUSION: CLOSING THE LAY-EXPERT DIVIDE

The themes discussed in this chapter together highlight the processes through which the public learns about and understands climate change, and how these processes differ from expert understanding. It is clear that the public *integrates* scientific information about climate change with other types of knowledge, and relates it to broader cultural concerns and values in constructing understanding. Individuals evaluate and interpret official information in the context of all other available information - gained from direct experience, the media, and informal social networks. Where this information is inconsistent or unclear individuals can be ambivalent or uncertain about the issue. Knowledge of other environmental issues, particularly ozone depletion, often acts as the basis on which the public assimilates their knowledge of climate change. Cultural conceptions of the environment and human nature are also woven into understanding of and response to climate change, as they are with flooding. Lay understanding is therefore relational (Bruner, 1986), while expert knowledge strives for abstraction from its origin and context. Furthermore, lay people and experts have "different epistemological assumptions concerning what counts as legitimate knowledge" (Irwin et al, 1999, p.1323): lay knowledge is typically informal and more inclusive, while expert knowledge is institutionalised and exclusive. Since individuals relate second-hand information to their personal, social and cultural context, this results in the heterogeneity we see in perceptions of climate change.

This individualised, context-dependent process of constructing understanding is consistent with previous sociological and psychological research in risk and science communication (e.g., Burgess et al., 1998; Irwin et al., 1999; Layton et al, 1993; Wynne, 1991). Firstly, these findings indicate support for the role of institutional and social factors in determining perceptions and response to climate change and flooding. This was particularly highlighted in Sections 6.6 and 4.4. Secondly, they highlight the interactive nature of learning, as described in constructivist theories of learning (e.g., Scott, 1987; Piaget, 1970). This was discussed in Sections 6.2-6.4, and is perhaps most clearly demonstrated in relation to the integration of climate change knowledge into the ozone depletion conceptual framework (cf. Kempton, 1991). I have suggested that the implication of these findings is that effective climate change communication must adopt relational strategies to highlight the relevance of this issue to people's lives in personal and cultural terms with which they identify.

However, while this research highlights important differences between scientific and lay discourses about climate change, scientific and lay knowledge should not be viewed as incommensurate.

> "Such a position is patently nonsensical as experts themselves move between institutional and everyday contexts, and lay people may draw upon elements of expert discourse in their own knowledging" (Irwin et al., 1999, p.1324).

We know from previous research (Wynne, 1991; 1992; Irwin et al., 1999; Kerr, Cunningham-Burley & Amos, 1998; Scott, 1996), and from the flooding interview data discussed in Chapter 4, that local, lay knowledge can be more useful than scientific knowledge within a particular, local context. This arises because 'scientific culture' emphasises generalisation from particular cases to abstract principles and collects data within laboratories (Bruner, 1986; Moscovici, 1984; Irwin & Wynne, 1996). While there is a tendency to equate 'expertise' with scientific knowledge, expertise in fact emerges from extended experience of any activity or occupation (Michael, 1996).

Furthermore, science, as a socio-cultural activity, is influenced by values, interests, perceptual biases, and other human factors (e.g., Collins & Pinch, 1993). In fact, scientists are also members of the public and have 'lay' concerns like non-scientists. Furthermore, scientists use many of the same relational strategies, such as metaphor, to learn and understand the world as non-scientists (e.g., Dunbar, 2001). In addition, as this research and other studies have shown, the public judges and excludes knowledge based on source, credibility and so on, in the same way that scientists do using their own criteria (e.g., Wynne, 1992). Highlighting such commonalities between science and society undermines a 'deficit' or colonialist view of the science-society relationship and facilitates dialogue and mutual exchange. Ultimately both science and society benefit from the integration of lay expertise and scientific knowledge because the quality and legitimacy of decision-making is augmented. In Chapter 8, I will discuss how more participatory approaches to decision-making might be applied to climate change.

Yet, despite these commonalities, a fundamental distinguishing feature of science is its lack of reflexivity (Beck, 1992; Irwin & Wynne, 1996). Science tends to deny its own contextuality and limitations and thus devalues other ways of seeing the world. Furthermore, as knowledge becomes more specialised, experts become less well-informed about related knowledge domains and more differentiated from non-experts in relation to their specialism (Ungar, 2000). It is these features of science which leads to its difficult relationship with society. However, climate change is not simply a 'scientific' issue; it is a fundamentally social, political and cultural one. These broader dimensions necessitate the involvement of all social actors in decision-making. Thus, effective policy-making not only needs to address the informational needs of society, but also the values, norms, institutional relationships, and physical infrastructure that underpin behavioural change.

While there are informational barriers to public engagement in climate change, these should not be overstated. Indeed, this research and previous studies show that there is widespread acceptance that climate change is a real and concerning issue caused by human activities. Arguably, the public does not *need* to fully understand the processes behind climate change in order to participate in decision-making and take appropriate action in relation to the issue (Bord et al., 2000). As Hargreaves et al. (2003) point out "for citizens to understand and act on the issue, they only need to be aware of the *causes and consequences* of climate change, so that they are in a position to judge what measures might be taken to combat it" (p.50). Nevertheless, the challenge for educators is to compete for the attention of the public in a society saturated by information, much of which may be of more immediate relevance to the interests, concerns and wellbeing of citizens (Ungar, 2000).

The social and institutional barriers to behavioural change are more intractable. Currently, there is little to motivate people to act in response to an issue that poses no certain, immediate or obvious threat; and which involves sacrificing what have come to be considered essential and highly symbolic aspects of our high-consumption, polluting, modern lives. Climate change policies will only work if the public supports them (unlike petrol price increases, which resulted in protests in the UK in 2000). This demands their engagement and involvement in policy development.

Furthermore, effective policy-making needs to be consistent and transparent. The public clearly perceives a disparity between government exhortations for individuals to reduce their energy consumption and widely-reported political inaction and scientific debate over climate change. This inconsistency contributes to widespread ambivalence and uncertainty, and distrust in climate change information. By ignoring public perceptions of uncertainty, and not explaining *why* people should reduce their car journeys and use energy-saving light-bulbs, government communication strategies intended to foster energy conservation behaviours does little to achieve its aims. Lessons learnt from the BSE controversy, highlight the importance of honesty and transparency in communicating risks to the public. Furthermore, as I have suggested, public expectations about the capacity of science to provide certainty must be addressed through science education that exposes the social practices and limitations of science.

In Chapter 8, I will further discuss the policy implications of this research and refer to examples of successful public information and participation strategies.

CHAPTER 7. DETERMINANTS OF PUBLIC UNDERSTANDING OF AND RESPONSE TO CLIMATE CHANGE

7.1 INTRODUCTION

The final aim of the thesis was to examine the determinants of public understanding and response to climate change. Chapters 5 and 6 included discussion of significant relationships that emerged from chi-square analyses of the survey measures. This chapter provides a fuller account of these relationships, by describing the results of multivariate analyses of the survey data to determine the most salient influences on respondents' understanding, concern and behaviour.

Consistent with the focus of this thesis, this analysis pays particular attention to the roles of experiential factors. The hypothesis discussed in Section 2.5 - that *experience of flooding* would influence perceptions and responses to climate change - is tested here. In addition, since interviewees and survey respondents closely linked air pollution and climate change, this chapter investigates whether *experience of air pollution* predicts understanding of and response to climate change. Furthermore, *risk perception, knowledge* and *environmental values* have been found in previous research to predict willingness to mitigate climate change (e.g., O'Connor et al., 1999). Therefore, this chapter discusses whether these variables determine understanding and behaviour. Finally, the salience of *a range of other factors* - including demographic variables, uncertainty, trust, perceived responsibility, and terminology - is also examined.

As I described in Chapter 3, *understanding* in relation to climate change comprises five measures:

- identifying 'carbon emissions' or 'CO2' as a cause of climate change (q15);
- claiming to know very little or nothing about climate change (i.e. ignorance) (q10);
- believing that climate change is affecting, or will affect, one personally (i.e. perceived threat);
- scoring in the top quartile on the 'Uncertainty Scale' (i.e. being very doubtful about the reality of anthropogenic climate change); and
- scoring in the top quartile on the 'Trust Scale' (i.e. being very trusting of information about climate change).

The measure for *concern* distinguishes those respondents who selected climate change as an environmental issue that concerns them (q1). *Action* in relation to climate change comprises 6 measures:

- claiming to have taken, or to regularly take, action out of concern for climate change (i.e. *intent-oriented* climate change action) (q22);
- claiming to regularly turn off lights they are not using (q26)[7];
- claiming to regularly buy energy efficient light-bulbs (q26);
- claiming to regularly walk or cycle to work (q26);
- claiming to regularly use public transport (q26); and
- claiming to drive less than 5000 miles per annum (q34).

The method used to predict the relative salience of the influences on understanding and response to climate change is binary logistic regression analysis. The rationale for this method is described in Chapter 3. The remaining sections of this chapter discuss the preferred models that emerged from the regression analyses. As discussed in Chapter 3, the models selected explain the largest proportion of the variance, while maintaining low standard error rates. Summary results tables in the following sections highlight the salient information from these analyses, namely the regression co-efficient and significance level for each independent variable. (The full data tables can be found in Appendices 7.1 - 7.12.) The regression co-efficient (known as 'B') indicates the salience of the independent variable in predicting the dependent variable. (The exponent of B gives us the 'odds ratio' for that variable. The odds ratio of an independent variable tells us how many times more likely a person with that particular characteristic will be part of the group we are trying to predict (i.e. the dependent variable); for example how much more likely women are to be concerned about climate change.) It is important to bear in mind that this analysis cannot tell us about the *direction* of the relationship, in other words the causal ordering, between the dependent and independent variables.

Amongst the independent variables included in the analyses are relevant coded open-ended survey responses. Where these appear in the results tables, the numerical codes assigned by NVivo (listed in Appendix 3.9) are also shown to aid interpretation.

Sections 7.2 - 7.6 discuss the significant predictors of understanding, concern and behaviour that emerge from different categories of independent variable: experience and perceived threat; knowledge and beliefs about climate change; environmental values and concerns; demographic variables; and actions. Section 7.7 concludes by summarising and discussing the significant and most salient influences on understanding, concern and action in relation to climate change.

[7] The prevalence of this action, accounting for 96% of respondents, should be considered when interpreting the results of this analysis. The regression equation is based on a very small comparison group of people who do not regularly turn off lights, and therefore predicts these cases with less accuracy (64%) than the larger group.

7.2 RELEVANT EXPERIENCE AND PERCEIVED THREAT FROM CLIMATE CHANGE AS PREDICTORS OF UNDERSTANDING AND RESPONSE

Table 7.1 Summary table of regression results: experience and perceived threat as independent variables

Dependent variables:	**'Understanding' measures**						**'Behaviour' measures**					
Independent variables:	CO2/ carbon emissions cause CC	Top quartile Uncertainty score	Top quartile Trust score	Climate change does/ will affect me	Don't know much/ anything about CC	Concern about climate change	Regularly turn off unused lights	Regularly buy energy efficient light-bulbs	Regularly walk/ cycle to work	Regularly use public transport	Lowest mileage quartile	Action out of concern for climate change
	Regression coefficient (B) & significance level											
Air pollution affected own health	-0.62	-0.36	-2.08	4.05	-0.61	0.24	-4.22	0.10	0.47	-2.32	-2.36	1.10
Air pollution affected family/ friends' health	-4.22	0.07	1.24	0.42	0.97	-0.23	-2.48	0.83	-0.45	2.62	2.03	-1.09
Experience of flood damage in last 5 yrs	0.30	1.29	-0.42	2.14	1.02	-0.17	-4.80	0.85	0.11	0.08	0.62	0.06
Believe climate change is affecting or is going to affect you, personally		-4.03	0.28		-1.43	0.42	5.19	-0.05	0.18	-1.53	-0.57	0.18
How is it affecting/ will it affect you?												
Sea level rise (22_5)		5.94						2.58	3.32	-10.1	2.19	-1.46
Flooding (22_16)								-0.63	-1.44	5.85	-0.55	1.34
Health (22_1)								0.93	1.19	-4.70	2.41	-0.26
Climate changes (22_14)								4.71				
Personal finances (22_13)								-1.54	4.95	-1.45		
Lifestyle changes (22_11)								-1.69	1.58	1.49		
All other (22)								3.59				
Personal, direct impact -hi-risk (24)		-1.14	0.33			-1.38	5.06	-2.67	-0.49	2.06	-3.04	-0.90

Key	p <0.01	p <0.05

7.2.1 Experience of flooding

In Chapter 5, we saw that flood victims generally do not differ from other respondents in their understanding and response to climate change. As *Table 7.1* shows, findings from the regression analyses largely support this: experience of flooding has no significant influence on concern about climate change or on any of the climate change behaviour or knowledge variables. There is, however, a significant positive influence of flooding experience on perceived threat from climate change. In other words, *those with experience of flooding are over 8 times (i.e. EXP[2.14]) more* *likely to feel that climate change does or will affect them than those without flooding experience.* This seems to suggest flood victims are aware of the connection between flooding and climate change, yet do not differ in their knowledge, beliefs or behavioural response to climate change.

7.2.2 Experience of air pollution

Chi-square analysis of survey responses, discussed in Chapter 5, suggested that experience of the health effects of air pollution relates to a number of dimensions of understanding and response. The regression analyses also identify both direct experience and family/friends' experience of air pollution as having significant influences on certain types of understanding and behaviour. The most salient influence of direct experience of air pollution is on perceived threat from climate change. This indicates that *respondents who feel their health has been affected by air pollution are 57 times more likely to believe that climate change does or will personally affect them.* Respondents with friends/family who have been affected are not significantly more likely to feel climate change does/will affect them. The results also show that respondents whose health has been affected by air pollution are significantly less likely to be very trusting of climate change information; while the opposite is the case for respondents whose family/friends' health has been affected. Experience of air pollution does not significantly influence knowledge (that carbon emissions cause climate change), concern, or uncertainty about climate change.

The results also indicate that experience of air pollution influences certain behaviours relating to climate change, although not always positively. *Action out of concern for climate change is significantly (3 times) more likely to be taken by respondents whose health has been affected by air pollution.* However these respondents are *not* significantly more likely to take the energy-reduction actions measured in the survey. In fact, respondents directly affected by air pollution are significantly *less* likely to drive fewer than 5000 miles annually. This apparent inconsistency may be partly explained with reference to previous research (e.g., Skov et al., 1991), which shows that being affected by air pollution leads people to *protect* themselves against the affects of exhaust fumes by driving more; while seeing the affects of air pollution on friends/family may encourage people to reduce their driving.

Respondents with friends/family affected by air pollution are, in contrast, *less* likely to say they take action explicitly out of concern for climate change. Yet, these respondents are significantly *more* likely to use public transport and to have very low annual mileage. As we saw in Chapter 5, the reasons for using public transport and driving less are often motivated by concerns other than environmental protection. Thus, not taking action out of concern for climate change need not be inconsistent with avoiding driving.

7.2.3 Perceived threat from climate change

As expected from the chi-square analysis, the regression analysis predicts that *respondents who believe that climate change does or will affect them are significantly (56 times) less likely to be very uncertain about the reality of climate change*. *They are also significantly less likely to know little or nothing about climate change.* These are rather unsurprising results, since perceived threat from climate change requires some awareness of what climate change is and belief that it is a real problem. Yet, perceived threat from climate change does not significantly influence knowledge that carbon emissions cause climate change; trust in climate change information; or concern about climate change. This group are also no more likely to take action specifically out of concern for climate change although they are significantly more likely to turn off lights they are not using.

Analysis of the *nature* of the perceived threat from climate change in predicting understanding, concern and behaviour shows no clear pattern. For example, those who believe sea-level rise will affect them are significantly less likely to use public transport, but significantly more likely to walk/cycle to work. This reinforces the point made above and in Chapter 5, that energy-reduction behaviours are conducted for a range of reasons often unrelated to environmental concerns. In terms of action specifically out of concern for climate change, this is significantly (3.8 times) *more likely amongst people who believe they will be affected by flooding.*

7.3 KNOWLEDGE AND BELIEFS AS PREDICTORS OF UNDERSTANDING AND RESPONSE

7.3.1 Knowledge about climate change

The regression analyses address the role of knowledge about climate change in predicting the dependent 'understanding', concern, and 'behaviour' measures. (Since there are a large number of knowledge-related independent variables, the regression results are shown only in Appendix 7 and not in a summary table here). The analyses indicate some significant relationships between climate change knowledge and 'understanding' variables that suggest *consistency in respondents' understanding*. For example, those who identify carbon emissions as a cause of climate change are significantly less likely to mention earth's cycles/ weather patterns as a cause and more likely to suggest reducing carbon emissions as a means of tackling climate change. The most uncertain respondents are significantly more likely to mention contradictory views/ debate in their unprompted understanding, to state earth's cycles/ weather patterns to be the cause, and to believe that climate change cannot be tackled. The respondents who are most trusting of climate change information are significantly more likely to state that individuals are responsible for tackling climate change, and that they believe the issue to be important because of the need and possibility for action. *This perhaps suggests that exhortations for individuals to act in relation to climate change have been accepted by this group.* Respondents who feel they are or will be affected by climate change are significantly more likely to talk about the process of trapping heat in their unprompted understanding of the issue, perhaps suggesting greater understanding of the issue.

Respondents who claim to know little or nothing about the issue are significantly more likely, when specifically asked about the causes of climate change, to mention pollution; and to suggest planting more trees, when asked about how to tackle climate change. Since this group were also most likely to identify business as responsible for tackling climate change (see 7.3.3, below), this may indicate that these respondents are drawing on their understanding of other environmental issues, such as pollution, to "fill the gaps" in their knowledge about climate change (cf. Popkin, 1991). This is consistent with the public's tendency to conceptually integrate environmental issues, which I identified in Chapter 6.

Concern about climate change does not seem to be significantly predicted by any of the knowledge or belief variables, with one exception. Those believing climate change will lead to sea level rise are slightly more likely to be concerned about climate change. This may reflect an awareness of the particular vulnerability of Portsmouth in relation to rising sea levels. However, as I discussed above, those concerned about climate change are no more likely to say they will be affected by it.

There are no clear patterns that emerge in predicting energy-reduction behaviours from knowledge of climate change. In the case of regularly turning off lights, none of the knowledge variables have a significant, positive influence on climate change. For buying energy efficient light bulbs, certain knowledge variables do affect the probability of action: those citing natural causes for climate change, catastrophic impacts, and the need for individuals to change their behaviour are more likely to take this action. Those walking/cycling to work are more likely to describe the process of trapping heat in their unprompted understanding, while belief that climate change is caused by aerosols or ozone depletion has a significant but negative influence on walking/ cycling to work.

Greenhouse gases, deforestation, flooding and global catastrophe were significantly more likely to be mentioned by those who regularly use public transport. This group was also significantly more likely to believe reducing car use, using renewable energy and individual action are appropriate action strategies to tackle climate change. Those with the lowest annual mileage are significantly more likely to mention human causes, CO2, personal observations, and global impacts; while less likely to state deforestation, or (as action strategies) renewable energy or recycling. Finally, there are few knowledge variables that significantly relate to taking action specifically out of concern for climate change. Those mentioning global impacts and human causes of climate change are somewhat more likely to take action, while those with little/no knowledge are less likely.

7.3.2 Uncertainty, trust and sources of information

Table 7.2 Summary table of regression results: source of information, trust in information and uncertainty about the reality of climate change as independent variables

Dependent variables:	**'Understanding' measures**					**'Behaviour' measures**						
Independent variables (comparison groups in brackets):	CO2/ carbon emissions cause CC	Top quartile Uncertainty score	Top quartile Trust score	Climate change does/ will affect me	Don't know much/ anything about CC	Concern about climate change	Regularly turn off unused lights	Regularly buy energy efficient light-bulbs	Regularly walk/ cycle to work	Regularly use public transport	Lowest mileage quartile	Action out of concern for climate change
	Regression coefficient (B) & significance level											
Source of climate change information:												
Television		2.52	2.01	4.82	2.49			-0.98	0.39	5.94	6.39	-0.36
Radio		0.42	0.75	1.43	1.07			-1.08	0.19	-1.51	-0.35	0.13
Newspaper		0.78	-0.89	-0.79	-1.37			0.89	0.84	1.20	0.51	0.30
Friends/ family		-0.23	-0.73	2.13	0.76			-0.03	-0.47	-0.02	-2.15	0.71
Environmental groups		0.45	-0.39	-1.08	-0.58			-0.61	0.66	-1.62	-1.29	0.26
Energy suppliers		0.10	-0.15	-1.16	0.79			2.64	1.87	-1.89	-1.67	0.85
Government		-0.39	-0.78	0.29	-0.04			0.47	-0.59	0.75	0.53	-0.38
Local council		1.24	1.41	-1.35	-1.39			-1.75	-1.60	3.39	0.42	0.12
Internet		1.26	-0.23	2.48	-2.80			-0.50	0.02	0.79	1.58	1.04
Journals		1.68	-0.46	0.19	0.89	-0.42	3.77		0.05	2.33	-1.43	-0.30
School/ university		-0.08	1.00	2.37	-2.90			-0.72	-0.54	-0.08	2.01	-0.30
Public libraries		-1.86	-1.71	-5.39	-1.47			0.48	2.66	-5.42	5.50	-0.65
Trust in Information scores (bottom quartile):												
2nd quartile	2.51	0.10		-0.35	-1.63	0.05	5.39	-1.19	-0.88	0.39	-0.43	0.27
3rd quartile	9.08	-0.70		0.23	0.19	-0.09	-2.91	-1.77	0.27	-0.28	-1.30	0.10
Top quartile	10.3	-2.71		0.03	-2.30	0.58	6.04	-2.17	-1.14	-1.12	-0.08	0.70
Uncertainty scores (bottom quartile):												
2nd quartile	-4.42		-0.69	-4.99	-2.74	-1.13	8.17	1.61	-1.99	1.46	0.61	-0.10
3rd quartile	3.86		-0.52	-3.11	-0.38	-1.09	5.19	-0.15	0.05	3.21	1.46	-0.17
Top quartile	1.53		-2.11	-7.63	-2.36	-2.17	8.62	-1.58	-1.10	6.47	-0.70	0.28

Key	p <0.01	p <0.05

The regression analyses examined whether sources and judgements about climate change information play a significant role in understanding and response to the issue (*Table 7.2*). Knowledge that CO2 causes climate change is not significantly predicted by source of information. Knowing little or nothing about climate change is significantly and positively predicted by hearing about the issue from television and (to a lesser extent) radio; and negatively predicted by hearing about it from the Internet and school/university. *This seems to support the point made in Section 5.2 that the media - unlike most other sources of information - is a passive and ubiquitous source that demands little in the way of audience attentiveness.* In contrast, respondents who feel they are or will be affected by climate change are significantly more likely to have heard about the issue from a range of sources, including the media, Internet, school/university and family/friends. Interestingly, those most uncertain about the reality of climate change are significantly more likely to hear about climate change from journals. *Their awareness from academic sources of the scientific debate about the causes climate change undoubtedly contributes to their scepticism.*

Uncertainty about the reality of climate change has no significant influence on knowing that CO2 causes climate change; while trust in information has a positive but non-significant influence on this knowledge. As suggested by the chi-square tests, there is a significant relationship between uncertainty and trust: as *uncertainty about climate change increases, the probability of being the most trusting of information decreases* (significant for the top uncertainty quartile). Conversely, as trust in information increases, the probability of being amongst the most uncertain decreases (significant for the top trust quartile). There is a significant negative relationship between uncertainty about climate change and perceived threat: the most certain respondents are more likely to believe they are or will be affected by climate change.

In predicting concern about climate change, there is no significant influence from source of information or trust, although there is a significant negative relationship with uncertainty. In other words, as might be expected, *concern tends to decrease as uncertainty increases*.

Sources of information about climate change significantly predict energy reduction behaviours, although each behaviour has different predictive sources of information. Thus, information from energy suppliers significantly and positively predicts buying energy efficient light bulbs. Walking/cycling to work is also significantly and positively related to information from energy suppliers, as well as information from public libraries. Television is the most salient predictive source of information for respondents who use public transport and have low annual mileage. Respondents who take action specifically out of concern for climate change are more likely to have heard about the issue from the Internet, and to a lesser extent, from energy suppliers.

Surprisingly, particularly given the results of the chi-square analysis (Chapter 5), uncertainty about the reality of climate change does not significantly influence action out of concern for climate change. Trust in information is also unrelated to specific climate change action. Yet, it does significantly and *negatively* influence buying energy efficient light bulbs: as trust in information increases, the probability of buying energy efficient light bulbs significantly decreases. Furthermore, as uncertainty increases, the probability of using public transport and turning off unused lights significantly increases. Again, these findings highlight the disconnection between energy consumption behaviours and environmental considerations, including beliefs about climate change.

7.3.3 Perceived responsibility and efficacy of action

Table 7.3 Summary table of regression results: belief that climate change can be tackled and main responsibility for tackling as independent variables

Dependent variables:	**'Understanding' measures**						**'Behaviour' measures**					
Independent variables (comparison groups in brackets):	CO2/ carbon emissions cause CC	Top quartile Uncertainty score	Top quartile Trust score	Climate change does/ will affect me	Don't know much/ anything about CC	Concern about climate change	Regularly turn off unused lights	Regularly buy energy efficient light-bulbs	Regularly walk/ cycle to work	Regularly use public transport	Lowest mileage quartile	Action out of concern for climate change
	Regression coefficient (B) & significance level											
Believe climate change can be tackled	8.55	-2.71	0.44	-0.82	-1.57	-0.38	0.73	-0.30	1.65	0.41	-0.26	0.41
Main responsibility for tackling climate change (international organisations):												
Business and industry		4.26	1.40	0.15	2.96	0.32		0.17	0.06	-3.79	-5.57	0.68
Environmental organisations		1.33	1.85	-1.26	-1.37	-1.35		-0.71	1.02	-12.4	-6.66	-0.33
Individuals		2.01	1.86	1.09	1.15	-0.66	-8.97	-2.68	0.94	1.39	0.58	1.15
Local government				-3.75	0.79	2.62		5.02	5.09	-3.83	-17.8	0.88
National government		1.04	0.13	0.14	1.14	0.34		-0.63	0.67	-3.07	-2.41	-0.59
'Other' (incl. multiple)		0.93	0.26	-2.34	-1.47	-1.03		-1.68	0.02	-3.83	1.32	-0.64
Unknown		-0.27	-0.74	-1.48	-0.25	0.00		0.32	0.58	-0.45	-1.69	-0.90

Key	p <0.01	p <0.05

The regression analysis suggests that beliefs about whether climate change can be tackled, and by whom, have some effect on understanding, but less on behaviour. As indicated in *Table 7.3*, respondents who most trust information about climate change are significantly more likely to identify individuals as having the main responsibility for tackling climate change, *again indicating acceptance of the 'do your bit' message central to much of this information*. Respondents who claim to know little or nothing about the issue *and* those who are most uncertain about the reality of climate change are significantly less likely to say climate change can be tackled, and more likely to identify business as having the main responsibility for tackling it.

Taking action out of concern for climate change is not significantly predicted by any of the responsibility variables or by belief that climate change can be tackled. Those walking/cycling to work are significantly more likely to agree that climate change can be tackled, but to state that local government has the main responsibility for tackling it. Identifying individuals as responsible for tackling climate change has a significant but *negative* influence on buying energy efficient light bulbs. All other relationships between beliefs about responsibility for tackling climate change and respondents' energy-reduction actions are negative or non-significant.

7.3.4 Beliefs about air pollution and weather

As I discussed in Chapters 5 and 6, the survey and interview data highlighted the close association between climate change and both air pollution and weather in public understanding. As we can see from *Table 7.4 the regression analyses support the conclusion that beliefs about air pollution and weather influence understanding and action in relation to climate change.*

Table 7.4 Summary table of regression results: beliefs about weather and air pollution as independent variables

Dependent variables:	**'Understanding' measures**						**'Behaviour' measures**					
Independent variables (comparison groups in brackets):	CO2/ carbon emissions cause CC	Top quartile Uncertainty score	Top quartile Trust score	Climate change does/ will affect me	Don't know much/ anything about CC	Concern about climate change	Regularly turn off unused lights	Regularly buy energy efficient light-bulbs	Regularly walk/ cycle to work	Regularly use public transport	Lowest mileage quartile	Action out of concern for climate change
	Regression coefficient (B) & significance level											
Believe pattern of is weather changing	2.45	-2.87	0.35	4.54	0.09	0.44	2.73	-0.73	0.10	-0.98	2.30	0.18
Reason why pattern of weather changing:												
Global warming (7 3 2 17)		-0.95	-2.22	0.38		0.04		-0.02	0.95	-0.13	-0.11	0.44
Pollution (7 3 2 7)			-1.20	-0.57							-2.26	
Natural weather variations (7 3 3 4)		1.88	-1.14	-0.82					0.24	-0.52		
doubt, uncertain views (7 1 5)		0.25	0.88	-3.01	1.02							
uncertainty - other (7 1)					3.08							
Aware of effects of air pollution		-0.62	-0.24	1.11	-0.41	-0.56	0.79	0.24	0.39	-0.59	3.54	0.50
Global warming (8 2 3 1)	-10.4	-3.68	-1.37	1.65		0.41		-0.47	-0.12	2.79	6.06	-1.32
Climate change (8 2 3 2)	3.39	-0.53	1.88	-1.52				-4.45	-2.56	7.94	-0.55	1.92

Key	p <0.01	p <0.05

The regression analyses suggest a link between observation of changing weather patterns and belief in anthropogenic climate change. This reinforces the point made in Chapter 6, that *people are persuaded by the evidence of their senses about the reality and potential threat of environmental* *issues, including climate change.* According to the regression analyses, those who feel the pattern of weather is changing are significantly more likely to feel climate change does or will affect them and significantly less likely to be very uncertain about the reality of climate change. Uncertain respondents who acknowledged changes in the weather were significantly more likely to believe this is due to natural variation in climate; while respondents who believe they are/will be affected by climate change were significantly less uncertain about the reasons for changing weather patterns. Knowing little or nothing about climate change is significantly and positively predicted by uncertainty about the causes of changing weather patterns.

Only one behavioural variable is significantly influenced by beliefs about changing weather patterns. People who have the lowest annual mileage are significantly more likely to believe weather patterns are changing.

Beliefs about the impacts of air pollution have a largely non-significant effect on climate change *understanding*, although (unsurprisingly) the most uncertain respondents are significantly less likely to identify global warming as an impact of air pollution. There is, however, a greater influence on *behaviour* from beliefs about air pollution. Respondents with low annual mileage are significantly more aware of the effects of air pollution and, particularly more likely to identify *global warming* and impacts on plants. Respondents who take action specifically out of concern for climate change and those who regularly use public transport are also significantly more likely to identify *climate change* as an effect of air pollution.

7.3.5 Terminology

In contrast to the chi-square test results, the regression analyses do not suggest any significant influence on understanding of terminology (that is, *global warming* versus *climate change)*.

7.4 ENVIRONMENTAL VALUES AND CONCERNS AS PREDICTORS OF UNDERSTANDING AND RESPONSE

Table 7.5 shows the influence on understanding, concern and behaviour by membership of an environmental organisation, environmental values and concerns. Members of environmental organizations are significantly more likely to feel climate change does/ will affect them, but less likely to be very trusting of information or to know little/ nothing about climate change. Membership of an environmental organization does not significantly predict any of the behavioural variables.

Table 7.5   Summary table of regression results: values and concerns as independent variables

Dependent variables:	'Understanding' measures								'Behaviour' measures			
Independent variables (comparison groups in brackets):	CO2/ carbon emissions cause CC	Top quartile Uncertainty score	Top quartile Trust score	Climate change does/ will affect me	Don't know much/ anything about CC	Concern about climate change	Regularly turn off unused lights	Regularly buy energy efficient light-bulbs	Regularly walk/ cycle to work	Regularly use public transport	Lowest mileage quartile	Action out of concern for climate change
	Regression coefficient (B) & significance level											
Member of environmental organisation	-5.24	-0.82	-1.47	2.36	-1.68		9.23	-0.95	-0.26	-1.11	-0.90	0.10
NEP score (bottom quartile):												
2nd quartile		0.18	0.24	0.93	0.28	0.04	-3.53	1.83	0.29	-5.15	-0.45	-0.19
3rd quartile		-1.78	1.27	-0.62	0.84	0.93	-5.44	-1.39	2.64	-2.86	-0.71	0.52
Top quartile		-2.26	0.28	0.87	-0.56	-0.22	0.70	-0.25	1.37	-3.41	0.35	0.28
PEV score (bottom quartile):												
2nd quartile	-3.99	-0.98	-1.67	1.89	-0.49	-0.43	6.12	-0.79	-0.24	-2.00	-1.16	1.15
3rd quartile	-10.1	1.21	-0.69	1.78	0.94	-0.17	-2.09	-0.41	0.99	-6.54	1.71	1.16
Top quartile	-12.8	-2.39	-2.18	1.08	-1.65	1.12	-0.01	-0.43	-0.55	-2.71	3.60	2.22
'Having a car is part of having a good lifestyle'								-0.30	-0.69	0.46	0.70	
Priority environmental concerns:												
Global Warming/ Climate Change		-2.68	2.13	-1.14	1.63		5.99	-0.22	0.31	0.38	0.81	0.45
Ozone Hole		-1.97	1.37	-2.69	1.51	-0.75		-1.74	0.30	-0.55	-2.28	0.40
Resource Depletion			0.27	-0.97	3.06			-0.77	0.31	4.19	0.39	1.11
Extinction of Species		0.83	0.29	0.90	1.94			0.31	-1.10	3.78	0.78	
Overpopulation		1.02	0.39	0.02	1.60			1.28	0.54	1.45	-1.35	
Radioactive Waste			0.76	-1.73	4.17			-0.79	2.89	-1.69	-5.06	
Air Pollution		-0.29	1.54	-1.56	2.25	-1.07		0.05	1.50	1.86	0.01	0.15
Water Pollution		1.60	0.58	-0.18	2.51			0.16	1.14	2.23	-1.02	
Flooding			1.79	-0.51	2.58	-0.15		-0.56	0.96	1.30	-1.32	-0.28
Litter			1.05	-0.48	3.03			-1.06	0.14	-1.49	2.93	
Poor Waste Management		1.87	2.18	-1.97	3.31			0.72	0.33	0.87	-2.47	
Traffic/ Congestion		-0.92	1.43	-1.14	2.05			-0.31	0.19	-0.15	-0.91	
GM Food			0.75	1.36	0.51			-0.46	1.11	1.13	-1.35	
Personal importance of climate change issue (not at all important):												
Not very important				-0.36		-0.90		0.23	0.46	-5.21	-4.34	4.16
Quite important				2.11		0.62		1.54	-0.38	-2.75	-7.21	3.98
Very important				3.73		1.02		2.96	-1.20	-4.58	-6.43	3.56

Key	p <0.01	p <0.05

On both measures of environmental values (the NEP and PEV scales), there is a significant negative relationship with uncertainty. That is, *the most pro-environmental respondents are the* *least likely to doubt the reality of climate change*. Furthermore, PEV scores positively influence the belief that climate change does/ will affect one (though the relationship is not linear). Respondents with top quartile PEV scores are also significantly more likely to be concerned about climate change. However, there is a significant, *negative* predictive influence of pro-environmental values on knowing carbon emissions cause climate change. *In other words, while those with higher pro-environmental values are much less likely to be uncertain about the reality of anthropogenic climate change and more likely to feel it will affect them, they are less likely to know that carbon emissions cause it.* This is consistent with the findings discussed in Chapter 5 that respondents with higher NEP scores tended to understand climate change in terms of ozone depletion, rather than more scientifically accurate terms. There no consistent pattern between trust in information and environmental values, with NEP scores having a more positive influence and PEV scores having a more negative influence on the top trust scores.

Most strikingly, *the regression analysis for predicting action out of concern for climate change shows a significant and positive influence of PEV scores*. As the score increases, the probability of taking action also increases, so that *respondents with top quartile PEV scores are over 9 times more likely to take action than those with bottom quartile scores*. *The relationship between environmental values and other energy-reduction actions is more ambiguous.* While there is a negative relationship between environmental values (on both measures) and public transport use, respondents who regularly walk/cycle to work are significantly more likely to disagree that 'having a car is part of having a good lifestyle', and significantly more likely to have relatively high (3^{rd} quartile) NEP scores. Respondents who regularly buy energy efficient light bulbs are significantly more likely to have only 2^{nd} quartile NEP scores. Again, these findings should not surprise us, since respondents' stated motivations for these actions were often not related to protecting the environment. Only in the case of low annual mileage, do pro-environmental values have some predictive, positive influence, with strength and significance of the relationship increasing with each quartile. However, since motivations for mileage were not addressed in the survey, we cannot tell whether environmental concern *motivates* low mileage or the relationship between values and mileage is due to some other cause. In fact, the regression analysis suggests that personal importance of climate change has a significant *negative* influence on low mileage. So, while respondents who drive the least tend to have higher environmental values than other people, they consider climate change in particular to be less personally important.

Environmental concerns also relate to understanding about climate change. Unsurprisingly, concern about climate change has a significant negative influence on the top uncertainty scores, and a significant positive influence on the top trust scores. In other words, respondents who are concerned about climate change are more likely to be very trusting of climate change information and less likely to be very uncertain about the reality of climate change.

It is surprising that concern for climate change has no significant influence on action out of concern for climate change. Concern about related issues - flooding, air pollution and ozone depletion - also have no significant influence on action out of concern for climate change. In fact, the only environmental concern that positively and significantly predicts action out of concern for climate change is concern for *resource depletion*. However, concern for climate change does have a significant, positive effect on turning off lights but not for any other energy-reduction behaviour. This result may be due to the wording of question 1, which asked respondents to select the three environmental issues that most concern them. We are therefore unable to say which respondents, if asked specifically about whether climate change concerned them, would have identified concern for the issue.

However, since the survey *did* ask respondents how important the issue of climate change is to them personally, this effectively provides an alternative measure of concern. Here again, though, there is no significant relationship with action out of concern with climate change, and a significant negative relationship with low mileage and public transport use. Only in the case of buying energy efficient bulbs does personal importance of climate change positively and significantly predict action. Personal importance of climate change also positively, but *not* significantly, influences perceived threat and concern for climate change.

When we look at the influence of other environmental concerns, we see that those concerned about air pollution are significantly less likely to have selected climate change as an issue that concerns them. It is possible that this result is again due to the forced selection of only three issues of concern in question 1. If they effectively equated air pollution and climate change, they would be unlikely to select both as concerns. There is some support for this conclusion, since concern for ozone depletion (which is also often equated with climate change) is close to having a statistically significant negative influence on concern for climate change ($p=0.1$).

Respondents concerned about air pollution are significantly more likely to walk/cycle to work, and to be very trusting of climate change information. Interestingly, respondents who selected flooding as a concern are more likely to be very trusting of climate change information, but also *to know little or nothing about climate change.* This again suggests the conceptual distinction made by respondents between these two issues.

7.5 DEMOGRAPHIC VARIABLES AS PREDICTORS OF UNDERSTANDING AND RESPONSE

7.5.1 Gender

As we can see from Table 7.6, gender significantly influences knowledge and trust in relation to climate change information. Consistent with the chi-square analysis and previous research, women are significantly more likely to have the greatest trust in information about climate change, but also to feel they know little or nothing about the issue. However, contrary to the results of chi-square tests, men are no more likely to be highly uncertain about the reality of climate change than women.

There is no significant difference between men and women in relation to concern about climate change, or action out of concern for climate change. In relation to the other behavioural variables, men are significantly more likely and to use public transport than women.

Table 7.6 Summary table of regression results: gender, age and income as independent variables

Dependent variables:	**'Understanding' measures**						**'Behaviour' measures**					
Independent variables (comparison groups in brackets):	CO2/ carbon emissions cause CC	Top quartile Uncertainty score	Top quartile Trust score	Climate change does/ will affect me	Don't know much/ anything about CC	Concern about climate change	Regularly turn off unused lights	Regularly buy energy efficient light-bulbs	Regularly walk/ cycle to work	Regularly use public transport	Lowest mileage quartile	Action out of concern for climate change
	Regression coefficient (B) & significance level											
Gender (female):												
Male	-1.19	0.48	-1.08	-0.88	-1.20	0.26	3.60	0.33	-0.90	2.41	-0.57	0.43
Age (16-24):												
25-34	-7.71	-2.96	2.43	2.56	-0.28	-0.88		-2.08	-1.90	5.21	-1.21	1.56
35-44	-6.24	-0.98	1.88	-0.22	-4.50	-0.60		-0.47	-1.65	3.36	-0.87	0.07
45-54	-6.41	-0.12	2.67	0.47	-3.85	-0.71		-0.80	-2.73	2.77	0.90	-0.03
55-64	-8.45	0.25	2.92	1.22	-2.60	-0.98		0.20	-3.48	4.93	1.79	0.80
65-74	-8.73	-2.00	2.85	0.71	-2.74	-0.51		-0.69	-5.40	5.21	3.95	0.14
75 or over	-10.5	-0.64	2.21	1.16	-1.35	-0.22		-1.19	-8.03	4.01	7.88	0.81
Unknown	1.35	-0.55	7.14	0.53		-0.67		0.73	-7.61	16.8	-0.57	0.39
Income (very low):												
Low		-1.18	-0.99	0.16	-1.01	0.38	4.01	-0.08	-0.23	0.52	-0.51	-0.72
Medium		-1.18	-2.49	1.58	0.49	0.46	-2.85	-1.13	0.86	-3.38	-1.47	-0.85
High		-2.22	-1.23	2.98	-1.73	0.86	23.9	-1.38	1.15	0.51	-2.73	-1.55
Very high		0.78	-1.46	1.65	-1.88	1.24	-6.88	-0.71	2.12	-3.06	-3.84	-1.72
Not known		1.12	-0.96	2.20	-0.67	0.35	-3.79	-1.47	1.28	-2.17	-0.87	-0.59

Key	p <0.01	p <0.05

7.5.2 Age

The regression analysis indicates that age has a largely negative influence on ignorance about climate change, with the 35-54 age group and respondents choosing not to give their age, significantly less likely to know little/ nothing about the issue than other age groups (*Table 7.6*). Age also has a negative, but *non*-significant, influence on knowing that carbon emissions cause climate change. Yet age has a positive influence on trust in information, with those aged 55-74 significantly more trusting than other age groups.

There is a negative, but non-significant, influence on concern about climate change by age. Age also does not significantly predict action out of concern for climate change.

Unsurprisingly, age has a negative predictive influence on walking/ cycling to work: as age increases (and respondents approach retirement), the probability of this action significantly decreases. Age also has some influence on using public transport and having low annual mileage, with older participants (aged 75 or above) significantly more likely to have low mileage, and 25-34 year olds more likely to use public transport.

7.5.3 Income

Income does not significantly influence knowledge (or ignorance) about climate change. Consistent with the chi-square analysis, respondents on 'very low' incomes are the most likely to be very trusting of climate change information; 'medium' income respondents are the least likely to be very trusting. Those on 'high' incomes or who prefer not to divulge their income are significantly more likely to feel that climate change does or will affect them.

Income positively, but not significantly, influences concern about climate change. Yet *income has a negative* (and, for most categories, significant) influence on action out of concern for climate change. In other words, respondents on high and very high incomes are significantly less likely (by a factor of around 5) to take action out of concern climate change. Largely consistent with this, most energy-reduction behaviours are negatively predicted by higher income categories. The most significant and linear negative relationship is between low annual mileage and income: as income increases, the probability of low annual mileage steadily decreases, with increasing significance. In the case of walking/cycling to work, however, higher income positively influences action. This is broadly consistent with the chi-square results discussed in Chapter 5.

Table 7.7 *Summary table of regression results: education and newspaper readership as independent variables*

Dependent variables:	**'Understanding' measures**						**'Behaviour' measures**					
Independent variables (comparison groups in brackets):	CO2/ carbon emissions cause CC	Top quartile Uncertainty score	Top quartile Trust score	Climate change does/ will affect me	Don't know much/ anything about CC	Concern about climate change	Regularly turn off unused lights	Regularly buy energy efficient light-bulbs	Regularly walk/ cycle to work	Regularly use public transport	Lowest mileage quartile	Action out of concern for climate change
	Regression coefficient (B) & significance level											
Highest general qualification (no formal qualifications):												
GCSE/O-Level	9.25	-0.67	0.55	1.94	-0.59	-0.92	-4.43	-0.96	0.47	-0.77	-0.21	-0.74
A-Level/Higher/BTEC	-8.59	-0.27	1.87	2.23	-1.28	-1.28	5.32	-0.83	-1.34	3.33	-2.76	0.21
Vocational/NVQ	-17.9	2.25	1.87	2.75	0.12	-2.05	0.16	-1.78	-0.85	2.63	3.58	0.12
Degree of equivalent	-0.54	-2.72	0.27	4.87	-2.37	-1.39	1.60	-2.67	-1.96	3.29	-0.63	0.12
Postgraduate qualification	3.46	1.94	0.96	2.77	-1.39	-1.58	15.3	-2.08	-1.02	3.74	1.61	-0.18
Other	19.9	-5.07	-1.66	-0.77	-3.08	-2.00	-7.88	-2.32	-0.14	12.0	0.38	0.52
Unknown	-20.8	-0.09	1.62	-3.46	-1.07	-0.67	16.6	6.75	-1.46	7.27	-6.09	0.67
Highest qualification in a science-related subject (no formal qualifications):												
GCSE/O-Level		-0.07	-0.53	-0.16	0.12			1.19	-1.05	-1.79	0.92	
A-Level/Higher/BTEC		1.36	0.09	-0.03	1.19			1.38	-2.27	-3.49	-2.01	
Vocational/NVQ		2.91	1.82	0.76	0.48			3.52	-0.15	-6.62	4.05	
Degree or equivalent		2.79	0.47	-3.39	0.59			3.24	0.79	-1.13	-0.55	
Postgraduate qualification		-1.98	-0.37	-0.52	-1.79			4.60	1.39	-4.42	-1.73	
Other		1.51	2.72	-1.28	4.99			6.34	-1.83	-21.4	-3.02	
Unknown		-2.09	0.58	-2.91	-0.54			2.27	-0.22	-6.31	1.81	
Newspaper regularly read:												
Sun/ News of the World		-1.33	0.38	1.43	-1.01	-0.30	-0.82	-1.97	2.65	-3.51	1.45	-0.53
Mirror/ Sunday Mirror		0.14	-1.74	-1.27	0.44	-1.62	3.65	-1.35	-2.18	4.44	1.97	-0.74
Daily Mail/ Mail on Sunday		0.91	-0.92	-1.87	1.43		0.15	-2.22	-0.31	4.23	1.94	-0.48
Express/ Sunday Express			-1.51	-0.90			-0.95	-0.65	-0.68	-0.38	5.80	-2.53
Daily/ Sunday Telegraph		-0.65	1.62	-0.82	-0.15	-0.77	1.92	4.59	0.62	-5.44	3.62	-0.58
Times/ Sunday Times		-1.52	0.86	0.84	-0.10	-0.55	-0.90	2.68	1.25	-2.06	3.34	0.46
Guardian/ Observer	15.2	1.28	0.00	0.59	-0.20	1.06	-4.00	3.00	1.88	1.26	-4.23	-0.78
Independent/ Independent on Sunday			-1.34	-4.26	0.89		-4.90	2.68	0.93	-4.59	1.37	-1.57
Local newspaper			0.93	-0.76	0.60			1.52	-0.07	-0.09	0.83	-0.29
None			1.13	0.76	0.65		-1.74	1.54	1.61	-2.76	1.31	-0.28
Any broadsheet			-0.18					-2.78	0.08	5.61	-4.66	
Any tabloid reader			2.88					3.44	0.46	-1.51	-3.73	

Key	p <0.01	p <0.05

7.5.4 General education and science education

As *Table 7.7,* above, shows, the influence of education on knowledge and beliefs about climate change is less evident than might be expected. Neither science education nor general education has any significant predictive influence on knowledge that carbon emissions cause climate change. As the level of general education increases, knowing little or nothing about climate change tends to decrease, but the relationship is only significant at the level of degree and 'other' qualifications. Furthermore, there is no clear or significant relationship between science education and ignorance about climate change, with the exception of 'other' science qualifications which positively predict knowing little or nothing about the issue. The influence of education on uncertainty and trust in information is non-linear. Those who hold degrees or 'other' general qualifications are significantly *less* likely to be the most uncertain about the reality of anthropogenic climate change; while those who hold a science degree are significantly *more* likely to be very uncertain (as we saw in Section 5.4.1). Respondents whose highest general qualifications are vocational or A-Level, and those with 'other' science qualifications, are significantly more likely to have greatest trust in climate change information.

The strongest influence of educational level on any of the 'understanding' variables is in predicting the belief that climate change does/ will affect one: as education increases, perceived threat from climate change becomes significantly more likely (until first degree level, after which the predictive influence decreases). There is not the same linear relationship for science education, however. In fact, respondents with science degrees are significantly *less* likely to perceive climate change as a personal threat.

Yet despite increased acceptance of the personal threat of climate change, respondents with higher general qualifications are significantly *less* likely to be concerned about climate change. The influence of science qualifications on concern was found to be non-significant.

These results indicate that general education and science education influence climate change conceptions in divergent ways. This should not be surprising, since exposure to information about climate change (including scientific disagreement over the issue) will be greater for people whose academic or professional interest relates to the issue.

In contrast to results of the chi-square analysis, education does not have a significant influence on action in relation to climate change. In relation to particular energy reduction behaviours, education influences each behaviour in different ways. Furthermore, general qualifications and science qualifications again influence these variables in different, and sometimes opposite, ways. Thus, in the case of buying energy efficient light bulbs, the probability of action tends to significantly *decrease* with general qualification level. However, the trend is reversed in relation to scientific qualifications: as scientific education *increases*, the probability of buying energy efficient light bulbs significantly increases. In contrast, public transport use is *positively* influenced by general education but *negatively* by scientific education. For other energy-reduction actions, significance levels are lower, though the influence of education is generally negative.

7.5.5 Newspaper readership

Newspaper readership significantly influences understanding about climate change, in particular trust in information (*Table 7.7*). Telegraph and local newspaper readers are more likely to be amongst the most trusting of climate change information, while Mirror and Express readers are less likely to be very trusting of information. When we include readers of *any* tabloid in the regression equation, we see (as in the chi-square tests) that this group is significantly more trusting of climate change information than other people. There is a positive, but non-significant, influence of Guardian/Observer readership on knowing CO2 causes climate change. Mail readers are significantly more likely to know little or nothing about climate change, and significantly less likely to perceive climate change as a threat. Independent readers are also significantly less likely to believe climate change does or will affect them.

Newspaper readership also has an influence on concern about climate change: Mirror readers are significantly less likely to be concerned, and Guardian/Observer readers more likely to be concerned. Yet newspaper readership does not positively predict action out of concern for climate change in the same way. The only significant relationship is for Express readership, which negatively predicts action.

Newspaper readership does, however, significantly affect energy-reduction actions. Readers of the Times, Telegraph, Guardian/Observer and local newspaper are significantly more likely to buy energy efficient bulbs; while readers of the Sun/News of the World and the Mail are less likely to do so. Sun/News of the World readers are significantly more likely to walk/cycle to work, while Mirror readers are less likely to do so. In contrast, Sun/News of the World readers are significantly *less* likely to use public transport, while Mirror readers are significantly more likely to do so. Mail readers are also more likely to use public transport, while Independent and Express readers are less likely to do so. Guardian/Observer readers are significantly less likely to have low annual mileage; readers of the Express, Telegraph and Times are more likely to.

We can see that there is no clear divide between tabloid and broadsheet newspaper readers in relation to either explicit climate change actions or energy-reduction behaviours. In fact, by scoring each participant according to whether they read *any* tabloid or broadsheet paper (and in many cases, participants read several papers), buying energy efficient bulbs is more likely amongst tabloid readers, while broadsheet readers are more likely to use public transport.

7.5.6 Political affiliation

While political affiliation does not significantly affect knowledge or ignorance in relation to climate change, it does influence other understanding variables (*Table 7.8*, below). Compared to Labour voters, all other respondents are significantly less likely to be very trusting of climate change information. This is consistent with the chi-square analysis discussed in Chapter 5. Labour voters are also significantly more likely to perceive climate change as a personal threat, but also to be amongst the most uncertain about the reality of anthropogenic climate change. The group least likely are non-voters. Again, consistent with the chi-square analysis, non-voters are the group least likely to believe that climate change does or will affect them or to act out of concern for climate change.

As we have seen for other independent variables, energy-reduction behaviours and explicit climate change action are influenced by different variables. Non-voters are significantly *more* likely to use public transport and to have low annual mileage. Liberal Democrat and 'other' voters are also significantly more likely to have low mileage, compared to Labour voters.

7.5.7 Ward/ area

As shown in *Table 7.8,* ward/area has a largely non-significant influence on understanding about climate change. The only significant relationship to emerge from the understanding regression analyses is for respondents living in Ward N (affluent, sub-urban), who are significantly *less* likely to know little/ nothing about climate change than those living in Ward A. Concern and action out of concern for climate change are also not significantly predicted by ward or area.

However, ward/area does affect energy-reduction actions. Respondents from Ward A (urban, low-medium income, students) are more likely to buy energy efficient bulbs and to walk/cycle to work; those in Ward B (urban, affluent) are significantly less likely to buy energy-efficient bulbs. Residents of Ward I (deprived, inner-city area) are significantly more likely to regularly use public transport, but less likely to walk/cycle to work. Those living in Ward N and Flood area 1 (both affluent, sub-urban areas) are significantly less likely to walk/cycle to work.

Table 7.8 *Summary table of regression results: political affiliation, ward/area, car ownership and perceptions of local public transport as independent variables*

Dependent variables:	**'Understanding' measures**						**'Behaviour' measures**					
Independent variables (comparison groups in brackets):	CO2/ carbon emissions cause CC	Top quartile Uncertainty score	Top quartile Trust score	Climate change does/ will affect me	Don't know much/ anything about CC	Concern about climate change	Regularly turn off unused lights	Regularly buy energy efficient light-bulbs	Regularly walk/ cycle to work	Regularly use public transport	Lowest mileage quartile	Action out of concern for climate change
	Regression coefficient (B) & significance level											
Political party most likely to support (Labour):												
Conservative		-1.56	-1.19	-1.82	0.38	-0.54	7.82	-0.57	-0.04	-2.92	1.45	-0.36
Liberal Democrat		-2.62	-1.60	-3.26	-1.32	-0.30	3.36	1.46	-0.81	0.52	5.63	-0.56
Other		-11.6	-4.39	-2.63		-1.98	6.33	-2.47	-1.13	2.14	6.36	0.42
Unsure/floating voter		-7.89	-1.21	-1.06	0.71	-1.38	-5.73	-2.82	-0.59	1.25	0.20	-1.01
Would not vote		-4.91	-0.27	-8.21	-0.53	-0.57	10.6	0.49	-0.40	4.07	4.96	-1.74
Unknown		-3.48	-2.28	-2.33	-0.22	-0.91	3.29	0.38	-1.74	-0.53	3.76	-0.57
Ward/Area (Ward A):												
Ward B		1.60	-0.93	0.72	0.07	0.08		-1.82	-0.17	2.53	-0.47	0.17
Ward I		0.54	-1.80	1.36	-1.29	-0.02		-0.24	-1.94	5.88	2.91	0.06
Ward N		1.80	0.98	-0.32	-2.00	-0.01		-0.68	-2.05	2.19	1.41	-0.81
Flood area 1		0.59	0.48	-0.12	-0.82	0.16		-0.29	-1.83	1.98	1.09	-0.58
Flood area 2		0.67	-0.57	-1.68	-0.20	0.35		-1.14	-0.21	1.60	-0.83	0.78
Ward/area unknown		0.52	1.45	1.25	2.84	-0.20		0.56	-0.38	9.49	3.69	0.79
Own or regularly drive a car/van		2.16	-0.17	-0.08	2.10	0.35	9.11	-0.22	-0.22	-8.59		0.76
Quality of local public transport (very poor):												
Poor			1.12	-2.00		1.05		-0.22	2.48	-1.23	2.97	0.82
Average			1.15	-0.70		1.14		0.93	2.02	0.89	2.23	0.28
Good			1.61	-2.97		1.29		0.10	1.82	7.08	3.74	0.33
Excellent			-0.54	-2.47		0.35		-2.48	2.63	2.29	9.65	-2.46
Unknown			0.75	-0.78		0.63		-0.21	2.54	-7.49	2.80	0.75

Key	p <0.01	p <0.05

7.5.8 Car ownership and perceptions of public transport

As *Table 7.8* shows, car ownership significantly influences both uncertainty and ignorance in relation to climate change. Car owners are more likely to claim they know little or nothing about climate change and to be amongst the most uncertain about its reality. Perceived quality of local public transport also has some predictive value for understanding, with those rating public transport as 'very poor' being less likely to believe climate change will affect them.

Naturally, both car ownership and perceptions of local public transport influence travel-related behaviours. Car owners, and respondents who say they do not know the quality of public transport, are significantly less likely to regularly use it. Those who rate public transport as ‘good’ are more likely to regularly use it. The relationship with perceptions of public transport is linear for low annual mileage: as perceived quality of public transport increases, the probability of low annual mileage increases ($p<0.05$ for ‘good’ and ‘excellent’ categories). Walking/ cycling to work is also positively predicted by perceived quality of public transport: people who rate public transport as ‘very poor’ are significantly less likely to regularly walk/cycle to work. In summary, this suggests that positive attitudes towards public transport are related to using alternatives to driving.

7.6 ACTIONS AS PREDICTOR OF UNDERSTANDING AND RESPONSE

Table 7.9 summarises the relationships between independent action variables and understanding about climate change, as well as inter-relationships between behavioural variables. Unsurprisingly, respondents who state they take action explicitly out of concern for climate change are significantly less likely to state they know little/ nothing about the issue. However, there is no clear relationship between other behaviours and understanding about climate change. Those who regularly take part in an environmental campaign are more likely to be the most trusting of climate change information, but also more likely to state they know little/ nothing about the issue. Conversely, those who regularly recycle glass are significantly less likely to be very trusting of climate change information and less likely to know little/ nothing about the issue.

It is noteworthy that *explicit climate change action is not significantly predicted by the particular energy-reduction behaviours measured in the survey. Conversely, with the exception of walking, regular energy-reduction behaviours are not significantly predicted by explicit climate change actions. However, other environmentally-relevant actions do relate to explicit climate change action: those who recycle glass, who buy organic food and who take part in environmental campaigns are significantly more likely to take action in response to climate change.* As we saw in Chapter 5, these three actions are most commonly motivated by environmental concern, whereas energy-reduction actions tend to have other motivations (such as saving money). Furthermore, regression analyses of these other environmental actions (see Appendix 7.13) suggest that NEP scores positively predict buying organic food and recycling glass. Thus, explicit climate change action and other environmental actions are likely to be related by underlying environmental values.

Most of the regular actions measured in the survey are significantly inter-related. For example, those who have the lowest quartile annual mileage, who walk/cycle to work, buy energy-efficient light bulbs or buy organic food are significantly more likely to turn off lights. In the case of buying energy efficient light bulbs, respondents who buy organic food, recycle, and take part in an environmental campaign are significantly more likely to act. There is a particularly strong and significant relationship between walking/cycling to work and using public transport.

Table 7.9 *Summary table of regression results: explicit climate change action and other regular actions as independent variables*

Dependent variables:	**'Understanding' measures**						**'Behaviour' measures**					
Independent variables (comparison groups in brackets):	CO2/ carbon emissions cause CC	Top quartile Uncertainty score	Top quartile Trust score	Climate change does/ will affect me	Don't know much/ anything about CC	Concern about climate change	Regularly turn off unused lights	Regularly buy energy efficient light-bulbs	Regularly walk/ cycle to work	Regularly use public transport	Lowest mileage quartile	Action out of concern for climate change
	Regression coefficient (B) & significance level											
Taken/ taking action out of concern for CC		-0.53	0.40	-0.51	-2.39	0.08	-0.66	-0.97	0.20	-2.08	-1.36	
Actions taken:												
Walking (6 2 1)								1.70	5.72	1.43	-0.47	
Avoid driving car (6 2 27)								2.61	-0.33	0.45	2.32	
Conserve energy (6 2 18)							22.7	-1.37	-0.86	-0.30	-1.43	
Other energy-related actions (6 2)								-0.67	-0.84	1.01	0.60	
Recycling (6 3 8)								2.06			-0.33	
Indirect action, i.e. political, financial (6 4)								0.43			2.24	
All other actions (6 3)								-1.34			-1.25	
Limited efficacy, ability: e.g. "I try", "when possible" (6 1 1)								-0.19			5.89	
Regular actions:												
Turn off lights I'm not using			2.13	-2.11	1.50	1.24		3.11	2.60	-0.12	0.14	0.15
Buy energy efficient light bulbs			-0.66	0.89	0.94	-0.29	8.18		-0.41	2.44	-1.30	-0.20
Walk/cycle to work			0.14	1.26	-0.24		9.69	-0.79		7.27	1.41	0.39
Use public transport			-0.35	-0.16	0.32		2.51	0.80	3.61		-2.03	-0.38
Recycle glass			-1.39	0.15	-3.34		-2.10	2.67	0.70	-2.67	0.66	1.48
Recycle other items			0.55	1.08	0.57		1.77	2.32	2.87	-0.48	4.23	0.63
Buy organic food			0.04	-0.98	-0.28		7.42	2.44	-1.20	5.79	2.00	0.84
Take part in a campaign about an environmental issue			1.47	1.04	1.80	0.60	-0.64	2.25	2.11	4.28	0.80	0.97
Mileage (1st quartile):												
2nd mileage quartile			-0.02	1.87	0.36	-0.26	-13.7	2.21	-0.30	-3.57		0.72
3rd mileage quartile			0.63	0.99	-1.59	0.39	-8.05	0.47	-2.17	-2.25		-0.65
Highest quartile mileage			-0.50	1.63	-0.01	-0.90	-12.3	1.71	-2.73	-0.03		-0.22
Unknown mileage (but drives)			-0.16	2.32	0.71	0.23	-9.05	2.06	-2.24	3.80		-0.09

Key	p <0.01	p <0.05

7.7 CONCLUSION

7.7.1 Key influences on understanding

Table 7.10 summarises the main characteristics of the five understanding groups, as identified by the regression analyses.

Table 7.10 Overview of groups with particular beliefs and knowledge about climate change

Percentage of respondents	Main beliefs and actions	Demographic, value and experience profile
17%	**Ignorance** – claim to know little or nothing about climate change. Identify pollution as cause of climate change; planting trees to tackle it; and business/industry as having main responsibility. Unlikely to perceive climate change as a threat or something that can be tackled. Unlikely to take explicit climate change action. Likely to hear about climate change from television or radio; but not the Internet or school/university. Concerned about radioactive waste* and poor waste management. Unlikely to recycle glass.	Female, generally younger (least likely to be aged 35-54*) and less educated (or holding 'other' science qualification*). Read Daily Mail/ Mail on Sunday. Car owners, unlikely to live in Ward N (affluent, sub-urban) Non-member of environmental organisation
6%	**Knowledge that CO2 causes climate change.** Also identify carbon reduction strategies to tackle climate change; less likely to identify natural causes for climate change	Not in top PEV quartile
44%	**Perceived threat from climate change** – believe climate change will personally affect one. Also know process of climate change involves trapping heat*; identify greenhouse gases as cause*; and individuals/public as responsible for tackling*. Most certain about reality of anthropogenic climate change*. Heard about the issue from a range of sources, including the media, Internet, school/university and family/friends. Believe weather patterns are changing.	Graduates in non-science subject, high income groups, Labour supporters (least likely to be a non-voter*); unlikely to read Mail or Independent Member of environmental organisation; 2nd or 3rd quartile PEV scores; own health affected by air pollution; experience of flood damage
26%	**Top quartile Uncertainty score** – respondents who are most doubtful of the reality of *anthropogenic* climate change. More likely to refer to contradictory views/ debate*; to state earth's cycles/ weather patterns as the cause; to believe it cannot be tackled, though to identify responsibility with business/industry*. Unlikely to trust climate change information Likely to hear about climate change from journals Unlikely to perceive climate change as a threat* or concern, or to believe weather patterns are changing	Science graduates, Labour supporters (least likely to be floating voters* or non-voters*), car owners Low pro-environmental values
25%	**Top quartile Trust score** – respondents who are most trusting of information about climate change. Believe individuals are responsible for tackling climate change; believe the issue to be important because of the need and possibility for action*; certain about reality of anthropogenic climate change. Heard about it from television and local council. Concerned about climate change, flooding, air pollution and poor waste management. Regularly turn off unused lights	Female, very low income groups (least likely to have medium income*), generally older (particularly aged 55-74*), tabloid readers*, Labour voters (least likely to vote for 'other' parties*). Educated to vocational level or A-Level; or with 'other' science qualifications Non-member of environmental organisation; do not have high pro-environmental values Air pollution affected health of friends/family; own health *not* affected by air pollution

* Most salient influences

Overall, we can see that different dimensions of 'understanding' have very different predictors, and are related to different beliefs and evaluations of climate change. This heterogeneity in public understanding was discussed in Section 6.7. A major implication of the finding that public understanding of climate change is determined and constrained by individuals' particular contexts is that communication strategies should be tailored to appeal to different target audiences.

Certain groups are more likely to say they *know little or nothing* about climate change, including women and those with little formal education. This group are likely to have heard about climate change from the media, as a passive and ubiquitous source of information.

Science graduates are amongst the *most uncertain* about the reality of climate change; while floating voters and non-voters are least likely to be very uncertain. Other significant influences on top uncertainty scores include hearing about climate change from journals, being a Labour supporter, owning a car; and *not* having high environmental values or trust scores, or being concerned about climate change. It appears, then, that people who are most uncertain about the reality of anthropogenic climate change are politically and scientifically interested (and sceptical), but do not highly value the environment. These individuals are more likely to be aware of the debate that surrounds the issue of climate change, which consequently influences their beliefs about its reality and their affective evaluation of it as a potential threat. Contrary to claims that uncertainty is related to *misconceptions* about climate change (see Fortner et al., 2000), this research suggests uncertainty is a product of knowledge rather than of ignorance.

Certain groups are more likely to be *very trusting* of climate change information than others. Women, tabloid readers, Labour supporters, very low income groups, and respondents whose highest qualifications are vocational or A-Levels. Furthermore, people who are most trusting of climate change information seem to have accepted the key messages from this information: that climate change is due to human activities, that it is cause for concern, and that individuals have a responsibility to 'do their bit' to tackle it. Yet, while this group is much less sceptical than the most uncertain respondents, they are no more pro-environmental and do not necessarily perceive climate change as a personal threat.

Respondents who *perceive climate change as a threat* are more likely to be graduates in non-science subjects, Labour supporters, and from high income groups. They are also very likely to be aware of the mechanism and causes of climate change, and to believe individuals have responsibility for tackling it. They are well-informed about climate change and believe weather patterns are changing. Furthermore, they are likely to have experience of flood damage and air pollution, and to have high environmental values. In sum, this group seems to be highly *motivated* to understand climate change, but (as I will show) are no more likely to act out of concern for climate change.

The analyses highlight the role of *environmental values* in understanding climate change, with more pro-environmental respondents perceiving climate change as a threat, and unlikely to be amongst the most uncertain or trusting groups. While they are less likely to know little/nothing about the issue, they are *also* less likely to identify CO2 as the cause. This highlights the point made in Chapter 5, that there is a disparity between knowledge and affective response to climate change. To be more specific, holding a scientifically 'accurate' conception of climate change is actually *less* likely amongst those who feel climate change is a real and personal threat and who most value the environment. The interview data is revealing in this respect. Academic interviewees argued that an "objective" scientific perspective tends to reduce fear and concern about climate change. One social researcher explicitly stated that studying climate change made her *less* concerned about the issue since she now realises that it "may be a cyclic thing" rather the "end of the world". This negative influence of scientific knowledge on perceived threat and concern (see below) in relation to climate change has important implications for communication strategies, as I will discuss in Chapter 8.

As discussed, *experience of air pollution* and *experience of flooding* both positively affect perceived threat from climate change. Bord et al. (2000) similarly noted a significant relationship between perceived risk from air pollution and perceived risk from global warming. Furthermore, belief that *weather patterns* are changing significantly influences both perceived risk from climate change and certainty about the issue. This suggests that people are persuaded by the evidence of their senses about the reality and potential threat of climate change. However, these experiential factors have little predictive influence on other understanding variables. Thus - contrary to the hypothesis outlined in Section 2.5 - experience of local environmental threats does not seem to have led individuals to become more informed about climate change or to be very trusting of information about it.

7.7.2 Key influences on concern

The significant influences on concern about climate change are summarised in *Table 7.11*. Overall, there are few significant influences on concern about climate change. Again, contrary to the hypothesis described in Section 2.5, people with experience of flooding are no more likely to be concerned about climate change. It is perhaps also surprising that perceived threat from climate change does not significantly predict concern. The influence of Guardian readership is also interesting, and perhaps results from the greater attention given to climate change in this newspaper (Hargreaves et al., 2003). As expected from previous research (Poortinga et al., 2002), environmental values are a strong positive influence on concern about climate change. The role of environmental values in concern about global environmental issues, such as climate change, was similarly highlighted by the chi-square analysis (see Section 5.3.1).

Table 7.11 *Characteristics of respondents selecting climate change as a priority environmental concern*

Percentage of respondents	Main beliefs and actions	Demographic, value and experience profile
20%	**Concern about climate change.** Also identify sea level rise as impact of climate change. Unlikely to be uncertain about reality of anthropogenic climate change*	Top quartile PEV scores* Guardian/Observer readers*, unlikely read the Mirror Likely to have no formal education (least likely to have vocational/other qualifications*, or postgraduate science qualifications)

* Most salient influences

7.7.3 Key influences on behaviour

Table 7.12 summarises the main characteristics of the group claiming to take action explicitly out of concern for climate change.

Table 7.12 *Characteristics of respondents taking action out of concern for climate change*

Percentage of respondents	Main actions and beliefs	Demographic, value and experience profile
31%	**Explicit climate change action** – claim to have taken, or to regularly take action out of concern for climate change. Also more likely to identify human causes* and global impacts of climate change, and less likely to know little or nothing about the issue. Believe that 'climate change' is an impact of air pollution*; and perceive flooding as a personal threat from climate change. More likely to hear about climate change from the Internet and energy suppliers. Concerned about resource depletion. Regularly recycle glass, take part in environmental campaigns and buy organic food	High PEV scores*, and very low income* Unlikely to read the Express* or to be a non-voter* Own health affected by air pollution; friends/family not affected by air pollution

* Most salient influences

Consistent with the chi-square analysis, *experience of flooding* was found to have no significant predictive influence on action in response to climate change. This supports the findings discussed in Chapter 4 that suggest the two issues are conceptually distinct for flood victims. Consistent with the chi-square results, however, respondents whose health has been *affected by air pollution* are significantly more likely to take action explicitly out of concern for climate change. The *conceptual* association of air pollution and climate change is also significant here: respondents who believe climate change is an impact of air pollution are amongst the most likely to take explicit climate change action. *Thus, beliefs and experience relating to air pollution positively predict* *action out of concern for climate change.* As I will argue in Chapter 8, public engagement in the issue of global climate change may be most effective if connections with *local* pollution can be highlighted.

In contrast to previous research, *perceived threat* from climate change was not found to significantly affect the probability of explicit climate change action. However, there is a significant relationship for those who specifically identify *flooding* as a personal threat from climate change. We saw in Chapter 5 that this group is significantly more likely to be comprised of flood victims. These findings may suggest an *indirect* relationship between flooding experience and explicit climate change action, moderated by belief that climate change will affect one through flooding. There is therefore partial support for previous studies that posit perceived threat as a determinant of responsive action (e.g., O'Connor et al., 1999; Baldassare & Katz, 1992).

Despite a significant relationship identified by the chi-square test, *education* was not found to significantly predict action out of concern for climate change. This contrasts with the findings of O'Connor et al. that education significantly predicts willingness to mitigate climate change (2002; 1999). On the other hand, the regression analysis found *non-voters* are significantly less likely to take explicit climate change action. This relationship was also found in the chi-square analysis. Findings from British Social Attitudes research (Witherspoon & Martin, 1991) similarly show that political interest has a "large and consistently positive impact" on environmental concern, particularly in relation to global environmental issues (p.14). Witherspoon and Martin (1991) suggest this is because people interested in politics are more likely to follow media coverage of environmental issues. In addition, they found that people more interested in politics tend to be more educated, have higher perceived self-efficacy, and are more environmentally active. This suggests that people with a higher level of education are more likely to *feel able to* influence both political and environmental situations (Curtice & Seyd, 2003). This is consistent with the well-established link between perceived self-efficacy and behaviour (see Section 2.3.2.5) and is incorporated into both Schwartz' (1977) Norm Activation Theory and the Theory of Planned Behaviour (Ajzen, 1991). While this survey did not explicitly measure perceived self-efficacy, it would be interesting to establish through further research whether this significantly predicts climate change action.

The regression analysis shows that the group *most* likely to take action out of concern for climate change are those with high environmental values. This is consistent with previous studies on willingness to mitigate climate change (O'Connor et al., 1999; Poortinga et al, 2004), and suggests climate change action is motivated by perceived threat to the environment. Other data from this research similarly show that concern about climate change is motivated by interest in the welfare of future generations and other species - and not self-interest. As I discussed in Section 6.5, the public perceive climate change as a spatially and temporally distant phenomenon and thus not as a direct, personal threat.

While knowledge of the particular causes of climate change is not a significant influence here, identifying human causes for climate change does significantly relate to explicit action. This again points to the low salience of detailed scientific knowledge in responding to climate change. Instead, respondents who act out of concern for climate change simply recognise the impacts of human actions on climate. This relates to the theme discussed in Section 6.4, that the public tends to draw on broader, cultural beliefs and moral concerns about the dysfunctional human-environment relationship to explain climate change, in preference to narrow scientific explanations.

The negative influence of income on explicit climate change action, as well as on most energy-reduction behaviours (particularly low mileage; see below), is also interesting. This finding is consistent with the chi-square analyses, discussed in Chapter 5, and with previous studies (e.g., DEFRA, 2002). It may indicate that the perceived sacrifice in responding to climate change, identified by many interviewees, is greater for those who have more to give up. In other words, those on higher incomes are less likely to conserve energy because, unlike others, they have the means to consume more desirable energy-based products and to drive frequently. *While many interviewees argued that cost is a barrier to environmental action, income may equally act as a barrier particularly where action involves energy reduction and, consequently, changes in lifestyle.*

Table 7.13 details the significant influences on the five energy-reduction behaviours measured in the survey, as identified by the regression analyses. These results highlight the difficulties associated with categorising people according to a particular behaviour, which may be motivated by divergent concerns and goals. Not only are there disparities between actions in terms of the variables that predict them, there are also apparent inconsistencies in the influences on each one. The significant predictors for regularly buying energy-efficient light bulbs appear particularly inconsistent, which suggests this is a very heterogeneous group. For example, we see that significant influences include both no formal qualifications *and* high science qualifications.

As discussed, these analyses highlight disparity between predictors of explicit climate change action and predictors of energy-reduction behaviours, with one exception. Regularly walking/cycling to work has a significant relationship with walking out of concern for climate change. In some cases, the influences of variables are in opposite directions for explicit climate change action and certain energy-reduction actions. For example, people with friends or family whose health has been affected by air pollution are significantly less likely to take action explicitly out of concern for climate change but significantly *more* likely to use public transport and to have very low annual mileage.

Table 7.13 Characteristics of respondents taking particular energy-reduction measures

Percentage of respondents	Main actions and beliefs	Demographic, value and experience profile
96%	**Regularly turn off unused lights.** Perceive climate change as a threat and a concern, but also likely to be uncertain about the reality of anthropogenic climate change*. Regularly walk/cycle to work*, buy energy-efficient lights bulbs* and buy organic food	Car owners*, with low annual mileage (least likely to have 2nd or top quartile mileage*)
66%	**Regularly buy energy-efficient light bulbs.** Also, less likely to cite natural causes for climate change*; more likely to identify catastrophic impacts*; the need for individuals to change their behaviour; to perceive climate changes and sea level rise as personal threats from climate change; and to rate climate change as a very important issue. Yet also least likely to identify individuals as having the main responsibility for tackling, or to believe climate change is an impact of air pollution*. More likely to hear about climate change from energy suppliers. Regularly turn off unused lights, recycle, buy organic food, take part in an environmental campaign.	Have no formal qualifications *or* high (particularly 'other'*) science qualifications. Less likely to be a floating voter or to live in Ward B. Read the Telegraph, Times, Guardian, Independent or any tabloid newspaper Low trust, uncertainty and NEP scores. 2nd or top quartile mileage.
44%	**Regularly walk/cycle to work.** Also more likely to describe the process of trapping heat*; and less likely to believe that climate change is caused by aerosols* or ozone depletion. Likely to perceive sea level rise and impacts on finances as threats from climate change; believe climate change can be tackled and local government most responsible for doing so*. Likely to hear about climate change from energy suppliers and public libraries. Concerned about radioactive waste and air pollution. Least likely to rate public transport 'very poor'. Likely to walk out of concern for climate change*. Regularly use public transport, turn off lights, recycle, take part in environmental campaign, but *less* likely to buy organic food.	Younger age groups (least likely to be over 65*), very high income, likely to reader the Sun (less likely to read the Mirror). Most likely to live in Ward A 3rd quartile NEP score; tend to disagree that having a car is part of having a good lifestyle. Low mileage.
37%	**Regularly use public transport.** Also identified greenhouse gases*, deforestation, flooding and global catastrophe in their understanding of climate change. This group also tended to believe reducing car use, using renewable energy and individual action are appropriate action strategies to tackle climate change. Unlikely to identify responsibility for tackling climate change with environmental organisations* or government. They perceive flooding, but not sea level rise* or health to be personal threats from climate change. However they are much more likely to be uncertain about the reality of anthropogenic climate change. Identify climate change as an impact of air pollution*. Yet also tend to rate climate change as not at all important. Likely to hear about climate change from television and local council, but not public libraries. Concerned about resource depletion. Rate quality of local public transport 'good'*, but not unknown*. Buy energy-efficient bulbs, buy organic food, take part in environmental campaigns, and walk/cycle to work*	Men, aged 24-34, non-voters, living in Ward I, unlikely to have science qualifications* (but most likely to have 'other' general qualifications*). Broadsheet readers, but also Mirror and Mail readers. Tend not to own car* or have low mileage Low environmental values Air pollution affected family/friends' health
22%	**Have low annual mileage (<5000m).** Also likely to mention human causes*, CO2, personal observations, and global impacts; while less likely to state deforestation, or (as action strategies) renewable energy or recycling. Unlikely to identify environmental organisations and business/industry as responsible for tackling it. Believe weather patterns are changing; more aware of impacts of air pollution, especially on food/crops* and wildlife* and global warming. Yet most likely to rate climate change as not at all important personally. Likely to hear about climate change from television and public libraries, but not family/friends. Concerned about litter. Recycles and buys organic food, but unlikely to use public transport. Rates local public transport 'good' or 'excellent'*	Older (75+*), very low income, read Express, Telegraph, Times but not Guardian/Observer. Least likely to vote Labour Top quartile PEV scores Air pollution affected family/friends' health, but *not* own health

* Most salient influences

As discussed, these differences are consistent with the various motivations for energy reduction behaviours (see Section 5.5.2). Furthermore, respondents identified a *range* of actions that they took out of concern for climate change (question 23). In fact, more respondents were taking *other* forms of action, than were taking energy-conservation actions, in response to climate change. In light of these survey findings, the disparity between predictors of energy-reduction behaviours and action in response to climate change becomes more understandable. In other words, since action to tackle climate change is not necessarily identified with energy reduction, the variables measured in this survey may not be the most salient predictors of energy conservation behaviour (see Section 2.3.3).

Nevertheless, we can draw some conclusions from these findings. Firstly, *many of the behavioural variables are strongly inter-related.* This may suggest that they have common motivational bases, such as saving money or environmental protection. It may also indicate that once certain actions are adopted (e.g., turning off unused lights), they facilitate adoption of similar actions (e.g., buying energy-efficient bulbs). As I indicated in Section 2.2.3.3, people may infer their attitude from observing their own behaviour in relation to a particular object or issue (Bem, 1967). Thus, people's attitude to saving money in relation to energy consumption may be realised, or reinforced, once they start taking a particular energy-reduction action.

Furthermore, it is clear that *car ownership and perceptions of public transport affect travel behaviour:* those who walk or cycle to work, use public transport, and have low mileage, tend to rate the quality of local public transport higher; car owners, and people who do not know about the quality of public transport, are less likely to use it. Fujii et al. (2001) similarly note that drivers consistently overestimate commute time by public transport, but that this over-estimation is corrected once they actually experience the journey by public transport. This suggests people may rationalise their driving habits by emphasising the disadvantages to using alternative modes of transport. In other words, perceived barriers to reduced energy use are constructed to justify existing behavioural patterns, in order to deny cognitive dissonance. This highlights the importance not only of providing an adequate infrastructure to facilitate sustainable behaviours and to open up viable alternatives to habitual choices (see Section 5.5.3), but also of removing cognitive and social barriers to changing behaviour patterns. The implications of this are discussed in the next chapter.

CHAPTER 8. TOWARDS A PARTICIPATORY APPROACH: CONCLUSIONS AND RECOMMENDATIONS

8.1 INTRODUCTION

In this final chapter, I reiterate the contribution represented by this thesis and summarise its main arguments, identifying where these support or diverge from previous research in this area. I also outline the implications of these findings for education and policy-making in relation to climate change, referring to case studies that point to more fruitful ways of engaging the public in the issue. Finally, I suggest areas in which future research might build on the findings from this study.

8.2 PUBLIC UNDERSTANDING OF AND RESPONSE TO CLIMATE CHANGE

8.2.1 How has this thesis made a contribution to the field?

Scientific research has identified human-induced climate change as a serious threat to human societies and the non-human world. Yet, climate change is an issue with major political, economic, socio-cultural, psychological, and ethical implications, which must be understood if policy-makers and wider society are to respond effectively to this issue. *The aim of this thesis has been to examine the contextual determinants and dimensions of public understanding of, and response to, climate change in order to inform the design of more effective public communication strategies and workable mitigation policies.*

The contribution of this research has been in providing a more in-depth understanding of UK public understanding of and response to climate change. Previous UK research in this area has been largely restricted to quantitative surveys of public knowledge, attitudes, and energy reduction actions. While providing a useful indication of understanding and behaviour, this approach has not exposed the range of beliefs that exist in relation to climate change, why these are held or how they are influenced. Nor do quantitative approaches examine inconsistencies and ambiguities in beliefs, values and actions. These surveys also assume that basic terminology is interpreted uniformly and that alternative terms - ‘climate change’ and ‘global warming’ - are understood as the same phenomenon. Although some studies in the US and Europe have used qualitative methods to address these issues, this thesis has examined the extent to which findings from these studies apply to a UK context.

Furthermore, a major omission from previous research - both in the UK and elsewhere - has been in distinguishing ‘intent-oriented’ from ‘impact-oriented’ action (Stern, 2000). In other words, previous studies have focussed on the prevalence of certain personal energy reduction actions, without identifying the actions (energy-related or otherwise) that are taken with the express intention of mitigating climate change. Therefore previous studies had not provided a clear picture of the level of public response to climate change.

These deficiencies have been addressed by this thesis, which has presented findings from a detailed quantitative and qualitative study of public understanding and response to climate change in the South of England. By focussing on an area of the UK considered to be at particular risk from climate change impacts - including sea-level rise, extremes of weather and flooding - this study provides a detailed case study in its own right, while also allowing for some comparison with research conducted nationally on public perceptions of climate change and energy use. The main findings from my research are predominantly consistent with those from previous studies, although interesting discrepancies have also emerged. In some cases these differences (e.g., in priority environmental concerns and perceptions of flooding) point to contextual variables, such as timing in relation to weather fluctuations and media coverage, that inevitably constrain direct comparisons. In other instances, divergent findings (e.g., higher rates of recycling) may suggest genuine variation between residents of Portsmouth and other areas of the UK.

Furthermore, the focus in this research on personal experience of local environmental issues (particularly, flooding) represents a unique contribution to understanding how individuals relate to global, long-term risks like climate change. This research also offers a valuable insight into how people behave in response to social dilemmas like climate change and to the challenge to their behaviour, values and beliefs posed by policies for energy reduction. In particular, my research exposes the strategies of denial and displacement of responsibility that are employed by individuals to reduce cognitive dissonance. Furthermore, the salience of distrust and uncertainty in public perceptions of climate change has been elucidated by this research. Terminology (*global warming* versus *climate change*) was also shown to be interpreted in qualitatively different ways.

As I will discuss in this chapter, my research questions the effectiveness of relying on information campaigns or economic incentives as sole means to change attitudes or behaviour. This is the approach favoured by the UK government in tackling climate change and other environmental issues. Instead my findings suggest the need for *multiple* strategies for engaging the public that consider the interactive nature of learning and the complex influences and constraints on behaviour. In particular, as I will show in this chapter, local strategies and participatory approaches are likely to offer the most effective means of tackling climate change.

8.2.2 What has this research told us about public understanding of climate change?

8.2.2.1 Knowledge and public engagement

As other studies have shown (e.g., DEFRA, 2002), awareness of climate change is near universal. However there is considerable variation in exposure to second-hand information and, consequently, the degree to which individuals feel informed about the issue. Some groups - including men, graduates, broadsheet readers, and those affected by air pollution - are more informed about climate change than others. Yet over one-fifth - significantly more of whom are aged 75 or over, have no formal qualifications or low income **-** state they know little or nothing about it. Interview data shows motivation to learn about climate change is related to professional *need* or personal *concern.* More often than not, this motivation is not present; most people do not actively seek out information about climate change (cf. Ungar, 2000). By far the most common second-hand source of information on climate change is the media, particularly television and newspapers. Yet media sources only inspire a moderate amount of trust, and reporting of climate change is considered unduly alarmist. *These findings indicate a need for innovative approaches to raising awareness about climate change - particularly amongst the hard-to-reach groups identified by this study.*

This research has highlighted the degree to which perceptions of information source affect perceptions of climate change. This is understandable given that climate change cannot be directly experienced, and is defined and exposed through second-hand scientific and media sources. Thus, I have shown that trust in information, and certainty about the reality of anthropogenic climate change, are closely inter-linked. People who trust information about climate change tend to believe that anthropogenic climate change is a real and concerning issue that can be tackled with appropriate action. They seem, in these respects, to have accepted the main messages of government information campaigns. Naturally, people who do not believe anthropogenic climate change is a real problem tend not to trust information about it. Yet, trust in climate change information does not necessarily indicate agreement with expert conceptions of the issue. The most trusting respondents are, in fact, significantly more likely to identify CFCs and other forms of pollution as causes of global warming, and to associate ozone depletion with changing weather patterns. Tabloid readers are also amongst the most trusting respondents.

Conversely, graduates and broadsheet readers are more aware of scientific models of climate change, but are more sceptical that it is a human-caused problem. Science postgraduates are amongst the least likely to be concerned about climate change. Indeed, awareness of scientific evidence of the natural causes of climate change and an "objective" scientific perspective seems to *reduce* fear and concern about climate change. Previous studies have similarly identified this phenomenon (e.g., Henriksen & Jorde, 2001; cf. Witherspoon & Martin, 1991). Furthermore, my research showed that *climate change,* the term preferred by the scientific community, was more often associated with natural causes, and seen as less concerning by respondents, than the more populist term *global warming*. This seems to indicate that scientific conceptions *undermine* motivations to protect the environment. In contrast to claims that uncertainty is related to misconceptions about climate change (see Fortner et al., 2000), this research suggests uncertainty is a product of knowledge rather than ignorance. Awareness of conflicting scientific evidence about climate change was found to be a key component of uncertainty about the issue. In turn, uncertainty was related to inaction in response to climate change. Previous research has similarly noted that attitudes towards science issues become more discriminating as knowledge increases (Evans & Durant, 1995; Bibbings, 2004a). *This knowledge paradox undermines the 'deficit' model of science communication and poses a challenge to educators: for these sceptical groups, more information is not the solution to engaging them in the issue of climate change.*

It is also interesting to note the relationship between belief in changing weather and trust in climate change information, since this seems to indicate that information is more credible where it is congruous with one's experience. It also appears that information is seen as more credible if it is consistent with values: those with higher environmental values are more likely to trust information about climate change and to believe it is a real and serious problem. *This indicates that communication will be more effective if information resonates with beliefs and values.* Indeed, this was a key finding from the exploratory study that examined the impact of environmental information on students with different prior beliefs.

Most people feel climate change is quite (49%) or very (24%) important to them personally, although in relation to other environmental concerns climate change does not rank as high as more tangible and immediate threats to well-being, such as traffic/congestion or pollution. As previous studies have indicated, climate change is not generally considered a direct personal risk. It is more often conceptualised as distant in space and time, with impacts affecting the wider environment and future generations. Causes are similarly not associated with personal actions (cf. DEFRA, 2002; Hargreaves et al., 2003; Kempton, 1991). Although most people identify human activities in some way contributing to climate change - most commonly through pollution and ozone depletion - very few people readily associated it with energy use. Accordingly, responsibility for tackling climate change is most commonly placed with international organisations.

Yet, *once prompted*, over half the survey respondents acknowledge the role of domestic energy consumption in causing climate change and claim to feel a moral obligation to do something about climate change. As others have noted (BBC, 2004), most people claim to be willing to act but are unwilling to make significant changes to their lifestyles. In order to reduce the cognitive dissonance resulting from an awareness of the need to mitigate climate change, people justify their inaction by identifying physical, social or financial barriers to energy reduction and displacing responsibility and blame (see Box 8.1). Indeed, this disparity between awareness of the need to reduce energy use and actual energy conservation behaviour is also suggested by the preference for recycling over energy conservation in mitigating climate change (see Box 8.2). *As I argue in Section 8.2.3.3, this suggests that education needs to form part of a wider strategy to reduce perceived barriers to action.*

Box 8.1 Summary of themes in the public understanding of climate change

Dimensions of public understanding of climate change	**Examples**
Understanding climate change in terms of local issues and familiar concepts - cognitive constructivism	Weather, air pollution, ozone depletion
Integration of scientific knowledge with other types of knowledge in cultural narratives and moral discourses	Pollution, other environmental issues (e.g., nuclear radiation), humans 'out of balance with nature'; concern for inequality; identifying blame
Evaluation of climate change information according to particular criteria (cf. Wynne, 1992):	
• Validation of second-hand information with sensory evidence	Observed changes in weather vs. reported debate about causes;
• Overall consistency of second-hand information	Government 'certainty' vs. dissenting political/scientific voices;
• Reliability of scientific data and methods	Diverse 'proxy' sources, conflicting results (e.g., ice thickening);
• Reliability of source of information	Distrust of media information as 'alarmist'
• Possible issue overspill from previous scientific controversies	Government handling of risk issues (e.g., BSE)
Dissociation of oneself from causes, impacts and responsibility in relation to climate change:	
• Climate change not defined as direct risk/threat	Impacts mostly defined as global and future;
• Lack of knowledge - consequences of actions not evident	Low awareness of energy consumption (esp. domestic) as cause of climate change;
• Denial of personal contribution to climate change - cognitive dissonance	Car owners less likely to identify vehicle pollution as a cause
• Displacement of blame - scapegoating	'Other people', the US, industry, government not acting…
• Personal efficacy undermined by perceived social and political inaction and institutional distrust - energy reduction as social dilemma	…so why should I?
• Alternative courses of action constrained by perceived dependence, physical infrastructure or financial disincentives	Public transport too expensive or inconvenient; young families 'need' a car
Heterogeneity in understanding and response according to:	
• Demographic variables	Men more knowledgeable and doubtful about reality of climate change; women more frightened and feel obliged to act;
• Experiential factors	People affected by air pollution more informed, interested and active in response to climate change;
• Values and beliefs	Those with higher environmental values more concerned and prepared to act, but associate climate change with ozone hole;
• Terminology	Term global warming evokes more concern than climate change

8.2.2.2 Flooding and climate change - separate issues?

One of the key points of interest in this research has been the role of flooding experience in understanding and response to climate change. Previous studies of risk perception and environmental behaviour identify direct experience of a threat as a major influence on perception, learning and action. This represents an obstacle to perceiving global phenomena like climate change as serious risks to personal well-being, since these issues are primarily exposed and communicated through second-hand sources of information. Nevertheless, the impacts of climate change *can* be directly experienced. It was therefore hypothesised that experience of flooding - as the most widespread impact from climate change - would influence understanding and response to climate change. For example, experiencing flood damage might make someone more attentive to climate change information, change their perceptions of the reality or severity of the risk of climate change, or encourage them to take personal action to mitigate it.

Contrary to expectations, the research found that flood victims differ very little from other participants in their understanding 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 will affect them, they are no more knowledgeable, concerned or active in relation to climate change than people without flooding experience. This research provides a comparison of understanding between the national public (DEFRA, 2002) and a coastal community predicted to be at particular risk from sea level rise and flooding associated with climate change. Contrary to expectations, Portsmouth residents appear to be *less* aware of these impacts that are most likely to affect them, than the UK public as a whole. Furthermore, those *who have already been flooded* in the Portsmouth area were found to be *no more likely* than those who have not been flooded to mention flooding as an impact of climate change. There is also no significant difference in responses from residents of different areas of Portsmouth - despite some being more at risk of flooding from rainfall and others from sea-level rise. There is therefore no increased awareness of the risk of flooding and sea-level rise amongst those most likely to be affected by these climate change impacts or indeed those already affected.

Evidently, climate change and flooding are viewed as largely *separate issues* by flood victims. 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 is clear that direct experience of flooding is central in accepting that *flooding* poses a genuine personal risk. In contrast, second-hand information about flood risk was found not to produce the same change in attitudes or behaviour. Furthermore, personal observation was evidently the most trusted source of information on the causes of flooding. So, blocked ditches and drains, road resurfacing, local development were considered the primary causes of local flooding, with “changing weather patterns” 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 been found in previous research (see Section 2.2.3.3).

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, as do the rest of the non-expert public. Furthermore, it is quite understandable that flood victims focus their attention and efforts on the immediate and pressing issue of responding to 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 *effectively* act to reduce flood risk, personal action to mitigate climate change will inevitably not result in this kind of tangible, local gain. *This finding implies that public response to climate change will most effectively be achieved through schemes that demonstrate the efficacy of personal action and result in local benefits.*

However, while flooding and climate change are differentiated by flood victims, this research has identified a number of themes that permeate public understanding and response to both flooding and climate change. In particular, cultural and moral discourses about modern society's dysfunctional relationship with nature are used to explain both issues. *Perhaps the most revealing similarity is the importance of moral indignation at the human causes of flooding and climate change in determining behavioural response to both issues. Concern for social and environmental justice thus characterises lay discourse about these - and indeed other - risk issues.* Furthermore, social and institutional context - in terms of alienation, distrust and perceived individual inefficacy - determines and constrains behaviour in relation to both issues. These findings and previous studies (e.g., Irwin et al, 1999; Wynne, 1991) highlight the way in which risk issues are conceptualised by the public as part of a larger set of social issues and institutional relationships. *Incorporating lay perspectives in decision-making regarding risks is likely to reduce public alienation from and suspicion of institutions responsible for defining and regulating risks*

8.2.2.3 Climate change as 'pollution'

While climate change is not closely associated with flooding, it is linked to a number of other environmental phenomena - most commonly ozone depletion, weather, and air pollution - through conceptual similarities and moral discourses. These associations have been widely recognised in previous research on public perceptions of climate change (e.g., Kempton, 1991, Hargreaves et al., 2003) and offer an insight into how the non-expert public learns about novel issues by *building understanding around existing concepts and concerns*. Box 8.1 summarises the dimensions of public understanding of climate change that were discussed at some length in Chapter 6. The implications of socially differentiated representations of climate change identified in this and other studies relate to epistemology, education and wider policy approaches to tackling climate change.

The conceptual integration of climate change and air pollution may explain why people who feel their health has been affected by air pollution are much more likely than people unaffected by air pollution to believe that climate change does or will personally affect them. My study also found that this group is significantly more likely to take action out of concern for climate change. Since air pollution is commonly understood as the main cause of global warming, it may be that experience of local pollution enables people to more readily accept - and act to mitigate - the risks associated with climate change. Perhaps the benefits from climate change mitigation are considered to be the same as action to reduce pollution. However, since regression analysis found that being affected by air pollution does not significantly predict energy-reduction actions the relationship clearly is not straightforward. These findings warrant further research to determine precisely how and why perceived threat from air pollution influences action to mitigate climate change. *Nevertheless, we can infer from the close relationship between beliefs and experience in relation to air pollution on one hand, and understanding and response to climate change on the other, that highlighting the links between local and global pollution issues may foster individual climate change action.*

8.2.3 What has this research told us about public response to climate change?

8.2.3.1 Asymmetry of intentions and impacts

As I have indicated, an important distinction made in this thesis is between 'intent-oriented' and 'impact-oriented' action (Stern, 2000). Respondents were asked firstly about whether they take any "action out of concern for climate change", and if so what this action entails. Secondly, they were asked about a number of energy-reduction behaviours and the reasons for taking these actions. The responses to these questions support the a priori distinction between energy reduction actions and actions (energy-related or otherwise) that are taken with the express intention of mitigating climate change. *There is a clear divergence between actions prescribed by policy-makers and those taken by the public to mitigate climate change.* Less than one-third of people are taking action out of concern for climate change, but more commonly these are *not energy-reduction* actions (see Box 8.2). The regression analyses indicate that high environmental values are the strongest influence on both concern about climate change and action out of concern for climate change. Conversely, people who take action to reduce domestic or travel-related energy generally do so for reasons unconnected to the environment (e.g., to save money or for health). Car ownership and perceptions of public transport were also found to strongly influence travel behaviours. These results imply that surveys that measure energy reduction as an indicator of public response to climate change falsely assume that these can be equated; consequently, they will provide a distorted picture of public behaviour.

Box 8.2 Public action in response to climate change - intent-oriented versus impact-oriented behaviours

Intent-oriented action - 'Action out of concern for climate change'	**Impact-oriented action - Energy-reduction behaviours**
31% have taken/are taking action Actions include both energy-reduction and (more commonly) other types of actions. Most popular actions are recycling (18%) and avoiding driving (8%) Most salient predictors include **pro-environmental values** (measured using a 3-item scale devised for this research) and **very low income**	96% regularly turn off unused lights (72% to save money) 66% regularly buy energy-efficient bulbs (47% to save money) 44% regularly walk/cycle to work (35% for health) 37% regularly use public transport (28% for convenience) **Disparate** predictors for each action, but behaviours strongly inter-related. Also, **car ownership** and **perceptions of public transport** affect travel behaviours

This divergence between actions prescribed by policy-makers and those taken by the public to mitigate climate change may suggest an *informational* 'gap' - a lack of awareness of which actions are most effective. This is borne out by respondents' suggestions for actions that would effectively mitigate climate change: most suggested pollution controls, renewable energy, or more information; only 4% mentioned energy efficiency. It may be - as Read et al. (1994) suggest - that actions viewed as 'good environmental practice' like recycling and pollution controls are suggested as appropriate solutions in the absence of detailed understanding of the causes of climate change.

On the other hand, there appears to be a *motivational* component to the difference in prescribed and actual mitigation actions. Energy-reduction - while more effective than other actions - may be viewed as more difficult or less favourable than other personal actions like recycling. It may be that commonly-practised impact-oriented environmental behaviours like recycling (DEFRA, 2002), are readily cited by respondents as evidence of their positive contribution to mitigating climate change. Conversely, car owners were found to be less likely to suggest reducing car use as a means of tackling climate change. Thus, there may be a tendency to *over*estimate one's contribution to mitigating climate change, as well as to *under*estimate one's negative impact, in order to reduce cognitive dissonance (cf. Stoll-Kleemann et al., 2001).

8.2.3.2 Costs and benefits of action

The interview data shows that impact-oriented environmental actions that are preferred tend to be more financially rewarding and convenient than the alternatives. In fact, as Box 8.2 shows, a much higher proportion of respondents claim they regularly conserve energy than say they take action out of concern for climate change. Crucially, this research and other studies (DEFRA, 2002) show that energy reduction is more often motivated by economic self-interest and other tangible benefits than by environmental concern. Indeed, those on very low incomes are amongst those most likely to consume less energy *and* to take action out of concern for climate change. Respondents in my research also explicitly agreed that government should provide *incentives* for pro-environmental action. Conversely, other studies show there is opposition to policies that involve individuals paying for climate change mitigation (DEFRA, 2002; BBC, 2004). *This highlights the need to provide adequate incentives and facilities to enable and motivate desired behaviours.*

These findings are consistent with expectance-value theories of behaviour, such as the Theory of Planned Behaviour (Ajzen, 1991), which posit that action is based on an evaluation of the outcomes of behaviour in terms of anticipated costs and rewards. Similarly, these results can be understood in terms of psychological theories of environmental concern and action. The work of Stern et al. (1993), in particular, shows that people respond to a particular issue when it is believed to pose a threat to themselves (most commonly) or to other valued individuals or objects (to a lesser extent). Accordingly, I have shown that environmental concerns are primarily defined in terms of issues and experiences that pose direct threats to individuals. People with experience of flooding and air pollution are significantly more concerned about these issues, respectively; while few people see climate change as either a direct threat or a personal concern. Those who believe they will be affected by flooding from climate change, however, are amongst those most likely to act to mitigate climate change. These findings suggest a natural tendency to respond to threats to self-interest. Similarly, the Pro-environmental Value (PEV) scale, developed for this study, indicates that most respondents do not place environmental values higher than financial or material values. To use Stern et al.'s (1993) language, most people prioritise egoistic concerns over environmental concerns. This accounts for the low prevalence of action to mitigate climate change in comparison to actions that provide tangible (particularly financial) benefits to the individual (see Box 8.2).

While climate change is not seen as an immediate threat to most people's personal health or well-being, it is widely understood to threaten the broader environment and future generations. People with higher environmental and altruistic values are likely to be more sensitised to this threat to other people and species, and more motivated to alleviate it. This is precisely the finding of the regression analysis of action out of concern for climate change. Moreover, chi-square analyses show people with higher environmental values are more pessimistic about the impacts of climate change, and more likely to feel personally at risk from climate change. They may therefore be acting out of self-interest as much as environmental or altruistic concern.

8.2.3.3 Learning through doing

The regression findings highlight the inter-relationships between behavioural variables. For example, people who regularly use public transport also buy energy-efficient bulbs and organic food, take part in environmental campaigns, and walk or cycle to work. Furthermore, perceptions of public transport affect travel behaviour: those who walk or cycle to work, use public transport, and have low mileage, tend to rate the quality of local public transport higher. Perceived barriers to using public transport may be constructed to justify continued car use, in order to reduce cognitive dissonance. Indeed, previous research has found that drivers' perceptions of public transport improve once they use it (Fujii et al., 2001). This suggests that attitudes may be altered through adoption of a particular pro-environmental behaviour. Once individuals experience a new behaviour, they will be more likely to infer the benefits of this action, and even of related actions. Thus, encouraging energy conservation requires provision of an adequate infrastructure *and* incentives to try alternatives to habitual behaviours.

8.2.3.4 Social and institutional barriers to action

This research exposes the way in which individuals respond to climate change as a 'social dilemma' (Dawes, 1980). Evidently, the prevailing social norm to freely consume energy and regularly drive a car deters individuals from changing their behaviour. Many participants were *unwilling* to make sacrifices to their comfortable standards of living, when they perceived that responsibility for tackling climate change was not being shared by other people or organisations. Furthermore, respondents felt individual action would be *wasted* without action being taken collectively. This was particularly the view held by non-voters. Consequently, participants were concerned that solutions to climate change - at both national and international levels - should be equitable and fair (cf. Darier & Schule, 1999). As Stoll-Kleemann et al. (2001) note "the tragedy of the commons outlook creates a powerful sense of awaiting others to act first before individual sacrifices are regarded as worthwhile" (p.115). *Workable mitigation policies will involve overcoming the social and institutional distrust that impedes perceived self-efficacy.* The interview data indicates that some flood victims felt able to achieve more as a group than individually in tackling flooding. *This suggests a sense of agency can be more effectively fostered at the community level, where the impacts of behaviour are more directly observable.*

In summary, both environmental values and self-interest can consciously motivate action in response to climate change, although physical, social, and institutional contexts also influence and constrain behaviour. There is a need for further research to provide a clearer theoretical grounding for these findings (see Section 8.4) and for policy measures to reflect the complex and multiple influences on behaviour (Section 8.3).

8.3 RECOMMENDATIONS FOR EDUCATION AND POLICY

The preceding discussion indicates a number of challenges facing educators and policy-makers in engaging the public in the issue of climate change and implementing workable policies. In this section, I propose a number of strategies for meeting these challenges.

8.3.1 Public education - making links to individuals' knowledge and concerns

As I have indicated, a significant segment of the public knows little or nothing about climate change. Furthermore, many people are unclear about the relationship between energy use and climate change, and do not believe they will be directly affected by the issue. This indicates a need for public education to enable citizens to participate in informed debate about policy responses to climate change.

The emphasis of public education should *not* be on communicating the scientific details of climate change. The survey findings suggest holding a scientifically 'accurate' conception of climate change is actually *less* common amongst those who feel climate change is a real and personal threat and who highly value the environment. Respondents who act out of concern for climate change simply recognise the impacts of human actions on climate without holding an accurate understanding of the causes. Thus, the motivation to act to mitigate climate change relates to broader, cultural beliefs and *moral concerns* about the dysfunctional human-environment relationship, rather than narrow 'scientific' explanations. Michael (1996), in his study on how 'ignorance' is constructed in relation to radiation, similarly found that science was often "rendered peripheral to the substantive, critical issues", namely that an overdose of radiation is dangerous (p.120). This also reflects the findings of the exploratory study that suggested formal environmental education had less influence on students' environmental behaviour than social and experiential factors. Yet, without some 'expert' input, well-intentioned climate change action risks being ineffective. Amongst those who accept the need to tackle climate change there is a need to align intent-oriented and impact-oriented behaviour.

In relation to content, education needs to highlight the role of personal energy use in contributing to climate change, and the consequences of not mitigating climate change (Hargreaves et al., 2003). Kempton (1997, p.20) suggests communicators should refer to 'using' too much energy, rather than 'burning' fossil fuels or 'emitting' greenhouse gases, when explaining the causes of climate change. This provides clearer links between climate change, individual energy behaviours and personal responsibility. Furthermore, this information must explicitly acknowledge existing conceptual models of climate change in order to alter them. As I discussed in Chapter 6, there is convincing evidence from previous educational research that new information is adapted to fit prior conceptions. Therefore the ozone depletion framework needs to be exposed and replaced by an 'energy consumption' framework (Kempton, 1997). Similarly, communication must employ familiar and meaningful language (for example, *global warming* rather than *climate change*), and use analogy and narrative to explain novel concepts in familiar terms (Bruner, 1986; Gentner & Gentner, 1983).

Effective communication must be tailored not only to the existing knowledge of particular audiences, but also to their concerns and values. In particular, widespread awareness and concern about the *health* effects of air pollution provide an appropriate springboard on which to initiate public engagement in climate change. Furthermore, cultural and moral discourses relating to *environmental* consequences of energy use and industrialisation are embedded in the 'air pollution' framework. Effective climate change communication should adopt similar discourses to engage the public in terms with which they identify. Finally, as I argued in Chapter 6, communication must be credible, transparent and consistent with the wider policy framework. By not *reinforcing* appropriate behaviours through appropriate legislation, adequate incentives or social processes, government exhortations for individuals to give up desirable and habitual actions are inevitably weakened.

The finding, discussed in Chapter 4, that generic advice was viewed by flood victims as irrelevant or obvious has been noted elsewhere in relation to energy conservation information. As Brandon and Lewis (1999) note: "general leaflets with often inappropriate information or vague statements were not viewed by the sample as useful" (p.84). Customised information is likely to have a greater impact on action. Tailored communication might include informational 'feedback' on domestic energy use. The rationale for this approach is that individuals are shown how particular actions contribute to their energy bills, and can therefore effectively modify their behaviour to reduce their energy consumption. This information "makes visible what was previously invisible", namely energy use (Kempton, Darley & Stern, 1992, p.1217). Furthermore, it highlights the benefits of action: positive messages tend to be more attractive and effective in motivating behaviour change than negative ones (Davies et al, 1997; Burgess et al., 1998). A review by Boardman and Darby (2000) of 38 feedback studies, carried out over a period of 25 years, shows energy savings ranging from 5% to 20% - often without the provision of additional energy conservation advice. Furthermore, this approach to encouraging energy conservation highlights the *financial* benefits of action, so will appeal to more people than information that relies on environmental concern. On the other hand, because it depends on a desire to save money, it will be less effective for higher income groups.

8.3.2 Changing incentive structures and changing values

As I discussed in Chapter 2, previous research has undermined any assumption that there is a straightforward relationship between knowledge and behaviour. In fact, the knowledge paradox described in Section 8.2.2.1 suggests that provision of more information - and particularly scientific information - about climate change is unlikely to foster public engagement. Furthermore, as we have seen most people *are* aware that driving contributes to climate change, yet few are willing to use alternatives. Thus, information alone is insufficient to change behaviour, particularly in relation to travel habits. In developed countries any attempt to change environmental behaviour must address the considerable incentives and social pressures to live high-consumption lifestyles (IUCN/ UNEP/ WWF, 1991).

According to Dawes (1980), there are two logical solutions to a social dilemma:

- Changing the incentive structure - punishing defective behaviour and rewarding co-operative behaviour (e.g., Hardin, 1968; Hillman, 2004a); or
- Fostering values and norms that favour social co-operation and environmental protection (e.g., Dobson, 2003; O'Riordan, 1976; Naess, 1987).

As I suggested in Chapters 1 and 2, the present UK strategy for mitigating climate change appears neither to provide adequate incentives for energy reduction, nor to address the lack of public trust and shared environmental values that discourages co-operative energy reduction behaviour. The findings from my research strongly support the need for *both* approaches.

Firstly, this research demonstrates that financial incentives are a strong motivation for reducing energy use. Conversely, cost is a major constraint on certain energy-reduction behaviours, such as travelling by public transport. However, while there is impressive evidence that people respond to economic incentives and disincentives under certain circumstances there are limitations of the 'rational actor' model of behaviour underpinning much economic policy formulation. Firstly, economic incentives are expensive and only change behaviour as long as the incentives are provided. It is an unsustainable strategy compared to changing consumption habits and values (Dobson, 2003). Furthermore, individuals are not motivated solely by economic self-interest (Jacobs, 1994; Dobson, 2003). Where there are social motivations for energy use, such as driving, economic (dis)incentives will not be sufficient to change deeply-entrenched habits, cherished activities, and prevailing social norms. In fact, economic policies that threaten personal or social values will risk being unenforceable. This was evident from my research and has also been demonstrated by the UK fuel protests of 2000. As McKenzie-Mohr and Smith (1999) point out, "our ability to regulate is contingent on people's willingness to be regulated" (p.8). This highlights the limitations of 'top-down' coercive approaches to changing behaviour, such as personal carbon quotas (Hillman, 2004a: see below).

Consequently, there is a need to change attitudes and values as well as behaviour. This research demonstrates that those with higher environmental values are more likely to act out of concern for climate change. Consumption and materialistic values play a central role in the UK and other developed societies, and are perpetuated through ubiquitous advertising and marketing. There is therefore a role for formal education in exposing the origin and impact of social values (Mayer, 1991); in fostering a sense of environmental 'citizenship' - the idea that environmental responsibilities accompany rights (Dobson, 2003); and in promoting media literacy to enable children to critically evaluate advertising (Bibbings, 2004b). This is a more profound and long-term approach to education than the informational strategies described in the previous section.

However, environmental education that endeavours to change values without concurrent changes to physical infrastructures is unlikely to produce sustainable changes. Thus, climate change mitigation policies must provide adequate *opportunities* to change behaviour. For example, offering free public transport on selected days to encourage people to experience alternative travel options might overcome psychological and habitual barriers to reducing car use (Fujii et al., 2001). In fact encouraging behaviour change through practical incentives may precede change in attitudes (Bem, 1967). In sum, changes to incentive structures, physical infrastructures, social norms and environmental values are necessary to foster society-wide pro-environmental behaviour.

8.3.3 Local solutions

Many of the barriers to engaging the public in climate change mitigation arise from the global and long-term nature of the problem. It is scientifically complex and uncertain, not amenable to direct observation or personal experience, and distant from everyday concerns and activities in both space and time. Therefore the most promising route to engaging the public in climate change is through the transposition of climate change to the local and personal level. As I described in Section 8.3.1, climate change information needs to be consistent with prior beliefs and values, and to identify the relationship between personal energy use and climatic consequences. In addition, effective climate change mitigation should *engage communities in developing solutions that enhance local environmental and socio-economic benefits and minimise costs* (IPCC, 2001d). While emissions targets must be agreed globally, local and participatory forms of decision-making can determine the particular route to achieving regional targets.

Environmental concerns are most commonly defined as local issues that threaten values and lifestyles (e.g., Hinchliffe, 1996). As Macnaghten (2003, p.80) observes:

> "The environment becomes meaningful when it engages with social life, inhibiting or facilitating the development of ongoing human relationships, whether in the context of family, friends or communities of interest".

Accordingly, my research demonstrates that communities affected by flooding are often prepared to make significant efforts to reduce their risk from flooding. Many of the flood victims interviewed for this study had made significant personal sacrifices in terms of time, effort, and money in order to understand their flooding problem and campaign for flood defence schemes. Furthermore, even in places where there are significant environmental and social problems, people identify with and are proud of their local area (Bibbings, 2004b). The public engage in environmental problems that threaten valued activities and local areas and that resonate with their personal experiences (Macnaghten, 2003).

In addition, perceived efficacy and motivation to act tend to be greater for action on a local or community level (Eden, 1993). Local action reaps more tangible and observable outcomes than action as part of a national or international effort. In part, this may explain the relative appeal of recycling: separating waste is a physical process that individuals can engage in and which benefits the local economy and environment by making jobs and reducing landfills. Through community action, such as flood action groups, several interviewees in my study felt able to achieve more than they could on an individual basis. These observations correspond to a broader shift towards more decentralised forms of political participation, protest and citizenship (Beck, 1992; Haste, 2004b). Such social movements are characterised by autonomy and the everyday interests of group members (Darnton, 2004); many are motivated by the "politics of distrust" in institutional authority and remote expertise (Pidgeon, 2001, p.231). This indicates a need to foster trust between the public and policy-makers in issues of social importance like climate change.

Yet, climate change is a global problem that demands international solutions, and as such individuals feel impotent to effect change through their own actions (Uzzell, 2000; Hulme, Lorenzoni & Nicholson-Cole, 2005). Global issues are also more susceptible than local problems to 'defective' behaviour characteristic of social dilemmas (Stern & Kirkpatrick, 1977). In effect, people have more to gain if they act to solve local problems, and also more to lose if they defect. As the number of actors increases, the impact of individual action to mitigate or exacerbate a collective problem decreases. Thus, strategies to motivate public action to tackle climate change need to focus on the local level where personal concerns, trust and efficacy are greatest.

- *Conserving energy at the local level*

An excellent example of such a project is the Cities for Climate Protection (CCP) initiative in the US, Canada, Europe and Australia, which effectively reframes the global issue of climate change in terms of existing and observable local concerns and tangible benefits, thereby mobilising individual and community action. These benefits include reduced energy costs and traffic congestion, improved local air quality and health, and even a strengthened sense of community as people move closer to work and schools (Betsill, 2001). By focussing lifestyles on the 'local' - such as purchase of locally-produced food and reduced personal travel - the impacts on global climate will be reduced and benefits will be realised locally (Hillman, 2004). This highlights the interconnection observed by my participants and elsewhere (e.g., IPCC, 2001d; Department of Health, 2001) between a range of social and environmental problems.

- *Managing energy at the local level*

Again, local management of energy resources are more likely to result in social co-operation than larger-scale management (Stern & Kirkpatrick, 1977). Climate change mitigation relies heavily on technological solutions and renewable energy sources (IPCC, 2001c). On-shore wind power is a controversial issue in the UK (Szarka, 2004). While many herald it as a solution to climate change and local air pollution, others object on aesthetic and other grounds. Where there are local benefits associated with building a windfarm, residents are more likely to accept the more negative aspects of such development. Furthermore, they will be assured that local interests are being considered, rather than doubting the motives of 'outside' organisations and government. As Bibbings (2004a, p.v) argues:

> "Developments stand a much greater chance of being accepted by the local population if the community is allowed to participate in decision-making from an early stage. Rather than 'educating' communities (a top-down, patronising approach that fails to give legitimacy to people's concerns) developers should seek to engage communities in a useful dialogue and involve them from early on. If a windfarm plan has been developed in partnership with local people, with benefits for local people (perhaps in the form of reduced energy bills) they are far more likely to be supportive."

Local, participatory solutions also provide a more flexible basis for decision-making. Climate change is a complex and long-term problem: "The challenge is not to find the best policy for today for the next 100 years, but to select a prudent strategy and to adjust it over time in the light of new information" (IPCC, 1995; ref in Houghton p.325). Scott and Gough (2003) similarly argue that environmental education must provide the (conceptual) tools that society can apply to solve environmental problems.

- *Community-based approaches to learning*

Community-based learning offer promising means of changing behaviour in response to environmental problems by building on the perceived trust and credibility of friends and family members (Poortinga & Pidgeon 2003; Rayner & Rickert, 1988; McKenzie-Mohr & Smith, 1999). Direct personal contact, through direct appeals or social support from others rather than through the media, is very effective in fostering pro-environmental behaviour (McKenzie-Mohr & Smith, 1999). The role of the media is likely to be less direct, at least in changing behaviour: "if you watch a documentary on global warming, and subsequently discuss it, the conversation you have may convince you to make your home more efficient" (McKenzie-Mohr & Smith, 1999, p.96). This was evident from my interview data. For example, one interviewee pointed out that only through seeing and speaking to friends do you "make the link" between environmental issues, such as climate change, and your own action. These findings are supported by previous psychological research on the role of social influence and 'modelling' in attitude and behaviour formation (Katz & Lazarsfield, 1965; Bandura, 1971). The Global Action Plan's 'EcoTeams' programme, for example, aims to encourage sustainable lifestyles by "helping learning groups to become more widespread in workplaces, communities and interest groups, to encourage culture change in civil society" (Bibbings, 2004a). Evaluations of this project indicate it has been highly effective in changing household behaviours (Staats & Harland, 1995).

Finally, participation in community projects is associated with social and psychological benefits. Increased social contact and involvement is an important influence on quality of life and tackles social exclusion and disenfranchisement (Darnton, 2004). In essence, community approaches to tackling climate change will help meet broader social and environmental objectives, including development, equity, sustainability, and public health (IPCC, 2001d; Rayner & Malone, 1998).

8.3.4 Participatory approaches to decisions-making and learning

This local approach also enables a more *participatory* role for the public, which has been restricted in national policy-making. Since the impacts and causes of climate change are distributed unevenly throughout countries and regions, solutions need to be found that are contextually relevant (IPCC, 2001c). Climate change policies must take account of regional climate impacts, and local needs and constraints (O'Connor et al, 2002). Workable policy responses will therefore involve decentralised and participatory decision-making (Kasemir et al., 2003).

There are moral, substantive and practical reasons for working towards more participatory modes of policy-making (Wilsdon & Willis, 2004). Accordingly, its value is increasingly being recognised by government and researchers (e.g., House of Lords Select Committee on Science and

Technology, 2000). Firstly, participatory decision-making *demonstrates a commitment to democratic principles and gives due consideration to issues of equity*. As such, it can be justified on normative grounds. Secondly, participatory decision-making is *more likely to result in effective and acceptable policies*. By involving community groups in devising solutions for climate change, they will be more likely to feel ownership of the knowledge-making process and to be prepared to change their behaviour (Houghton, 2004). Furthermore, increased transparency reduces distrust and suspicion of experts and policy-makers and fosters engagement with disenfranchised groups (IPCC, 2001c). This was indicated by the flood victims interviewed for this research, many of whom felt alienated from flooding authorities' decision-making and failed to identify with official flooding information and advice. Thirdly, participatory approaches *improve the quality of decision-making and produces socially robust science.* I described in Chapter 4 how flooded communities develop lay expertise in order to understand and respond to their flooding problem. Decision-making will be improved if it involves people with unique, first-hand experience and knowledge of the particular flooding problem.

- *Acknowledging lay expertise about the impacts of climate change*

In relation to climate change, there is less motivation to develop lay expertise, or even to attend to media information about the issue. Respondents with a greater understanding of climate change had often *needed* to learn about the issue for their job. Yet even for climate change, non-scientists can make valuable contributions to understanding the issue. Climate change is a particularly complex and necessarily inter-disciplinary area of science in which traditional scientific assumptions of certainty and prediction are fundamentally challenged. As the impacts are increasingly felt and there are more observable changes in weather, the role for indigenous and lay expertise in understanding and responding to climate change potentially increases (Luganda, 2004). This has been recognised by scientists at the Centre for Ecology and Hydrology who, in conjunction with the Woodland Trust, have established the UK Phenology Network. This project gathers together seasonal observations, such as sightings of the first blossom or bumblebees in spring, made by gardeners and other members of the public. These are then used alongside other climate records to track the impacts of climate change (Woodland Trust, 2005).

- *Incorporating lay perspectives in the development of climate change solutions*

Furthermore, climate change is not simply a 'scientific' issue; it is a fundamentally social, political, cultural, and moral one. The causes, impacts and solutions cannot be separated from human societies and economies, their values and lifestyles. Responses to risk and uncertainty, environmental values, and concerns about social equity are among the moral dimensions to be addressed in climate change policies. Accordingly, some argue the scientific and moral uncertainty inherent in climate change *demands* a more inclusive, participatory approach to knowledge construction and decision-making that exposes competing interests and allows for negotiation

(Kasemir et al., 2003a; Bostrom & Fischhoff, 2001). It cannot afford to be hijacked by hegemonic 'truth' claims or subject to unquestioned scientistic assumptions (Beck, 1992; O'Riordan & Rayner, 1991). 'Experts' hold 'lay' values and beliefs that can influence their interpretation of data and their recommendations for policy responses. All stakeholders, including the public, should determine societal responses to climate change. A participatory model should therefore be applied to climate change decision-making and moral responsibility shared between citizens and policy-makers.

However, others disagree that the public should be able to *choose* policies for tackling climate change. There is increasing concern about the severity of the threat from climate change, and need for urgent action. Technological fixes may eventually decouple greenhouse gas emissions from energy consumption, but this may not provide the timely response needed to tackle the *impending* threat of dangerous climate change (Meinshausen, 2005). Some estimate that the reduction in emissions needed in the UK to stabilise climate change is in the order of 90% within the next few decades (Hillman, 2004b). This suggests fundamental and urgent changes to lifestyles are required. When left up to individuals to voluntarily reduce their energy use, this evidently produces little change.

Hillman (2004) argues that personal choice must be sacrificed where there is a much greater societal need. As in times of war where personal movements and consumption are restricted by government, he proposes an enforced system of carbon rationing to deal with the pressing threat of climate change. Furthermore, since this threat is greater for developing countries than for developed countries, and for future than present generations, there is a *moral* imperative for personal consumption to be reduced amongst industrialised counties. In effect, participatory decision-making may be appropriate for local and short-term environmental issues where communities can determine outcomes that affect *them*. However, since those in developing countries and future generation cannot have a say in current UK energy and climate policy, can or *should* a participatory model be applied? Lloyd (2000) argues that it is inappropriate and dangerous for policies based on expert assessment (including climate change) to "lack any legitimacy or authority unless they enjoy populist validation and support" (p.14). Given that individuals tend to be motivated by egoistic concerns, can the public be *trusted* to make responsible policy choices that involve personal or national sacrifice?

There appears, then, to be a dilemma in responding to climate change: can personal choice and democratic ideals be preserved if we are to respond effectively to the serious threat to society and the environment posed by climate change?

However, this dilemma is premised on the assumption that the 'serious threat to society and the environment' is understood and accepted by all social actors. As we have seen in this thesis and in the scientific and political debate surrounding climate change, this is clearly not the case. Before democratic principles are abandoned, there needs to be a more concerted effort to fully inform the public about the potential consequences of sustained energy consumption and the implications of policies to mitigate climate change (e.g., Kasemir et al, 2003a). Participatory methods involve deliberation of expert evidence and often direct contact with experts. This is more likely to foster understanding, trust and engagement in an issue than where information is communicated through mass media sources (MORI, 2005).

Moreover, in any society, preserving public safety and choice involves an inevitable trade-off between individual freedom and the freedom of others, between the rights and responsibilities of citizenship. Therefore inviting citizens to participate in climate change policy-making does not mean these policies will fail to produce social change. Rather it improves the chances that they will be fairer and more workable.

Participatory methods have been tested through a number of European deliberative focus groups, which involved non-expert participants being given expert scientific and policy information in order to inform their decision-making about preferred climate change policy options (Kasemir et al., 2003a). The findings suggest that the public considers a business-as-usual approach to energy use to be less attractive than energy reduction through both behavioural and technological adaptations. Participants supported mitigation measures despite scientific uncertainty, indicating support for the precautionary principle. Nevertheless, they were reluctant to make *personal* sacrifices in order to achieve this low-energy future. This suggests that deliberative approaches to policy-making must also involve looking for acceptable *structural* changes that will facilitate and motivate reduced energy use (see Section 8.3.2, above).

8.3.5 Summary - the need for multiple approaches

The previous environmental psychology literature consistently highlights inadequacies of changing behaviour through only one type of intervention. Rather, informational, moral, incentive-based and community approaches are most effective *in combination* (Gardner & Stern, 1996). Multiple approaches reflect the contextual influences on learning about climate change and the multiple motivations and complex influences and constraints on behaviour, discussed in this thesis. To quote Stern (2000):

> "Since different individuals face different impediments to behaviour change and the impediments are often multiple, little happens until the right combination of intervention types is found" (p.419).

This iterative policy-making process emerges through understanding and involving different societal actors.

8.4 LIMITATIONS OF THE PRESENT STUDY

A retrospective view on the research conducted for this thesis indicates that, while it represents a significant and original contribution to the field, it also suffers from inevitable limitations and weaknesses. Firstly, and most notably, this study has adopted a primarily exploratory approach. The review of theoretical perspectives on risk perception and environmental behaviour (Chapter 2) indicated that no single theoretical framework addressed the range of influences on perception and behaviour identified in the empirical literatures. Thus, in this thesis I have chosen not to design the research around any particular theory or theories. The only explicit hypothesis tested in this research was that flooding experience influences perceptions of and response to climate change. This hypothesis was generated from a review of the empirical risk literature, which highlighted the fundamental importance of experiential factors (see Section 2.2.3.3). Analysis of the survey and interview data remained open to any other significant themes and relationships that emerged; and these were interpreted in relation to previous empirical findings and theoretical frameworks. A more theory-driven approach may well have failed to expose some of these relationships, but would have facilitated, and improved confidence in, the interpretation of results. I therefore strongly recommend that future research builds on the findings of this exploratory study and adopts a more theory-driven approach (see Section 8.5, below).

As I described in Chapter 3, as well as advantages, there are inevitably limitations to the methods selected for this study. Firstly, the reliance on self-reported measures of behaviour represents a significant methodological limitation in this study. Although using self-reports of behaviour is less time-intensive and intrusive than conducting observational measurements, self-reports may not accurately reflect actual behaviours taken. Future research can improve on this study by including more objective measures of behaviour, such as household energy readings.

Secondly, as discussed in Section 3.4.2.5, the survey sample was more educated and somewhat more affluent than the total ward populations. Furthermore, the response rate was considerably lower in the most deprived area (Ward I) than in other areas. More resources, including an accompanying researcher, would have allowed for face-to-face visits to addresses to deliver and collect questionnaires, thus improving the overall response rate of the survey, particularly amongst more deprived groups. As described in Chapter 3, this method was used by Bickerstaff (1999) and was piloted in this study, but found to be problematic from the point of view of researcher safety and time constraints.

Finally, the interview schedule for flood victims and non flood victims did not cover the same issues: non flood victims were not explicitly asked about their understanding of flooding, but were asked about environmental concerns in general and climate change in particular. This asymmetry represents a weakness of the present study since conclusions about the conceptual distinction between flooding and climate change are based primarily on interviews with flood victims. Future qualitative research should examine how individuals without experience of flooding understand flooding in relation to climate change.

8.5 FURTHER RESEARCH

In Section 8.4, I outlined ways in which future research might improve methodologically on this study. Here, I propose seven areas in which further research might build on the findings from this study:

1. The research described in this thesis focussed on residents in the South of England, and primarily Hampshire. Future research should extend this type of in-depth analysis of public understanding and response to climate change to a representative nation-wide study. Such research might explore the reasons for differences in environmental behaviours and concerns measured in this survey and previous national survey research (DEFRA, 2002).

2. The survey conducted for this research did not address whether there was any variation in concern, perceived risk, or action according to whether respondents had children. Given that the most common reason for considering climate change an important issue was concern for future generations, it may be interesting to see whether this relates to being a parent. This study found a higher proportion of those aged 25-54 who rated the issue as very important, said this was due to concern for future generations; yet other research suggests parenthood is not a significant influence on concern about climate change (Bibbings, 2004a). This paradox deserves further qualitative investigation. Related to this, the discrepancies noted between this study and previous research in relation to the influence of age on perceptions of climate change (see Section 6.7.1.1) warrant further investigation.

3. Future research might also determine how and why perceived threat from air pollution influences action to mitigate climate change, as well as a number of dimensions of understanding. As already indicated, the connection identified in this research and by Bord et al. (2000) between perceived threat from air pollution and beliefs about climate change may offer insights into how to communicate climate change risks more effectively.

4. More fundamentally, further research should try to address the need for a more theory-grounded approach to understanding perceptions of, and behavioural response to, climate change. My exploratory approach has indicated that both morality and cost-benefit evaluations influence action in response to climate change. The relationship between political engagement and climate change action also suggests perceived self-efficacy may be significant here. Future studies should compare several theoretical models, such as norm activation models (Schwartz, 1977; Stern et al., 1993) and the theory of planned behaviour (Ajzen, 1991), to determine which most closely explains and predicts observed action. Similarly, future research on perceptions of climate change might consider relating the findings from this and other studies (e.g., Kempton, 1991) to an appropriate theoretical framework. One such framework is the Social Amplification of Risk Framework, which has recently been developed and tested against empirical risk research (Pidgeon, Kasperson & Slovic, 2003).

5. Uncertainty emerged as a central feature of public perceptions of climate change. The dimensions of uncertainty exposed through analysis of survey and interview data in this research deserve further investigation amongst other populations and stakeholder groups. For example, cross-national research might compare the way in which uncertainty is constructed and mobilised amongst different cultures. Comparisons might also be made between policy-makers, scientists, business, and journalists; or between different environmental issues, such as climate change and air pollution (cf. Fortner et al., 2000).

6. This study focussed on the public's response to climate change primarily in terms of mitigation rather than adaptation. Although the interviews with flood victims provide an insight into adaptive response to climate change, the research did not explicitly address public views on adaptation to climate change. Further studies might address the extent to which the UK public considers adaptation to be preferable to mitigation, or their perceptions of responsibility and self-efficacy in relation to adaptation. This information would need to be considered in the development of a comprehensive climate change strategy.

7. Finally, an obvious path to take in relation to further research is to implement and test the recommendations put forward in this chapter. For example, attention might be focussed on an evaluation of participatory approaches to climate change policy-making; or testing alternative approaches to presenting climate change information so as "to invoke the right cultural models when discussing the issue" (Kempton, 1997, p.19).

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APPENDICES

APPENDIX 3.1 QUESTIONNAIRE USED IN EXPLORATORY STUDY

My name is Lorraine Whitmarsh, and I'm researching environmental education for my PhD. I'd be really grateful if you'd take a few minutes to complete this questionnaire, which is designed to find out how you think about, and act towards, the environment.

Sex: Male / Female Age: …………… Degree Course: ……………………………..

1) How often do you take the following actions, *for environmental reasons*?
(Please tick appropriate box)

Recycle paper or newspapers	Regularly ❑	Occasionally ❑	Never ❑	N/A ❑
Recycle glass	Regularly ❑	Occasionally ❑	Never ❑	N/A ❑
Conserve electricity by turning off lights	Regularly ❑	Occasionally ❑	Never ❑	N/A ❑
Cut down the use of your car	Regularly ❑	Occasionally ❑	Never ❑	N/A ❑
Buy phosphate-free washing powder/ liquid	Regularly ❑	Occasionally ❑	Never ❑	N/A ❑
Buy other environmentally safe or recycled products	Regularly ❑	Occasionally ❑	Never ❑	N/A ❑
Take your own bags when going shopping	Regularly ❑	Occasionally ❑	Never ❑	N/A ❑
Contribute (money or time) to an environmental organisation	Regularly ❑	Occasionally ❑	Never ❑	N/A ❑
Encourage others to take environmentally-friendly actions (e.g. recycle)	Regularly ❑	Occasionally ❑	Never ❑	N/A ❑
Visit natural places (i.e. countryside, parks, forests, beaches etc.)	Regularly ❑	Occasionally ❑	Never ❑	N/A ❑

2) Please indicate how much you agree or disagree with the following statements by circling a number:
(5= Strongly Agree; 4= Agree Somewhat; 3= Neither Agree nor Disagree; 2= Disagree Somewhat; 1= Strongly Disagree)

	Strongly Agree				Strongly Disagree
I find it hard to get too concerned about environmental issues	5	4	3	2	1
Science and technology will eventually solve most environmental problems	5	4	3	2	1
Nature is valuable for its own sake	5	4	3	2	1
Humans were created to rule over the rest of nature	5	4	3	2	1
We should protect the environment at all costs, regardless of economic considerations	5	4	3	2	1
I consider myself to be distinct from the rest of the natural world	5	4	3	2	1
I do not feel that humans are dependent on nature to survive	5	4	3	2	1
Plants and animals exist primarily to be used by humans	5	4	3	2	1
I believe that nature is sacred	5	4	3	2	1
I believe that humans are just another animal	5	4	3	2	1
When I am in a natural place (e.g. the countryside), I sometimes feel I am 'one with nature'	5	4	3	2	1
What I have learnt from science makes me appreciate the natural world more	5	4	3	2	1
I believe that humans are part of nature	5	4	3	2	1
I believe that humans are 'stewards' for Earth	5	4	3	2	1

3) How would you define 'the environment'? *(continue over page, if required)*

4) Why did you decide to do this course? [In post-course questionnaires, the following question was substituted: What, if anything, do you feel you gained primarily from the 'Life, Environment & People' course?]

Thank you very much for your time.

APPENDIX 3.2 INTERVIEW SCHEDULE USED IN EXPLORATORY STUDY

Introduce: purpose of research - confidentiality - consent form

Life, Environment & People Course

Why did you choose to do the 'Life, Environment & People' course?

What have you thought of the course so far?

What, if anything, do you feel you gained primarily from the course? [Did you gain anything beyond the information you learned?]

Did anything have a particular impact on you? [What do you remember most from the course?]

Has the course changed your views about anything? [Has your perspective or viewpoint changed at all because of the course?]

How about the way you view yourself [in relation to the environment]?

Have you changed your views about science at all?

Have you changed the way you feel/ your concern about the environment, because of the course?

Has the course changed the way you behave? [towards the environment, other people, etc.)

Do you feel your understanding of the environment or environmental issues has changed because of the course?

Did you find any of the things you were taught on the course conflicted with or contradicted what you have been taught in other (science) courses?

Have you particularly agreed or disagreed with anything that was taught on the course?

Do you have any views on the way the course was taught? (discussion time, art, credibility of course leader)

Other courses

Have you taken any other courses relating to the environment at Bath?

How did they compare to the 'Life, Environment & People' unit?

Did they change the way you think or act towards the environment?

Concern and behaviour

[refer to reasons for taking 'Life, Environment & People' unit - interest, concern etc.]
What do you think has led to you being concerned/ interested in environmental issues? [spending time in the countryside, experience of pollution/ environmental damage, etc.)

Do you spend much time in natural places, like the countryside? How does it make you feel?

Do you take any particular actions to protect the environment, or prevent damaging it? (recycling, conserving energy, shopping behaviour, activism/ membership etc)

What do you think would make you do more to protect the environment?

APPENDIX 3.3 QUANTITATIVE RESULTS FROM EXPLORATORY STUDY

	Pre-course (Feb 02)		Post-course (May 02)	
	Mean	SD	Mean	SD
Nature is valuable for its own sake	4.55	0.74	4.50	0.83
I believe that humans are part of nature	4.45	0.51	4.41	0.67
What I have learnt from science makes me appreciate the natural world more	4.32	0.65	4.18	0.85
I believe that nature is sacred	3.73	0.98	3.82	1.13
I believe that humans are just another animal	3.64	1.18	3.47	1.05
We should protect the environment at all costs, regardless of economic considerations	3.59	0.59	3.53	0.84
When I am in a natural place (e.g. the countryside), I sometimes feel I am 'one with nature'	3.18	0.96	3.38	1.10
I believe that humans are 'stewards' for Earth	2.91	1.06	3.22	0.87
Science and technology will eventually solve most environmental problems	2.52	0.93	2.42	1.00
I consider myself to be distinct from the rest of the natural world	2.45	1.10	2.03	1.10
I find it hard to get too concerned about environmental issues	2.05	0.72	2.09	0.93
Humans were created to rule over the rest of nature	1.68	1.04	1.71	1.12
Plants and animals exist primarily to be used by humans	1.59	0.67	1.48	0.83
I do not feel that humans are dependent on nature to survive	1.50	0.91	1.36	0.82
Conserve energy by turning off lights	1.82	0.39	1.89	0.30
Visit natural places (i.e. countryside, parks, forests, beaches etc.)	1.55	0.60	1.62	0.49
Recycle glass	1.36	0.73	1.35	0.54
Recycle paper or newspapers	1.27	0.77	1.09	0.63
Cut down the use of your car	1.12	0.78	1.10	0.70
Encourage others to take environmentally-friendly actions (e.g. recycle)	1.00	0.69	1.12	0.59
Buy other environmentally safe or recycled products	0.91	0.29	0.85	0.61
Take your own bags when going shopping	0.86	0.71	0.71	0.80
Contribute (money or time) to an environmental organisation	0.36	0.66	0.50	0.66
Buy phosphate-free washing powder/ liquid	0.24	0.44	0.31	0.54

All variables not significant at 0.05 level or below using Mann-Whitney U test

APPENDIX 3.4 QUALITATIVE RESULTS FROM EXPLORATORY STUDY

1) SURVEY DATA

Definitions of 'the environment'	**Feb 02** (N=20)		**May 02** (N=33)	
	No of refs*	**% of N**	**No of refs***	**% of N**
That which surrounds us/ is around us	8	40	8	24
"Everything"/ includes subject or "thing"/ all-inclusive	3	15	9	27
Place/ space in which we live	4	20	8	24
Earth/ global/ world	3	15	5	15
"That which I perceive"	1	5	1	3
Living space (inc. 'continuous living space')	1	5	8	24
Dynamic/ dynamically	0	0	3	9
"Affecting us directly and indirectly"/ affects us and we affect	0	0	2	6
"Living and non-living"/ "natural and man-made"	8	40	2	6
"Natural" only/ generally	4	20	2	6
"Components"/ "elements"/ "things" (i.e. separate/ discrete - contents of space)	6	30	3	9
Within us/ not external to us	0	0	2	6
Interaction	2	10	8	24
Different meanings	2	10	1	3
"Contribution" by things to environment	1	5	0	0
"systems"	1	5	0	0
Something to be enjoyed, looked after and appreciated	0	0	1	3
Technical/ 'scientific' terminology (e.g., abiotic, habitat, homoeostatic)	3	15	2	6

"What, if anything, do you feel you gained primarily from the 'Life, Environment & People' course?" (Post-course questionnaire only)	**No. of refs*** (N=33)
Exposure to different perspectives on life/ nature/ environment; broadened viewpoint; realising value of others'/ diverse viewpoints; questioned status quo, or own certainties/ assumptions	23
Different view of science/ scientists/ technology	6
Insight into/ defining/ developing/ questioning own views	3
Nothing/ very little gained (because already environmentally responsible)	3
Increased awareness of own place/ human interaction in the world	2
No actual/ practical solutions to environmental problems	2
Opportunity to think for myself/ not be dictated to	2
Importance of holism, not being 'discrete'	2
Awareness of consequences of actions	1
Increased sense of responsibility	1
Greater understanding of environmental issues	1
Given ideas of how to conserve nature and how to persuade others to do the same	1
Greater appreciation of the environment	1
Appreciation that 'everything is not always what it seems'	1

* total greater than no. of participants, because many gave more than one definition/outcome

2) INTERVIEW FINDINGS

Name (changed to protect interviewees' confidentiality)	*Age*	*Degree Course*
Angela	22	Applied Biology
Becky	22	Applied Biology
Charles	21	Applied Biology
Diane	22	Applied Biology
Eric	21	Natural Sciences
Fiona	22	Natural Sciences
Greg	22	Applied Biology
Harry	21	Natural Sciences
Ian	21	Natural Sciences
John	22	Natural Sciences

1) Why did students choose the 'Life, Environment & People' course?

Interest in conservation was the primary factor for Angela and Becky. Becky also thought it would make an interesting change to the 'memorise and recite' format of other courses. For Charles, 'Life, Environment and People' (LEP) was supposed to be an easy module that would enable him to get some much-needed marks. He explained that many people referred to it as a "faff module", because it's not about "definite facts" and "you've got the chance of being able to blag your way out of an answer". Diane, a biologist, had learnt about the course from the course leader and felt the content sounded more interesting than the alternatives. Greg also knew the course leader and had found him to be an enthusiastic and interesting lecturer. He was attracted to the course because it gave "a little bit more freedom to express our own opinions" and because he felt he is "quite environmentally conscious".

The biological focus in Eric's Natural Sciences degree meant that the course hadn't been optional for him. Similarly, Fiona had only had a choice of LEP and one other course for her final semester and felt LEP looked the more interesting. John again was restricted with his choices and chose LEP because it "complemented" his other biological options. Harry and Ian were both specialising in environmental studies within their Natural Sciences degree, so chose LEP because it was an environmental option. As Harry put it, choosing LEP was "a natural continuation of my previous studies".

Evidently, for natural scientists specialising in biology or environmental studies, LEP was not necessarily an optional course; while the biologists taking LEP had more actively chosen the course – either because of it's reputation as an "easy module" or because of its content. Inevitably, though, the course attracts more environmentally-conscious people. As Eric observed:

> "…perhaps the course suffers from it's title, 'Life, Environment and People' because it has 'environment' in it, so if it has 'environment' and you study environmental studies, or you have an interest in it, then you're going to do it consciously, whereas if you don't give a damn about environmental issues and, you know, you can go out of your way to avoid them, then you're not going to study it".

2) What are students' overall views of the 'Life, Environment & People' course?

On the whole, the students felt they had enjoyed the course, even thought it was very different from their other courses. In particular, the biologists who were interviewed were very enthusiastic about the course. Charles said,

> "I enjoyed it more than anything else at uni so far, in terms of academically anyway. It's just generally great and I think he should keep doing it."

Greg similarly, said he had “loved” the course because it offered a forum in which ideas and opinions could be discussed and shared. Becky described the course as “interesting” and “thought-provoking… the course that has made me think the most, even outside of lectures”. Although she had expected the course to be more about “environmental causes”, she was glad she had taken it. Charles also said it was the only course that he and his friends would talk about outside of lectures: it had even led them to have an unprecedented “serious pub conversation”. Diane also felt that the course “makes you think a lot more” and was “the course I catch myself thinking about outside of lectures”. Harry, a natural scientist, admitted, “it’s certainly been a good course for making you think”, but also felt offended that the course leader seemed to assume that the students were not environmentally conscious:

> “…me and my friends are environmentally conscious as much as you can be, being students and we do recycle, and we do compost our own food… but um, I feel that perhaps when it’s suggested that um you can’t work for the environment without holding perhaps some of the worldviews that are expressed, I feel a little bit like- a little bit like I’m under attack, as if um, as if my own efforts are not really coming to anything, because I disagree with some of the things that are expressed in the lecture.”

Overwhelmingly, all interviewees (with the exception of Eric) enjoyed the opportunity to voice their opinions and discuss ideas. Most of them described the course as “different” or “a refreshing change”, contrasting the format of LEP with the typical approach to teaching in their other lectures of “crib learning” and “regurgitating facts”. The language used by the students to criticise the conventional lecturing style is strikingly similar. Ian, for example, said usually “they’re telling us facts and we have to recite them”; and Diane likewise described her other courses as “it’s just sit there, write what the lecturer says… um, and… then go away and learn it and regurgitate it in the exam”. Charles criticised the format of his other courses, in which, “you sit down and you hear all about what I have to tell you, you take the notes and you regurgitate it in the exam.” He went on to describe how LEP was different to this:

> “It’s no longer a lecture course in my opinion, it’s sort of like, it’s turned into a conversation. People say- nobody raises their hand anymore, they just come out with what’s on my mind, and that really makes it brilliant… It’s never ever happened before in four years of biology lectures, that is the only course I’ve seen that happen on. And that’s an achievement, I think.”

Becky used similar language, when she explained why she preferred the LEP format to that of the other courses:

> “…because we haven’t actually got lots of notes to just go away and learn, and regurgitate in the exam, which you do for most courses, it’s a bit different …you go into a [typical] lecture they can stand and talk at you for hours… whereas because of the way it's [LEP]- it's taught it's- you feel a lot more included, so you don't feel you're being preached at, which is quite nice… it's definitely- definitely the course I think most about, definitely the course I've enjoyed the most as well, so I think it's definitely a good way of teaching. It makes you feel a bit more equal, and 'cause we are at that stage now where you don't want to be taught any more, you want to be considered a bit more of an equal, and so that is quite nice… it’s made us think a bit more, and actually not just be a clone of someone else.”

Eric was generally unimpressed by the course. He said he felt confused during most of the lectures, and was unsure of the course leader’s “point”. Like Harry, Eric felt the approach of “breaking down preconceptions” was not relevant for environmentally-conscious students, such as himself. What most of the other interviewees enjoyed about the course – the freedom to voice opinions and discuss issues – Eric was uncomfortable with. He explained, “I’m used to and like someone stood up the front, telling us how it is and passively learning”. Early on in the course Fiona and Ian had also been confused about the purpose of the lectures, and about some of the ideas they were being introduced to, but both agreed that things were becoming clearer as the course went on.

Ian and Charles both suggested that LEP should be a mandatory module for first year students. Ian and Eric, also pointed out that biologists tend to be persuaded of the view that biotechnology is a "good" thing, which led Ian to the conclusion that LEP might present a more balanced view in relation to the environment and biotechnology.

3) What do students feel they have gained from the course?

The outcomes of the course described by interviewees supports the findings from the quantitative questionnaires. Angela, Greg, Charles and Harry felt the main outcome of the course for them was that it "raised awareness" about the environment and other people's views on the environment. For Fiona, too, the course had given her "a different way of looking at the environment" and therefore different approaches to solving environmental problems. Likewise, John – who described the course as "completely different to anything that I'd experienced before" – felt the outcome for him was "considering different outlooks, different viewpoints". Becky said that she felt being exposed to other people's views had made her more open-minded and willing to question "what you do and how you react to things… It's kind of made me a bit more aware of what I should be doing and what I shouldn't be doing".

Diane also felt she had become more open-minded: "it's opened my eyes quite a lot". She felt the world seemed less "black and white" and that she had gained "a better perspective". She had become more questioning particularly of science, which she felt was no longer "the be-all-and-end-all".

Interestingly Charles also felt the course had given him "a little bit more faith in science" because he could see there was room to air opinions rather than merely learning verbatim "facts", an approach with which he had become disillusioned. Like Charles, Greg was reassured that the course leader was "allowed to have these ideas", especially working in a university that is "so strict on science". Greg explained that hearing the LEP course leader discuss ideas that he had previously already begun to consider had reinforced and validated them. Ian and Harry, who were both specialising in environmental studies, also felt that the course had "clarified the things that I thought I believed", some of which had been "unconscious" assumptions (Harry).

Ian also felt he had gained confidence after giving his presentation. Greg also felt the course, through the increased interaction and group work, had allowed him to make "a lot more friends".

Angela admitted that another outcome for her was behavioural: "I'm recycling more and things like that". Becky had found the course was something that she would often discuss with her housemate, and through these conversations she had persuaded her housemate to start recycling.

Eric felt LEP might have added to an overall improvement in his understanding of environmental issues since the start of his degree, but could not isolate the impact of any one unit from the degree as a whole.

4) What do students remember from the course?

Students were asked what, if anything, in particular from the course had had an impact on them, or been particularly memorable. Becky felt it was the course leader's general "way of thinking, his inclusionality stuff", but added that she felt his ideas were still in the early stages and needed more time to be refined.

Charles described the way the course leader has "reinterpreted natural selection…his whole idea of binning adaptation and, um, replacing it with this idea of attunement", and his general "holistic approach". He later went on to say that "the whole paper thing" (the course leader folding a piece to paper to demonstrate interconnectedness of the two halves) had really impressed him, and had highlighted the importance of interactions in the environment.

During the interview, Greg made several references to images he had remembered from the course, including (like Charles) “the demonstration with the paper” and “the idea of the curve” (that to describe a curve, it must be dissected into tiny straight lines), as well as a number of concepts like “inclusionality”, “continuous context”, “space and boundaries”, “movement of energy and matter”, “fluid numbers”, “tributaries”, “fungus”, our interaction with the surrounding air, and the importance of “water”.

Diane said that, unlike other courses, LEP “felt like one long lecture broken up, in that it all tied together” and so it has difficult to isolate any one element from it as memorable, except perhaps the group work. Earlier, however, she described how seeing the word “adaptation” in an article makes her think that the word “attunement” may be more appropriate. “Every time I read the word ‘adaptation’ I think ‘shouldn’t that be ‘attune’?’” Like Diane, Fiona felt perhaps the group work had been significant, highlighting the importance of interactions and complexity, and undermining a simple cause-and-effect model, in understanding the environment.

Harry felt there were both positive and negative impacts from the course. Negatively, he recalled a lecture he had missed, but which had angered his friends, in which there were “ideas expressed that the Western worldview was a kind of illness”. He called this “objectionable” because it showed an intolerance for a valid point of view. From a positive point of view, Harry acknowledged the value of the course leader’s mycological expertise in “how nature is not a closed system”. Harry felt he could use this mycological evidence to support his own arguments more “objectively”.

Eric, again, could not isolate any impact from LEP from his other environmental courses. Ian also could not recall anything memorable from the course, but had found the group presentation particularly enjoyable. John did not find anything particularly memorable because he said he had found the ideas expressed in the course difficult to understand and accept.

Several of the students interviewed referred to the reading they had done in connection with the LEP course. Greg was particularly influenced by the core text by David Suzuki, who “sums up exactly what I think in a couple of his chapters”. Angela admitted she often did little reading for her courses, but the enthusiasm of the LEP course leader had encouraged her to do the extra reading throughout the course. Likewise, Becky admitted “I’ve been doing a lot more reading for this course than I would for any others, and there are alot more texts that are actually really interesting to read”. This reading had given her “a general awareness”, increased her understanding and concern about environmental issues, and also reinforced her desire to work in conservation. She went on, “it has made me think… about how I can influence other people, and how I can use my knowledge and the facts that I've learnt to kind of sway other people's thinking”. Fiona had found reading the course leader’s book had helped her understand and enjoy the course more. Ian had not found reading the course notes at the start of the course helpful because it was not until the course was nearing the end that it had begun to make sense to him. Interestingly, Diane and Eric felt that, unlike other courses, there was not much reading around that could be done for LEP.

5) Did the course change students’ views about anything?

On the whole, students felt the course had opened their eyes to a more holistic view of the world and forced them to question their previous assumptions. Initially Becky claimed, “I haven’t really changed my views, I’ve just kind of accepted that there are others out there”, but subsequently qualified this by saying:

> “I suppose it has altered mine a bit in that I think a bit more of- you do tend to think of one thing, and not really think of how everything else relates to it, and I’ve changed that now, I’ve tried- I do try now to kind of consider like the knock-on effects”.

Similarly, Angela felt that having done the course she now agreed that you must look at the whole environment to understand it: “you can’t separate it into bits”. Charles, too, spoke about his increased awareness of interactions in the world, concluding, “if it’s taught me anything, it’s taught me to just not be as reductionist in my thinking as I am about some things". Later, though, he added that he was "more anti-capitalist":

> "He's got me ranting at my housemates if that's anything to- they're all economists, so! They're all economists, so I'm like 'you're all evil!' and I'd never have said that to them before, so I suppose that's slightly pro-active. If anything I'd say it's made me a little bit more anti-capitalist, actually, I'd say."

Fiona and Diane did not feel their views had really changed, but that perhaps they had changed how she might approach and solve an environmental problem- namely from a more holistic perspective. Diane also felt the course had enabled her to question her assumptions:

> "If anything, it's got rid of some of my opinions, in other words it's made me realise that… my opinion is… I don't have one! …What it's done most is break down some of the things I thought I knew, but in a good way, sort of vetting my views, cutting out the dead wood as it were. So I can reintegrate and re-think about it, and I haven't really got to that stage yet…. That position will be more flexible than my earlier position. It has helped me to see that other people's points of view can be different from mine, and still valid".

John similarly, explained that he had not changed his views, but had begun to question them more, particularly his assumptions about the value of reductionism.

Greg did not feel his views had changed because of the LEP course; rather his views had been "added to and shaped". Harry couldn't pinpoint any of his views that had been changed by the course, but suggested, "there are times when I'm sure an idea has been planted, but perhaps will come to fruition later on". Ian, like Harry was specialising in environmental science, and felt most of the LEP course reinforced ideas that he had developed during his other courses, but did not change his views.

As before, Eric did not feel his change in viewpoint could be attributed to LEP, or any other individual course, but described having an overall increased sense of responsibility and an increased awareness of the impact of his life since starting university. He later expressed the view that LEP probably does not change students' opinions, for example, of GM. Natural scientists tend to be more anti-GM, and biologists more pro-GM, because of the focus of the other courses they have studied: LEP will not change that.

6) Did the course change students' views about themselves or their relationship with the environment?

Angela felt she had somewhat changed her view of herself in relation to the environment, having done the LEP course:

> "I see… myself and, I don't know- just always brought up to think of yourself as an individual, and this is your little bit of the world, and you just get on with it really, whereas now I think, well actually no, I'm not just in my own little bubble. Like the way I- the things I do affect other- other people and affect other beings as well."

Fiona gave a similar response:

> "Before, you sort of think humans can change everything and do everything, but then with this course, it makes you think actually I'm so small compared to everything and maybe if I do change something then what sort of impact does that have… like more than what we see really? … 'Cause everything's just integrated together, so it's quite different".

Becky felt she had not changed her view of herself, although she had become "a bit more aware of other people". For Greg his ambivalent relationship with the environment had not been resolved through the LEP course. He explained:

> "There's two, um, indecisions that I have, whether I'm a part of the environment therefore I don't really matter that much, or because I am a part of the environment, I am a vital part of it and what I do does matter. Um, so from a global point of view, one person- one human is not going to be much of a difference, you know not going to affect it that much, yet from sort of a personal point of view, um, you can have a large effect".

Eric also seemed to be aware of the conflicting views about the human-environment relationship and the significance of individuals' behaviour that were suggested in his environmental sciences courses:

> "I think one thing with all of them is that I feel that big changes need to be made. So you do sometimes question what difference the little changes you can make will do, but equally at the same time they sort of encourage you to make those little changes, so I'll question the validity of 'Why bother?' They still persuade you to do it, sort of seems almost paradoxical".

He went on to describe his frustration that everyone, even to some extent him and his friends, want to earn money and have material goods, so economic structures and attitudes are too large and entrenched to be changed by one individual.

Neither Harry nor Ian felt LEP had really changed their views on his relationship with the environment. Ian admitted that he might not have consciously thought that "we are our environment… but it's probably quite a reasonable way of presenting it". Harry had found LEP and previous environmental courses had reinforced his perception of himself as integrated into the environment, in a similar way to the Maori people.

A number of interviewees felt that, through the discussion format of LEP, they had gained more confidence to voice their opinions. Charles, for example, felt his view of himself had not really changed, other than that he was more confident. Diane had also enjoyed speaking out in the LEP classes, which she admitted she tended not to in other classes. She felt her opinions were valued more in LEP than in other courses:

> "… often if you get to speak out in class in others, it's to give answers that are specific and they're right or they're wrong, and if you sit there and you know the answer, and you know that the lecturer's going to give it to you sooner or later anyway, what's the point of saying it? But with 'Life, Environment and People' you can actually say your own opinion, which isn't necessarily going to come out anyway, so there is a point to saying it."

She also described the LEP course as changing "who I am as a person", because she had learnt to think in a different way, question previously unquestioned beliefs and consider other people's opinions. She acknowledged, though, that a number of other concurrent factors, associated with coming to the end of her degree, were causing her to change rapidly. Similarly, Eric agreed that the university experience had changed him but he was unsure in what ways.

Equally, the opportunity to give presentations improved the confidence of some students, such as Ian. Greg, too, said he felt more confident in giving an animated presentation and "making a fool out of myself", because he had developed friendships with many of the group.

7) Did the course change students' views about science?

Angela felt her view of science had changed considerably during her final year, due in part to LEP and to another course called 'Biology as a Worldview'. She explained that she had lost a lot of faith in science, but still considered it the "best method we have". Similarly, Fiona and Greg had begun to question the certainty of science during the 'Biology as a Worldview' course the previous semester, and found LEP reinforced that message. Greg explained that he had changed from "strongly believing in science" to becoming quite "sceptical" of it, because he was more aware of scientists' "contradicting views" and the limitations with focussing on "one thing".

Diane's view of science had also been "modified" by the LEP course, although she felt the course leader went too far in demanding "a complete reconstruction" of science. In particular, she explained that she felt more open to non-scientists' ideas, and to "the whole wishy-washy green movement".

Becky also felt LEP had made her "more critical of the whole scientific process" for its focus on "one thing and not anything else". Natural scientists Harry, Ian and Eric all felt LEP reinforced what they had learnt about science in their 'History and Philosophy of Science' (HPSci) lectures. Eric explained that the HPSci lectures had been "hard to get your head round" because it undermined the 'black-and-white' approach of science. HPSci also highlighted:

> "…things like theory-laden-ness and you know that most scientists go in looking for results and happen to find it, and you have to question whether they only found it because they were looking for it, or whether it is actually true…"

But, like Diane, Eric concluded that he was still "a great believer in science". Harry also explained that HPSci had changed his view of science, from a belief that science produced certain knowledge to the view that:

> "Science is a tool that we use, and it can suggest answers but, um, obviously it's up to us to decide which aspect of science applies in a particular situation. And equally science can get it wrong, and what we think as true today may not be true in ten years time. I think definitely that view was supported in 'Life and Environment' lectures".

Ian also described becoming more critical of science through both HPSci and LEP, particularly questioning its reductionism and objectivity. He also felt LEP challenges "your expectations of what a science teaching course is… It's challenged the assumption that I go in, I take notes and I then learn those notes." As mentioned earlier, Charles also saw the fact that the LEP course leader was "allowed" to run a course in such an unconventional way, as a redeeming feature of science. After his past experience of lecturers who "chastised" people for expressing their opinions, through LEP he was becoming less "cynical" and regaining some faith in science. He had also enjoyed the fact that the course was "a work in progress" and sometimes self-contradictory, rather than couched in the language of "facts" and certainty as were his other courses.

8) Did the course change students' feelings and concern for the environment?

When asked if LEP had made them more concerned about the environment, most students started by pointing out that they have always had some concern for the environment. The most common view was that LEP had not increased concern significantly. Harry, for example, felt LEP and his other environmental courses had "not fostered environmental concern from nothing" but had raised his awareness of the issues they were studying. Angela explained that her concern for the environment had significantly increased in her placement at the National Trust, but felt LEP had built on, not changed, her concern for the environment. As mentioned, Becky felt the reading associated with LEP, rather than the lectures themselves, had probably increased her existing environmental concern.

Several of the students linked this question about their concern for the environment with their environmental behaviour. Charles explained that he had always been aware of environmental problems, and that his awareness of interactions in the environment had been raised through LEP, but that having done LEP he didn't "feel any more motivated to particularly run out and save the world… because I'm lazy". Diane also admitted not always acting on her concern:

> "I think I'm sort of an average person, in that yes, I'm worried about it, and yes, I try and do my bit, but sometimes I do think 'Ooh, I can't be bothered to walk all the way there, I'll drive' and that sort of thing!"

She felt that LEP might have made her more concerned in response to media reports of people "burning down forests", but that it had not effected "the little everyday things", like recycling.

Fiona also discussed why her concern did not always lead to actions to protect the environment. She had always been concerned, but LEP somehow reminded her of that.

> "I'm not really environmentalist or anything, but I do worry about it. But I've never actually done anything about it, 'cause you know when you kind of forget, and with this course it kind of brings it back to you at bit".

John felt his existing "mild degree of concern" for the environment had not been changed by LEP. Eric again felt all his environmental science units had increased his concern about the environment, but also his confidence to "make a difference". He felt he was now able to take a constructive approach to "fixing" environmental problems, unlike people who say "'Oh, this global warming! Oh, the world's going to end!'". He concluded by saying that environmental studies had given him "probably more fear, but that's based on more knowledge… I do appreciate that there can still be answers".

Like Eric, Ian felt that environmental concern could be "negative" and unconstructive.

> "I do worry about it, but at the same time worrying isn't very productive, so um, I can't put it to one side as it were, but I enjoy learning about it, and I'd quite like to get a job in an environment-related sector, so, yeah I kind of worry but you can't let worrying take over".

Ian, though did not feel his concern had changed through taking LEP. Similarly, Greg felt LEP had not changed his existing awareness and concern about the environment. He explained his view that "unless we do something really drastic, the environment can take care of itself". Yet when asked if this meant he was not concerned about the environment, he reiterated his ambivalence about the human-environment relationship:

> "I don't want to see, you know, environmental- you know, impacts on the environment affecting other people: people I know, or myself, in my lifetime… I am concerned about the environment, but I think a lot of that stems from the fact I love being in it".

Greg's "indecision" about the human-environment relationship seems to stem from whether he is viewing the environment on a global or local level. His concern seems to be more restricted to local issues of quality of life and enjoyment of natural resources.

9) Did the course change students' behaviour towards the environment?

Angela, a biologist, was the only interviewee who had significantly changed her behaviour because of the LEP course. She explained:

> "Yeah, I've started turning lights off, turning heaters off when we don't need them, turning the telly off at the mains, rather than just putting it on standby, things like that. Um… trying to persuade my flatmates to, try and recycle things rather than just chuck it all in the bin, um… kind of reusing carrier bags… um, just little things like that".

Harry had already become very environmentally conscious over the course of his degree (recycling, composting, buying second-hand clothes, and so on), but felt LEP had made him "more conscious of further things I could do". He felt somewhat financially restricted as a student, but had decided to give up meat in favour of more energy-efficient grain foods.

Becky thought LEP might have changed her behaviour, had she not already been environmentally active – recycling, conserving energy, lift-sharing, buying recycled paper and so on. As a result of LEP, though, Becky also persuaded her housemate to recycle. Greg also felt his behaviour had not changed through LEP, since he already recycled paper and glass, and cycled everywhere. He admitted these actions, though, were also motivated by the desire to save money and "enjoy the journeys" he took.

Charles admitted that it was unlikely anything would motivate him to significantly change his environmental behaviour, because he was "just lazy". He explained, though, that this was not a failure of the LEP course; rather "that's more to do with me than it is to do with the course". He felt that the course undoubtedly had more effect on people, unlike him, who had never considered ideas like Gaia Theory and "gigantic energy cycling" before.

As mentioned, Diane admitted she often didn't want the inconvenience of taking environmental actions, although she "tries to do her bit" when she is at her parents' home. She thought she might make more of an effort when she left university to recycle, compost and donate to an environmental charity, but explained that the course hadn't focussed on the ways students should change their behaviour:

> "I don't feel like the course has been a very 'Let's save the planet, we need to do this, this, this, and this'. It's been a 'We need to change the way we think and realise we haven't got all the answers', and it feels like a starting point more than a ultimate answer, and I think that's what it'll end up being for me as well, the way I think about things, it's a starting point, and yes it is probably trying to change a bit".

Similarly, Fiona felt she would "like to think it [LEP] would change my behaviour" but that "time" remained an obstacle to taking more pro-environmental actions at least until she left university. Ian and John's responses were similar: they had not changed his behaviour because of LEP, and (apart from recycling) found most environmental actions too inconvenient.

As before, Eric could not assign behavioural change to any one unit he had taken, but agreed he took more environmental actions now than before university. He no longer left appliances, lights or heating on; "now I don't really think about turning them off, I just turn them off". He increasingly felt the individual was responsible for taking steps to protect the environment, and now made time for environmental actions.

10) Did the course change students' understanding, or increase their knowledge, of the environment or environmental issues?

Students were asked whether they felt their knowledge or understanding of the environment had increased because of LEP. Most felt they had been exposed to a different way of viewing the environment and environmental problems, and that this increased their critical ability more than providing them with factual information. A few, though, felt their knowledge had also increased. Angela, for example, felt the course had "definitely" increased her knowledge and understanding of the environment, but went on to say that the course was more aimed at changing *how* students think about things:

> "We did a couple of lectures on water, and I'd never really thought of water in that way at all, and it does link all things and. Um, yeah there have been certain things like that that have really um, yeah, really increased my knowledge. But the course wasn't really 'this is it go and learn it' it was much more 'think about the way things happen'. So I think that's the most useful thing, is he's taught us how to think about things in a different way, rather than giving us information to learn."

Diane made a similar point:

> "That's one thing that I think this course has done less. It's- it's not about knowledge, it's more about a way of thinking".

She admitted, though, that the research she had done for her group presentation had increased her knowledge. Becky, again, felt the associated reading had increased her understanding of the environment, and given her the confidence to persuade other people about "what they can do to help". Charles felt he had gained "a wider perspective" more than increased knowledge, and admitted that he was surprised that he had been convinced by some of the more "hippy" sounding ideas, such as Gaia Theory. John and Fiona both felt that LEP offered a different approach to potentially solving environmental problems. As Fiona stated:

> "I think if you get stuck on one view all the time and it might just be in completely the wrong direction, whereas I think if you have other views like his and that and you actually take them into consideration, um, I mean… yeah, just think if you bring all views together, even if some may be wrong and that, but you just bring different ideas in, and focus on the problem, if one of them doesn't work, do a different one, and things like that".

Ian also said his understanding of the environment was now broader, having taken LEP. It had given his a "different perspective" to the usual scientific view of "this is the facts, and this is how it should be". He explained the difference in his view between knowledge and critical, problem-solving skills:

> "It's not all factual, so it's just increased my thinking I think, different ways of thinking as well it's brought out mainly, rather than actual knowledge. I've kind of got the confidence that I can- when presented with knowledge I can kind of evaluate it, to get what- get what I think is the importance out of it, rather than I have all this knowledge now, I have the ability to manipulate and handle knowledge better."

Harry made a similar point, but interestingly, concluded that his understanding of environmental issues had in many ways become less clear since taking HPSci and LEP. Although his knowledge of the environment had in some ways increased, he explained that these courses highlighted that "clear-cut answers are not something that science can provide" and that "there are issues to discuss".

Eric felt LEP probably supported what he already knew, rather than changing his understanding. Greg also didn't think his understanding had improved.

12) Was there any contradiction or conflict with what was taught in other courses?

One of the reasons for asking about any contradiction between what was taught on LEP and other natural science-based courses was to explore the idea of environmental science as "subversive" by determining whether students felt there were irresolvable conflicts in what was taught. What was most evident from the responses was that the students did not feel concerned that conflicting viewpoints were presented. Many were undecided about their own position, and did not necessarily feel they had to agree with any of the views presented in their courses. Most felt the differences were not problematic for them, and some admitted that they just write what is expected of them from the course leader.

Angela explained that a lot of her biology courses had taught that "DNA is the basis of all life" and "evolution occurs through natural selection", and LEP was a very different set of ideas. She felt uncomfortable at first with the differences between LEP and her other courses, and still felt concerned about what she should revise for LEP since there was nothing "to just go away and learn". She explained:

> "…It's rocking the foundations of everything we've been taught throughout our degree… it's quite unnerving for some people. But um I think it's good to challenge it: you can't just take things like that for granted".

When asked if she had made her mind up about which view she agreed more with, she responded:

> "I guess I'm sitting on the fence really. I can see that both sides have their strengths and weaknesses, um, and I haven't made my mind up at all!"

Becky also identified conflicting views presented in LEP and her other courses. She used the course leader's language to contrast the "discretist" and "thinking of one thing" approach of most science courses, with the "think of everything… highly inclusional" approach in LEP. She agreed the LEP approach "made sense", but did not resolve some difficulties, such as "the experiments thing: it's very difficult to prove anything without being discretist". She concluded that neither view should be rejected; rather they should somehow be combined. She felt the views were not irreconcilable, but that "people's opinions" needed to be more open-minded to different views to bring the two together. This was also the view of Fiona, a natural scientist, who felt there was some contradiction between the focus on "the bigger picture" and the smaller one, but that both were necessary to understand the world. She then decided that generally the differences were not too great, and had not been problematic for her personally:

> "[LEP] has still got the same ideas as a lot of other sciences but he sort of expresses them in a different way".

She tended to agree with a number of, even opposing, views that were presented (see next section). Greg did not feel that there was significant contradiction between LEP and his other courses, except in terms of the different teaching styles. He admitted that the LEP course leader's "discourse is quite unique" - emphasising boundaries and "fluid numbers" - but since his other courses were not related to the environment there had been "no conflicting remarks".

Charles identified stark contradictions in the views presented elsewhere to those in LEP: "it's not the reductionist, rational viewpoint". He gave examples where the LEP course leader suggested "replacing number theory", saying "attunement" instead of adaptation" and viewing everything as a system. Like Angela, he also mentioned the differences in teaching style, and implications for exam revision. Despite the apparent contradictions, he agreed there was a need to be less reductionist, but that some rationalism was also necessary.

Charles concluded that the aim of the course was not to reach agreement with one view or the other:

> "If I'd resolved it in my own mind I'd be disappointed! No, it's just the thing is, he offers- he doesn't offer- he offers a couple of answers, but he- he raises more questions than answers… there are some things I agree with him with, there are some things I disagree with him with… the whole aspect of the whole course, has been- the way I've looked at it just as being a conversation".

Diane felt "contradict" was "too strong a word" for the differences between LEP and her other courses. Rather she felt LEP made her question the assumptions she had developed from previous science education, such as the appropriateness of the word "adaptation". She described looking for commonalities between her courses, such as bacteria changing the environment in her 'Bacteria' course. Interestingly, she admitted:

> "In the 'Bacteria' exam I will write things that I wouldn't dream of writing if I was writing about the same thing in the 'Life, Environment and People' exam, but I think it's just two ways of looking at things, and both are useful".

For the natural scientists, the differences between LEP and their other (often environmental) courses were not quite so stark. Harry felt that having taken HPSci had made him "come to an understanding that … different aspects of science don't fit in with each other". So for him, the differences and conflicts between "two aspects of science… weren't a concern, it was just felt that they're… two different approaches". Ian felt his course on biotechnology, which emphasised genetic causality, linearity and certainty had contradicted the emphasis in LEP on dynamism and interdependence. He concluded that he wasn't sure "which one's right" but felt the LEP view seemed "more logical" and should be stressed on "the larger scale"; whereas "the other assumptions are easier for us to handle, and legitimise a whole lot more". Like Angela, John felt from his own position that both views of science had merits, but did not agree or disagree with either: "I'm an accomplished fence-sitter!". He did not see a problem in being presented with contradicting views: "it's fairly, um, easy to separate one person's worldview from another for the purposes of doing work". This suggests a somewhat relativist view, similar to that of Diane. John went on, though, to make a similar point to Greg and Fiona about the common 'factual' basis of all his courses: "I can't actually find anything to strenuously disagree with about [the LEP viewpoint]. I think it's more of a philosophical approach, and same actual facts [as my other courses]".

Eric explained that the purpose of LEP was similar to that of his other courses, but the approach and some of "the science" was different. He had found the idea of a reciprocal relationship between organisms and environment different to the traditional idea of evolution as "forced", concluding it was an "interesting" view. Overall, he admitted that he did not always take in what was said in the LEP course, and that when contradictions arose he generally "ignored" the course leader or dismissed him as "mad". Like Diane and John, though, he could see the utility in accepting the course leader's view for the purposes of coursework:

> "I feel that if I wrote an essay for [the course leader] I would just put in all his buzz-words".

13) Did students generally agree or disagree with what was taught on the course?

On the whole the interviewees tended to agree with the main message of the LEP course, while some disagreed with the approach or the details. Angela said she tended to agree with what was said on the LEP course – particularly in relation to viewing the environment as a whole. There were one or two instances where she felt she could not see how the view presented would work, such as in implementing a new voting system. Likewise, Becky tended to agree with the overall message in LEP, but was concerned that the approach the course leader used tended to "attack" conventional views, rather than remain open to other views.

Charles agreed with much of what was covered on LEP, and appreciated the course leader's honesty in admitting his view was sometimes flawed and contradictory. Yet, he felt that the course leader "underestimates the value that traditional science has, in that it has yielded results". He felt it was too much to demand a "total change", when it was often more effect to "work within a system" to bring about change. He felt, in this respect, that the course leader was too radical and ambitious: "He's prone to taking abstractions in some cases too far… re-inventing numbers is just silly". He went on to say that the course was sometimes "too holistic" and did not offer a viable alternative method for understanding the world. Diane also felt the course leader was asking for "a complete reconstruction of the way we think about things", which was going too far when much of science works still well. She felt, though, she agreed with the general message that "everybody needs to be more involved".

Eric could not identify anything he had particularly agreed with or disagreed with on LEP, but generally felt the course leader was "making it up as he goes along" and not addressing the real issues:

> "I probably went into the course thinking the way I thought, and then whenever Alan Rayner came out with… something fundamentally different and at odds with it, I dismissed him as a crank, probably… quite a lot of the time he's either contradicting himself, or on things like evolution he has decided is totally wrong, evolution by natural selection, on almost a technicality, and then makes up his own bizarre thesis on very little evidence, as far as I can tell".

Greg said he had agreed with the majority of what had been taught on LEP, except the area of semantics "which gets to me a lot". This was something that also frustrated Harry. He felt there was no practical use to a discussion about how the environment should be defined. Similarly, he felt the discussion about space, while it was not wrong, had no practical value. He also disagreed with the reinterpretation of evolution. Like Eric, he felt an attack on natural selection, which has "immense explanative power" required an alternative. Like Becky, Harry also disagreed with the approach of rejecting other viewpoints. Ian felt, in retrospect, that he had agreed with most of what was taught on LEP, although he had been confused during some parts of the course. Ian, like Charles, used the word "hippy-ish" to describe some of the ideas he was beginning to accept as "quite reasonable" about the environment from the LEP course.

Fiona had not found anything to disagree with in the LEP course, but seemed to agree with opposing views that had also been presented:

> "I think the way that he says it you can't really disagree! You kind of think 'oh, yeah I suppose'… when he was away in Sweden or something he had a debate and he said, this scientist said 'life is this' or something, and he said it a different way, and I thought, 'well, I agree with both of those', so it's sort of difficult".

John gave a similar response:

> "Well, I have to say, I didn't come away holding his viewpoint… but on the other hand, I can't actually find anything to strenuously disagree with about it. I think it's- I think it's more of a philosophical approach, and same actual facts…"

14) What did students think about the way in which the course was taught?

As discussed, most students enjoyed the format of the LEP course, and some described it as their "favourite course". Many contrasted the informal discussion-style approach in LEP with their other courses, in which they passively memorise "the facts" for their exams. Often the students described the course as "interesting", "different" and "a refreshing change". Charles, for example, liked the fact that the course was like "a conversation" rather than a lecture. Greg and Charles both noted that the discussion format worked only because the class was sufficiently small. Harry felt that discussion was an "integral" part of environmental education:

> "Lecturing at fosters a- the idea that facts are being communicated, and um discussing more has an underlying thought that this is an issue that can be discussed, it's not a factual issue that we're talking about".

Diane and Eric noted that the course had a more integrated structure than other courses. While Diane seemed to like the continuity of the course, Eric found it hard to follow. He said he liked a much more structured and focussed approach to a course, whereas in LEP "it goes wherever it happens to go, when someone comes up with a good point".

A number of students, including Eric, Angela, Charles and Fiona, voiced concerns about their exam for LEP, because they were unclear how to revise for such an open-ended opinion-based course. Fiona felt the down-side of a discussion-based course was that there was less structure and less written material from which to revise. She felt perhaps there could have been more "telling us about stuff" in combination with the discussion time.

From Angela's point of view, the approach taken by the course leader in LEP made the course much more enjoyable and meaningful that her other courses:

> "You don't feel like you're being talked to, um, it's like we're just having a chat most of the time, um… and that he does bring in our own ideas and our own experiences, and then relates things to that, and I think if you're being taught about something that actually you couldn't directly relate to, you take it in a lot more than if you're being taught something that means nothing to you, and you're just being told to go away and learn it… and he's so enthusiastic about it that it makes you become enthusiastic about it yourself".

As mentioned, Becky found being talked to as "an equal" a pleasant change from her other courses. She found the way LEP was taught:

> "…makes you think a lot more, it makes you question what you thought before, and what you still think, it makes you relate it to other courses as well, and it does keep your attention a lot better".

Greg had particularly appreciated the opportunity in LEP to express his ideas in his coursework: "I've put something personal into it, as opposed to just regurgitating information".

Students' responses to the use of art during the LEP course were mixed. Although not everyone found it a useful explanatory tool, several admitted it made the course more interesting. Greg found art a useful medium through which to express his ideas, although he warned that it was not always appropriate in science. Becky also explained that the art had helped her understand and remember the ideas relayed on the course. Harry had studied the relationship between art and science through the HPSci course, and had become aware of the valuable role art can have in science education.

Diane felt the fact that the course leader had to explain his art defeated the object of using it: "I always thought that art had to speak for itself… it might help if you could actually get it just by looking at it". Ian and Greg both felt the inherent limitation with using art was that it is very "personal", and so means more to the artist than anyone else.

Evidently for many of the students the use of art in science education presented something of, as Ian put it, "a culture shock". Ian agreed that art and science are not totally separate, but did not plan on producing a painting for his coursework: "I'll just do an essay, 'cause I'm a science student, and that's what I'm familiar with". Eric, though, remained unconvinced about the use of art in science:

> "I've always been taught art and science is two absolutely 'discrete' – and not 'distinct' – totally discrete entities, science being one hundred per cent factual, and art being one hundred per cent interpretive and emotional, and I- I'm not convinced you can demonstrate facts through emotion".

To Eric, the description of the paintings' meaning did not accord with his own view of simply "a picture". Furthermore, he found that unlike "reciting or taking the first letter of each word", the paintings were not a useful memory aid for him. Fiona also didn't find the art a useful explanatory tool.

As well as the course leader's paintings, several of the students (e.g. Charles and Greg) found the analogies useful in explaining an idea, including "the folded piece of paper" and "the curve broken up into straight lines".

Several, however, felt that it was an approach that would not work for all courses. Diane, for example, concluded:

> "I think if I'd have had more than one course like that I'd have found it a bit… frustrating, or it wouldn't have had quite so much impact almost, 'cause I think I would have switched off more… [Also] it would be very confusing".

And Greg agreed that along with discussion there was also a need for "an exchange of information" within university courses.

Angela and Ian also said they would not want all their courses taught in the format of LEP: they had enjoyed it because it had been different and had allowed them to explore controversial environmental issues. John was also of the opinion that both conventional lecture courses and discussion-based courses had their merits.

15) How did other environmental courses compare to the 'Life, Environment & People' unit? Did they impact on attitudes or behaviour towards the environment?

As already discussed, many of the students contrasted the format of their other lectures with that of LEP. Many of the other environment courses the students had taken involved – as Angela put it – "just being talked to… then go away and learn it", with little chance of discussion. However, some of the environmental science modules that the natural scientists had taken were more varied and interactive, engaging the students in projects and including guest lectures and discussions.

Angela had taken some ecology modules, which had been about "processes and ecosystems, and how different organisms interact, and there was nothing really on how humans interact with their environment". Perhaps for this reason, unlike LEP, these courses had not changed Angela's attitudes or behaviour towards the environment.

Some of the students interviewed had been taking 'Plant Biotechnology', which they felt had some environmental content. Becky pointed out that it's "more about how the technology can be used to aid humans… how to feed starving people" than about the environmental impact of the technology. This course was also lecture-based, although there had been some time for questions. Becky felt the course had presented arguments for and against GM, although Fiona and Ian both felt the bias of the course was definitely pro-GM. Becky felt the outcome of this course for her had been to raise her awareness of the "potential danger of GM". For Fiona, she felt she had been given more information about GM and its environmental impact, but felt that there was so much uncertainty involved that she was unsure of her own views on it.

Charles had taken an 'Environmental Physiology' course, but was critical of the way it had been taught. All the information given in the lectures were already on the handouts, and students were expected to "crib learn them to memory, then basically just recite them in the exam". He had also taken 'Ecology and Evolution' 'Biosphere', and the ecology field trip but again had not found these courses very interesting or enjoyable. He felt this might have been because some of the lecturers were not open to discussion, and did not want their views to be questioned. He described these other courses as "what I do nine to five before I go and do something else", whereas LEP had made him think. Nevertheless, he accepted that these other environmental courses had increased his knowledge of environmental issues more than had the LEP course:

> "Others are better at- others have been better in terms of like understanding the environmental impact of like particular things, like you go over case studies of what's happened in cases of mercury poisoning and cadmium poisoning, and you understand what the effects of these things in the environment are, like how it can lead to complete and utter mess… [LEP] was completely different in that it encouraged dialogue and it encouraged conversation; those didn't…".

As already mentioned, Eric found it hard to isolate the impact of any one of his environmental modules. Generally he felt his understanding of, and concern for, the environment had increased as a result of these courses, and he now had a better "appreciation of the impact of our lives" on the environment. These courses had also encouraged his sense of individual responsibility, and given him "ideas of how to go about starting to change something". However he added, "as much as any of the courses, it's probably the people involved in them, and just talking to my friends" that had impacted on his environmental attitudes and understanding. Some of these other environmental courses had involved discussion, but he felt they were more focussed and lecturer-led, and therefore useful, than the discussion in LEP. Although Eric didn't recall being given any specific information on how to change his behaviour, he thought they had motivated him to change his behaviour because:

> "They probably just start to change your mindset, discussion of why things are failing, the fact that we use all this technology that we may not need to, and we're very wasteful and all that sort of thing, just- I suppose just absorption into that, you know, constant suggestion of these things means that you eventually do come round, and sort of try to be less wasteful, and you just slightly adapt your own mindset".

Both Eric and Harry found that the seminar-based environmental courses they had taken in their second year were probably the most enjoyable and had the greatest impact on them. For Harry the content and format of the seminar-based environmental courses was significant in changing his attitudes and behaviour towards the environment. He made several references to ideas and topics that had been introduced to him through these courses, such as "Maori worldviews". He felt discussion on the course had been important in highlighting the controversial, rather than factual, nature of the subject; and in this more meaningful context the lecture element to the course "took on a whole new meaning… and was much more useful". The in-depth project work on the course demanded considerable research and made the students "think a lot more", which Harry felt "perhaps made me want to be environmental". Harry had been particularly moved and influenced by the guest speakers whose dedication, commitment and passion for environmental causes had put the students to shame:

> "When I turn the lights off at home, it's like your parents and such like, say 'Why are you bothering. Why bother? It's not something that we need to do', whereas the thing is perhaps- it sounds really bad, but perhaps with a group of old people who perhaps didn't think that way, and I think being more radical than us as students, so perhaps maybe that showed us up a little bit… that made me think as well that these people had dedicated so much to changing what we do about the world, and maybe- maybe that had some effect on me… Maybe towards the end of their careers, perhaps they were turning to a new generation… hidden behind all what they were saying, maybe they were saying 'We would like you to work on this a little bit', and try and make us want to do it".

Harry had also been inspired by some of his reading relating to the environment, in which it had become apparent that environment action was less about "campaigning for the Earth", and more "for ourselves" since we are inseparable from our environment. As a result of his environmental courses, Harry had become more pro-environmental in his attitudes and behaviour. Eric explained this impact of the seminar-based environmental course was largely due to it being the first course he had taken relating to the environment:

> "I don't suppose it was a favourite particularly because of anything we did within it, but just because it started to- the interest was sparked".

Interestingly, Greg felt he had enjoyed 'Biology as a Worldview' more than LEP, only because it had introduced a more philosophical approach to science *first.* Similarly, he felt that the 'Biosphere' course had impacted on the way he thought about the environment more significantly than LEP, because it was the first course that introduced him to a more "holistic" approach to the environment. He explained:

> "I think any time you're introduced to new ideas, they- you know, that you're interested in or believe in you're bound to take note of them… [When I took 'Biosphere',] that's when I started thinking more about the environment on a global scale, as opposed to you know how they teach you at school, sort of, fumes going up in the air, the reactions that go on, recycling your rubbish. I think I've been able to see it from a, sort of a, wider perspective. And as I say that's why they've promoted more thought for me".

Ian had also taken the same seminar-based environmental science courses as Harry and Eric. He had particularly enjoyed the scenario exercise, in which the group debated about whether their 'island' should join the World Trade Organisation. For Ian this enabled him to look at and debate environmental issues in a "real world" context, when "it's possible when you're doing what I'm doing to seem a bit detached from reality". He was able to see what jobs might be available in the environmental field, and to relate different subjects to his own "speciality" within the environmental debate. Despite having found this course interesting and enjoyable, Ian did not feel it had changed his attitudes or behaviour towards the environment, because "it's probably a bit kind of detached from anything I can kind of do on an individual level". He later recalled, though, that one of the guest speakers had encouraged the students to shop in the 'Farmer's Market' in Bath, but he had "only bought a bit from there, because… on a student budget, I just go for the convenience of Sainsbury's".

16) What factors do students think have influenced their environmental concern or behaviour?

The media evidently played a significant role in raising awareness and concern about environmental problems for several interviewees. Angela could recall being "worried about destruction of the rainforests" from a very young age due to the media coverage. Similarly, as a child, Becky had developed an interest in wildlife through television. Ian also described the impact of television on his environmental concern:

> "There was a lot when I was about fifteen on the TV about global warming, and that all that type of, 'oh the world's going to end' type of thing. Um, I don't know, maybe that kind of triggered an interest".

Eric was more specific in identifying the children's television programme "Blue Peter" as being a major factor in his environmental concern. He explained:

> "They have the Blue Peter garden, and they do the Annual Appeals to help the less fortunate in Cambodia or wherever, um, just a general doing good for society probably came from that… I'm not a massively- well, I'm getting better, but certainly when I was younger I wasn't particularly a people person… so maybe environmental issues are a way of being socially responsible, without having to directly deal with individuals or with groups of people".

Evidently this programme may have fostered a generally more altruistic character in Eric, although as he pointed out, it seems likely that he was already predisposed to be socially and environmentally responsible for "Blue Peter" to have appealed to him. John was unsure about where he had heard about energy saving light bulbs, speculating it was either through the media or at university, but concluded: "it just made sense, so I did it".

Family also played a role in developing environmentally conscious attitudes and behaviour in some students. Angela felt her family had made her aware of environmental issues, and had encouraged her to recycle and to understand the natural world: "when I was in a pushchair my granddad was teaching me to identify different trees and plants". Becky's own family had encouraged her interest in wildlife by buying her books and taking her to the zoo. She had later developed much of her environmental behaviour while staying with an environmentally conscious family in her placement year. Living with this family made Becky "get into the habit" of recycling and saving energy, which she was encouraging those she now lived with to do. (Incidentally, "habit" was how Eric described how he had developed regular pro-environmental actions). Harry explained that his parents "and the group of people I meet a lot at home" were all teachers, which had contributed to him now wanting to get involved in environmental education. He also helped out his parents each year on a camping trip, organised for children who lived in city estates, in which he could see the "observable impact" of the countryside on the children. From this he felt the countryside might have influenced his interest in the environment, and his desire to work to protect his local habitats. Ian felt his interest in the environment had probably originated through going for walks with his family while he was growing up.

Several of the students had been brought up in rural areas, including Angela, Eric, Harry and Greg, and said they enjoyed spending time outdoors. Several called themselves "an outdoors person". Eric and Greg described walking the dog in surrounding countryside while they were growing up. For Harry, being brought up in a small village, "entertainment for me has always been going to the park, or maybe going to the river and trying to catch some crabs, or going playing tennis". Fiona also said she had spent many of her holidays in South Africa, as an "eco-tourist". Both Fiona and Greg felt their desire to keep "unspoilt" the natural places where they enjoyed spending time had contributed to their overall environmental concern. As Greg explained, he had been influenced by both positive and negative experiences within natural environments. Enjoying unspoilt countryside, as well as seeing litter and pollution, had made him environmentally conscious:

> "I am concerned about the environment, but I think a lot of that stems from the fact I love being in it… You can think of the complexity of everything that's going on around you… Because I used to love going out, climbing trees, playing with the dog, being out in the open air, then I can appreciate it unspoilt, and the fact that by having too much plastic litter, cars, et cetera et cetera, it can damage this stuff, sort of immediately… You see that cars- the grass by the side of the road, you know may not grow quite so well, or the trees are losing their fir, or their cones, pines, you know that's an immediate thing you see as a child, and you think 'well, I don't want that to happen'. You know 'why is it happening?' 'Oh the cars are causing acid rain': I think that gets your environmental awareness, a little bit stimulated".

For some students school had also been a factor in their interest in the environment or natural sciences. Fiona's interest in the environment and conservation had stemmed largely from studying biology and geography in school. Diane and John had chosen to study an environmental course (LEP) because of their interest in biology. For Diane, her interest in the natural world and particularly animals had come from "needing to know why" from an early age. She also admitted, though, "I think it also comes from at my school I liked the teachers in the science department, and I didn't like the ones in the English department!" John also admitted biology was the subject he had "done best in at GCSE". Harry was unsure about where his environmental concern had originally come from, but described "a concern everybody has" when they hear in school about elephants' extinction due to poaching.

Angela and Becky's interest in conservation had been particularly developed during their year-long placement. For Angela working in the National Trust Conservation Department made her "much more aware of the sort of effects of what people do". Becky had worked in Chester Zoo, which had made her much more aware of animal extinction and resource depletion: "because you have to interact with the public, you have to know what you're talking about".

Becky and Greg had both joined voluntary environmental organisations, and found these had further developed their environmental awareness. Greg had done some voluntary work with the British Tree Conservation Volunteers, who promote responsibly managed woodland; and Becky had joined the Environmental Investigation Agency, who protect whales and dolphins. Both found this experience had confirmed a desire to work in conservation in the future.

Only one student, Charles, admitted he was not very concerned about the environment, although he was aware of the importance of protecting it. Like John, he was unsure where this awareness had come from, but suggested it may have been from studying science or his "general reading". Interestingly, he was also the only interviewee who claimed he had never enjoyed being out in natural environments.

17) Do students spend much time in 'natural environments', and if so, how does it make them feel?

All but one (Charles) of the students described enjoying spending time in natural environments. Interestingly, a few students found it hard to explain why they enjoyed it. Angela called it "a difficult question".

One of the reasons students felt they enjoyed spending time in a natural environment, was because it was "separate from work" and "a complete change of scene" (Angela). Greg suggested that his appreciation of the countryside was due to it being an escape from work, and worried that if he decided to work in the environment, he might stop enjoying it. Becky described the outside as "more interesting, not all the same, it's not all uniform"; and Eric also described it as "not these man-made, uniform structures". Several described the countryside as "relaxing", "chills you out" and place to go when "stressed". Diane and Eric described "a feeling of space" and "more time" in the countryside. Evidently there was a sense of anonymity for some people, which made them relax. As Diane described:

> "[Being in the countryside] makes me think life's bigger as well sometimes. If you're out in the park, even if it's just seeing somebody walk part, you think 'Oh, yeah, they don't know me, and they don't know my problems, and they don't really care either'!"

Fiona described something similar: "It's not about you and about anything; it's just all these… animals, um, just getting on with life, really". Eric gave a similar explanation. Ian also mentioned the idea that being in the countryside offers an escape from daily problems, and from social conformity:

> "It's kind of less frustrating than being inside 'cause there's no desks and no work and it's just a release basically, and you can be stupid and loud as you like and, or just it can be relaxing as well, so and as long as the weather's nice, it just offers a release".

Some described the sensations they only experience in the countryside. Several (like Ian, above) said they liked going outside when it was warm and sunny. Becky described enjoying the "nice country air", while the "smells" were something which Charles hated about the countryside. Greg felt he liked to enjoy every journey, and "experience" all the feelings, smells and sights. He also liked to cycle to see a view over Bath, and then take a photo to "recreate the feelings". Diane also described her enjoyment of the countryside as in some way influenced by information about the environment:

> "The whole talk about pollution does get to you and it's a psychological effect, you think 'Oh, I'm in a busy- I'm in the middle of London, it's disgusting, I'm- what am I breathing in here?' and when you're under a tree, especially as a biologist, you think 'Oh, it's giving out oxygen, how nice!"

Greg also liked to appreciate the "complexity" of the environment around him, when he spent time outdoors. For him, this was something that was part of a profound, almost mystical experience:

> "You can sort of get that feeling sometimes, like that sort of ecstatic, you know excitement, you just feel really 'at one' with everything around you. I think that's what I call a 'tree-huggy' feeling… [It happens] sometimes when it's just really quiet, and usually there's loads of noise, cars et cetera, and there's nothing except the wind, you know you can feel the wind, and you can smell particular smells that bring back memories, I think that's when you get that feeling of being, sort of, part of nature, as opposed to being removed from it".

Several felt they needed to get outdoors regularly. Angela, for example, said she felt "horrible" if she "spend a day stuck indoors", and considered it "natural" to go outside. Likewise, Eric described feeling "stuck in the city during the week". Harry seemed to express an assumption that most people prefer not to be inside:

> "I don't think I use the outside any more or any less than anybody else, but maybe that- I'm making a little bit of an assumption there as to how much people go outside, but I mean I certainly don't sit indoors watching the TV during the day".

Some of the students explained that they would like to spend more time outdoors, but that being at university – working in laboratories and the library all week – made it hard to do so.

18) What kinds of behaviour do students engage in to protect the environment?

Virtually all the students interviewed took part in the council-run recycling scheme in Bath. Charles was the only exception: he did not engage in any pro-environmental behaviour. Other than recycling, the pro-environmental activities that the students were involved in included:

- Turning lights off (Angela, Becky, Eric)
- Turning the telly (cookers, other appliances) off at the mains, not leaving on standby (Angela, Becky, Eric, Fiona)
- Turning heaters off/ down when we don't need them (Angela, Eric)
- Trying to persuade my flatmates to recycle things (Angela, Becky)
- Trying not to use my car too much/ lift-sharing (Becky, Fiona)
- Cycling rather than driving (Eric, Greg)
- Composting food (Angela, Harry)
- Reusing carrier bags (Angela)
- Avoiding eating meat (Harry)

- Using energy-saving light bulbs (John)
- Buying locally-produced food (Harry, Ian)
- Buying from charity shops (Harry)
- Buying recycled paper (Becky)
- Buying other environmentally-friendly products (Becky)
- Joining an environmental organisation (Becky)
- Volunteering for an environmental organisation (Greg)

Several students also thought they might pursue a career in an environment-related sector.

19) What do students think might encourage them to do more to protect the environment?

In general, the students felt that more time, money and convenient facilities would enable them to do more for the environment. Several said they would do more to protect the environment once they had left university, and had more time and money available. In Angela's case this would be buying organic food instead of "Sainsbury's economy range", when she had the money. Becky, Greg and Eric all wanted to be more pro-active environmentally – join conservation groups, do voluntary work, develop a career in conservation or environmental education – once they had finished university and had more time and money. Fiona said time and convenience were the biggest obstacles to her taking more pro-environmental actions. For Ian, the obstacles were money and convenience. For example he preferred the price and convenience of Sainsbury's economy range, to that of the locally produced Farmer's Market food. Yet he also claimed that money was not important to him, and after university he planned to do some part-time voluntary work in a local environmental charity. He felt environmental behaviour was more difficult for students and others with low income levels:

> "I think a lot of environmental stuff might kind of be a middle-class ideal, but it isn't quite… real enough, but hopefully when I have got a bit of money and I am twelve grand in debt or whatever, then I can stick to my principles a bit more".

For John, convenience was the primary motivator in engaging in pro-environmental activities. He explained: "I think more people will do something like that if they don't have to go hugely out of their way to do so". As well as a possible career in environmental education, Harry wanted to grow his own vegetables in an allotment, and perhaps install solar heating (which he had learnt about in his environmental studies), once he could afford his own house.

Diane was not someone who was already doing many pro-environmental activities, because she found them inconvenient. She felt, though, that having more convenient facilities would enable her be more active, for example to recycle; and having more money would enable her to donate to environmental causes:

> "I've sort of always promised myself that when I'm actually earning some money that I'll start looking into donating and things like that… [Also] it's if the opportunity is there. I think for example if I moved to a new area and there was a paper recycling bank and… um, at my local shop that I always went to, then I'd be more likely to do it, if I found out that- than if I'd found out that the paper recycling bank was two miles away, and I was never going to go there sort of thing. So, I think it is a case of facilities, and I think just being realistic, I think it's always more likely people are going to do something if it's easier".

It is interesting to note that both Diane and Ian both felt environmental strategies needed to be more "real" or "realistic" to encourage involvement.

Evidently some interviewees were motivated by economic incentives, as well as by pro-environmental intentions. Greg admitted that cycling places was cheaper than taking the bus; and John used energy-saving light bulbs because it saves money and "the planet" at the same time.

Some of the interviewees speculated about what would be effective in changing other people's behaviour towards the environment. Angela felt that some people, including her housemates, would never be persuaded to be more environmentally active because they could not "see the point of wildlife: we don't need it, it doesn't do anything, we're better than it". Others, who are too busy with their work and social life while at university to look beyond "their little bubble", need to be made aware of the consequences of them not conserving energy or resources. She warned, though, that "telling people what to do" is counter-productive: "It's thinking about it, rather than being told what to do: people don't like being told what to do". Becky made a similar point that education should not be "preachy". She went on to point out that if there were no parking at the university she, and others, would be forced to take the more pro-environmental options – again, an issue of convenience and facilities.

Charles felt little could motivate him to be more active and less apathetic about the environment. He did suggest, though, that as LEP developed over time, or involved a field trip element, it might become more effective in changing behaviour even in the more apathetic people. He explained:

> "If you're like sitting there and he's able to bring out like a real effect, a real face-on-face effect of like 'look here, look what's happening here', that might really be able to hammer home an awful lot of what he's saying".

He recalled that a number of classmates had been inspired to "save the world" after their ecology field trip. John and Becky also suggested that LEP might have changed their behaviour towards the environment, had they not already been taking some action to protect it. As already mentioned, several students suggested LEP would be more effective if it was a first year course or compulsory, in order to balance anti-religious evolutionary, or pro-GM, arguments presented in other courses.

APPENDIX 3.5 INTERVIEWEE CONSENT FORM (MAIN STUDY)

Introduction and Consent Form for Interviewees
Department of Psychology, University of Bath

Thank you for giving up your time to be interviewed. The interview should only take about an hour, and you do not have to answer all the questions if you don't want to. Please feel free to ask any questions you may have about the interview or my research. If you want to contact me after the interview, please call me on 07979 415661 or e-mail me on psplew@bath.ac.uk.

Area of Research:	Environmental Psychology/ Education
Purpose of Research:	To investigate how people respond to and learn about environmental problems in general and flooding/ climate change in particular This research forms part of the investigator's PhD research
Investigator:	Lorraine Whitmarsh

I understand the procedures to be used, and I agree to participate in this research.

I understand that I am free to withdraw my participation at any time.

I understand that participation in this research is confidential and that my name will not be used in connection with the results in any way.

I understand that I have the right to obtain information about the findings of the research and about how they will be used after the research is completed.

Signature: ………………………………………………..

Name: ………………………………………………..

Date: …………………………..

Occupation: ………………………………………………..

Telephone number: ………………………………………………...

APPENDIX 3.6 SURVEY QUESTIONNAIRE FOR MAIN STUDY ('CLIMATE CHANGE' VERSION[8])

[8] Two versions of the postal survey were used: one referred to 'climate change' and the other to 'global warming'. This split-survey design exposes where responses differ according the terminology used.

Section 1. General environmental concerns

1. Please look at the following list of environmental issues, and **circle** the **three** issues that **concern** you the most. *Please only circle **three** issues from the list:*

Air pollution
Pollution of rivers and seas
Flooding
Litter
Poor waste management (e.g. overuse of landfills)
Traffic/ congestion
GM food
Climate change
The hole in the ozone layer
Using up the earth's resources
Extinction of species
Radioactive waste
Overpopulation (of the earth by humans)

2. In your view, has air pollution ever affected your health?
   - ☐ Yes
   - ☐ No
   - ☐ Don't know

3. Has air pollution ever affected the health of any of your family or friends?
   - ☐ Yes
   - ☐ No
   - ☐ Don't know

4. **Apart from effects on people's health**, are you aware of any other effects of air pollution?
   - ☐ Yes (go to question 5)
   - ☐ No (go to question 6)
   - ☐ Don't know (go to question 6)

5. If yes, what other effects are you aware of? ____

____

6. Have you, **in the last 5 years**, experienced any form of flood damage (including to your home, garden or vehicle)?
   - ☐ Yes
   - ☐ No
   - ☐ Don't know

7. Do you feel the pattern of weather is generally changing?
   - ☐ Yes (go to question 8)
   - ☐ No (go to question 9)
   - ☐ Don't know (go to question 9)

8. If yes, why do you think this might be? ____

____

Section 2. Global environmental issues

9. Have you heard of "climate change"?

- ☐ Yes (go to question 10)
- ☐ No (go to question 25)
- ☐ Don't know (go to question 25)

10. What do you know about it? ____

____

____

____

____

11. Where have you heard about climate change? *Tick as many as you feel apply:*

Television ☐	Government agencies/ information ☐
Radio ☐	Public libraries ☐
Newspaper ☐	Friends/ family ☐
Internet ☐	Local council ☐
Specialist publications/academic journals ☐	Energy suppliers ☐
Environmental groups (e.g. Worldwide Fund for Nature) ☐	Other ☐
School/ college/ university ☐	(*Please write in* ________________)

12. By **ticking one box on each row** please indicate **how much you would <u>trust</u> information about climate change** if you heard it from...

	A lot	A little	Not very much	Not at all	Can't choose
A family member or a friend	☐	☐	☐	☐	☐
A scientist	☐	☐	☐	☐	☐
The government	☐	☐	☐	☐	☐
An energy supplier	☐	☐	☐	☐	☐
An environmental organisation (e.g. Worldwide Fund for Nature)	☐	☐	☐	☐	☐
The media (i.e. television, radio, newspapers)	☐	☐	☐	☐	☐

13. How important is the issue of climate change to you personally?

- ☐ Very important (go to question 14)
- ☐ Quite important (go to question 14)
- ☐ Not very important (go to question 15)
- ☐ Not at all important (go to question 15)

14. Why is it important to you? ______________________________

____

____

15. What do you think **causes** climate change? ______________________________

____

____

16. What **impacts**, if any, do you think climate change may have? ______________________________

____

____

17. Do you think climate change is something that is affecting or is going to affect you, personally?

- ☐ Yes (go to question 18)
- ☐ No (go to question 19)
- ☐ Don't know (go to question 19)

18. If yes, in what way(s) is it affecting you, or is it going to affect you? ______________________________

____

____

19. Do you think anything can be done to tackle climate change?

- ☐ Yes (go to question 20)
- ☐ No (go to question 22)
- ☐ Don't know (go to question 22)

20. If yes, what do you think can be done to tackle climate change? ______________________________

____

____

21. Who do you think should have the **main** responsibility for tackling climate change? ***Please tick one box only:***

- ☐ International organisations (e.g. the UN)
- ☐ The national government
- ☐ Local government
- ☐ Business and industry
- ☐ Environmental organisations/ lobby groups (e.g. Worldwide Fund for Nature)
- ☐ Individuals
- ☐ Other (*please write in*: ________________)

22. Have you ever taken, or do you regularly take, any action out of concern for climate change?

- ☐ Yes (go to question 23)
- ☐ No (go to question 24)
- ☐ Don't know (go to question 24)

23. If yes, what did you do/ are you doing? ______________________________

____

____

24. Please indicate how much you agree or disagree with the following statements about **climate change** by **ticking one box on each row**:

	Agree strongly	Agree	Neither agree nor disagree	Disagree	Disagree strongly
a. We can all do our bit to reduce the effects of climate change	☐	☐	☐	☐	☐
b. Climate change is inevitable because of the way modern society works	☐	☐	☐	☐	☐
c. People should be made to reduce their energy consumption if it reduces climate change	☐	☐	☐	☐	☐
d. Climate change will improve the British weather	☐	☐	☐	☐	☐
e. Climate change is just a natural fluctuation in earth's temperatures	☐	☐	☐	☐	☐
f. I would only do my bit to reduce climate change if everyone else did as well	☐	☐	☐	☐	☐
g. The government should provide incentives for people to look after the environment	☐	☐	☐	☐	☐
h. It is already too late to do anything about climate change	☐	☐	☐	☐	☐
i. Human activities have no significant impact on global temperatures	☐	☐	☐	☐	☐
j. Climate change is something that frightens me	☐	☐	☐	☐	☐
k. Developing countries should take most of the blame for climate change	☐	☐	☐	☐	☐
l. I am uncertain about whether climate change is really happening	☐	☐	☐	☐	☐
m. Radical changes to society are needed to tackle climate change	☐	☐	☐	☐	☐
n. People are too selfish to do anything about climate change	☐	☐	☐	☐	☐
o. The evidence for climate change is unreliable	☐	☐	☐	☐	☐
p. The United States should take most of the blame for climate change	☐	☐	☐	☐	☐
q. Claims that human activities are changing the climate are exaggerated	☐	☐	☐	☐	☐

	Agree strongly	Agree	Neither agree nor disagree	Disagree	Disagree strongly
r. If I come across information about climate change I will tend to look at it	☐	☐	☐	☐	☐
s. There is too much conflicting evidence about climate change to know whether it is actually happening	☐	☐	☐	☐	☐
t. Leaving the lights on in my home adds to climate change	☐	☐	☐	☐	☐
u. Climate change is a consequence of modern life	☐	☐	☐	☐	☐
v. The effects of climate change are likely to be catastrophic	☐	☐	☐	☐	☐
w. Nothing I do makes any difference to climate change one way or another	☐	☐	☐	☐	☐
x. Pollution from industry is the main cause of climate change	☐	☐	☐	☐	☐
y. I tend to consider information about climate change to be irrelevant to me	☐	☐	☐	☐	☐
z. Recent floods in this country are due to climate change	☐	☐	☐	☐	☐
aa. It is too early to say whether climate change is really a problem	☐	☐	☐	☐	☐
bb. The media is often too alarmist about issues like climate change	☐	☐	☐	☐	☐
cc. Flooding is not increasing, there is just more reporting of it in the media these days	☐	☐	☐	☐	☐
dd. There is no point in me doing anything about climate change because no-one else is	☐	☐	☐	☐	☐
ee. Experts are agreed that climate change is a real problem	☐	☐	☐	☐	☐
ff. Nothing I do on a daily basis contributes to the problem of climate change	☐	☐	☐	☐	☐
gg. Industry and business should be doing more to tackle climate change	☐	☐	☐	☐	☐
hh. For the most part, the government honestly wants to reduce climate change	☐	☐	☐	☐	☐
ii. I do not believe climate change is a real problem	☐	☐	☐	☐	☐
jj. The government is not doing enough to tackle climate change	☐	☐	☐	☐	☐
kk. I feel a moral duty to do something about climate change	☐	☐	☐	☐	☐

Section 3. General views about the environment

25. Now please indicate how much you agree or disagree with the following **general statements** by **ticking one box on each row:**

	Agree strongly	Agree	Neither agree nor disagree	Disagree	Disagree strongly
a. Jobs today are more important than protecting the environment for the future	☐	☐	☐	☐	☐
b. I am unwilling to make personal sacrifices for the sake of the environment	☐	☐	☐	☐	☐
c. If my job caused environmental problems, I'd rather be unemployed than carry on causing them	☐	☐	☐	☐	☐
d. Having a car is part of having a good lifestyle	☐	☐	☐	☐	☐
e. Humans have the right to modify the natural environment to suit their needs	☐	☐	☐	☐	☐
f. Humans are severely abusing the planet	☐	☐	☐	☐	☐
g. Plants and animals have the same rights as humans to exist	☐	☐	☐	☐	☐
h. Nature is strong enough to cope with the impact of modern industrial nations	☐	☐	☐	☐	☐
i. Humans were meant to rule over the rest of nature	☐	☐	☐	☐	☐
j. The balance of nature is very delicate and easily upset	☐	☐	☐	☐	☐

26. The following is a list of activities that you may do. For each one **that you do <u>regularly</u>**, please indicate **your reason or reasons** for doing so. *Tick as many as you feel apply:*

	Convenience	To save money	To protect the environment	For my health	Habit	Moral obligation	Another reason (please write in)
Walk or cycle to work	☐	☐	☐	☐	☐	☐	___________
Use public transport	☐	☐	☐	☐	☐	☐	___________
Turn off lights I'm not using	☐	☐	☐	☐	☐	☐	___________
Buy energy efficient light bulbs	☐	☐	☐	☐	☐	☐	___________
Buy organic food	☐	☐	☐	☐	☐	☐	___________
Recycle glass	☐	☐	☐	☐	☐	☐	___________
Recycle other items	☐	☐	☐	☐	☐	☐	___________
Take part in a campaign about an environmental issue	☐	☐	☐	☐	☐	☐	___________

27. How would you rate the quality of public transport in your local area?

- Excellent ☐
- Good ☐
- Average ☐
- Poor ☐
- Very poor ☐
- Don't know ☐

Section 4. About you

Finally, just so that I can compare the views of different people, please could you tell me about yourself:

28. Are you…

- Male ☐
- Female ☐
- Prefer not to say ☐

29. Please indicate the age bracket you are in:

- 16-24 ☐
- 25-34 ☐
- 35-44 ☐
- 45-54 ☐
- 55-64 ☐
- 65-74 ☐
- 75-84 ☐
- 85 or over ☐
- Prefer not to say ☐

30. What is your highest qualification?

- No formal qualifications ☐
- GCSE/ O-Level ☐
- A-Level/ Higher/ BTEC ☐
- Vocational/ NVQ ☐
- Degree or equivalent ☐
- Postgraduate qualification ☐
- Other (*please write in:* ______________) ☐

31. What is your highest qualification in a **science-related subject**?

- No formal qualifications ☐
- GCSE/ O-Level ☐
- A-Level/ Higher/ BTEC ☐
- Vocational/ NVQ ☐
- Degree or equivalent ☐
- Postgraduate qualification ☐
- Other (*please write in:* __________________) ☐

32. Which political party are you **most likely to support**? *Please tick one box only:*

- Labour ☐
- Liberal Democrats ☐
- Conservative ☐
- Other (*please write in:* _______________) ☐
- None/ would not vote ☐
- Prefer not to say ☐

33. Do you own (or regularly drive) a car/ van?

Yes (go to question 34) ☐
No (go to question 35) ☐

34. If yes, roughly how many miles do you drive (per year)?

_________________ miles per year

35. Please indicate your approximate income per annum (before tax)?

Up to £9,999 ☐
£10,000 - £14,999 ☐
£15,000 - £19,999 ☐
£20,000 - £24,999 ☐
£25,000 - £29,999 ☐
£30,000 - £39,999 ☐
£40,000 - £49,999 ☐
£50,000 or more ☐

Prefer not to say ☐

36. Which of these newspapers do you read regularly? *Tick as many as you feel apply:*

Sun/ News of the World ☐
Daily Mail/ Mail on Sunday ☐
Daily Telegraph/ Sunday Telegraph ☐
Times/ Sunday Times ☐
Express/ Sunday Express ☐
Guardian/ Observer ☐
Independent/ Independent on Sunday ☐
Daily Star ☐
Financial Times ☐
Mirror/ Sunday Mirror ☐
Local newspaper ☐
Other (*please write in:* _______________) ☐

None ☐

37. Are you a member of any environmental organisations (e.g. Friends of the Earth, Worldwide Fund for Nature)?

Yes ☐
No ☐

38. Would you be willing to take part in a brief interview (either in person or over the phone) to discuss these issues further? **As with this questionnaire, interviews will be strictly confidential.**

Yes ☐
No ☐

If yes, please could you write your full telephone number here: ________________________

If you would like to receive a copy of the results of this research, please enter your postal/ email address here:

If you have anything to add about the issues raised in this questionnaire or any comments about the questionnaire itself, please write them here:

Thank you for giving up your time to complete this questionnaire. It is very much appreciated.

APPENDIX 3.7 SURVEY COVERING LETTER (MAIN STUDY)

[University of Bath letterhead]

September 2003

Dear Sir/ Madam,

Survey of environmental concerns

My name is Lorraine Whitmarsh and I am currently working on a research project about environmental concerns funded by the University of Bath. Most of this research is being carried out in the Portsmouth area, and your address has been selected by a scientific sampling method to ensure a representative picture of people's views. Your help and assistance in completing the enclosed questionnaire will be invaluable for the study.

If you agree to participate, **all the information you provide will be completely anonymous and confidential.**

The questionnaire starts by asking you about a range of environmental issues that may affect you and moves on to ask you how you feel about global environmental problems. If you don't want to answer all of the questions, you don't have to - please just do what you can. It shouldn’t take long to complete, and I hope you’ll enjoy it.

Once you’ve completed the questionnaire, please could you return it to me in the enclosed stamped, addressed envelope.

At the end of the project, key findings from the survey will be sent to organisations like Hampshire County Council, Portsmouth City Council and the Environment Agency. This survey will provide a valuable insight into how people like you feel about certain environmental problems and how you feel they should be tackled.

Should you have any queries or concerns about the survey, please do not hesitate to contact me on the address above.

Thank you very much for your help.

Yours faithfully,

Lorraine Whitmarsh

APPENDIX 3.8 CENSUS DATA FOR SURVEY SAMPLING (MAIN STUDY)

Census data from 2001 was available for the four selected Portsmouth wards (‘St Thomas’, ‘St Jude’, ‘Drayton & Farlington’, and ‘Nelson’) from the Portsmouth City Council website (www.portsmouth.gov.uk).

Census data from 2001 for the two Flood Areas (located in ‘Fareham East’ ward and ‘Droxford, Soberton & Hambledon’ wards) had not been published at the time of the survey; therefore data from the 1991 census was used for these areas.

The following tables present demographic data for the 6 selected wards:

1 Age

	St Thomas	St Jude	Drayton & Farlington	Nelson	Fareham East	Droxford, Soberton & Hambledon	**Total survey wards**	**Cumulative %**	**Re-grouped totals**
All people	12,674	11,097	12,313	14,551					
All adults	**10,711**	**9,979**	**10,054**	**11,397**	4983	2441	**49,565**		
16-17	241	158	296	358	132	85			**16-24**
%	**2.25**	**1.58**	**2.94**	**3.14**	**2.65**	**3.48**	**2.56**	**2.56**	**17.66**
18-19	640	355	251	360	145	75			
%	**5.98**	**3.56**	**2.50**	**3.16**	**2.91**	**3.07**	**3.68**	**6.25**	
20-24	1,836	1,707	468	1,106	408	131			
%	**17.14**	**17.11**	**4.65**	**9.70**	**8.19**	**5.37**	**11.41**	**17.66**	
25-29	987	1,277	447	1,274	399	120			**25-34**
%	**9.21**	**12.80**	**4.45**	**11.18**	**8.01**	**4.92**	**9.09**	**26.74**	**18.39**
30-34	824	999	749	1,437	437	165			
%	**7.69**	**10.01**	**7.45**	**12.61**	**8.77**	**6.76**	**9.30**	**36.05**	
35-39	800	767	901	1,278	388	239			**35-44**
%	**7.47**	**7.69**	**8.96**	**11.21**	**7.79**	**9.79**	**8.82**	**44.87**	**16.85**
40-44	724	637	900	935	489	296			
%	**6.76**	**6.38**	**8.95**	**8.20**	**9.81**	**12.13**	**8.03**	**52.90**	
45-49	680	562	828	832	416	245			**45-54**
%	**6.35**	**5.63**	**8.24**	**7.30**	**8.35**	**10.04**	**7.19**	**60.09**	**14.29**
50-54	663	583	921	783	358	212			
%	**6.19**	**5.84**	**9.16**	**6.87**	**7.18**	**8.68**	**7.10**	**67.19**	
55-59	594	469	876	661	326	187			**55-64**
%	**5.55**	**4.70**	**8.71**	**5.80**	**6.54**	**7.66**	**6.28**	**73.47**	**11.68**
60-64	524	389	743	506	318	196			
%	**4.89**	**3.90**	**7.39**	**4.44**	**6.38**	**8.03**	**5.40**	**78.87**	
65-69	490	404	689	495	313	171			**65-74**
%	**4.57**	**4.05**	**6.85**	**4.34**	**6.28**	**7.01**	**5.17**	**84.04**	**9.95**
70-74	476	407	594	481	287	126			
%	**4.44**	**4.08**	**5.91**	**4.22**	**5.76**	**5.16**	**4.78**	**88.82**	
75-79	517	446	608	377	226	104			**75-84**
%	**4.83**	**4.47**	**6.05**	**3.31**	**4.54**	**4.26**	**4.60**	**93.42**	**8.12**
80-84	392	417	423	278	194	44			
%	**3.66**	**4.18**	**4.21**	**2.44**	**3.89**	**1.80**	**3.53**	**96.95**	
85-89	223	268	239	170	101	36			**85+**
%	**2.08**	**2.69**	**2.38**	**1.49**	**2.03**	**1.47**	**2.09**	**99.04**	**3.05**
90+	100	134	121	66	46	9			
%	**0.93**	**1.34**	**1.20**	**0.58**	**0.92**	**0.37**	**0.96**	**100.00**	

2 Gender

	All adults	Males	%	Females	%
St Thomas	**10,711**	5277	49.3	5,434	50.7
St Jude	**9,979**	5124	51.3	4,855	48.7
Drayton & Farlington	**10054**	4755	47.3	5299	52.7
Nelson	**11,397**	5614	49.3	5,783	50.7
Fareham East			48.3		51.7
Droxford, Soberton & Hambledon			49.3		50.8
Totals			**49.1**		**50.9**

3 Highest qualifications

		% of people aged 16 - 74 with:					
	All people aged 16-74	**None**	**Level 1***	**Level 2****	**Level 3*****	**Level 4/5#**	**Other/ level unknown**
St Thomas	9497	24.1	12	16.1	18.1	24.3	5.3
St Jude	8718	17.1	11	16.6	17.2	32.9	5.3
Drayton & Farlington	8660	23.2	17.1	21.1	8	22.3	8.2
Nelson	10503	33.3	22.5	19.6	7.7	9.9	7
Fareham East		Data N/A					
Droxford, Soberton & Hambledon		Data N/A					
Totals		**24.43**	**15.65**	**18.35**	**12.75**	**22.35**	**6.45**

Notes: * 1+'O' level passes, 1+CSE/GCSE any grades; NVQ level 1; Foundation GNVQ.
** 5+ 'O' level passes; 5+ CSEs (grade 1's); 5+GCSEs (grades A-C); School Certificate; 1+'A' levels/AS levels; NVQ level 2; Intermediate GNVQ.
*** 2+ 'A' levels; 4+ AS levels; Higher School Certificate; NVQ level 3; Advanced GNVQ.
# First degree; Higher degree; NVQ levels 4 and 5; HNC; HND; Qualified Teacher Status; Qualified Medical Doctor; Qualified Dentist; Qualified Nurse; Midwife; Health Visitor.

4 Car ownership

		% of all households						
	All house-holds	**None**	**One**	**Two**	**Three**	**Four or more**	**All cars or vans in the area**	**Cars per head** (all people in households)
St Thomas	5886	43.9	41.6	11.8	2.2	0.5	4344	0.36
St Jude	5597	37.8	45.9	14.1	1.7	0.5	4556	0.44
Drayton & Farlington	5042	15.3	45	32.3	6	1.4	6740	0.55
Nelson	6139	39.2	44.6	13.7	2	0.6	4968	0.35
Fareham East	2379	22.7	46.0	25.5	5.8			Data N/A
Droxford, Soberton & Hambledon	1163	10.2	34.4	41.9	13.5			Data N/A
Totals		**28.2**	**42.9**	**23.2**	**5.2**			**0.4**

* The number of cars or vans owned, or available for use, by one or more members of a household. It included company cars and vans available for private use.
The count of cars or vans in an area is based on details for private households only. Cars or vans used by residents of communal establishments are not counted.

5 Household income

Ward	£ (per annum)
St Thomas	23,625
St Jude	27,786
Drayton & Farlington	29,559
Nelson	22,276
Fareham East	Data N/A
Droxford, Soberton & Hambledon	Data N/A
Survey ward average	**25,812**
National average	26,200

6 Deprivation index

	Score	Rank
St Thomas	32.6	1715
St Jude	24.7	2698
Drayton & Farlington	8.0	7077
Nelson	32.6	1712
Fareham East	Data N/A	
Droxford, Soberton & Hambledon	Data N/A	
Total	**24.5**	

Source: Oxford University & DETR (from www.portsmouth.gov.uk)
Note: Rank - 1 is the most deprived, 8414 the least deprived by this measure.
These scores combine Income, Employment, Health, Education, Housing and Geographical access to services domains.

7 Marital status

	% of people aged 16 and over						
	All people aged 16+	**Single** (never married)	**Separated** (still legally married)	**Divorced**	**Widowed**	**Married**	**Re-married**
St Thomas	10732	44.9	2.9	11.7	9.6	24.4	6.4
St Jude	9977	50.7	3.1	9.8	8.8	22.4	5.3
Drayton & Farlington	10042	19.5	1.8	6.3	10	53.7	8.7
Nelson	11402	36.8	3.5	12.7	8	31.4	7.6
Totals		**38.0**	**2.8**	**10.1**	**9.1**	**33.0**	**7.0**
Fareham East		24.8				25.2	
Droxford, Soberton & Hambledon		23.1				26.9	

8 Employment status

	% economically active (16-74)					**% economically inactive** (16-74)				
	Employees									
	Part-time*	Full-time*	Self - employed	Unemployed	Full-time student	Retired	Student	Looking after home / family	Perm sick / disabled	Other
St Thomas	14.1	58	10.5	6.2	11.2	28.1	35.7	15	13	8.3
St Jude	10.9	63.1	11.2	5.6	9.1	30.3	33.6	11	15.3	9.8
Drayton & Farlington	21.2	59.7	12.3	2.1	4.7	59.7	8.9	16.7	9.4	5.3
Nelson	17	65.7	9.3	4.9	3.1	36	11.2	25.1	16.7	11.1
Survey ward average	**15.8**	**61.6**	**10.8**	**4.7**	**7.0**	**38.5**	**22.4**	**17.0**	**13.6**	**8.6**

Employment data for Fareham East and Droxford, Soberton & Hambledon wards not available as percentages of total ward population

9 Health status

	% Working age with limiting long-term illness*	**General health * :**		
		Good	**Fairly good**	**Not good**
St Jude	11.9	68	23.3	8.7
St Thomas	14	64.7	25.7	9.6
Nelson	13.9	67	24.2	8.8
Drayton & Farlington	10.2	71.4	21.9	6.6
Fareham East	Data N/A			
Droxford, Soberton & Hambledon	Data N/A			
Survey ward average	**12.5**	**67.8**	**23.8**	**8.43**

Notes: * Limiting long-term illness covers any long-term illness; health problem or disability which limits daily activities or work. Working age population is 16-64 inclusive for men and 16-59 inclusive for women.

** General health refers to health over the 12 months prior to Census day (29 April 2001).

APPENDIX 3.9 CODING STRUCTURE OF QUALITATIVE SURVEY DATA (MAIN STUDY)

Node Title & Address	No. of cases	% of responses
NB - Totals emboldened; No of cases over 20 highlighted and input into SPSS		
(1) /Impacts	**1253**	100.00
(1 1) /Impacts/human impacts	**234**	18.68
(1 1 1) /Impacts/human impacts/health, spread of disease	**48**	3.83
(1 1 1 1) /Impacts/human impacts/health, spread of disease/skin cancer	10	0.80
(1 1 1 2) /Impacts/human impacts/health, spread of disease/breathing disorders	4	0.32
(1 1 1 3) /Impacts/human impacts/health, spread of disease/unspecific, cancers	34	2.71
(1 1 2) /Impacts/human impacts/social impacts	9	0.72
(1 1 3) /Impacts/human impacts/more home repairs, protection	1	0.08
(1 1 4) /Impacts/human impacts/local, UK impacts- explicit	17	1.36
(1 1 5) /Impacts/human impacts/life-style	18	1.44
(1 1 6) /Impacts/human impacts/impact on tourism	3	0.24
(1 1 7) /Impacts/human impacts/impact on humans ~gen~	11	0.88
(1 1 8) /Impacts/human impacts/impact on human quality of life	4	0.32
(1 1 9) /Impacts/human impacts/impact on future generations	4	0.32
(1 1 10) /Impacts/human impacts/impact on agriculture, food supply	82	6.54
(1 1 11) /Impacts/human impacts/human migration	13	1.04
(1 1 12) /Impacts/human impacts/human extinction	2	0.16
(1 1 13) /Impacts/human impacts/energy demand	3	0.24
(1 1 14) /Impacts/human impacts/employment, ind, economics	12	0.96
(1 1 16) /Impacts/human impacts/developing countries	5	0.40
(1 1 17) /Impacts/human impacts/deaths	2	0.16
(1 2) /Impacts/nonhuman impacts	**143**	11.41
(1 2 1) /Impacts/nonhuman impacts/plant cycles changing	7	0.56
(1 2 2) /Impacts/nonhuman impacts/nature,balance disrupted	16	1.28
(1 2 3) /Impacts/nonhuman impacts/natural disasters	4	0.32
(1 2 4) /Impacts/nonhuman impacts/insects	3	0.24
(1 2 5) /Impacts/nonhuman impacts/impacts on wildlife, veg'n, flora&fa	52	4.15
(1 2 6) /Impacts/nonhuman impacts/habitats affected	18	1.44
(1 2 7) /Impacts/nonhuman impacts/extinction of species	43	3.43
(1 3) /Impacts/uncertainty	**60**	4.79
(1 3 1) /Impacts/uncertainty/doubt about reality, scepticism	14	1.12
(1 3 2) /Impacts/uncertainty/personally unsure	25	2.00
(1 3 3) /Impacts/uncertainty/uncertainty of scientists, evidence	5	0.40
(1 3 4) /Impacts/uncertainty/don't know	16	1.28
(1 4) /Impacts/confusion with causes	**5**	0.40
(1 4 6) /Impacts/confusion with causes/pollution, air quality	5	0.40
(1 5) /Impacts/beneficial impacts	**15**	1.20
(1 6) /Impacts/general impacts	**763**	60.89
(1 6 1) /Impacts/general impacts/temperature increase, heat	46	3.67
(1 6 2) /Impacts/general impacts/temperature changes -incl decrease	13	1.04
(1 6 4) /Impacts/general impacts/salination	1	0.08
(1 6 5) /Impacts/general impacts/sea level rise, loss of land	126	10.06
(1 6 7) /Impacts/general impacts/ozone layer	1	0.08
(1 6 8) /Impacts/general impacts/next ice age	5	0.40
(1 6 9) /Impacts/general impacts/melting icecaps,burgs	64	5.11
(1 6 10) /Impacts/general impacts/landslides, earthquakes	3	0.24

(1 6 11) /Impacts/general impacts/increase in ice, caps thickening	3	0.24
(1 6 12) /Impacts/general impacts/changes, extremes in weather	99	7.90
(1 6 12 1) /Impacts/general impacts/changes, extremes in weather/hotter, wetter -UK seasons	20	1.60
(1 6 12 2) /Impacts/general impacts/changes, extremes in weather/increased rainfall	5	0.40
(1 6 12 3) /Impacts/general impacts/changes, extremes in weather/storms, tornadoes	19	1.52
(1 6 12 24) /Impacts/general impacts/changes, extremes in weather/change, less rainfall	9	0.72
(1 6 14) /Impacts/general impacts/Gulf Stream, oceanic circulation	5	0.40
(1 6 15) /Impacts/general impacts/flooding	127	10.14
(1 6 16) /Impacts/general impacts/fires	8	0.64
(1 6 17) /Impacts/general impacts/exposure to sun	10	0.80
(1 6 18) /Impacts/general impacts/everything, alot	5	0.40
(1 6 19) /Impacts/general impacts/El Nino	1	0.08
(1 6 20) /Impacts/general impacts/desertification	20	1.60
(1 6 21) /Impacts/general impacts/depletion of resources	4	0.32
(1 6 22) /Impacts/general impacts/climate change, impacts	57	4.55
(1 6 23) /Impacts/general impacts/change in seasons	16	1.28
(1 6 24) /Impacts/general impacts/drought, water shortages	42	3.35
(1 6 25) /Impacts/general impacts/change environment	20	1.60
(1 6 26) /Impacts/general impacts/detrimental to the environment	5	0.40
(1 6 27) /Impacts/general impacts/catastrophe, destroy earth	29	2.31
(1 7) /Impacts/none, not alot	5	0.40
(1 7 1) /Impacts/none, not alot/no UK, local impacts	1	0.08
(1 8) /Impacts/long-term, future impacts	**27**	2.15

(2) /How personally affected	**599**	100.00
(2 1) /How personally affected/beneficially	**10**	1.67
(2 1 1) /How personally affected/beneficially/enjoy warmer weather	5	0.83
(2 1 2) /How personally affected/beneficially/lower heating bills	5	0.83
(2 2) /How personally affected/adversely	**450**	75.13
(2 2 1) /How personally affected/adversely/health	**51**	8.51
(2 2 1 1) /How personally affected/adversely/health/unspecific	27	4.51
(2 2 1 2) /How personally affected/adversely/health/asthma, breathing difficulties	16	2.67
(2 2 1 3) /How personally affected/adversely/health/skin cancer	8	1.34
(2 2 2) /How personally affected/adversely/weather	85	14.19
(2 2 2 1) /How personally affected/adversely/weather/heat intolerance, dislike	14	2.34
(2 2 2 2) /How personally affected/adversely/weather/cold, wet -dislike, neg impact	4	0.67
(2 2 3) /How personally affected/adversely/travel, transport	5	0.83
(2 2 4) /How personally affected/adversely/social impacts	4	0.67
(2 2 5) /How personally affected/adversely/sea level rise	36	6.01
(2 2 6) /How personally affected/adversely/quality of life	3	0.50
(2 2 7) /How personally affected/adversely/pollution, air quality	15	2.50
(2 2 8) /How personally affected/adversely/nature, wildlife, env't	19	3.17
(2 2 9) /How personally affected/adversely/natural resources	2	0.33
(2 2 10) /How personally affected/adversely/horticulture	9	1.50
(2 2 11) /How personally affected/adversely/lifestyle changes	21	3.51
(2 2 12) /How personally affected/adversely/leisure, tourism	11	1.84
(2 2 13) /How personally affected/adversely/personal finances	**21**	3.51
(2 2 13 1) /How personally affected/adversely/personal finances/maintenance costs on home	3	0.50
(2 2 13 2) /How personally affected/adversely/personal finances/impact on job, business	3	0.50
(2 2 13 3) /How personally affected/adversely/personal finances/value of home	1	0.17
(2 2 13 10) /How personally affected/adversely/personal finances/cost of living, tax, ins	14	2.34

(2 2 14) /How personally affected/adversely/climate changes	22	3.67
(2 2 15) /How personally affected/adversely/future generations, family	15	2.50
(2 2 16) /How personally affected/adversely/flooding	69	11.52
(2 2 17) /How personally affected/adversely/energy supply & consumption	5	0.83
(2 2 18) /How personally affected/adversely/economy, industry	6	1.00
(2 2 19) /How personally affected/adversely/drought, water shortages	9	1.50
(2 2 20) /How personally affected/adversely/desertification	1	0.17
(2 2 21) /How personally affected/adversely/catastrophe, destruction of planet	1	0.17
(2 2 22) /How personally affected/adversely/agriculture, food supply	22	3.67
(2 3) /How personally affected/uncertainty	**46**	7.68
(2 3 1) /How personally affected/uncertainty/self-doubt, unsure	40	6.68
(2 3 2) /How personally affected/uncertainty/sceptical, doubt	6	1.00
(2 4) /How personally affected/personal, direct impact -hi-risk	71	11.85
(2 9) /How personally affected/inaction so far	2	0.33
(2 10) /How personally affected/awareness	1	0.17
(2 11) /How personally affected/impacts affect everyone	19	3.17

(3) /Why important	**749**	100.00
(3 1) /Why important/doubt about reality	14	1.87
(3 2) /Why important/impacts	**449**	59.95
(3 2 1) /Why important/impacts/health	1	0.13
(3 2 1 1) /Why important/impacts/health/personal health	6	0.80
(3 2 1 20) /Why important/impacts/health/health - gen	24	3.20
(3 2 2) /Why important/impacts/weather, temperature	41	5.47
(3 2 3) /Why important/impacts/sea level rise	17	2.27
(3 2 4) /Why important/impacts/beneficial impacts	**6**	0.80
(3 2 4 1) /Why important/impacts/beneficial impacts/reduced heating bills	1	0.13
(3 2 4 2) /Why important/impacts/beneficial impacts/enjoy warm weather	5	0.67
(3 2 5) /Why important/impacts/quality of life	11	1.47
(3 2 6) /Why important/impacts/professionally	2	0.27
(3 2 7) /Why important/impacts/pollution	8	1.07
(3 2 8) /Why important/impacts/on vuln,poor people, countries	9	1.20
(3 2 9) /Why important/impacts/natural resources	4	0.53
(3 2 10) /Why important/impacts/natural disasters	2	0.27
(3 2 12) /Why important/impacts/melting ice caps	6	0.80
(3 2 13) /Why important/impacts/local impacts	9	1.20
(3 2 14) /Why important/impacts/lifestyle, life	26	3.47
(3 2 15) /Why important/impacts/leisure, tourism	2	0.27
(3 2 16) /Why important/impacts/impacts on wildlife	36	4.81
(3 2 17) /Why important/impacts/impacts on humans, their survival	24	3.20
(3 2 18) /Why important/impacts/impact on me, my life	16	2.14
(3 2 19) /Why important/impacts/horticulture	5	0.67
(3 2 22) /Why important/impacts/food supplies, production	15	2.00
(3 2 23) /Why important/impacts/flooding	21	2.80
(3 2 24) /Why important/impacts/fires	3	0.40
(3 2 25) /Why important/impacts/financial implications	2	0.27
(3 2 26) /Why important/impacts/energy consumption	3	0.40
(3 2 27) /Why important/impacts/on economy, industry	3	0.40
(3 2 28) /Why important/impacts/drought, water supplies	10	1.34
(3 2 30) /Why important/impacts/desertification	1	0.13
(3 2 31) /Why important/impacts/conseqs uncertain	10	1.34
(3 2 32) /Why important/impacts/choice of location to live	2	0.27
(3 2 33) /Why important/impacts/impacted, changed environment	39	5.21

(3 2 35) /Why important/impacts/affect us all	17	2.27
(3 2 36) /Why important/impacts/moral dimension, worldview	**68**	9.08
(3 2 36 11) /Why important/impacts/moral dimension, worldview/unnatural change	3	0.40
(3 2 36 21) /Why important/impacts/moral dimension, worldview/future of planet	37	4.94
(3 2 36 29) /Why important/impacts/moral dimension, worldview/disrupt balance of nature	7	0.93
(3 2 36 34) /Why important/impacts/moral dimension, worldview/catastrophe, end of world	21	2.80
(3 3) /Why important/motivation	**282**	37.65
(3 3 2) /Why important/motivation/resp, concern for family,future gen'	154	20.56
(3 3 3) /Why important/motivation/resp, concern for envt	51	6.81
(3 3 4) /Why important/motivation/need & poss for action	22	2.94
(3 3 5) /Why important/motivation/human-caused	22	2.94
(3 3 6) /Why important/motivation/fear	8	1.07
(3 3 7) /Why important/motivation/want information	5	0.67
(3 3 9) /Why important/motivation/inaction so far, irresponsible	6	0.80
(3 3 10) /Why important/motivation/concern about greed, materialism	5	0.67
(3 3 11) /Why important/motivation/dislike change	9	1.20
(3 4) /Why important/don't know	4	0.53

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(4) /Causes	**1110**	100.00
(4 1) /Causes/uncertainty	**70**	6.31
(4 1 1) /Causes/uncertainty/doubt about reality, unconvinced	10	0.90
(4 1 2) /Causes/uncertainty/personally unsure, self-doubt	31	2.79
(4 1 3) /Causes/uncertainty/don't know	19	1.71
(4 1 4) /Causes/uncertainty/uncertainty of scientists, evidence	8	0.72
(4 1 5) /Causes/uncertainty/media hype, exaggeration	2	0.18
(4 2) /Causes/confusion with impact, terminol	**27**	2.43
(4 2 1) /Causes/confusion with impact, terminol/melting of ice caps	13	1.17
(4 2 2) /Causes/confusion with impact, terminol/global warming, climate change	14	1.26
(4 3) /Causes/natural	**110**	9.91
(4 3 1) /Causes/natural/earth's cycles, changes, weather pat	62	5.59
(4 3 2) /Causes/natural/sun's activities - heat, cycles, sun	13	1.17
(4 3 3) /Causes/natural/undefined	13	1.17
(4 3 4) /Causes/natural/volcanic activity, tectonics	8	0.72
(4 3 5) /Causes/natural/meteors	2	0.18
(4 3 6) /Causes/natural/orbit, polarity, spin	7	0.63
(4 3 7) /Causes/natural/ocean currents	2	0.18
(4 3 8) /Causes/natural/other planets, moon	3	0.27
(4 4) /Causes/God	1	0.09
(4 6) /Causes/human activities, man, us	**902**	81.26
(4 6 1) /Causes/human activities, man, us/description, explanation of process	23	2.07
(4 6 2) /Causes/human activities, man, us/undefined	45	4.05
(4 6 3) /Causes/human activities, man, us/moral dimension, worldview	**151**	13.60
(4 6 3 1) /Causes/human activities, man, us/moral dimension, worldview/selfishness, greed	9	0.81
(4 6 3 2) /Causes/human activities, man, us/moral dimension, worldview/disregard, abuse of nature	12	1.08
(4 6 3 4) /Causes/human activities, man, us/moral dimension, worldview/~modern~ way of life	12	1.08
(4 6 3 5) /Causes/human activities, man, us/moral dimension, worldview/excessive emissions	9	0.81

(4 6 3 6) /Causes/human activities, man, us/moral dimension, worldview/~misuse of~ technology	3	0.27
(4 6 3 7) /Causes/human activities, man, us/moral dimension, worldview/irresponsibility, injustice	10	0.90
(4 6 3 8) /Causes/human activities, man, us/moral dimension, worldview/capitalism, profit culture, consumer	8	0.72
(4 6 3 9) /Causes/human activities, man, us/moral dimension, worldview/interference, meddling	3	0.27
(4 6 3 10) /Causes/human activities, man, us/moral dimension, worldview/poor education, ignorance	8	0.72
(4 6 3 11) /Causes/human activities, man, us/moral dimension, worldview/imbalance created	5	0.45
(4 6 3 12) /Causes/human activities, man, us/moral dimension, worldview/over-reliance, too many cars	7	0.63
(4 6 3 15) /Causes/human activities, man, us/moral dimension, worldview/industrialisation, overindustrialisa	11	0.99
(4 6 3 16) /Causes/human activities, man, us/moral dimension, worldview/man made disasters	1	0.09
(4 6 3 17) /Causes/human activities, man, us/moral dimension, worldview/waste, poor waste management	8	0.72
(4 6 3 18) /Causes/human activities, man, us/moral dimension, worldview/mis,overuse of earth's resources, en	31	2.79
(4 6 3 19) /Causes/human activities, man, us/moral dimension, worldview/over-population	14	1.26
(4 6 5) /Causes/human activities, man, us/other environmental issues	**160**	14.41
(4 6 5 1) /Causes/human activities, man, us/other environmental issues/CFCs, aerosols	26	2.34
(4 6 5 2) /Causes/human activities, man, us/other environmental issues/chemicals	24	2.16
(4 6 5 3) /Causes/human activities, man, us/other environmental issues/freon gases, fridges	5	0.45
(4 6 5 4) /Causes/human activities, man, us/other environmental issues/ozone increase	3	0.27
(4 6 5 6) /Causes/human activities, man, us/other environmental issues/nuclear, radiation	5	0.45
(4 6 5 7) /Causes/human activities, man, us/other environmental issues/ozone layer depletion	91	8.20
(4 6 5 9) /Causes/human activities, man, us/other environmental issues/carbon monoxide	4	0.36
(4 6 5 14) /Causes/human activities, man, us/other environmental issues/pesticides	2	0.18
(4 6 9) /Causes/human activities, man, us/person, organisation, country	**83**	7.48
(4 6 9 1) /Causes/human activities, man, us/person, organisation, country/personal responsibility	1	0.09
(4 6 9 2) /Causes/human activities, man, us/person, organisation, country/developing countries	4	0.36
(4 6 9 3) /Causes/human activities, man, us/person, organisation, country/governments	5	0.45
(4 6 9 4) /Causes/human activities, man, us/person, organisation, country/industry, factory emissions, poll'n	58	5.23
(4 6 9 6) /Causes/human activities, man, us/person, organisation, country/western world, developed countries	3	0.27
(4 6 9 6 1) /Causes/human activities, man, us/person, organisation, country/western world, developed countries/USA	8	0.72
(4 6 9 7) /Causes/human activities, man, us/person, organisation, country/big business	4	0.36
(4 6 10) /Causes/human activities, man, us/greenhouse gases	**226**	20.36
(4 6 10 1) /Causes/human activities, man, us/greenhouse gases/CO2, carbon emissions	36	3.24
(4 6 10 2) /Causes/human activities, man, us/greenhouse gases/emissions, fumes, waste gases ~gen~	25	2.25
(4 6 10 3) /Causes/human activities, man, us/greenhouse gases/pollution ~gen~	135	12.16
(4 6 10 4) /Causes/human activities, man, us/greenhouse gases/methane	7	0.63
(4 6 10 5) /Causes/human activities, man, us/greenhouse gases/NO2	2	0.18

(4 6 10 9) /Causes/human activities, man, us/greenhouse gases/greenhouse gases undefined	21	1.89
(4 6 13) /Causes/human activities, man, us/type of activity, object	**214**	19.28
(4 6 13 2) /Causes/human activities, man, us/type of activity, object/destruction of rainforest, trees	49	4.41
(4 6 13 3) /Causes/human activities, man, us/type of activity, object/power stations	9	0.81
(4 6 13 4) /Causes/human activities, man, us/type of activity, object/agricultural activity	1	0.09
(4 6 13 5) /Causes/human activities, man, us/type of activity, object/domestic emissions, energy	3	0.27
(4 6 13 7) /Causes/human activities, man, us/type of activity, object/energy, fuel consumption	9	0.81
(4 6 13 8) /Causes/human activities, man, us/type of activity, object/space exploration, rockets	6	0.54
(4 6 13 9) /Causes/human activities, man, us/type of activity, object/building, development	2	0.18
(4 6 13 10) /Causes/human activities, man, us/type of activity, object/fossil fuels consumption, burning	54	4.86
(4 6 13 11) /Causes/human activities, man, us/type of activity, object/smoke, fires	**7**	0.63
(4 6 13 11 1) /Causes/human activities, man, us/type of activity, object/smoke, fires/smoke	2	0.18
(4 6 13 11 2) /Causes/human activities, man, us/type of activity, object/smoke, fires/smoking	1	0.09
(4 6 13 11 3) /Causes/human activities, man, us/type of activity, object/smoke, fires/fires	4	0.36
(4 6 13 12) /Causes/human activities, man, us/type of activity, object/cars, traffic, exhaust fumes, poll'n	65	5.86
(4 6 13 13) /Causes/human activities, man, us/type of activity, object/planes	9	0.81

(5) /How tackle	**959**	100.00
(5 1) /How tackle/responsibility for action	**256**	26.69
(5 1 1) /How tackle/responsibility for action/business	18	1.88
(5 1 2) /How tackle/responsibility for action/developed countries	5	0.52
(5 1 2 1) /How tackle/responsibility for action/developed countries/USA	27	2.82
(5 1 3) /How tackle/responsibility for action/power stations	4	0.42
(5 1 4) /How tackle/responsibility for action/media	1	0.10
(5 1 5) /How tackle/responsibility for action/international (general)	67	6.99
(5 1 6) /How tackle/responsibility for action/industry	35	3.65
(5 1 7) /How tackle/responsibility for action/individuals, public	31	3.23
(5 1 8) /How tackle/responsibility for action/government	48	5.01
(5 1 9) /How tackle/responsibility for action/everyone	6	0.63
(5 1 10) /How tackle/responsibility for action/developing countries	12	1.25
(5 1 11) /How tackle/responsibility for action/local government	2	0.21
(5 2) /How tackle/limited efficacy of action	**19**	1.98
(5 2 1) /How tackle/limited efficacy of action/too late?	1	0.10
(5 2 6) /How tackle/limited efficacy of action/action unlikely, difficult	17	1.77
(5 2 7) /How tackle/limited efficacy of action/improvement not immediate	1	0.10
(5 3) /How tackle/actions	**631**	65.80
(5 3 1) /How tackle/actions/use nuclear energy	3	0.31
(5 3 2) /How tackle/actions/use public transport	9	0.94
(5 3 3) /How tackle/actions/use environmentally friendly product	5	0.52
(5 3 4) /How tackle/actions/taxation, fines	10	1.04
(5 3 5) /How tackle/actions/less selfishness, greed, apathy	11	1.15
(5 3 6) /How tackle/actions/respect nature, care for envt	13	1.36
(5 3 7) /How tackle/actions/renewable, clean energy, fuels	43	4.48
(5 3 8) /How tackle/actions/reduce car pollution	11	1.15
(5 3 9) /How tackle/actions/remove corruption	1	0.10
(5 3 10) /How tackle/actions/improve, reduce development	5	0.52

(5 3 11) /How tackle/actions/refrigerator manufact, disposal	4	0.42
(5 3 12) /How tackle/actions/reduce pollution, emissions	110	11.47
(5 3 13) /How tackle/actions/reduce meat consumption	1	0.10
(5 3 14) /How tackle/actions/reduce other transport	5	0.52
(5 3 15) /How tackle/actions/reduce fossil fuels	34	3.55
(5 3 16) /How tackle/actions/reduce deforestation, plant trees	27	2.82
(5 3 17) /How tackle/actions/reduce carbon, g-gas emissions	30	3.13
(5 3 18) /How tackle/actions/reduce car use	29	3.02
(5 3 19) /How tackle/actions/reduce aviation	5	0.52
(5 3 20) /How tackle/actions/recycle, improve waste mgt	31	3.23
(5 3 21) /How tackle/actions/make cars more env-friendly	15	1.56
(5 3 22) /How tackle/actions/maintaining cars properly	1	0.10
(5 3 23) /How tackle/actions/lobbying	1	0.10
(5 3 24) /How tackle/actions/limit population growth	6	0.63
(5 3 25) /How tackle/actions/limit industrialisation	2	0.21
(5 3 26) /How tackle/actions/less materialism, consumerism, consu	8	0.83
(5 3 27) /How tackle/actions/kyoto	9	0.94
(5 3 28) /How tackle/actions/incentives	7	0.73
(5 3 29) /How tackle/actions/regulation, legislation	12	1.25
(5 3 30) /How tackle/actions/improve, increase public transport	8	0.83
(5 3 31) /How tackle/actions/improve methods of production	5	0.52
(5 3 32) /How tackle/actions/immediate action	5	0.52
(5 3 33) /How tackle/actions/conserve domestic energy	5	0.52
(5 3 34) /How tackle/actions/monitoring	5	0.52
(5 3 35) /How tackle/actions/reduce carbon monoxide	1	0.10
(5 3 36) /How tackle/actions/energy efficiency, conservation	25	2.61
(5 3 37) /How tackle/actions/walk more	2	0.21
(5 3 38) /How tackle/actions/education, information, awareness	38	3.96
(5 3 39) /How tackle/actions/ecotourism	1	0.10
(5 3 40) /How tackle/actions/conserve, manage resources	18	1.88
(5 3 43) /How tackle/actions/change farming methods	1	0.10
(5 3 44) /How tackle/actions/change atts, behaviour, lifestyle	33	3.44
(5 3 45) /How tackle/actions/other environmental issues	**36**	3.75
(5 3 45 8) /How tackle/actions/other environmental issues/remove nuclear weapons	2	0.21
(5 3 45 33) /How tackle/actions/other environmental issues/reduce chemicals	6	0.63
(5 3 45 35) /How tackle/actions/other environmental issues/fix ozone hole, reduce CFCs	23	2.40
(5 3 45 41) /How tackle/actions/other environmental issues/conserve water	3	0.31
(5 3 45 42) /How tackle/actions/other environmental issues/conserve habitats, wildlife	2	0.21
(5 5) /How tackle/uncertainty	**53**	5.53
(5 5 1) /How tackle/uncertainty/unsure of causes	15	1.56
(5 5 2) /How tackle/uncertainty/self-doubt	8	0.83
(5 5 3) /How tackle/uncertainty/natural temp changes	6	0.63
(5 5 4) /How tackle/uncertainty/mistrust of information	4	0.42
(5 5 5) /How tackle/uncertainty/more research	9	0.94
(5 5 6) /How tackle/uncertainty/ask the experts, listen to sci's	6	0.63
(5 5 7) /How tackle/uncertainty/don't know	4	0.42
(5 5 8) /How tackle/uncertainty/agree its happening	1	0.10

(6) /What actions	**566**	100.00
(6 1) /What actions/limited efficacy, ability	**75**	13.25
(6 1 1) /What actions/limited efficacy, ability/caveat: try, when possible	65	11.48
(6 1 2) /What actions/limited efficacy, ability/may be ineffective, futile	5	0.88
(6 1 3) /What actions/limited efficacy, ability/not enough, only little things	5	0.88
(6 2) /What actions/energy related actions	**237**	41.87
(6 2 1) /What actions/energy related actions/walking	27	4.77

(6 2 2) /What actions/energy related actions/use renewable energy	4	0.71
(6 2 3) /What actions/energy related actions/use public transport	9	1.59
(6 2 4) /What actions/energy related actions/turn off car engine when stationary	1	0.18
(6 2 5) /What actions/energy related actions/turn lights off	13	2.30
(6 2 6) /What actions/energy related actions/sold car, stopped driving	2	0.35
(6 2 7) /What actions/energy related actions/solar power	3	0.53
(6 2 8) /What actions/energy related actions/shop locally	1	0.18
(6 2 9) /What actions/energy related actions/only one car	1	0.18
(6 2 10) /What actions/energy related actions/not having bonfires, open fires	3	0.53
(6 2 11) /What actions/energy related actions/maintain car properly	1	0.18
(6 2 12) /What actions/energy related actions/low energy light bulbs	7	1.24
(6 2 13) /What actions/energy related actions/drive slower, economically	3	0.53
(6 2 14) /What actions/energy related actions/don't drive, no car	5	0.88
(6 2 15) /What actions/energy related actions/domestic insulation	11	1.94
(6 2 16) /What actions/energy related actions/cycling	16	2.83
(6 2 17) /What actions/energy related actions/conserve heat	16	2.83
(6 2 18) /What actions/energy related actions/conserve energy	38	6.71
(6 2 19) /What actions/energy related actions/chose fuel efficient car	10	1.77
(6 2 21) /What actions/energy related actions/car sharing	4	0.71
(6 2 22) /What actions/energy related actions/car converted to LPG	1	0.18
(6 2 23) /What actions/energy related actions/buying energy efficient goods	9	1.59
(6 2 24) /What actions/energy related actions/buy local, seasonal foods	2	0.35
(6 2 25) /What actions/energy related actions/buy home close to work	1	0.18
(6 2 26) /What actions/energy related actions/avoid flying	2	0.35
(6 2 27) /What actions/energy related actions/avoid driving car	47	8.30
(6 3) /What actions/other environmental actions	**221**	39.05
(6 3 1) /What actions/other environmental actions/use, buy env friendly products, svcs	20	3.53
(6 3 2) /What actions/other environmental actions/use unleaded petrol	7	1.24
(6 3 3) /What actions/other environmental actions/use natural ways	1	0.18
(6 3 4) /What actions/other environmental actions/use CFC free products, avoid sprays	17	3.00
(6 3 5) /What actions/other environmental actions/sun protection	1	0.18
(6 3 6) /What actions/other environmental actions/report excessive pollution	1	0.18
(6 3 7) /What actions/other environmental actions/reduce bags used, taken	2	0.35
(6 3 8) /What actions/other environmental actions/recycling	104	18.37
(6 3 9) /What actions/other environmental actions/proper fridge disposal	4	0.71
(6 3 10) /What actions/other environmental actions/planting, saving trees	3	0.53
(6 3 11) /What actions/other environmental actions/not having bonfires, open fires	3	0.53
(6 3 12) /What actions/other environmental actions/growing plants that will do well	1	0.18
(6 3 13) /What actions/other environmental actions/growing organic produce	3	0.53
(6 3 14) /What actions/other environmental actions/following guidelines, advice	2	0.35
(6 3 15) /What actions/other environmental actions/flooding precautions, drainage	2	0.35
(6 3 16) /What actions/other environmental actions/educate, encourage others	7	1.24
(6 3 17) /What actions/other environmental actions/conserve water	9	1.59
(6 3 18) /What actions/other environmental actions/composting	7	1.24
(6 3 19) /What actions/other environmental actions/close windows when spraying	1	0.18
(6 3 20) /What actions/other environmental actions/buy organic	4	0.71
(6 3 21) /What actions/other environmental actions/be environmentally conscious	3	0.53
(6 3 22) /What actions/other environmental actions/avoid waste, reuse	12	2.12
(6 3 23) /What actions/other environmental actions/avoid packaging	2	0.35
(6 3 24) /What actions/other environmental actions/action at work	5	0.88
(6 4) /What actions/indirect action ~pol, fin~	**28**	4.95
(6 4 1) /What actions/indirect action ~pol, fin~/wrote to council, MP	3	0.53
(6 4 2) /What actions/indirect action ~pol, fin~/voting	2	0.35
(6 4 3) /What actions/indirect action ~pol, fin~/boycott, avoid bad companies	2	0.35
(6 4 4) /What actions/indirect action ~pol, fin~/ethical investment	1	0.18
(6 4 5) /What actions/indirect action ~pol, fin~/protests, demos	2	0.35
(6 4 6) /What actions/indirect action ~pol, fin~/signed petitions, support campaigns	4	0.71

(6 4 7) /What actions/indirect action ~pol, fin~/support environmental organisation	14	2.47
(6 5) /What actions/need information on actions	3	0.53
(6 6) /What actions/every little helps	1	0.18
(6 7) /What actions/considering action	1	0.18

(7) /Why weather changed	**913**	100.00
(7 1) /Why weather changed/uncertainty	**119**	13.03
(7 1 1) /Why weather changed/uncertainty/need to look over longer period	3	0.33
(7 1 2) /Why weather changed/uncertainty/media hype	1	0.11
(7 1 3) /Why weather changed/uncertainty/I'm not an expert	2	0.22
(7 1 4) /Why weather changed/uncertainty/gw unproven by science	3	0.33
(7 1 5) /Why weather changed/uncertainty/doubt, uncertain views	88	9.64
(7 1 6) /Why weather changed/uncertainty/don't know	9	0.99
(7 1 7) /Why weather changed/uncertainty/contradictory arguments, debate	6	0.66
(7 1 8) /Why weather changed/uncertainty/biased information	1	0.11
(7 1 10) /Why weather changed/uncertainty/may only be perceived change	6	0.66
(7 2) /Why weather changed/reason for view	**143**	15.66
(7 2 1) /Why weather changed/reason for view/past environmental destruction	1	0.11
(7 2 2) /Why weather changed/reason for view/speed of change	6	0.66
(7 2 3) /Why weather changed/reason for view/description of weather changes	94	10.30
(7 2 4) /Why weather changed/reason for view/change occured in past	42	4.60
(7 3) /Why weather changed/cause of change	**651**	71.30
(7 3 2) /Why weather changed/cause of change/anthropogenic	**456**	49.95
(7 3 2 1) /Why weather changed/cause of change/anthropogenic/waste	2	0.22
(7 3 2 2) /Why weather changed/cause of change/anthropogenic/blame other countries	**7**	0.77
(7 3 2 2 1) /Why weather changed/cause of change/anthropogenic/blame other countries/USA	2	0.22
(7 3 2 2 2) /Why weather changed/cause of change/anthropogenic/blame other countries/other countries	5	0.55
(7 3 2 3) /Why weather changed/cause of change/anthropogenic/space travel	4	0.44
(7 3 2 4) /Why weather changed/cause of change/anthropogenic/smoke	2	0.22
(7 3 2 5) /Why weather changed/cause of change/anthropogenic/scientific activities	1	0.11
(7 3 2 6) /Why weather changed/cause of change/anthropogenic/radioactive waste	1	0.11
(7 3 2 7) /Why weather changed/cause of change/anthropogenic/pollution	65	7.12
(7 3 2 8) /Why weather changed/cause of change/anthropogenic/ozone layer depletion, hole	62	6.79
(7 3 2 9) /Why weather changed/cause of change/anthropogenic/overpopulation	4	0.44
(7 3 2 10) /Why weather changed/cause of change/anthropogenic/nuclear power stations	1	0.11
(7 3 2 11) /Why weather changed/cause of change/anthropogenic/moral dimension	**25**	2.74
(7 3 2 11 1) /Why weather changed/cause of change/anthropogenic/moral dimension/abuse of planet	5	0.55
(7 3 2 11 2) /Why weather changed/cause of change/anthropogenic/moral dimension/nature out of balance	2	0.22
(7 3 2 11 4) /Why weather changed/cause of change/anthropogenic/moral dimension/mismgt, overuse of nat resouces	6	0.66
(7 3 2 11 5) /Why weather changed/cause of change/anthropogenic/moral dimension/interference in nature	2	0.22
(7 3 2 11 6) /Why weather changed/cause of change/anthropogenic/moral dimension/lack of conservation	1	0.11
(7 3 2 11 7) /Why weather changed/cause of change/anthropogenic/moral dimension/lack of concern, commitment	1	0.11

(7 3 2 11 8) /Why weather changed/cause of change/anthropogenic/moral dimension/industrialisation, tech progress	4	0.44
(7 3 2 11 9) /Why weather changed/cause of change/anthropogenic/moral dimension/consumption, consumerism	1	0.11
(7 3 2 11 10) /Why weather changed/cause of change/anthropogenic/moral dimension/apocalyse, planet destroyed	3	0.33
(7 3 2 12) /Why weather changed/cause of change/anthropogenic/industrial, factory emissions	4	0.44
(7 3 2 13) /Why weather changed/cause of change/anthropogenic/human-caused, impact	22	2.41
(7 3 2 14) /Why weather changed/cause of change/anthropogenic/polar gear	1	0.11
(7 3 2 15) /Why weather changed/cause of change/anthropogenic/greenhouse gases	6	0.66
(7 3 2 16) /Why weather changed/cause of change/anthropogenic/greenhouse effect	6	0.66
(7 3 2 17) /Why weather changed/cause of change/anthropogenic/global warming	171	18.73
(7 3 2 18) /Why weather changed/cause of change/anthropogenic/fossil fuels	7	0.77
(7 3 2 19) /Why weather changed/cause of change/anthropogenic/environmental issues	1	0.11
(7 3 2 20) /Why weather changed/cause of change/anthropogenic/energy consumption	3	0.33
(7 3 2 21) /Why weather changed/cause of change/anthropogenic/diverting rivers	1	0.11
(7 3 2 22) /Why weather changed/cause of change/anthropogenic/development	5	0.55
(7 3 2 23) /Why weather changed/cause of change/anthropogenic/deforestation	24	2.63
(7 3 2 24) /Why weather changed/cause of change/anthropogenic/chemicals	2	0.22
(7 3 2 25) /Why weather changed/cause of change/anthropogenic/CFC gases, aerosols	5	0.55
(7 3 2 26) /Why weather changed/cause of change/anthropogenic/cars, traffic fumes	7	0.77
(7 3 2 27) /Why weather changed/cause of change/anthropogenic/carbon, CO2 emissions	8	0.88
(7 3 2 28) /Why weather changed/cause of change/anthropogenic/carbon monoxide	1	0.11
(7 3 2 29) /Why weather changed/cause of change/anthropogenic/aircraft	3	0.33
(7 3 2 30) /Why weather changed/cause of change/anthropogenic/agricultural practices	3	0.33
(7 3 3) /Why weather changed/cause of change/natural	**106**	11.61
(7 3 3 1) /Why weather changed/cause of change/natural/volcanic activity	2	0.22
(7 3 3 2) /Why weather changed/cause of change/natural/solar activity	3	0.33
(7 3 3 3) /Why weather changed/cause of change/natural/plate movement	2	0.22
(7 3 3 4) /Why weather changed/cause of change/natural/natural weather variations	90	9.86
(7 3 3 5) /Why weather changed/cause of change/natural/Gulf Stream, sea currents	4	0.44
(7 3 3 6) /Why weather changed/cause of change/natural/earth's polarity, axis, orbit	5	0.55
(7 3 8) /Why weather changed/cause of change/undefined	**89**	9.75
(7 3 8 1) /Why weather changed/cause of change/undefined/methane	2	0.22
(7 3 8 2) /Why weather changed/cause of change/undefined/melting glaciers, ice caps	12	1.31
(7 3 8 3) /Why weather changed/cause of change/undefined/higher tides	1	0.11
(7 3 8 4) /Why weather changed/cause of change/undefined/climate warming	19	2.08
(7 3 8 5) /Why weather changed/cause of change/undefined/radiation	1	0.11
(7 3 8 6) /Why weather changed/cause of change/undefined/ozone layer, ozone changes	32	3.50
(7 3 8 7) /Why weather changed/cause of change/undefined/ozone layer getting larger	1	0.11
(7 3 8 8) /Why weather changed/cause of change/undefined/global cooling	1	0.11
(7 3 8 9) /Why weather changed/cause of change/undefined/climate change	20	2.19

(8) /Other effects of air pollution	**608**	100.00
(8 1) /Other effects of air pollution/human-specific impacts	**170**	27.96
(8 1 1) /Other effects of air pollution/human-specific impacts/visibility	10	1.64
(8 1 2) /Other effects of air pollution/human-specific impacts/smog	15	2.47
(8 1 3) /Other effects of air pollution/human-specific impacts/smell	3	0.49
(8 1 4) /Other effects of air pollution/human-specific impacts/losing taste	1	0.16
(8 1 5) /Other effects of air pollution/human-specific impacts/lethargy	1	0.16
(8 1 6) /Other effects of air pollution/human-specific impacts/retard intellectual development	1	0.16
(8 1 7) /Other effects of air pollution/human-specific impacts/inhaling	1	0.16

(8 1 8) /Other effects of air pollution/human-specific impacts/human health	22	3.62
(8 1 9) /Other effects of air pollution/human-specific impacts/germs	1	0.16
(8 1 10) /Other effects of air pollution/human-specific impacts/financial cost	3	0.49
(8 1 11) /Other effects of air pollution/human-specific impacts/dirt	20	3.29
(8 1 12) /Other effects of air pollution/human-specific impacts/damages buildings	64	10.53
(8 1 13) /Other effects of air pollution/human-specific impacts/damage to materials	4	0.66
(8 1 14) /Other effects of air pollution/human-specific impacts/clarity of photography	1	0.16
(8 1 15) /Other effects of air pollution/human-specific impacts/affects food, crops	21	3.45
(8 1 16) /Other effects of air pollution/human-specific impacts/damage to vehicles	2	0.33
(8 2) /Other effects of air pollution/other impacts	**395**	64.97
(8 2 1) /Other effects of air pollution/other impacts/weather	6	0.99
(8 2 2) /Other effects of air pollution/other impacts/water pollution	9	1.48
(8 2 3) /Other effects of air pollution/other impacts/global warming	**60**	9.87
(8 2 3 1) /Other effects of air pollution/other impacts/global warming/global warming	24	3.95
(8 2 3 2) /Other effects of air pollution/other impacts/global warming/climate change	24	3.95
(8 2 3 11) /Other effects of air pollution/other impacts/global warming/impacts of global warming	4	0.66
(8 2 3 13) /Other effects of air pollution/other impacts/global warming/greenhouse effect	8	1.32
(8 2 4) /Other effects of air pollution/other impacts/tides	1	0.16
(8 2 5) /Other effects of air pollution/other impacts/temperature rise	4	0.66
(8 2 6) /Other effects of air pollution/other impacts/soil, land pollution	8	1.32
(8 2 7) /Other effects of air pollution/other impacts/environmental issues	1	0.16
(8 2 8) /Other effects of air pollution/other impacts/plant photosynthesis	1	0.16
(8 2 9) /Other effects of air pollution/other impacts/long term effects	1	0.16
(8 2 10) /Other effects of air pollution/other impacts/kills plants, trees	16	2.63
(8 2 11) /Other effects of air pollution/other impacts/evolution, mutation of life	2	0.33
(8 2 12) /Other effects of air pollution/other impacts/health of other species	14	2.30
(8 2 13) /Other effects of air pollution/other impacts/affects habitats	3	0.49
(8 2 14) /Other effects of air pollution/other impacts/depletion of the ozone layer	27	4.44
(8 2 15) /Other effects of air pollution/other impacts/damage, toxins in atmosphere	8	1.32
(8 2 16) /Other effects of air pollution/other impacts/affects, damages env't, nature	15	2.47
(8 2 17) /Other effects of air pollution/other impacts/affects rays	2	0.33
(8 2 18) /Other effects of air pollution/other impacts/catastrophe	1	0.16
(8 2 19) /Other effects of air pollution/other impacts/bird population demise	2	0.33
(8 2 20) /Other effects of air pollution/other impacts/affects wildlife, animals	45	7.40
(8 2 21) /Other effects of air pollution/other impacts/affects the balance of nature	1	0.16
(8 2 22) /Other effects of air pollution/other impacts/affects plants - general	71	11.68
(8 2 23) /Other effects of air pollution/other impacts/affects ozone - general	20	3.29
(8 2 24) /Other effects of air pollution/other impacts/affects ecosystems	5	0.82
(8 2 25) /Other effects of air pollution/other impacts/affects all life	7	1.15
(8 2 26) /Other effects of air pollution/other impacts/acid rain, polluted rain	61	10.03
(8 2 27) /Other effects of air pollution/other impacts/effects of ozone depletion	2	0.33
(8 2 28) /Other effects of air pollution/other impacts/rise in ozone	2	0.33
(8 3) /Other effects of air pollution/pollutant type	**30**	4.93
(8 3 1) /Other effects of air pollution/pollutant type/smoking	3	0.49
(8 3 2) /Other effects of air pollution/pollutant type/other pollutants	20	3.29
(8 3 3) /Other effects of air pollution/pollutant type/CO2 levels	5	0.82
(8 3 4) /Other effects of air pollution/pollutant type/CFC levels	2	0.33
(8 4) /Other effects of air pollution/doubt, uncertain views	13	2.14

(9) /What known about global warming	**1962**	100.00
(9 1) /What known about global warming/causes	**415**	21.15
(9 1 1) /What known about global warming/causes/waste	4	0.20
(9 1 4) /What known about global warming/causes/overpopulation	1	0.05
(9 1 6) /What known about global warming/causes/moral dimension	**11**	0.56

(9 1 6 1) /What known about global warming/causes/moral dimension/modern society	1	0.05
(9 1 6 2) /What known about global warming/causes/moral dimension/abuse of nature	1	0.05
(9 1 6 3) /What known about global warming/causes/moral dimension/USA inaction	3	0.15
(9 1 6 4) /What known about global warming/causes/moral dimension/UK inaction	1	0.05
(9 1 6 5) /What known about global warming/causes/moral dimension/mismgt of resources	2	0.10
(9 1 6 7) /What known about global warming/causes/moral dimension/shortsighted	1	0.05
(9 1 6 8) /What known about global warming/causes/moral dimension/selfishness, ignorance	2	0.10
(9 1 7) /What known about global warming/causes/power stations	4	0.20
(9 1 8) /What known about global warming/causes/pollution	70	3.57
(9 1 9) /What known about global warming/causes/industry, factory emissions	13	0.66
(9 1 10) /What known about global warming/causes/pollutant type	**126**	6.42
(9 1 10 1) /What known about global warming/causes/pollutant type/NO2	1	0.05
(9 1 10 2) /What known about global warming/causes/pollutant type/methane	7	0.36
(9 1 10 3) /What known about global warming/causes/pollutant type/greenhouse gases	23	1.17
(9 1 10 4) /What known about global warming/causes/pollutant type/gases	13	0.66
(9 1 10 5) /What known about global warming/causes/pollutant type/fuel emissions	5	0.25
(9 1 10 6) /What known about global warming/causes/pollutant type/smoke	4	0.20
(9 1 10 7) /What known about global warming/causes/pollutant type/CO2	46	2.34
(9 1 10 8) /What known about global warming/causes/pollutant type/chemicals	7	0.36
(9 1 10 9) /What known about global warming/causes/pollutant type/refrigeration gases	1	0.05
(9 1 10 10) /What known about global warming/causes/pollutant type/CFCs, aerosols	14	0.71
(9 1 10 11) /What known about global warming/causes/pollutant type/carbon monoxide	5	0.25
(9 1 11) /What known about global warming/causes/natural causes	**61**	3.11
(9 1 11 1) /What known about global warming/causes/natural causes/natural variation in climate	37	1.89
(9 1 11 2) /What known about global warming/causes/natural causes/earth's polarity, axis	3	0.15
(9 1 11 3) /What known about global warming/causes/natural causes/change has occured in past	14	0.71
(9 1 11 4) /What known about global warming/causes/natural causes/sun is hotter, brighter, closer	5	0.25
(9 1 11 5) /What known about global warming/causes/natural causes/solar activity	1	0.05
(9 1 11 9) /What known about global warming/causes/natural causes/plate movement	1	0.05
(9 1 12) /What known about global warming/causes/human caused	36	1.83
(9 1 13) /What known about global warming/causes/fossil fuels	17	0.87
(9 1 14) /What known about global warming/causes/energy consumption, waste	4	0.20
(9 1 15) /What known about global warming/causes/domestic energy consumption	3	0.15
(9 1 16) /What known about global warming/causes/development	2	0.10
(9 1 17) /What known about global warming/causes/developing countries	3	0.15
(9 1 18) /What known about global warming/causes/developed countries	1	0.05
(9 1 19) /What known about global warming/causes/deforestation	25	1.27
(9 1 20) /What known about global warming/causes/daily actions contribute	4	0.20
(9 1 21) /What known about global warming/causes/cars, vehicle emissions	22	1.12
(9 1 22) /What known about global warming/causes/aviation	1	0.05
(9 1 23) /What known about global warming/causes/animal excretia	1	0.05
(9 1 24) /What known about global warming/causes/industrialisation	6	0.31
(9 2) /What known about global warming/impacts	**863**	43.99
(9 2 1) /What known about global warming/impacts/weather, seasons change	127	6.47
(9 2 2) /What known about global warming/impacts/unnatural, abnormal change	3	0.15
(9 2 3) /What known about global warming/impacts/UK, European impacts	18	0.92
(9 2 4) /What known about global warming/impacts/temperature increase	140	7.14
(9 2 5) /What known about global warming/impacts/temperature decrease	2	0.10
(9 2 6) /What known about global warming/impacts/summers hotter, winters wetter	31	1.58
(9 2 7) /What known about global warming/impacts/storms, hurricanes, gales	17	0.87
(9 2 8) /What known about global warming/impacts/skin cancers, sunburn	2	0.10

(9 2 9) /What known about global warming/impacts/sea temperature increase	10	0.51
(9 2 10) /What known about global warming/impacts/rising sea levels, land loss	57	2.91
(9 2 11) /What known about global warming/impacts/plant cycles changing	5	0.25
(9 2 12) /What known about global warming/impacts/pessimism, catastrophe	6	0.31
(9 2 13) /What known about global warming/impacts/personal observations	31	1.58
(9 2 14) /What known about global warming/impacts/people dying	1	0.05
(9 2 15) /What known about global warming/impacts/other species dying	2	0.10
(9 2 16) /What known about global warming/impacts/movement north of weather	1	0.05
(9 2 18) /What known about global warming/impacts/melting iceburgs, glaciers	117	5.96
(9 2 19) /What known about global warming/impacts/local impacts	2	0.10
(9 2 20) /What known about global warming/impacts/knock on effects	3	0.15
(9 2 21) /What known about global warming/impacts/impacts on other species	15	0.76
(9 2 22) /What known about global warming/impacts/impacts on humans	6	0.31
(9 2 24) /What known about global warming/impacts/impact on holidays	1	0.05
(9 2 25) /What known about global warming/impacts/impact on environment	6	0.31
(9 2 26) /What known about global warming/impacts/impact on climate	38	1.94
(9 2 27) /What known about global warming/impacts/impact on biodiversity, ecosystems	2	0.10
(9 2 28) /What known about global warming/impacts/ice age	3	0.15
(9 2 29) /What known about global warming/impacts/horticulture	6	0.31
(9 2 30) /What known about global warming/impacts/health	2	0.10
(9 2 31) /What known about global warming/impacts/habitats destroyed	3	0.15
(9 2 32) /What known about global warming/impacts/gulf stream	6	0.31
(9 2 33) /What known about global warming/impacts/global impacts	59	3.01
(9 2 34) /What known about global warming/impacts/future generations	1	0.05
(9 2 35) /What known about global warming/impacts/flooding	52	2.65
(9 2 36) /What known about global warming/impacts/fires	6	0.31
(9 2 37) /What known about global warming/impacts/filters out light	1	0.05
(9 2 38) /What known about global warming/impacts/famine	4	0.20
(9 2 39) /What known about global warming/impacts/extinction, loss of species	4	0.20
(9 2 40) /What known about global warming/impacts/El Ninos	3	0.15
(9 2 41) /What known about global warming/impacts/earthquakes	1	0.05
(9 2 42) /What known about global warming/impacts/increased rainfall	22	1.12
(9 2 43) /What known about global warming/impacts/drought, less rainfall	31	1.58
(9 2 44) /What known about global warming/impacts/desertification	2	0.10
(9 2 46) /What known about global warming/impacts/beneficial impacts	2	0.10
(9 2 47) /What known about global warming/impacts/agriculture	12	0.61
(9 3) /What known about global warming/source of information	**44**	2.24
(9 3 1) /What known about global warming/source of information/scientists	12	0.61
(9 3 2) /What known about global warming/source of information/school, college	1	0.05
(9 3 3) /What known about global warming/source of information/media	27	1.38
(9 3 4) /What known about global warming/source of information/knowledge from travel	1	0.05
(9 3 5) /What known about global warming/source of information/government	3	0.15
(9 4) /What known about global warming/uncertainty, level of knowledge	**331**	16.87
(9 4 1) /What known about global warming/uncertainty, level of knowledge/want information, should know more	8	0.41
(9 4 2) /What known about global warming/uncertainty, level of knowledge/unsure, self-doubt	30	1.53
(9 4 3) /What known about global warming/uncertainty, level of knowledge/know alot	5	0.25
(9 4 4) /What known about global warming/uncertainty, level of knowledge/impact-cause confusion	3	0.15
(9 4 5) /What known about global warming/uncertainty, level of knowledge/exaggeration, hype	6	0.31
(9 4 6) /What known about global warming/uncertainty, level of knowledge/doubt about reality, causes	86	4.38
(9 4 6 13) /What known about global warming/uncertainty, level of knowledge/doubt about reality, causes/theory, hypothesis	12	0.61

(9 4 7) /What known about global warming/uncertainty, level of knowledge/don't know much, anything	101	5.15
(9 4 8) /What known about global warming/uncertainty, level of knowledge/disinterested	1	0.05
(9 4 9) /What known about global warming/uncertainty, level of knowledge/definitely happening	4	0.20
(9 4 10) /What known about global warming/uncertainty, level of knowledge/contradictory views, debate	31	1.58
(9 4 11) /What known about global warming/uncertainty, level of knowledge/cc is different to gw	23	1.17
(9 4 12) /What known about global warming/uncertainty, level of knowledge/concern, worry	2	0.10
(9 4 13) /What known about global warming/uncertainty, level of knowledge/need more research	1	0.05
(9 4 14) /What known about global warming/uncertainty, level of knowledge/uncertain impacts	18	0.92
(9 5) /What known about global warming/process	**306**	15.60
(9 5 1) /What known about global warming/process/trapping of heat, gases- blanket	27	1.38
(9 5 2) /What known about global warming/process/thinning the air	1	0.05
(9 5 3) /What known about global warming/process/thermal expansion causes rising sea	1	0.05
(9 5 4) /What known about global warming/process/sun,uv penetrating, reduced protect'	45	2.29
(9 5 5) /What known about global warming/process/sun emits radio-activity	1	0.05
(9 5 6) /What known about global warming/process/ozone depletion, hole	118	6.01
(9 5 7) /What known about global warming/process/ozone layer affected	15	0.76
(9 5 8) /What known about global warming/process/ozone layer increasing	3	0.15
(9 5 9) /What known about global warming/process/iceburgs cool planet	1	0.05
(9 5 10) /What known about global warming/process/harmful elements through hole	1	0.05
(9 5 11) /What known about global warming/process/greenhouse effect	30	1.53
(9 5 12) /What known about global warming/process/global warming	21	1.07
(9 5 13) /What known about global warming/process/cloud cover	2	0.10
(9 5 14) /What known about global warming/process/climate change	11	0.56
(9 5 15) /What known about global warming/process/changes in wavelength	2	0.10
(9 5 16) /What known about global warming/process/energy absorption, retention	5	0.25
(9 5 17) /What known about global warming/process/atmosphere changed, damaged	14	0.71
(9 5 18) /What known about global warming/process/balance of nature disturbed	6	0.31
(9 5 19) /What known about global warming/process/acid rain	2	0.10
(9 6) /What known about global warming/action to tackle	**3**	0.15
(9 6 1) /What known about global warming/action to tackle/recycling, composting help	1	0.05
(9 6 2) /What known about global warming/action to tackle/powerless as individual	1	0.05
(9 6 3) /What known about global warming/action to tackle/Kyoto	1	0.05

(10) /Additional comments	**303**	100.00
(10 1) /Additional comments/survey-related	**149**	49.17
(10 1 1) /Additional comments/survey-related/why psychology~	4	1.32
(10 1 2) /Additional comments/survey-related/want survey to have impact	5	1.65
(10 1 3) /Additional comments/survey-related/survey waste of time	4	1.32
(10 1 4) /Additional comments/survey-related/questionnaire too long	8	2.64
(10 1 5) /Additional comments/survey-related/questionnaire too acad	2	0.66
(10 1 6) /Additional comments/survey-related/questionnaire repetitive	4	1.32
(10 1 7) /Additional comments/survey-related/questionnaire not impartial	9	2.97
(10 1 8) /Additional comments/survey-related/questionnaire not envtl	4	1.32
(10 1 9) /Additional comments/survey-related/question irrelevant	1	0.33
(10 1 10) /Additional comments/survey-related/may be biased sample	3	0.99
(10 1 11) /Additional comments/survey-related/good questionnaire	17	5.61
(10 1 12) /Additional comments/survey-related/publish results locally	1	0.33

(10 1 13) /Additional comments/survey-related/good luck with research	48	15.84
(10 1 14) /Additional comments/survey-related/choice of boxes difficult, restrict	8	2.64
(10 1 15) /Additional comments/survey-related/bigger issues than cc	5	1.65
(10 1 16) /Additional comments/survey-related/cc is imp issue	11	3.63
(10 1 17) /Additional comments/survey-related/enclosed information	2	0.66
(10 1 18) /Additional comments/survey-related/questionnaire raised awareness	8	2.64
(10 1 19) /Additional comments/survey-related/feel guilty	3	0.99
(10 1 20) /Additional comments/survey-related/disability	2	0.66
(10 2) /Additional comments/actions to tackle	**49**	16.17
(10 2 1) /Additional comments/actions to tackle/reduce junk mail	1	0.33
(10 2 2) /Additional comments/actions to tackle/reduce pollution	2	0.66
(10 2 3) /Additional comments/actions to tackle/personal actions taken	3	0.99
(10 2 4) /Additional comments/actions to tackle/need education	3	0.99
(10 2 5) /Additional comments/actions to tackle/need better waste mgt	4	1.32
(10 2 6) /Additional comments/actions to tackle/need better planning	1	0.33
(10 2 7) /Additional comments/actions to tackle/make surfaces reflective	1	0.33
(10 2 8) /Additional comments/actions to tackle/make people env conscious	3	0.99
(10 2 9) /Additional comments/actions to tackle/listen to scientists	3	0.99
(10 2 10) /Additional comments/actions to tackle/introduce legislation for ALL	2	0.66
(10 2 11) /Additional comments/actions to tackle/individual efficacy	1	0.33
(10 2 12) /Additional comments/actions to tackle/increase taxation of cars	1	0.33
(10 2 13) /Additional comments/actions to tackle/improve public transport	6	1.98
(10 2 14) /Additional comments/actions to tackle/holistic approach	1	0.33
(10 2 15) /Additional comments/actions to tackle/go local	1	0.33
(10 2 16) /Additional comments/actions to tackle/facilitate, enforce recycling	4	1.32
(10 2 17) /Additional comments/actions to tackle/everything in moderation	1	0.33
(10 2 18) /Additional comments/actions to tackle/control population	1	0.33
(10 2 19) /Additional comments/actions to tackle/alternative energy	1	0.33
(10 2 20) /Additional comments/actions to tackle/businesses should act	3	0.99
(10 2 21) /Additional comments/actions to tackle/act though doubtful	5	1.65
(10 2 22) /Additional comments/actions to tackle/family inform me	1	0.33
(10 3) /Additional comments/uncertainty	**24**	7.92
(10 3 1) /Additional comments/uncertainty/unsure of truth, info varies	7	2.31
(10 3 2) /Additional comments/uncertainty/unaware of approp action	1	0.33
(10 3 3) /Additional comments/uncertainty/doubt about reality	8	2.64
(10 3 4) /Additional comments/uncertainty/insufficient knowledge	8	2.64
(10 4) /Additional comments/causes, blame	**20**	6.60
(10 4 1) /Additional comments/causes, blame/result of capitalism	2	0.66
(10 4 2) /Additional comments/causes, blame/resources wasted	2	0.66
(10 4 3) /Additional comments/causes, blame/destruction of rainforests	2	0.66
(10 4 4) /Additional comments/causes, blame/everyone to blame	1	0.33
(10 4 6) /Additional comments/causes, blame/blame others	6	1.98
(10 4 6 5) /Additional comments/causes, blame/blame others/developing countries	4	1.32
(10 4 6 7) /Additional comments/causes, blame/blame others/USA	3	0.99
(10 5) /Additional comments/limited efficacy, trust	**37**	12.21
(10 5 1) /Additional comments/limited efficacy, trust/modern living limits alt~beh	5	1.65
(10 5 2) /Additional comments/limited efficacy, trust/no faith in govts	12	3.96
(10 5 4) /Additional comments/limited efficacy, trust/individuals impotent	4	1.32
(10 5 5) /Additional comments/limited efficacy, trust/ignorance,apathy of others	5	1.65
(10 5 6) /Additional comments/limited efficacy, trust/hard to influence society	1	0.33
(10 5 7) /Additional comments/limited efficacy, trust/env gps not objective	3	0.99
(10 5 8) /Additional comments/limited efficacy, trust/recycling landfilled	1	0.33
(10 5 9) /Additional comments/limited efficacy, trust/can't tackle cc	1	0.33
(10 5 10) /Additional comments/limited efficacy, trust/should do, care more	3	0.99
(10 5 12) /Additional comments/limited efficacy, trust/age limits understanding, concern	2	0.66

(10 6) /Additional comments/other environmental issues	**8**	2.64
(10 6 1) /Additional comments/other environmental issues/pollution experience	2	0.66
(10 6 2) /Additional comments/other environmental issues/nuclear	2	0.66
(10 6 4) /Additional comments/other environmental issues/flooding experience	4	1.32
(10 7) /Additional comments/moral dimension	**16**	5.28
(10 7 1) /Additional comments/moral dimension/greed, selfishness	6	1.98
(10 7 2) /Additional comments/moral dimension/humans destroying envt	5	1.65
(10 7 3) /Additional comments/moral dimension/humans resp for envt	3	0.99
(10 7 4) /Additional comments/moral dimension/act for future generations	2	0.66
Grand Total	**9022**	

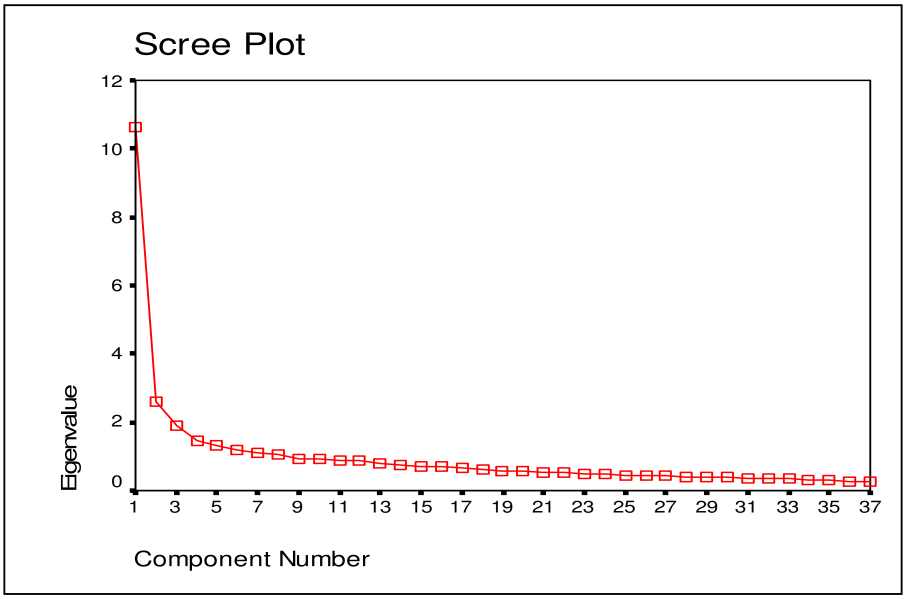
Number of Nodes: 737

APPENDIX 3.10 PRINCIPAL COMPONENTS ANALYSIS OF SURVEY QUESTIONS 24 AND 25 (MAIN STUDY)

Principal Components Analysis of Question 24	Component				
Rotated Component Matrix	1	2	3	4	5
We can all do our bit to reduce the effects of global warming	-0.201	-0.601	0.305	0.255	
Global warming is inevitable because of the way modern society works			0.199		0.586
People should be made to reduce their energy consumption if it reduces global warming	-0.195	-0.225	0.431	0.409	
Global warming will improve the British weather	0.113	0.275			
Global warming is just a natural fluctuation in earth's temperatures	0.613	0.429			-0.104
I would only do my bit to reduce global warming if everyone else did as well		0.458		-0.122	0.432
The government should provide incentives for people to look after the environment		-0.150	0.226	0.364	
It is already too late to do anything about global warming	0.158	0.577		-0.123	0.131
Human activities have no significant impact on global temperatures	0.427	0.501	-0.153		
Global warming is something that frightens me	-0.515	-0.179	0.224	0.422	
Developing countries should take most of the blame for global warming		0.153		0.170	0.470
I am uncertain about whether global warming is really happening	0.742	0.240			
Radical changes to society are needed to tackle global warming	-0.379	-0.296	0.413	0.293	0.307
People are too selfish to do anything about global warming		0.135	0.605	0.214	
The evidence for global warming is unreliable	0.730	0.299			
The United States should take most of the blame for global warming			0.571		0.209
Claims that human activities are changing the climate are exaggerated	0.605	0.445	-0.148		
If I come across information about global warming I will tend to look at it	-0.143	-0.112		0.678	
There is too much conflicting evidence about global warming to know whether it is actually happening	0.700	0.268	0.116		
Leaving the lights on in my home adds to global warming	-0.101	-0.599	0.206		0.112
Global warming is a consequence of modern life	-0.245	-0.393	0.316	-0.194	0.502
The effects of global warming are likely to be catastrophic	-0.539	-0.168	0.405	0.160	
Nothing I do makes any difference to global warming one way or another	0.245	0.660		-0.164	
Pollution from industry is the main cause of global warming	-0.289		0.424		0.256
I tend to consider information about global warming to be irrelevant to me	0.222	0.498		-0.480	0.116
Recent floods in this country are due to global warming	-0.566		0.225	0.211	
It is too early to say whether global warming is really a problem	0.737	0.272		-0.156	
The media is often too alarmist about issues like global warming	0.692	0.153		-0.252	
Flooding is not increasing, there is just more reporting of it in the media these days	0.587		-0.134	-0.349	0.136
There is no point in me doing anything about global warming because no-one else is	0.165	0.586		-0.271	0.273
Experts are agreed that global warming is a real problem	-0.495	-0.135			0.388
Nothing I do on a daily basis contributes to the problem of global warming	0.218	0.672		-0.116	
Industry and business should be doing more to tackle global warming	-0.314	-0.493	0.303	0.235	0.212
For the most part, the government honestly wants to reduce global warming			-0.553	0.313	0.526
I do not believe global warming is a real problem	0.545	0.478		-0.208	
The government is not doing enough to tackle global warming	-0.294	-0.348	0.439		
I feel a moral duty to do something about global warming	-0.246	-0.479	0.217	0.425	

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.

a Rotation converged in 7 iterations.



Total Variance Explained

	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	10.649	28.781	28.781	10.649	28.781	28.781
2	2.619	7.079	35.860	2.619	7.079	35.860
3	1.900	5.135	40.995	1.900	5.135	40.995
4	1.450	3.920	44.915	1.450	3.920	44.915
5	1.319	3.564	48.479	1.319	3.564	48.479
6	1.195	3.229	51.708	1.195	3.229	51.708
7	1.094	2.957	54.666	1.094	2.957	54.666
8	1.070	2.893	57.559	1.070	2.893	57.559
9	0.935	2.528	60.086			
10	0.918	2.480	62.567			
11	0.895	2.420	64.986			
12	0.870	2.352	67.338			
13	0.807	2.180	69.518			
14	0.755	2.041	71.559			
15	0.713	1.928	73.487			
16	0.691	1.868	75.355			
17	0.649	1.755	77.110			
18	0.602	1.627	78.736			
19	0.591	1.598	80.334			
20	0.554	1.498	81.833			
21	0.527	1.425	83.258			
22	0.515	1.391	84.649			
23	0.504	1.363	86.013			
24	0.485	1.310	87.322			
25	0.461	1.245	88.567			
26	0.450	1.216	89.783			
27	0.432	1.169	90.952			
28	0.404	1.091	92.043			
29	0.391	1.056	93.099			
30	0.385	1.041	94.140			
31	0.359	0.971	95.111			
32	0.343	0.928	96.039			
33	0.332	0.899	96.937			
34	0.308	0.832	97.769			
35	0.294	0.795	98.565			
36	0.272	0.735	99.299			
37	0.259	0.701	100.000			

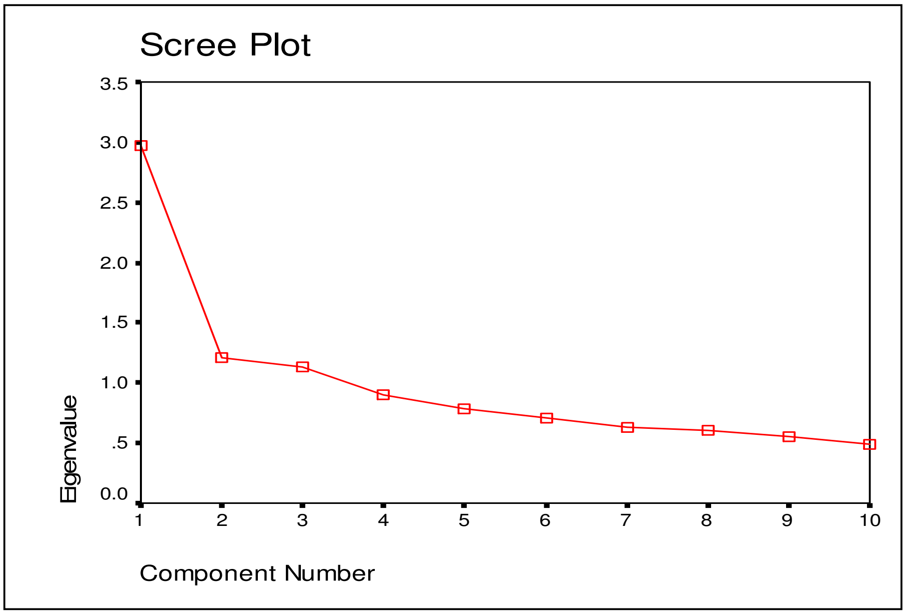
Extraction Method: Principal Component Analysis.

Principal Components Analysis of Question 25

Rotated Component Matrix

	Component 1	2	3
Jobs today are more important than protecting the environment for the future	-0.131	0.749	
I am unwilling to make personal sacrifices for the sake of the environment		0.779	
If my job caused environmental problems, I'd rather be unemployed than carry on causing them		-0.466	0.458
Having a car is part of having a good lifestyle			-0.824
Humans have the right to modify the natural environment to suit their needs	0.474		0.481
Humans are severely abusing the planet	0.767		
Plants and animals have the same rights as humans to exist	0.626		0.313
Nature is strong enough to cope with the impact of modern industrial nations	0.563	-0.382	0.158
Humans were meant to rule over the rest of nature	0.441		0.443
The balance of nature is very delicate and easily upset	0.734	-0.140	

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.
a Rotation converged in 5 iterations.



Total Variance Explained

Component	Initial Eigenvalues Total	% of Variance	Cumulative %	Extraction Sums of Squared Loadings Total	% of Variance	Cumulative %
1	2.968513	29.68513	29.68513	2.968513	29.68513	29.68513
2	1.207123	12.07123	41.75636	1.207123	12.07123	41.75636
3	1.133326	11.33326	53.08962	1.133326	11.33326	53.08962
4	0.903882	9.038818	62.12844			
5	0.789585	7.895849	70.02429			
6	0.703269	7.032695	77.05698			
7	0.633987	6.339866	83.39685			
8	0.607645	6.076449	89.4733			
9	0.558712	5.587119	95.06042			
10	0.493958	4.939582	100			

Extraction Method: Principal Component Analysis.

APPENDIX 5.1 CHI-SQUARE RESULTS FOR QUESTION 11 - SOURCES OF CLIMATE CHANGE INFORMATION

		Total	Questionnaire Version		Cramer's V	Sig.
			Climate change	Global warming		
Heard about it from television	Count	**539**	239	300	**0.177**	**0**
	% within category	**91.50%**	86.30%	96.20%	**589**	
Heard about it from radio	Count	**387**	171	216	**0.079**	**0.056**
	% within category	**65.70%**	61.70%	69.20%	**589**	
Heard about it from newspaper	Count	**501**	217	284	**0.178**	**0**
	% within category	**85.10%**	78.30%	91.00%	**589**	
Heard about it from internet	Count	**78**	34	44	**0.027**	**0.514**
	% within category	**13.20%**	12.30%	14.10%	**589**	
Heard about it from journals	Count	**110**	55	55	**0.029**	**0.489**
	% within category	**18.70%**	19.90%	17.60%	**589**	
Heard about it from environmental groups	Count	**202**	78	124	**0.122**	**0.003**
	% within category	**34.30%**	28.20%	39.70%	**589**	
Heard about it from school/ university	Count	**123**	45	78	**0.107**	**0.009**
	% within category	**20.90%**	16.20%	25.00%	**589**	
Heard about it from government	Count	**132**	60	72	**0.017**	**0.681**
	% within category	**22.40%**	21.70%	23.10%	**589**	
Heard about it from public libraries	Count	**42**	17	25	**0.036**	**0.377**
	% within category	**7.10%**	6.10%	8.00%	**589**	
Heard about it from friends/ family	Count	**214**	88	126	**0.089**	**0.03**
	% within category	**36.30%**	31.80%	40.40%	**589**	
Heard about it from local council	Count	**72**	32	40	**0.019**	**0.639**
	% within category	**12.20%**	11.60%	12.80%	**589**	
Heard about it from energy suppliers	Count	**121**	52	69	**0.041**	**0.316**
	% within category	**20.50%**	18.80%	22.10%	**589**	

APPENDIX 5.2 CHI-SQUARE RESULTS FOR QUESTION 25 - ENVIRONMENTAL VALUE AND WORLDVIEW SCORES

			Total	NEP score quartiles 1	2	3	4	Cramer's V	Sig.
PEV score quartiles	1	Count	**84**	58	73	54	47		
		% within column	**14.30%**	56.30%	39.50%	39.10%	28.80%	**0.376**	**0**
	2	Count	**128**	20	65	31	29	**0.217**	**0**
		% within column	**21.70%**	19.40%	35.10%	22.50%	17.80%	**589**	
	3	Count	**145**	19	34	41	34		
		% within column	**24.60%**	18.40%	18.40%	29.70%	20.90%		
	4	Count	**232**	6	13	12	53		
		% within column	**39.40%**	5.80%	7.00%	8.70%	32.50%		
Total		Count	**589**	103	185	138	163		
		% within column	**100.00%**	100.00%	100.00%	100.00%	100.00%		

				PEV score quartiles 1	2	3	4	Cramer's V	Sig.
NEP score quartiles	1	Count	**103**	58	20	19	6		
		% within column	**17.50%**	25.00%	13.80%	14.80%	7.10%	**0.376**	**0**
	2	Count	**185**	73	65	34	13	**0.217**	**0**
		% within column	**31.40%**	31.50%	44.80%	26.60%	15.50%	**589**	
	3	Count	**138**	54	31	41	12		
		% within column	**23.40%**	23.30%	21.40%	32.00%	14.30%		
	4	Count	**163**	47	29	34	53		
		% within column	**27.70%**	20.30%	20.00%	26.60%	63.10%		
Total		Count	**589**	232	145	128	84		
		% within column	**100.00%**	100.00%	100.00%	100.00%	100.00%		

				NEP score quartiles 1	2	3	4	Cramer's V	Sig.
"Having a car is part of having a good lifestyle"	**Disagree strongly**	Count	**20**	2	4	3	11		
		% within column	**3.60%**	2.10%	2.50%	2.20%	6.80%	**0.201**	**0.034**
	Disagree	Count	**109**	13	32	23	41	**0.116**	**0.034**
		% within column	**19.70%**	13.80%	19.60%	16.90%	25.50%	**554**	
	Neither agree nor disagree	Count	**122**	17	38	37	30		
		% within column	**22.00%**	18.10%	23.30%	27.20%	18.60%		
	Agree	Count	**271**	52	80	69	70		
		% within column	**48.90%**	55.30%	49.10%	50.70%	43.50%		
	Agree strongly	Count	**32**	10	9	4	9		
		% within column	**5.80%**	10.60%	5.50%	2.90%	5.60%		
Total		Count	**554**	94	163	136	161		
		% within column	**100.00%**	100.00%	100.00%	100.00%	100.00%		

				PEV score quartiles					
				1	2	3	4	Cramer's V	Sig.
"Having a car is part of having a good lifestyle"	Disagree strongly	Count	**20**	5	2	4	9		
		% within column	**3.60%**	2.20%	1.60%	3.20%	11.40%	**0.232**	**0.003**
	Disagree	Count	**109**	39	22	26	22	**0.134**	**0.003**
		% within column	**19.70%**	17.30%	17.50%	21.00%	27.80%	**554**	
	Neither agree nor disagree	Count	**122**	48	32	28	14		
		% within column	**22.00%**	21.30%	25.40%	22.60%	17.70%		
	Agree	Count	**271**	119	67	58	27		
		% within column	**48.90%**	52.90%	53.20%	46.80%	34.20%		
	Agree strongly	Count	**32**	14	3	8	7		
		% within column	**5.80%**	6.20%	2.40%	6.50%	8.90%		
Total		Count	**554**	225	126	124	79		
		% within column	**100.00%**	100.00%	100.00%	100.00%	100.00%		

APPENDIX 5.3 CHI-SQUARE RESULTS FOR QUESTION 16 - UNDERSTANDING ABOUT THE IMPACTS OF CLIMATE CHANGE

			Total	Experience of flood damage			
				No	Yes		
(1 6 15) /Impacts/general impacts/flooding	No	Count	**462**	346	116	**Cramer's V**	**Sig.**
		% within column	**78.40%**	78.60%	77.90%	**0.008**	**0.841**
	Yes	Count	**127**	94	33	**0.008**	**0.841**
		% within column	**21.60%**	21.40%	22.10%	**589**	
Total		Count	**589**	440	149		
		% within column	**100.00%**	100.00%	100.00%		

			Total	Experience of flood damage			
				No	Yes		
(1 6 5) /Impacts/general impacts/sea level rise, loss of land	No	Count	**464**	346	118	**Cramer's V**	**Sig.**
		% within column	**78.80%**	78.60%	79.20%	**-0.006**	**0.885**
	Yes	Count	**125**	94	31	**0.006**	**0.885**
		% within column	**21.20%**	21.40%	20.80%	**589**	
Total		Count	**589**	440	149		
		% within column	**100.00%**	100.00%	100.00%		

			Total	Ward (numeric)					
				1	2	3	4	5	6
(1 6 5) /Impacts/general impacts/sea level rise, loss of land	No	Count	**464**	45	89	103	48	104	61
		% within column	**78.80%**	71.40%	77.40%	88.00%	80.00%	77.00%	73.50%
	Yes	Count	**125**	18	26	14	12	31	22
		% within column	**21.20%**	28.60%	22.60%	12.00%	20.00%	23.00%	26.50%
Total		Count	**589**	63	115	117	60	135	83
		% within column	**100.00%**	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

Cramer's V	Sig.
0.13	0.083
0.13	0.083
573	

			Total	Ward					
				A	B	N	I	F1	F2
(1 6 15) /Impacts/general impacts/flooding	No	Count	**462**	45	94	98	47	104	61
		% within column	**78.40%**	71.40%	81.70%	83.80%	78.30%	77.00%	73.50%
	Yes	Count	**127**	18	21	19	13	31	22
		% within column	**21.60%**	28.60%	18.30%	16.20%	21.70%	23.00%	26.50%
Total		Count	**589**	63	115	117	60	135	83
		% within column	**100.00%**	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

Cramer's V	Sig.
0.101	0.319
0.101	0.319
573	

APPENDIX 5.4 CHI-SQUARE RESULTS FOR QUESTION 24 - ATTITUDES TO CLIMATE CHANGE

Please note that the chi-square results for question 24 extended over 176 pages, because it comprises an output matrix of 37 attitude statements by 19 demographic/ value variables. It is therefore appended as an Excel file entitled Appendix 5.4 on CD-ROM.

APPENDIX 5.5 CHI-SQUARE RESULTS FOR QUESTION 26 - MOTIVATIONS FOR IMPACT-ORIENTED ENVIRONMENTAL ACTIONS

Please note that the chi-square results for question 26 extended over 160 pages, because it comprises an output matrix of 56 action/ motivation variables by 19 demographic/ value variables. It is therefore appended as an Excel file entitled Appendix 5.5 on CD-ROM.

APPENDIX 7 BINARY LOGISTIC REGRESSION ANALYSIS RESULTS

Codes for regression output

action	Ever taken/ regularly take action out of concern for global warming/ climate change
action1	Walk/cycle to work - Regular action
action11	Take part in a campaign about an environmental issue - Regular action
action2	Use public transport - Regular action
action3	Turn off lights I'm not using - Regular action
action5	Buy energy efficient light bulbs - Regular action
action6	Buy organic food - Regular action
action8	Recycle glass - Regular action
action9	Recycle other items - Regular action
age2534	Age 25-34
age3544	Age 35-44
age4554	Age 45-54
age5564	Age 55-64
age6574	Age 65-74
age75	Age 75 or over
agenosay	Age unknown
air_awar	Awareness of other effects of air pollution
broadshe	Broadsheet reader
car_own	Own or regularly drive a car/ van
concer10	Concern - Resource Depletion
concer11	Concern - Extinction of Species
concer12	Concern - Radioactive Waste
concer13	Concern - Overpopulation
concern1	Concern - Air Pollution
concern2	Concern - Water Pollution
concern3	Concern - Flooding
concern4	Concern - Litter
concern5	Concern - Poor Waste Management
concern6	Concern - Traffic/ Congestion
concern7	Concern - GM Food
concern8	Concern - Global Warming/ Climate Change
concern9	Concern - Ozone Hole
effect_u	Global warming/ climate change affecting personally
env_orgn	Membership of environmental organisation
fac_aver	Public transport rated average
fac_exce	Public transport rated excellent
fac_good	Public transport rated good
fac_poor	Public transport rated poor
facnosay	Unknown public transport
flood_u	Experience of flood damage
gen_alev	A-Level/Higher/BTEC highest general qualification
gen_degr	Degree of equivalent highest general qualification
gen_voc	Vocational/NVQ highest general qualification
gender	Gender
gengcse	GCSE/O-Level highest general qualification
gennosay	Unknown highest general qualification
genother	Other highest general qualification
genpostg	Postgraduate qualification highest general qualification
health_f	Air pollution affected family/friends' health

health_u	Air pollution affected own health
highinc	High income
libdem	Vote liberal democrat
lowinc	Low income
medinc	Medium income
mile_2nd	2nd mileage quartile
mile_3rd	3rd mileage quartile
mile_top	Highest quartile mileage
milnosay	Unknown mileage (but drives)
nep_2nd	2nd quartile NEP score
nep_3rd	3rd quartile NEP score
nep_top	Top quartile NEP score
newspa1	Newspaper regularly read - Sun/ News of the World
newspa10	Newspaper regularly read - Mirror/ Sunday Mirror
newspa11	Newspaper regularly read - Local newspaper
newspa13	Newspaper regularly read - None
newspa2	Newspaper regularly read - Daily Mail/ Mail on Sunday
newspa3	Newspaper regularly read - Daily Telegraph/ Sunday Telegraph
newspa4	Newspaper regularly read - Times/ Sunday Times
newspa5	Newspaper regularly read - Express/ Sunday Express
newspa6	Newspaper regularly read - Guardian/ Observer
newspa7	Newspaper regularly read - Independent/ Independent on Sunday
nosay	Income not known
notvimp	Issue of GW not very important personally
novote	Would not vote
o11_1	(1 1 1) /Impacts/human impacts/health, spread of disease
o13_2	(1 3 2) /Impacts/uncertainty/personally unsure
o16_15	(1 6 15) /Impacts/general impacts/flooding
o16_27	(1 6 27) /Impacts/general impacts/catastrophe, destroy earth
o16_5	(1 6 5) /Impacts/general impacts/sea level rise, loss of land
o18	(1 8) /Impacts/long-term, future impacts
o32_1_20	(3 2 1 20) /Why important/impacts/health/health - gen
o32_14	(3 2 14) /Why important/impacts/lifestyle, life
o32_16	(3 2 16) /Why important/impacts/impacts on wildlife
o32_17	(3 2 17) /Why important/impacts/impacts on humans, their survival
o32_2	(3 2 2) /Why important/impacts/weather, temperature
o32_23	(3 2 23) /Why important/impacts/flooding
o32_33	(3 2 33) /Why important/impacts/impacted, changed environment
o32_3621	(3 2 36 21) /Why important/impacts/moral dimension, worldview/future of planet
o32_3634	(3 2 36 34) /Why important/impacts/moral dimension, worldview/catastrophe, end of world
o33_2	(3 3 2) /Why important/motivation/resp, concern for family,future gen'
o33_3	(3 3 3) /Why important/motivation/resp, concern for envt
o33_4	(3 3 4) /Why important/motivation/need & poss for action
o33_5	(3 3 5) /Why important/motivation/human-caused
o41	(4 1) /Causes/uncertainty - all other
o43	(4 3) /Causes/natural - all other
o43_1	(4 3 1) /Causes/natural/earth's cycles, changes, weather pat
o46_10_1	(4 6 10 1) /Causes/human activities, man, us/greenhouse gases/CO2, carbon emissions
o46_10_2	(4 6 10 2) /Causes/human activities, man, us/greenhouse gases/emissions, fumes, waste gases ~gen~
o46_10_3	(4 6 10 3) /Causes/human activities, man, us/greenhouse gases/pollution ~gen~
o46_10_9	(4 6 10 9) /Causes/human activities, man, us/greenhouse gases/greenhouse gases undefined
o46_13_2	(4 6 13 2) /Causes/human activities, man, us/type of activity, object/destruction of rainforest, trees
o46_1310	(4 6 13 10) /Causes/human activities, man, us/type of activity, object/fossil fuels consumption, burning

o46_1312	(4 6 13 12) /Causes/human activities, man, us/type of activity, object/cars, traffic, exhaust fumes, poll'n
o46_3	(4 6 3) /Causes/human activities, man, us/moral dimension, worldview - all other
o46_3_18	(4 6 3 18) /Causes/human activities, man, us/moral dimension, worldview/mis,overuse of earth's resources, en
o46_5_1	(4 6 5 1) /Causes/human activities, man, us/other environmental issues/CFCs, aerosols
o46_5_2	(4 6 5 2) /Causes/human activities, man, us/other environmental issues/chemicals
o46_5_7	(4 6 5 7) /Causes/human activities, man, us/other environmental issues/ozone layer depletion
o81_12	(8 1 12) /Other effects of air pollution/human-specific impacts/damages buildings
o81_8	(8 1 8) /Other effects of air pollution/human-specific impacts/human health
o91	(9 1) /What known about global warming/causes - all other
o91_12	(9 1 12) /What known about global warming/causes/human caused
o91_19	(9 1 19) /What known about global warming/causes/deforestation
o91_21	(9 1 21) /What known about global warming/causes/cars, vehicle emissions
o92	(9 2) /What known about global warming/impacts - all other
o92_1	(9 2 1) /What known about global warming/impacts/weather, seasons change
o92_10	(9 2 10) /What known about global warming/impacts/rising sea levels, land loss
o92_13	(9 2 13) /What known about global warming/impacts/personal observations
o92_18	(9 2 18) /What known about global warming/impacts/melting iceburgs, glaciers
o92_26	(9 2 26) /What known about global warming/impacts/impact on climate
o92_33	(9 2 33) /What known about global warming/impacts/global impacts
o92_35	(9 2 35) /What known about global warming/impacts/flooding
o92_4	(9 2 4) /What known about global warming/impacts/temperature increase
o92_42	(9 2 42) /What known about global warming/impacts/increased rainfall
o92_43	(9 2 43) /What known about global warming/impacts/drought, less rainfall
o92_6	(9 2 6) /What known about global warming/impacts/summers hotter, winters wetter
o93_3	(9 3 3) /What known about global warming/source of information/media
o94	(9 4) /What known about global warming/uncertainty, level of knowledge - all other
o94_10	(9 4 10) /What known about global warming/uncertainty, level of knowledge/contradictory views, debate
o94_11	(9 4 11) /What known about global warming/uncertainty, level of knowledge/cc is different to gw
o94_2	(9 4 2) /What known about global warming/uncertainty, level of knowledge/unsure, self-doubt
o94_6	(9 4 6) /What known about global warming/uncertainty, level of knowledge/doubt about reality, causes
o94_7	(9 4 7) /What known about global warming/uncertainty, level of knowledge/don't know much, anything
o95	(9 5) /What known about global warming/process - all other
o95_1	(9 5 1) /What known about global warming/process/trapping of heat, gases- blanket
o95_11	(9 5 11) /What known about global warming/process/greenhouse effect
o95_12	(9 5 12) /What known about global warming/process/global warming
o95_4	(9 5 4) /What known about global warming/process/sun,uv penetrating, reduced protect'
o95_6	(9 5 6) /What known about global warming/process/ozone depletion, hole
quiteimp	Issue of GW quite important personally
resp_bus	Business and industry main responsibility for tackling
resp_env	Environmental organisations main responsibility for tackling
resp_ind	Individuals main responsibility for tackling
resp_loc	Local government main responsibility for tackling
resp_nat	National government main responsibility for tackling
resp_oth	'Other' (inc. multiple) responsibility for tackling
respnsay	Unknown responsibility for tackling
sci_alev	A-Level/Higher/BTEC highest science qualification
sci_degr	Degree or equivalent highest science qualification
sci_voca	Vocational/NVQ highest science qualification
scigcse	GCSE/O-Level highest science qualification
scinosay	Unknown highest science qualification
sciother	Other highest science qualification

scipostg	Postgraduate qualification highest science qualification
source1	Heard about it from television
source10	Heard about it from friends/ family
source11	Heard about it from local council
source12	Heard about it from energy suppliers
source2	Heard about it from radio
source3	Heard about it from newspaper
source4	Heard about it from internet
source5	Heard about it from journals
source6	Heard about it from environmental groups
source7	Heard about it from school/ university
source8	Heard about it from government
source9	Heard about it from public libraries
tabloid	Tabloid reader
tackle	Can anything be done to tackle global warming/ climate change
tory	Vote conservative
trus_top	top quartile trust score
trust_2	2nd quartile trust score
trust_3	3rd quartile trust score
unc_2nd	2nd quartile uncertainty score (without missing data)
unc_3rd	3rd quartile uncertainty score (without missing data)
unc_top	Top quartile uncertainty score (without missing data)
valu_2nd	2nd quartile environmental value
valu_3rd	3rd quartile environmental value
valu_top	Top quartile environmental value
VALUE4_1	Having a car is part of having a good lifestyle
version	Questionnaire Version
veryimp	Issue of GW very important personally
vhighinc	Very high income
voteuns	Unsure/floating voter
votnosay	Vote unknown
votother	Vote other
ward_b	Ward B
ward_f	Area F
ward_h	Area H
ward_i	Ward I
ward_n	Ward N
wardnsay	Ward unknown
weatherc	Feel pattern of weather changing
x22	(2 2) /How personally affected/adversely - alll other
x22_1	(2 2 1) /How personally affected/adversely/health
x22_11	(2 2 11) /How personally affected/adversely/lifestyle changes
x22_13	(2 2 13) /How personally affected/adversely/personal finances
x22_14	(2 2 14) /How personally affected/adversely/climate changes
x22_16	(2 2 16) /How personally affected/adversely/flooding
x22_5	(2 2 5) /How personally affected/adversely/sea level rise
x23_1	(2 3 1) /How personally affected/uncertainty/self-doubt, unsure
x24	(2 4) /How personally affected/personal, direct impact -hi-risk
x51	(5 1) /How tackle/responsibility for action - all other
x51_2_1	(5 1 2 1) /How tackle/responsibility for action/developed countries/USA
x51_5	(5 1 5) /How tackle/responsibility for action/international (general)
x51_6	(5 1 6) /How tackle/responsibility for action/industry
x51_7	(5 1 7) /How tackle/responsibility for action/individuals, public
x51_8	(5 1 8) /How tackle/responsibility for action/government
x53	(5 3) /How tackle/actions - all other
x53_12	(5 3 12) /How tackle/actions/reduce pollution, emissions

x53_15	(5 3 15) /How tackle/actions/reduce fossil fuels
x53_16	(5 3 16) /How tackle/actions/reduce deforestation, plant trees
x53_17	(5 3 17) /How tackle/actions/reduce carbon, g-gas emissions
x53_18	(5 3 18) /How tackle/actions/reduce car use
x53_20	(5 3 20) /How tackle/actions/recycle, improve waste mgt
x53_36	(5 3 36) /How tackle/actions/energy efficiency, conservation
x53_38	(5 3 38) /How tackle/actions/education, information, awareness
x53_44	(5 3 44) /How tackle/actions/change atts, behaviour, lifestyle
x53_4535	(5 3 45 35) /How tackle/actions/other environmental issues/fix ozone hole, reduce CFCs
x53_7	(5 3 7) /How tackle/actions/renewable, clean energy, fuels
x55	(5 5) /How tackle/uncertainty - total
x61_1	(6 1 1) /What actions/limited efficacy, ability/caveat: try, when possible
x62	(6 2) /What actions/energy related actions - all other
x62_1	(6 2 1) /What actions/energy related actions/walking
x62_18	(6 2 18) /What actions/energy related actions/conserve energy
x62_27	(6 2 27) /What actions/energy related actions/avoid driving car
x63	(6 3) /What actions/other environmental actions - all other
x63_8	(6 3 8) /What actions/other environmental actions/recycling
x64	(6 4) /What actions/indirect action ~pol, fin~
x71	(7 1) /Why weather changed/uncertainty - all other
x71_5	(7 1 5) /Why weather changed/uncertainty/doubt, uncertain views
x73_2_13	(7 3 2 13) /Why weather changed/cause of change/anthropogenic/human-caused, impact
x73_2_17	(7 3 2 17) /Why weather changed/cause of change/anthropogenic/global warming
x73_2_7	(7 3 2 7) /Why weather changed/cause of change/anthropogenic/pollution
x73_3_4	(7 3 3 4) /Why weather changed/cause of change/natural/natural weather variations
x81	(8 1) /Other effects of air pollution/human-specific impacts - all other
x81_15	(8 1 15) /Other effects of air pollution/human-specific impacts/affects food, crops
x82	(8 2) /Other effects of air pollution/other impacts - all other
x82_14	(8 2 14) /Other effects of air pollution/other impacts/depletion of the ozone layer
x82_20	(8 2 20) /Other effects of air pollution/other impacts/affects wildlife, animals
x82_22	(8 2 22) /Other effects of air pollution/other impacts/affects plants - general
x82_26	(8 2 26) /Other effects of air pollution/other impacts/acid rain, polluted rain
x82_3_1	(8 2 3 1) /Other effects of air pollution/other impacts/global warming
x82_3_2	(8 2 3 2) /Other effects of air pollution/other impacts/climate change
x91_10	(9 1 10) /What known about global warming/causes/pollutant type - all other
x91_10_3	(9 1 10 3) /What known about global warming/causes/pollutant type/greenhouse gases
x91_10_7	(9 1 10 7) /What known about global warming/causes/pollutant type/CO2
x91_11	(9 1 11) /What known about global warming/causes/natural causes - all other
x91_11_1	(9 1 11 1) /What known about global warming/causes/natural causes/natural variation in climate
x91_8	(9 1 8) /What known about global warming/causes/pollution

APPENDIX 7.1 BINARY LOGISTIC REGRESSION ANALYSIS RESULTS FOR PREDICTING KNOWLEDGE THAT CO2/CARBON EMISSIONS CAUSE CLIMATE CHANGE

Understanding - CO2/carbon emissions cause climate change (variable codes listed above)	**B**	**S.E.**	**Wald**	**df**	**Sig.**	**Exp(B)**
AGE2534	-7.71	5.00	2.38	1	0.12	0.00
AGE3544	-6.24	4.33	2.08	1	0.15	0.00
AGE4554	-6.41	4.51	2.02	1	0.15	0.00
AGE5564	-8.45	4.60	3.37	1	0.07	0.00
AGE6574	-8.73	5.54	2.48	1	0.12	0.00
AGE75	-10.51	6.37	2.72	1	0.10	0.00
AGENOSAY	1.35	5.17	0.07	1	0.79	3.85
ENV_ORGN	-5.24	3.61	2.11	1	0.15	0.01
FLOOD_U	0.30	1.73	0.03	1	0.86	1.34
GEN_ALEV	-8.59	72.16	0.01	1	0.91	0.00
GEN_DEGR	-0.54	2.59	0.04	1	0.83	0.58
GEN_VOC	-17.94	90.68	0.04	1	0.84	0.00
GENDER	-1.19	1.74	0.46	1	0.50	0.31
GENGCSE	9.25	5.63	2.70	1	0.10	10401.71
GENNOSAY	-20.81	217.14	0.01	1	0.92	0.00
GENOTHER	19.85	11.13	3.18	1	0.07	418076327.61
GENPOSTG	3.46	3.17	1.19	1	0.28	31.69
HEALTH_F	-4.22	2.73	2.38	1	0.12	0.01
HEALTH_U	-0.62	2.10	0.09	1	0.77	0.54
NEWSPA6	15.20	9.04	2.83	1	0.09	4012125.07
O16_15	5.26	3.03	3.02	1	0.08	191.98
O16_5	3.41	2.85	1.44	1	0.23	30.27
O18	15.89	9.06	3.08	1	0.08	7980345.74
O43_1	-13.46	6.47	4.32	1	0.04	0.00
O46_1310	-12.52	7.43	2.84	1	0.09	0.00
O46_5_1	-3.19	2.94	1.18	1	0.28	0.04
O95_1	-7.34	4.35	2.85	1	0.09	0.00
TACKLE	8.55	4.92	3.01	1	0.08	5146.54
TRUS_TOP	10.27	6.01	2.92	1	0.09	28712.63
TRUST_2	2.51	3.65	0.47	1	0.49	12.25
TRUST_3	9.08	5.69	2.54	1	0.11	8789.39
UNC_2ND	-4.42	2.88	2.36	1	0.12	0.01
UNC_3RD	3.86	3.69	1.09	1	0.30	47.44
UNC_TOP	1.53	2.86	0.29	1	0.59	4.64
VALU_2ND	-3.99	2.67	2.23	1	0.14	0.02
VALU_3RD	-10.10	5.79	3.04	1	0.08	0.00
VALU_TOP	-12.79	6.65	3.70	1	0.05	0.00
WEATHERC	2.45	2.98	0.68	1	0.41	11.65
X51_7	11.53	6.50	3.15	1	0.08	102090.38
X53_12	-17.00	15.07	1.27	1	0.26	0.00
X53_15	12.54	6.65	3.55	1	0.06	279418.06
X53_17	18.25	9.10	4.02	1	0.04	84234557.54
X53_18	-2.24	3.19	0.49	1	0.48	0.11
X82_3_1	-10.37	9.77	1.13	1	0.29	0.00
X82_3_2	3.39	3.58	0.90	1	0.34	29.68
X91_10_7	18.51	8.68	4.54	1	0.03	109067699.78
X91_11	11.53	7.52	2.35	1	0.13	101882.13
X91_11_1	0.36	2.71	0.02	1	0.89	1.44
Constant	-25.78	16.24	2.52	1	0.11	0.00

Understanding - Don't know much/anything	B	S.E.	Wald	df	Sig.	Exp(B)
MILE_TOP	-0.01	0.82	0.00	1	0.99	0.99
MILNOSAY	0.71	0.96	0.55	1	0.46	2.03
NEP_2ND	0.28	0.69	0.17	1	0.68	1.33
NEP_3RD	0.84	0.75	1.27	1	0.26	2.32
NEP_TOP	-0.56	0.90	0.39	1	0.53	0.57
NEWSPA1	-1.01	0.73	1.90	1	0.17	0.36
NEWSPA10	0.44	0.94	0.23	1	0.63	1.56
NEWSPA11	0.60	0.47	1.59	1	0.21	1.82
NEWSPA13	0.65	0.77	0.71	1	0.40	1.92
NEWSPA2	1.43	0.54	6.98	1	0.01	4.16
NEWSPA3	-0.15	0.61	0.06	1	0.81	0.86
NEWSPA4	-0.10	0.67	0.02	1	0.89	0.91
NEWSPA6	-0.20	1.22	0.03	1	0.87	0.82
NEWSPA7	0.89	1.09	0.66	1	0.42	2.43
NOSAY	-0.67	0.74	0.84	1	0.36	0.51
NOVOTE	-0.53	1.01	0.28	1	0.60	0.59
O16_15	1.11	0.61	3.25	1	0.07	3.02
O16_5	-1.71	0.70	5.92	1	0.01	0.18
O46_10_1	-2.29	1.92	1.41	1	0.23	0.10
O46_10_3	2.53	0.66	14.67	1	0.00	12.51
O81_8	1.55	1.43	1.16	1	0.28	4.69
RESP_BUS	2.96	1.16	6.52	1	0.01	19.21
RESP_ENV	-1.37	1.15	1.42	1	0.23	0.25
RESP_IND	1.15	1.26	0.82	1	0.36	3.14
RESP_LOC	0.79	2.09	0.14	1	0.70	2.21
RESP_NAT	1.14	0.77	2.19	1	0.14	3.13
RESP_OTH	-1.47	0.95	2.40	1	0.12	0.23
RESPNSAY	-0.25	0.65	0.14	1	0.71	0.78
SCI_ALEV	1.19	1.01	1.40	1	0.24	3.30
SCI_DEGR	0.59	1.13	0.28	1	0.60	1.81
SCI_VOCA	0.48	1.55	0.10	1	0.76	1.62
SCIGCSE	0.12	0.74	0.03	1	0.87	1.13
SCINOSAY	-0.54	1.02	0.28	1	0.60	0.58
SCIOTHER	4.99	1.70	8.60	1	0.00	147.30
SCIPOSTG	-1.79	1.57	1.30	1	0.25	0.17
SOURCE1	2.49	1.29	3.69	1	0.05	12.01
SOURCE10	0.76	0.53	2.02	1	0.16	2.13
SOURCE11	-1.39	1.07	1.70	1	0.19	0.25
SOURCE12	0.79	0.67	1.39	1	0.24	2.20
SOURCE2	1.07	0.52	4.21	1	0.04	2.93
SOURCE3	-1.37	0.77	3.14	1	0.08	0.25
SOURCE4	-2.80	1.19	5.55	1	0.02	0.06
SOURCE5	0.89	0.79	1.27	1	0.26	2.44
SOURCE6	-0.58	0.66	0.76	1	0.38	0.56
SOURCE7	-2.90	0.89	10.60	1	0.00	0.06
SOURCE8	-0.04	0.58	0.01	1	0.94	0.96
SOURCE9	-1.47	1.27	1.34	1	0.25	0.23
TACKLE	-1.57	0.61	6.61	1	0.01	0.21
TORY	0.38	0.91	0.17	1	0.68	1.47
TRUS_TOP	-2.30	0.81	8.06	1	0.00	0.10
TRUST_2	-1.63	0.71	5.26	1	0.02	0.20
TRUST_3	0.19	0.74	0.07	1	0.80	1.21
UNC_2ND	-2.74	0.87	10.05	1	0.00	0.06
UNC_3RD	-0.38	0.78	0.24	1	0.62	0.68
UNC_TOP	-2.36	0.98	5.86	1	0.02	0.09
VALU_2ND	-0.49	0.57	0.74	1	0.39	0.62

Understanding - Don't know much/anything	B	S.E.	Wald	df	Sig.	Exp(B)
VALU_3RD	0.94	0.61	2.42	1	0.12	2.57
VALU_TOP	-1.65	0.93	3.16	1	0.08	0.19
VHIGHINC	-1.88	1.22	2.38	1	0.12	0.15
VOTEUNS	0.71	1.26	0.32	1	0.57	2.04
VOTNOSAY	-0.22	0.99	0.05	1	0.82	0.80
WARD_B	0.07	0.91	0.01	1	0.94	1.07
WARD_F	-0.82	0.93	0.78	1	0.38	0.44
WARD_H	-0.20	0.99	0.04	1	0.84	0.82
WARD_I	-1.29	1.17	1.22	1	0.27	0.27
WARD_N	-2.00	0.99	4.08	1	0.04	0.14
WARDNSAY	2.84	1.25	5.15	1	0.02	17.20
WEATHERC	0.09	0.61	0.02	1	0.88	1.10
X51_2_1	2.00	1.41	2.02	1	0.16	7.39
X53_16	3.85	1.09	12.49	1	0.00	46.79
X53_18	-2.75	1.64	2.83	1	0.09	0.06
X53_7	-2.14	1.33	2.59	1	0.11	0.12
X71	3.08	1.20	6.56	1	0.01	21.66
X71_5	1.02	0.66	2.40	1	0.12	2.77
Constant	-4.70	3.49	1.82	1	0.18	0.01

APPENDIX 7.3 BINARY LOGISTIC REGRESSION ANALYSIS RESULTS FOR PREDICTING PERCEIVED THREAT FROM CLIMATE CHANGE

Understanding - Believe climate change does/will affect one (variable codes listed above)	**B**	**S.E.**	**Wald**	**df**	**Sig.**	**Exp(B)**
ACTION	-0.51	0.63	0.65	1	0.42	0.60
ACTION1	1.26	0.69	3.30	1	0.07	3.52
ACTION11	1.04	0.87	1.45	1	0.23	2.83
ACTION2	-0.16	0.66	0.06	1	0.81	0.85
ACTION3	-2.11	1.41	2.24	1	0.13	0.12
ACTION5	0.89	0.62	2.04	1	0.15	2.42
ACTION6	-0.98	0.69	2.02	1	0.16	0.38
ACTION8	0.15	0.83	0.03	1	0.86	1.16
ACTION9	1.08	1.15	0.88	1	0.35	2.93
AGE2534	2.56	1.68	2.34	1	0.13	12.98
AGE3544	-0.22	1.53	0.02	1	0.89	0.80
AGE4554	0.47	1.74	0.07	1	0.79	1.60
AGE5564	1.22	1.79	0.46	1	0.50	3.38
AGE6574	0.71	1.73	0.17	1	0.68	2.03
AGE75	1.16	2.17	0.28	1	0.59	3.18
AGENOSAY	0.53	3.14	0.03	1	0.87	1.70
AIR_AWAR	1.11	0.61	3.27	1	0.07	3.03
CAR_OWN	-0.08	0.99	0.01	1	0.94	0.92
CONCER10	-0.97	0.93	1.08	1	0.30	0.38
CONCER11	0.90	0.91	0.98	1	0.32	2.46
CONCER12	-1.73	1.02	2.88	1	0.09	0.18
CONCER13	0.02	0.84	0.00	1	0.98	1.02
CONCERN1	-1.56	0.84	3.40	1	0.07	0.21
CONCERN2	-0.18	0.77	0.05	1	0.82	0.84
CONCERN3	-0.51	0.92	0.30	1	0.58	0.60
CONCERN4	-0.48	0.88	0.30	1	0.58	0.62
CONCERN5	-1.97	0.93	4.46	1	0.03	0.14
CONCERN6	-1.14	0.78	2.12	1	0.15	0.32
CONCERN7	1.36	0.99	1.90	1	0.17	3.90
CONCERN8	-1.14	0.88	1.68	1	0.19	0.32
CONCERN9	-2.69	1.16	5.41	1	0.02	0.07
ENV_ORGN	2.36	0.96	6.05	1	0.01	10.59
FAC_AVER	-0.70	0.98	0.50	1	0.48	0.50
FAC_EXCE	-2.47	3.52	0.49	1	0.48	0.08
FAC_GOOD	-2.97	1.20	6.15	1	0.01	0.05
FAC_POOR	-2.00	0.99	4.05	1	0.04	0.14
FACNOSAY	-0.78	1.09	0.52	1	0.47	0.46
FLOOD_U	2.14	0.86	6.22	1	0.01	8.51
GEN_ALEV	2.23	1.18	3.56	1	0.06	9.32
GEN_DEGR	4.87	1.44	11.52	1	0.00	130.61
GEN_VOC	2.75	1.42	3.75	1	0.05	15.69
GENDER	-0.88	0.69	1.64	1	0.20	0.41
GENGCSE	1.94	1.22	2.53	1	0.11	6.92
GENNOSAY	-3.46	2.01	2.96	1	0.09	0.03
GENOTHER	-0.77	1.42	0.29	1	0.59	0.46
GENPOSTG	2.77	1.56	3.15	1	0.08	15.94
HEALTH_F	0.42	0.67	0.39	1	0.53	1.52

Understanding - Believe climate change does/will affect one	B	S.E.	Wald	df	Sig.	Exp(B)
HEALTH_U	4.05	1.12	13.18	1	0.00	57.57
HIGHINC	2.98	1.20	6.19	1	0.01	19.63
LIBDEM	-3.26	1.13	8.32	1	0.00	0.04
LOWINC	0.16	0.92	0.03	1	0.86	1.18
MEDINC	1.58	1.07	2.16	1	0.14	4.85
MILE_2ND	1.87	0.96	3.78	1	0.05	6.46
MILE_3RD	0.99	1.04	0.91	1	0.34	2.68
MILE_TOP	1.63	1.02	2.56	1	0.11	5.11
MILNOSAY	2.32	1.33	3.07	1	0.08	10.20
NEP_2ND	0.93	0.85	1.21	1	0.27	2.54
NEP_3RD	-0.62	0.93	0.45	1	0.50	0.54
NEP_TOP	0.87	0.96	0.82	1	0.37	2.38
NEWSPA1	1.43	1.00	2.05	1	0.15	4.19
NEWSPA10	-1.27	1.29	0.97	1	0.32	0.28
NEWSPA11	-0.76	0.56	1.86	1	0.17	0.47
NEWSPA13	0.76	0.98	0.60	1	0.44	2.14
NEWSPA2	-1.87	0.72	6.75	1	0.01	0.15
NEWSPA3	-0.82	0.73	1.26	1	0.26	0.44
NEWSPA4	0.84	0.78	1.15	1	0.28	2.31
NEWSPA5	-0.90	0.87	1.06	1	0.30	0.41
NEWSPA6	0.59	1.31	0.20	1	0.65	1.80
NEWSPA7	-4.26	1.33	10.19	1	0.00	0.01
NOSAY	2.20	0.99	4.91	1	0.03	9.05
NOTVIMP	-0.36	2.18	0.03	1	0.87	0.70
NOVOTE	-8.21	1.71	22.91	1	0.00	0.00
O11_1	0.63	0.92	0.47	1	0.49	1.87
O13_2	-2.35	2.20	1.15	1	0.28	0.09
O16_15	0.08	0.70	0.01	1	0.91	1.08
O16_27	-5.32	1.41	14.17	1	0.00	0.00
O16_5	0.68	0.70	0.94	1	0.33	1.97
O18	2.00	1.22	2.70	1	0.10	7.39
O32_1_20	-2.20	1.34	2.68	1	0.10	0.11
O32_14	2.67	1.24	4.64	1	0.03	14.44
O32_16	-2.08	1.72	1.45	1	0.23	0.13
O32_17	-1.90	2.54	0.56	1	0.46	0.15
O32_23	-0.73	1.44	0.25	1	0.61	0.48
O32_3621	-2.42	1.44	2.81	1	0.09	0.09
O32_3634	2.39	1.52	2.48	1	0.12	10.91
O33_2	-3.74	0.86	19.12	1	0.00	0.02
O33_3	4.88	1.25	15.22	1	0.00	131.42
O33_4	-3.29	1.33	6.11	1	0.01	0.04
O33_5	-1.11	2.03	0.30	1	0.58	0.33
O41	-2.10	1.28	2.69	1	0.10	0.12
O43_1	-1.40	1.20	1.36	1	0.24	0.25
O46_10_1	-0.05	1.38	0.00	1	0.97	0.95
O46_10_3	1.87	0.68	7.65	1	0.01	6.49
O46_10_9	5.27	2.48	4.53	1	0.03	194.78
O46_13_2	0.96	0.96	1.00	1	0.32	2.60
O46_1310	0.30	1.09	0.07	1	0.79	1.34
O46_1312	-0.81	0.88	0.84	1	0.36	0.45
O46_3	0.61	0.80	0.59	1	0.44	1.85
O46_3_18	-2.39	1.14	4.38	1	0.04	0.09
O46_5_1	-3.42	1.68	4.13	1	0.04	0.03
O91_12	-4.80	1.56	9.46	1	0.00	0.01
O92_13	0.66	1.40	0.22	1	0.64	1.94
O92_33	2.01	0.95	4.50	1	0.03	7.43

Understanding - Believe climate change does/will affect one	B	S.E.	Wald	df	Sig.	Exp(B)
O92_35	-2.45	1.20	4.17	1	0.04	0.09
O92_6	2.25	1.42	2.51	1	0.11	9.46
O94_10	0.54	1.23	0.19	1	0.66	1.71
O94_2	-2.11	1.34	2.49	1	0.11	0.12
O94_6	-0.40	0.86	0.22	1	0.64	0.67
O94_7	-0.05	0.72	0.00	1	0.95	0.95
O95_1	7.33	1.89	15.02	1	0.00	1521.87
QUITEIMP	2.11	2.13	0.98	1	0.32	8.22
RESP_BUS	0.15	1.12	0.02	1	0.89	1.16
RESP_ENV	-1.26	1.44	0.76	1	0.38	0.28
RESP_IND	1.09	1.13	0.92	1	0.34	2.97
RESP_LOC	-3.75	2.98	1.58	1	0.21	0.02
RESP_NAT	0.14	0.81	0.03	1	0.86	1.15
RESP_OTH	-2.34	0.97	5.86	1	0.02	0.10
RESPNSAY	-1.48	0.98	2.29	1	0.13	0.23
SCI_ALEV	-0.03	1.17	0.00	1	0.98	0.97
SCI_DEGR	-3.39	1.35	6.33	1	0.01	0.03
SCI_VOCA	0.76	1.54	0.24	1	0.62	2.14
SCIGCSE	-0.16	0.85	0.03	1	0.85	0.85
SCINOSAY	-2.91	1.30	4.98	1	0.03	0.05
SCIOTHER	-1.28	1.73	0.54	1	0.46	0.28
SCIPOSTG	-0.52	1.72	0.09	1	0.76	0.59
SOURCE1	4.82	1.54	9.74	1	0.00	123.83
SOURCE10	2.13	0.61	12.27	1	0.00	8.45
SOURCE11	-1.35	1.00	1.83	1	0.18	0.26
SOURCE12	-1.16	0.79	2.14	1	0.14	0.31
SOURCE2	1.43	0.68	4.41	1	0.04	4.16
SOURCE3	-0.79	0.88	0.81	1	0.37	0.45
SOURCE4	2.48	0.99	6.25	1	0.01	11.95
SOURCE5	0.19	0.95	0.04	1	0.84	1.21
SOURCE6	-1.08	0.66	2.66	1	0.10	0.34
SOURCE7	2.37	0.79	8.97	1	0.00	10.68
SOURCE8	0.29	0.71	0.17	1	0.68	1.34
SOURCE9	-5.39	1.39	15.14	1	0.00	0.00
TACKLE	-0.82	0.83	0.98	1	0.32	0.44
TORY	-1.82	1.09	2.81	1	0.09	0.16
TRUS_TOP	0.03	0.88	0.00	1	0.97	1.03
TRUST_2	-0.35	0.79	0.19	1	0.66	0.71
TRUST_3	0.23	0.80	0.08	1	0.78	1.26
UNC_2ND	-4.99	1.12	19.95	1	0.00	0.01
UNC_3RD	-3.11	1.04	8.98	1	0.00	0.04
UNC_TOP	-7.63	1.40	29.62	1	0.00	0.00
VALU_2ND	1.89	0.73	6.67	1	0.01	6.59
VALU_3RD	1.78	0.81	4.86	1	0.03	5.94
VALU_TOP	1.08	1.08	1.01	1	0.32	2.95
VERSION	0.57	0.59	0.95	1	0.33	1.78
VERYIMP	3.73	2.25	2.74	1	0.10	41.73
VHIGHINC	1.65	1.31	1.60	1	0.21	5.22
VOTEUNS	-1.06	1.66	0.41	1	0.52	0.35
VOTNOSAY	-2.33	1.18	3.89	1	0.05	0.10
VOTOTHER	-2.63	2.25	1.36	1	0.24	0.07
WARD_B	0.72	0.89	0.64	1	0.42	2.05
WARD_F	-0.12	1.10	0.01	1	0.91	0.88
WARD_H	-1.68	1.26	1.76	1	0.18	0.19
WARD_I	1.36	1.32	1.06	1	0.30	3.90
WARD_N	-0.32	1.12	0.08	1	0.78	0.73

Understanding - Believe climate change does/will affect one	**B**	**S.E.**	**Wald**	**df**	**Sig.**	**Exp(B)**
WARDNSAY	1.25	1.55	0.65	1	0.42	3.49
WEATHERC	4.54	1.08	17.61	1	0.00	93.85
X51_7	6.13	1.65	13.74	1	0.00	457.43
X53_15	2.24	1.11	4.09	1	0.04	9.43
X53_20	-2.64	1.30	4.15	1	0.04	0.07
X53_38	-1.32	1.43	0.85	1	0.36	0.27
X53_44	2.94	1.34	4.79	1	0.03	18.95
X53_7	-1.55	1.19	1.70	1	0.19	0.21
X71_5	-3.01	1.01	8.87	1	0.00	0.05
X73_2_17	0.38	0.65	0.34	1	0.56	1.46
X73_2_7	-0.57	0.85	0.46	1	0.50	0.56
X73_3_4	-0.82	0.88	0.88	1	0.35	0.44
X82_3_1	1.65	1.22	1.83	1	0.18	5.19
X82_3_2	-1.52	1.81	0.71	1	0.40	0.22
X91_10_3	-3.74	2.41	2.40	1	0.12	0.02
X91_10_7	-4.30	1.30	10.97	1	0.00	0.01
X91_11	-6.24	2.05	9.22	1	0.00	0.00
X91_11_1	3.08	1.47	4.40	1	0.04	21.77
Constant	-5.72	4.23	1.83	1	0.18	0.00

APPENDIX 7.4 BINARY LOGISTIC REGRESSION ANALYSIS RESULTS FOR PREDICTING TOP QUARTILE UNCERTAINTY SCORES

Understanding - Top quartile Uncertainty scores (variable codes listed above)	**B**	**S.E.**	**Wald**	**df**	**Sig.**	**Exp(B)**
ACTION	-0.53	0.83	0.41	1	0.52	0.59
AGE2534	-2.96	2.04	2.10	1	0.15	0.05
AGE3544	-0.98	1.89	0.27	1	0.60	0.38
AGE4554	-0.12	1.94	0.00	1	0.95	0.89
AGE5564	0.25	1.94	0.02	1	0.90	1.29
AGE6574	-2.00	2.13	0.88	1	0.35	0.14
AGE75	-0.64	1.96	0.11	1	0.75	0.53
AGENOSAY	-0.55	2.77	0.04	1	0.84	0.58
AIR_AWAR	-0.62	0.59	1.08	1	0.30	0.54
CAR_OWN	2.16	0.92	5.50	1	0.02	8.71
CONCER11	0.83	0.76	1.18	1	0.28	2.30
CONCER13	1.02	0.68	2.24	1	0.13	2.78
CONCERN1	-0.29	0.63	0.21	1	0.65	0.75
CONCERN2	1.60	0.66	5.95	1	0.01	4.96
CONCERN5	1.87	0.68	7.57	1	0.01	6.51
CONCERN6	-0.92	0.58	2.49	1	0.11	0.40
CONCERN8	-2.68	0.93	8.37	1	0.00	0.07
CONCERN9	-1.97	1.07	3.40	1	0.07	0.14
EFFECT_U	-4.03	0.91	19.54	1	0.00	0.02
ENV_ORGN	-0.82	0.80	1.06	1	0.30	0.44
FLOOD_U	1.29	0.69	3.46	1	0.06	3.63
GEN_ALEV	-0.27	1.10	0.06	1	0.80	0.76
GEN_DEGR	-2.72	1.29	4.41	1	0.04	0.07
GEN_VOC	2.25	1.34	2.83	1	0.09	9.49
GENDER	0.48	0.62	0.60	1	0.44	1.62
GENGCSE	-0.67	1.06	0.40	1	0.53	0.51
GENNOSAY	-0.09	2.84	0.00	1	0.98	0.92
GENOTHER	-5.07	1.81	7.88	1	0.01	0.01
GENPOSTG	1.94	1.45	1.80	1	0.18	6.96
HEALTH_F	0.07	0.74	0.01	1	0.93	1.07
HEALTH_U	-0.36	0.88	0.17	1	0.68	0.70
HIGHINC	-2.22	1.29	2.98	1	0.08	0.11
LIBDEM	-2.62	0.98	7.11	1	0.01	0.07
LOWINC	-1.18	0.89	1.75	1	0.19	0.31
MEDINC	-1.18	1.01	1.35	1	0.25	0.31
NEP_2ND	0.18	0.67	0.07	1	0.79	1.20
NEP_3RD	-1.78	0.77	5.37	1	0.02	0.17
NEP_TOP	-2.26	0.98	5.29	1	0.02	0.10
NEWSPA1	-1.33	0.81	2.70	1	0.10	0.27
NEWSPA10	0.14	1.03	0.02	1	0.89	1.15
NEWSPA2	0.91	0.64	2.04	1	0.15	2.48
NEWSPA3	-0.65	0.74	0.77	1	0.38	0.52
NEWSPA4	-1.52	0.81	3.57	1	0.06	0.22
NEWSPA6	1.28	1.22	1.10	1	0.29	3.60
NOSAY	1.12	0.89	1.57	1	0.21	3.05
NOVOTE	-4.91	1.27	15.04	1	0.00	0.01
O13_2	2.55	1.21	4.43	1	0.04	12.87
O41	0.33	0.96	0.12	1	0.73	1.40

Understanding - Top quartile Uncertainty scores	B	S.E.	Wald	df	Sig.	Exp(B)
O43_1	2.50	0.98	6.48	1	0.01	12.21
O46_10_1	-1.85	1.78	1.07	1	0.30	0.16
O46_10_2	-0.65	1.57	0.17	1	0.68	0.52
O46_10_9	1.67	1.43	1.36	1	0.24	5.30
O46_13_2	-2.45	1.39	3.10	1	0.08	0.09
O46_1310	-0.32	1.11	0.08	1	0.77	0.73
O46_5_1	1.45	1.57	0.86	1	0.35	4.28
O94_10	3.76	1.22	9.50	1	0.00	43.02
O94_2	-3.98	2.20	3.26	1	0.07	0.02
O94_6	-0.49	0.81	0.37	1	0.54	0.61
O94_7	-0.78	0.72	1.18	1	0.28	0.46
RESP_BUS	4.26	1.22	12.19	1	0.00	70.85
RESP_ENV	1.33	1.30	1.06	1	0.30	3.79
RESP_IND	2.01	1.39	2.11	1	0.15	7.48
RESP_NAT	1.04	0.91	1.31	1	0.25	2.83
RESP_OTH	0.93	0.93	1.00	1	0.32	2.52
RESPNSAY	-0.27	0.80	0.12	1	0.73	0.76
SCI_ALEV	1.36	1.14	1.41	1	0.23	3.89
SCI_DEGR	2.79	1.19	5.45	1	0.02	16.23
SCI_VOCA	2.91	1.83	2.53	1	0.11	18.30
SCIGCSE	-0.07	0.84	0.01	1	0.93	0.93
SCINOSAY	-2.09	1.21	3.00	1	0.08	0.12
SCIOTHER	1.51	2.17	0.48	1	0.49	4.51
SCIPOSTG	-1.98	1.54	1.64	1	0.20	0.14
SOURCE1	2.52	1.21	4.35	1	0.04	12.45
SOURCE10	-0.23	0.61	0.14	1	0.71	0.80
SOURCE11	1.24	1.01	1.52	1	0.22	3.46
SOURCE12	0.10	0.70	0.02	1	0.89	1.11
SOURCE2	0.42	0.60	0.48	1	0.49	1.52
SOURCE3	0.78	0.86	0.81	1	0.37	2.17
SOURCE4	1.26	0.89	2.00	1	0.16	3.53
SOURCE5	1.68	0.86	3.81	1	0.05	5.34
SOURCE6	0.45	0.67	0.44	1	0.51	1.56
SOURCE7	-0.08	0.82	0.01	1	0.92	0.92
SOURCE8	-0.39	0.73	0.28	1	0.59	0.68
SOURCE9	-1.86	1.23	2.29	1	0.13	0.15
TACKLE	-2.71	0.87	9.61	1	0.00	0.07
TORY	-1.56	0.89	3.10	1	0.08	0.21
TRUS_TOP	-2.71	0.89	9.27	1	0.00	0.07
TRUST_2	0.10	0.76	0.02	1	0.89	1.11
TRUST_3	-0.70	0.80	0.77	1	0.38	0.50
VALU_2ND	-0.98	0.64	2.38	1	0.12	0.37
VALU_3RD	1.21	0.76	2.57	1	0.11	3.36
VALU_TOP	-2.39	1.23	3.75	1	0.05	0.09
VERSION	-0.94	0.57	2.79	1	0.09	0.39
VHIGHINC	0.78	1.15	0.45	1	0.50	2.17
VOTEUNS	-7.89	2.12	13.90	1	0.00	0.00
VOTNOSAY	-3.48	1.05	10.87	1	0.00	0.03
VOTOTHER	-11.62	18.23	0.41	1	0.52	0.00
WARD_B	1.60	0.97	2.69	1	0.10	4.93
WARD_F	0.59	1.02	0.33	1	0.56	1.81
WARD_H	0.67	1.10	0.37	1	0.54	1.95
WARD_I	0.54	1.21	0.20	1	0.65	1.72
WARD_N	1.80	1.03	3.05	1	0.08	6.04
WARDNSAY	0.52	1.57	0.11	1	0.74	1.68

Understanding - Top quartile Uncertainty scores	B	S.E.	Wald	df	Sig.	Exp(B)
WEATHERC	-2.87	0.77	13.69	1	0.00	0.06
X22_5	5.94	1.76	11.38	1	0.00	379.34
X23_1	1.68	1.19	1.99	1	0.16	5.35
X24	-1.14	1.36	0.70	1	0.40	0.32
X51_7	-2.21	1.95	1.28	1	0.26	0.11
X53_12	-0.03	0.79	0.00	1	0.97	0.97
X53_15	-2.43	1.59	2.35	1	0.13	0.09
X53_17	-1.34	1.32	1.03	1	0.31	0.26
X53_18	4.83	1.45	11.16	1	0.00	125.15
X53_44	-1.64	1.26	1.71	1	0.19	0.19
X53_4535	3.11	1.45	4.62	1	0.03	22.37
X55	2.56	1.10	5.43	1	0.02	12.92
X71_5	0.25	0.71	0.13	1	0.72	1.29
X73_2_17	-0.95	0.64	2.24	1	0.13	0.39
X73_3_4	1.88	0.90	4.36	1	0.04	6.53
X82_3_1	-3.68	1.54	5.70	1	0.02	0.03
X82_3_2	-0.53	1.60	0.11	1	0.74	0.59
X91_10_7	-2.46	1.21	4.14	1	0.04	0.09
X91_11	-2.07	1.38	2.27	1	0.13	0.13
Constant	1.63	2.89	0.32	1	0.57	5.10

APPENDIX 7.5 BINARY LOGISTIC REGRESSION ANALYSIS RESULTS FOR PREDICTING TOP QUARTILE TRUST SCORES

Understanding - Top quartile Trust scores (variable codes listed above)	**B**	**S.E.**	**Wald**	**df**	**Sig.**	**Exp(B)**
ACTION	0.40	0.49	0.66	1	0.42	1.49
ACTION1	0.14	0.44	0.10	1	0.75	1.15
ACTION11	1.47	0.60	6.04	1	0.01	4.34
ACTION2	-0.35	0.54	0.42	1	0.52	0.70
ACTION3	2.13	1.04	4.21	1	0.04	8.41
ACTION5	-0.66	0.41	2.59	1	0.11	0.52
ACTION6	0.04	0.45	0.01	1	0.92	1.04
ACTION8	-1.39	0.63	4.83	1	0.03	0.25
ACTION9	0.55	0.87	0.40	1	0.53	1.73
AGE2534	2.43	1.11	4.83	1	0.03	11.36
AGE3544	1.88	1.06	3.16	1	0.08	6.57
AGE4554	2.67	1.10	5.92	1	0.01	14.40
AGE5564	2.92	1.16	6.32	1	0.01	18.61
AGE6574	2.85	1.22	5.47	1	0.02	17.34
AGE75	2.21	1.26	3.06	1	0.08	9.11
AGENOSAY	7.14	1.99	12.87	1	0.00	1266.23
AIR_AWAR	-0.24	0.48	0.24	1	0.62	0.79
BROADSHE	-0.18	0.90	0.04	1	0.84	0.83
CAR_OWN	-0.17	0.70	0.06	1	0.81	0.84
CONCER10	0.27	0.56	0.22	1	0.64	1.31
CONCER11	0.29	0.65	0.20	1	0.66	1.33
CONCER12	0.76	0.68	1.26	1	0.26	2.14
CONCER13	0.39	0.63	0.38	1	0.54	1.48
CONCERN1	1.54	0.56	7.42	1	0.01	4.66
CONCERN2	0.58	0.59	0.98	1	0.32	1.78
CONCERN3	1.79	0.71	6.46	1	0.01	6.02
CONCERN4	1.05	0.61	2.91	1	0.09	2.85
CONCERN5	2.18	0.65	11.38	1	0.00	8.83
CONCERN6	1.43	0.53	7.19	1	0.01	4.16
CONCERN7	0.75	0.73	1.06	1	0.30	2.11
CONCERN8	2.13	0.61	12.33	1	0.00	8.38
CONCERN9	1.37	0.69	3.93	1	0.05	3.95
EFFECT_U	0.28	0.48	0.33	1	0.57	1.32
ENV_ORGN	-1.47	0.66	4.99	1	0.03	0.23
FAC_AVER	1.15	0.79	2.11	1	0.15	3.15
FAC_EXCE	-0.54	1.74	0.10	1	0.76	0.58
FAC_GOOD	1.61	0.93	2.97	1	0.08	4.98
FAC_POOR	1.12	0.81	1.91	1	0.17	3.05
FACNOSAY	0.75	0.83	0.82	1	0.37	2.12
FLOOD_U	-0.42	0.50	0.69	1	0.41	0.66
GEN_ALEV	1.87	0.85	4.80	1	0.03	6.48
GEN_DEGR	0.27	0.93	0.08	1	0.77	1.31
GEN_VOC	1.87	0.91	4.16	1	0.04	6.47
GENDER	-1.08	0.45	5.65	1	0.02	0.34
GENGCSE	0.55	0.83	0.44	1	0.51	1.74
GENNOSAY	1.62	1.41	1.31	1	0.25	5.04
GENOTHER	-1.66	1.15	2.09	1	0.15	0.19
GENPOSTG	0.96	1.01	0.89	1	0.35	2.60

Understanding - Top quartile Trust scores	B	S.E.	Wald	df	Sig.	Exp(B)
HEALTH_F	1.24	0.43	8.23	1	0.00	3.45
HEALTH_U	-2.08	0.58	12.90	1	0.00	0.12
HIGHINC	-1.23	0.80	2.34	1	0.13	0.29
LIBDEM	-1.60	0.71	5.13	1	0.02	0.20
LOWINC	-0.99	0.58	2.89	1	0.09	0.37
MEDINC	-2.49	0.73	11.64	1	0.00	0.08
MILE_2ND	-0.02	0.64	0.00	1	0.98	0.98
MILE_3RD	0.63	0.67	0.89	1	0.35	1.88
MILE_TOP	-0.50	0.73	0.46	1	0.50	0.61
MILNOSAY	-0.16	0.88	0.03	1	0.85	0.85
NEP_2ND	0.24	0.66	0.14	1	0.71	1.28
NEP_3RD	1.27	0.65	3.80	1	0.05	3.55
NEP_TOP	0.28	0.68	0.17	1	0.68	1.32
NEWSPA1	0.38	0.75	0.26	1	0.61	1.46
NEWSPA10	-1.74	0.86	4.11	1	0.04	0.17
NEWSPA11	0.93	0.43	4.74	1	0.03	2.55
NEWSPA13	1.13	0.78	2.09	1	0.15	3.10
NEWSPA2	-0.92	0.76	1.45	1	0.23	0.40
NEWSPA3	1.62	0.77	4.44	1	0.04	5.06
NEWSPA4	0.86	0.69	1.56	1	0.21	2.36
NEWSPA5	-1.51	0.77	3.86	1	0.05	0.22
NEWSPA6	0.00	0.88	0.00	1	1.00	1.00
NEWSPA7	-1.34	1.15	1.36	1	0.24	0.26
NOSAY	-0.96	0.62	2.42	1	0.12	0.38
NOVOTE	-0.27	0.72	0.15	1	0.70	0.76
O11_1	-1.67	0.75	4.91	1	0.03	0.19
O13_2	-2.82	2.01	1.96	1	0.16	0.06
O16_15	0.93	0.48	3.80	1	0.05	2.53
O18	-1.16	0.94	1.53	1	0.22	0.31
O32_1_20	0.97	0.94	1.08	1	0.30	2.65
O32_16	2.65	0.83	10.33	1	0.00	14.19
O32_17	1.72	0.93	3.41	1	0.06	5.58
O32_23	2.13	1.04	4.21	1	0.04	8.41
O32_3621	0.93	0.71	1.73	1	0.19	2.53
O33_2	1.44	0.46	9.89	1	0.00	4.24
O33_3	0.55	0.74	0.55	1	0.46	1.73
O33_4	3.41	1.02	11.12	1	0.00	30.33
O33_5	1.27	1.03	1.52	1	0.22	3.54
O41	-0.22	1.09	0.04	1	0.84	0.81
O43_1	1.57	0.90	3.03	1	0.08	4.83
O46_10_1	-0.58	0.81	0.52	1	0.47	0.56
O46_10_3	-0.22	0.48	0.21	1	0.64	0.80
O46_13_2	0.06	0.63	0.01	1	0.92	1.06
O46_1310	1.23	0.67	3.38	1	0.07	3.43
O46_1312	0.53	0.59	0.81	1	0.37	1.70
O46_3	0.79	0.56	2.00	1	0.16	2.21
O46_3_18	-1.22	0.97	1.59	1	0.21	0.30
O46_5_1	0.97	0.86	1.26	1	0.26	2.63
O92_13	-0.87	0.90	0.93	1	0.33	0.42
O92_33	0.66	0.60	1.21	1	0.27	1.94
O94_10	0.10	1.16	0.01	1	0.93	1.10
O94_6	-0.56	0.65	0.74	1	0.39	0.57
O94_7	-1.00	0.57	3.12	1	0.08	0.37
RESP_BUS	1.40	0.97	2.09	1	0.15	4.04
RESP_ENV	1.85	1.03	3.23	1	0.07	6.35
RESP_IND	1.86	0.79	5.53	1	0.02	6.40
RESP_NAT	0.13	0.59	0.05	1	0.82	1.14

Understanding - Top quartile Trust scores	B	S.E.	Wald	df	Sig.	Exp(B)
RESP_OTH	0.26	0.68	0.14	1	0.70	1.29
RESPNSAY	-0.74	0.68	1.16	1	0.28	0.48
SCI_ALEV	0.09	0.81	0.01	1	0.92	1.09
SCI_DEGR	0.47	0.90	0.27	1	0.60	1.61
SCI_VOCA	1.82	1.31	1.95	1	0.16	6.20
SCIGCSE	-0.53	0.63	0.70	1	0.40	0.59
SCINOSAY	0.58	0.82	0.50	1	0.48	1.78
SCIOTHER	2.72	1.25	4.71	1	0.03	15.11
SCIPOSTG	-0.37	1.22	0.09	1	0.76	0.69
SOURCE1	2.01	1.01	3.91	1	0.05	7.43
SOURCE10	-0.73	0.41	3.10	1	0.08	0.48
SOURCE11	1.41	0.66	4.56	1	0.03	4.08
SOURCE12	-0.15	0.51	0.09	1	0.77	0.86
SOURCE2	0.75	0.47	2.53	1	0.11	2.11
SOURCE3	-0.89	0.65	1.85	1	0.17	0.41
SOURCE4	-0.23	0.68	0.11	1	0.74	0.80
SOURCE5	-0.46	0.65	0.51	1	0.48	0.63
SOURCE6	-0.39	0.49	0.63	1	0.43	0.68
SOURCE7	1.00	0.59	2.92	1	0.09	2.73
SOURCE8	-0.78	0.49	2.59	1	0.11	0.46
SOURCE9	-1.71	0.94	3.31	1	0.07	0.18
TABLOID	2.88	0.93	9.60	1	0.00	17.82
TACKLE	0.44	0.60	0.52	1	0.47	1.55
TORY	-1.19	0.66	3.25	1	0.07	0.30
UNC_2ND	-0.69	0.56	1.52	1	0.22	0.50
UNC_3RD	-0.52	0.62	0.71	1	0.40	0.59
UNC_TOP	-2.11	0.77	7.51	1	0.01	0.12
VALU_2ND	-1.67	0.54	9.67	1	0.00	0.19
VALU_3RD	-0.69	0.51	1.82	1	0.18	0.50
VALU_TOP	-2.18	0.70	9.52	1	0.00	0.11
VERSION	0.54	0.40	1.80	1	0.18	1.71
VHIGHINC	-1.46	0.89	2.71	1	0.10	0.23
VOTEUNS	-1.21	1.19	1.04	1	0.31	0.30
VOTNOSAY	-2.28	0.80	8.17	1	0.00	0.10
VOTOTHER	-4.39	1.77	6.13	1	0.01	0.01
WARD_B	-0.93	0.76	1.50	1	0.22	0.39
WARD_F	0.48	0.75	0.41	1	0.52	1.62
WARD_H	-0.57	0.86	0.43	1	0.51	0.57
WARD_I	-1.80	0.94	3.62	1	0.06	0.17
WARD_N	0.98	0.80	1.52	1	0.22	2.67
WARDNSAY	1.45	1.12	1.67	1	0.20	4.28
WEATHERC	0.35	0.63	0.31	1	0.58	1.42
X23_1	-0.73	0.74	0.98	1	0.32	0.48
X24	0.33	0.66	0.25	1	0.62	1.40
X51_7	1.28	0.85	2.27	1	0.13	3.61
X53_15	-2.34	1.03	5.15	1	0.02	0.10
X53_16	1.13	0.86	1.73	1	0.19	3.10
X53_20	-1.53	0.82	3.43	1	0.06	0.22
X53_38	-1.30	0.80	2.66	1	0.10	0.27
X53_44	-2.03	0.95	4.61	1	0.03	0.13
X53_7	0.79	0.74	1.16	1	0.28	2.21
X71_5	0.88	0.61	2.07	1	0.15	2.40
X73_2_17	-2.22	0.49	20.87	1	0.00	0.11
X73_2_7	-1.20	0.62	3.81	1	0.05	0.30
X73_3_4	-1.14	0.78	2.16	1	0.14	0.32
X82_3_1	-1.37	1.07	1.62	1	0.20	0.25
X82_3_2	1.88	0.99	3.61	1	0.06	6.52

Understanding - Top quartile Trust scores	B	S.E.	Wald	df	Sig.	Exp(B)
X91_11	1.81	1.29	1.96	1	0.16	6.10
X91_8	1.17	0.66	3.17	1	0.08	3.21
Constant	-10.62	2.83	14.09	1	0.00	0.00

APPENDIX 7.6 BINARY LOGISTIC REGRESSION ANALYSIS RESULTS FOR PREDICTING CONCERN ABOUT CLIMATE CHANGE

Concerned about climate change (variable codes listed above)	**B**	**S.E.**	**Wald**	**df**	**Sig.**	**Exp(B)**
ACTION	0.08	0.35	0.05	1	0.82	1.08
ACTION11	0.60	0.39	2.39	1	0.12	1.83
ACTION3	1.24	0.83	2.22	1	0.14	3.45
ACTION5	-0.29	0.34	0.75	1	0.39	0.75
AGE2534	-0.88	0.86	1.03	1	0.31	0.42
AGE3544	-0.60	0.82	0.54	1	0.46	0.55
AGE4554	-0.71	0.83	0.73	1	0.39	0.49
AGE5564	-0.98	0.86	1.29	1	0.26	0.38
AGE6574	-0.51	0.87	0.34	1	0.56	0.60
AGE75	-0.22	0.90	0.06	1	0.81	0.80
AGENOSAY	-0.67	1.56	0.19	1	0.67	0.51
AIR_AWAR	-0.56	0.35	2.55	1	0.11	0.57
CAR_OWN	0.35	0.51	0.46	1	0.50	1.42
CONCERN1	-1.07	0.35	9.23	1	0.00	0.34
CONCERN3	-0.15	0.51	0.08	1	0.77	0.86
CONCERN9	-0.75	0.47	2.51	1	0.11	0.47
EFFECT_U	0.42	0.37	1.29	1	0.26	1.52
FAC_AVER	1.14	0.65	3.03	1	0.08	3.12
FAC_EXCE	0.35	1.21	0.08	1	0.77	1.42
FAC_GOOD	1.29	0.70	3.45	1	0.06	3.64
FAC_POOR	1.05	0.68	2.40	1	0.12	2.85
FACNOSAY	0.63	0.75	0.71	1	0.40	1.89
FLOOD_U	-0.17	0.41	0.16	1	0.69	0.85
GEN_ALEV	-1.28	0.58	4.83	1	0.03	0.28
GEN_DEGR	-1.39	0.58	5.72	1	0.02	0.25
GEN_VOC	-2.05	0.71	8.21	1	0.00	0.13
GENDER	0.26	0.35	0.54	1	0.46	1.29
GENGCSE	-0.92	0.58	2.54	1	0.11	0.40
GENNOSAY	-0.67	1.05	0.41	1	0.52	0.51
GENOTHER	-2.00	0.77	6.82	1	0.01	0.14
GENPOSTG	-1.58	0.65	6.00	1	0.01	0.21
HEALTH_F	-0.23	0.39	0.35	1	0.56	0.80
HEALTH_U	0.24	0.45	0.29	1	0.59	1.27
HIGHINC	0.86	0.64	1.84	1	0.18	2.37
LIBDEM	-0.30	0.48	0.38	1	0.54	0.74
LOWINC	0.38	0.49	0.61	1	0.44	1.47
MEDINC	0.46	0.57	0.65	1	0.42	1.58
MILE_2ND	-0.26	0.51	0.26	1	0.61	0.77
MILE_3RD	0.39	0.48	0.65	1	0.42	1.47
MILE_TOP	-0.90	0.56	2.60	1	0.11	0.41
MILNOSAY	0.23	0.67	0.12	1	0.73	1.26
NEP_2ND	0.04	0.51	0.01	1	0.94	1.04
NEP_3RD	0.93	0.53	3.13	1	0.08	2.53
NEP_TOP	-0.22	0.52	0.18	1	0.67	0.80
NEWSPA1	-0.30	0.54	0.32	1	0.57	0.74
NEWSPA10	-1.62	0.72	5.02	1	0.03	0.20
NEWSPA3	-0.77	0.41	3.53	1	0.06	0.46
NEWSPA4	-0.55	0.42	1.76	1	0.18	0.57
NEWSPA6	1.06	0.53	4.00	1	0.05	2.90

Concerned about climate change	B	S.E.	Wald	df	Sig.	Exp(B)
NOSAY	0.35	0.52	0.47	1	0.49	1.42
NOTVIMP	-0.90	1.12	0.64	1	0.42	0.41
NOVOTE	-0.57	0.61	0.87	1	0.35	0.57
O16_5	0.72	0.36	3.99	1	0.05	2.06
O46_10_1	0.30	0.63	0.22	1	0.64	1.35
O91_12	-1.02	0.86	1.41	1	0.24	0.36
O92_13	0.62	0.60	1.07	1	0.30	1.87
O92_33	-0.14	0.51	0.08	1	0.78	0.87
QUITEIMP	0.62	1.06	0.34	1	0.56	1.85
RESP_BUS	0.32	0.68	0.21	1	0.64	1.37
RESP_ENV	-1.35	1.03	1.70	1	0.19	0.26
RESP_IND	-0.66	0.65	1.03	1	0.31	0.52
RESP_LOC	2.62	1.59	2.73	1	0.10	13.75
RESP_NAT	0.34	0.45	0.57	1	0.45	1.40
RESP_OTH	-1.03	0.52	3.91	1	0.05	0.36
RESPNSAY	0.00	0.54	0.00	1	1.00	1.00
SOURCE5	-0.42	0.42	1.00	1	0.32	0.66
TACKLE	-0.38	0.47	0.65	1	0.42	0.68
TORY	-0.54	0.49	1.18	1	0.28	0.58
TRUS_TOP	0.58	0.49	1.37	1	0.24	1.78
TRUST_2	0.05	0.49	0.01	1	0.93	1.05
TRUST_3	-0.09	0.48	0.03	1	0.85	0.91
UNC_2ND	-1.13	0.42	7.16	1	0.01	0.32
UNC_3RD	-1.09	0.47	5.45	1	0.02	0.34
UNC_TOP	-2.17	0.61	12.58	1	0.00	0.11
VALU_2ND	-0.43	0.40	1.15	1	0.28	0.65
VALU_3RD	-0.17	0.41	0.18	1	0.67	0.84
VALU_TOP	1.12	0.48	5.39	1	0.02	3.05
VERSION	0.41	0.31	1.75	1	0.19	1.51
VERYIMP	1.02	1.10	0.85	1	0.36	2.76
VHIGHINC	1.24	0.69	3.22	1	0.07	3.47
VOTEUNS	-1.38	1.03	1.80	1	0.18	0.25
VOTNOSAY	-0.91	0.56	2.59	1	0.11	0.40
VOTOTHER	-1.98	1.36	2.12	1	0.15	0.14
WARD_B	0.08	0.52	0.02	1	0.88	1.08
WARD_F	0.16	0.53	0.10	1	0.75	1.18
WARD_H	0.35	0.62	0.33	1	0.57	1.42
WARD_I	-0.02	0.68	0.00	1	0.98	0.98
WARD_N	-0.01	0.58	0.00	1	0.99	0.99
WARDNSAY	-0.20	0.73	0.08	1	0.78	0.82
WEATHERC	0.44	0.50	0.75	1	0.39	1.55
X24	-1.38	0.52	7.09	1	0.01	0.25
X73_2_17	0.04	0.34	0.01	1	0.91	1.04
X82_3_1	0.41	0.69	0.35	1	0.55	1.51
X91_10_7	-0.22	0.69	0.10	1	0.75	0.80
X91_11_1	0.31	0.77	0.16	1	0.69	1.36
Constant	-1.46	1.89	0.59	1	0.44	0.23

APPENDIX 7.7 BINARY LOGISTIC REGRESSION ANALYSIS RESULTS FOR PREDICTING ACTION OUT OF CONCERN FOR CLIMATE CHANGE

Action out of concern for climate change (variable codes listed above)	B	S.E.	Wald	df	Sig.	Exp(B)
ACTION1	0.39	0.39	0.97	1	0.32	1.47
ACTION11	0.97	0.47	4.23	1	0.04	2.64
ACTION2	-0.38	0.42	0.83	1	0.36	0.68
ACTION3	0.15	0.86	0.03	1	0.86	1.17
ACTION5	-0.20	0.38	0.28	1	0.60	0.82
ACTION6	0.84	0.39	4.59	1	0.03	2.31
ACTION8	1.48	0.68	4.75	1	0.03	4.38
ACTION9	0.63	1.09	0.33	1	0.56	1.87
AGE2534	1.56	1.15	1.85	1	0.17	4.77
AGE3544	0.07	1.09	0.00	1	0.95	1.07
AGE4554	-0.03	1.13	0.00	1	0.98	0.97
AGE5564	0.80	1.15	0.48	1	0.49	2.22
AGE6574	0.14	1.18	0.01	1	0.91	1.14
AGE75	0.81	1.30	0.39	1	0.53	2.24
AGENOSAY	0.39	1.68	0.05	1	0.82	1.48
AIR_AWAR	0.50	0.38	1.71	1	0.19	1.64
CAR_OWN	0.76	0.65	1.36	1	0.24	2.13
CONCER10	1.11	0.40	7.54	1	0.01	3.03
CONCERN1	0.15	0.40	0.15	1	0.70	1.16
CONCERN3	-0.28	0.61	0.21	1	0.65	0.76
CONCERN8	0.45	0.42	1.13	1	0.29	1.57
CONCERN9	0.40	0.54	0.55	1	0.46	1.50
EFFECT_U	0.18	0.45	0.17	1	0.68	1.20
ENV_ORGN	0.10	0.51	0.04	1	0.85	1.10
FAC_AVER	0.28	0.66	0.17	1	0.68	1.32
FAC_EXCE	-2.46	1.83	1.81	1	0.18	0.09
FAC_GOOD	0.33	0.70	0.21	1	0.64	1.39
FAC_POOR	0.82	0.71	1.36	1	0.24	2.28
FACNOSAY	0.75	0.76	0.99	1	0.32	2.12
FLOOD_U	0.06	0.49	0.01	1	0.91	1.06
GEN_ALEV	0.21	0.72	0.09	1	0.77	1.23
GEN_DEGR	0.12	0.67	0.03	1	0.86	1.12
GEN_VOC	0.12	0.83	0.02	1	0.88	1.13
GENDER	0.43	0.41	1.08	1	0.30	1.54
GENGCSE	-0.74	0.76	0.94	1	0.33	0.48
GENNOSAY	0.67	1.21	0.31	1	0.58	1.96
GENOTHER	0.52	0.82	0.40	1	0.53	1.68
GENPOSTG	-0.18	0.73	0.06	1	0.81	0.84
HEALTH_F	-1.09	0.46	5.56	1	0.02	0.34
HEALTH_U	1.10	0.50	4.79	1	0.03	3.00
HIGHINC	-1.55	0.77	4.07	1	0.04	0.21
LIBDEM	-0.56	0.58	0.95	1	0.33	0.57
LOWINC	-0.72	0.56	1.63	1	0.20	0.49
MEDINC	-0.85	0.63	1.82	1	0.18	0.43
MILE_2ND	0.72	0.56	1.65	1	0.20	2.05
MILE_3RD	-0.65	0.59	1.22	1	0.27	0.52
MILE_TOP	-0.22	0.63	0.12	1	0.73	0.81
MILNOSAY	-0.09	0.73	0.02	1	0.90	0.91
NEP_2ND	-0.19	0.55	0.12	1	0.73	0.83

Action out of concern for climate change	B	S.E.	Wald	df	Sig.	Exp(B)
NEP_3RD	0.52	0.59	0.79	1	0.37	1.69
NEP_TOP	0.28	0.59	0.23	1	0.63	1.33
NEWSPA1	-0.53	0.70	0.57	1	0.45	0.59
NEWSPA10	-0.74	0.95	0.61	1	0.44	0.48
NEWSPA11	-0.29	0.37	0.61	1	0.43	0.75
NEWSPA13	-0.28	0.66	0.17	1	0.68	0.76
NEWSPA2	-0.48	0.42	1.35	1	0.24	0.62
NEWSPA3	-0.58	0.46	1.57	1	0.21	0.56
NEWSPA4	0.46	0.44	1.10	1	0.29	1.59
NEWSPA5	-2.53	1.00	6.42	1	0.01	0.08
NEWSPA6	-0.78	0.65	1.44	1	0.23	0.46
NEWSPA7	-1.57	0.82	3.62	1	0.06	0.21
NOSAY	-0.59	0.56	1.11	1	0.29	0.55
NOTVIMP	4.16	10.80	0.15	1	0.70	64.22
NOVOTE	-1.74	0.80	4.79	1	0.03	0.18
O16_15	-0.78	0.43	3.38	1	0.07	0.46
O16_5	-0.16	0.44	0.13	1	0.71	0.85
O18	0.83	0.74	1.26	1	0.26	2.29
O33_2	0.69	0.41	2.86	1	0.09	2.00
O33_3	0.91	0.60	2.26	1	0.13	2.47
O46_10_1	1.06	0.81	1.73	1	0.19	2.90
O91_12	1.75	0.72	5.92	1	0.01	5.75
O92_13	-1.10	0.81	1.86	1	0.17	0.33
O92_33	1.36	0.54	6.31	1	0.01	3.89
O94_7	-1.26	0.55	5.22	1	0.02	0.28
QUITEIMP	3.98	10.80	0.14	1	0.71	53.63
RESP_BUS	0.68	0.72	0.90	1	0.34	1.98
RESP_ENV	-0.33	0.96	0.12	1	0.73	0.72
RESP_IND	1.15	0.71	2.60	1	0.11	3.15
RESP_LOC	0.88	1.79	0.24	1	0.62	2.42
RESP_NAT	-0.59	0.52	1.33	1	0.25	0.55
RESP_OTH	-0.64	0.58	1.23	1	0.27	0.53
RESPNSAY	-0.90	0.70	1.67	1	0.20	0.41
SOURCE1	-0.36	0.81	0.20	1	0.66	0.70
SOURCE10	0.71	0.38	3.48	1	0.06	2.04
SOURCE11	0.12	0.55	0.04	1	0.84	1.12
SOURCE12	0.85	0.43	3.79	1	0.05	2.33
SOURCE2	0.13	0.42	0.10	1	0.75	1.14
SOURCE3	0.30	0.58	0.27	1	0.60	1.35
SOURCE4	1.04	0.49	4.56	1	0.03	2.83
SOURCE5	-0.30	0.49	0.37	1	0.54	0.74
SOURCE6	0.26	0.41	0.42	1	0.52	1.30
SOURCE7	-0.30	0.47	0.41	1	0.52	0.74
SOURCE8	-0.38	0.42	0.81	1	0.37	0.69
SOURCE9	-0.65	0.66	0.98	1	0.32	0.52
TACKLE	0.41	0.56	0.55	1	0.46	1.51
TORY	-0.36	0.60	0.35	1	0.55	0.70
TRUS_TOP	0.70	0.57	1.52	1	0.22	2.02
TRUST_2	0.27	0.53	0.26	1	0.61	1.31
TRUST_3	0.10	0.52	0.03	1	0.86	1.10
UNC_2ND	-0.10	0.51	0.04	1	0.84	0.90
UNC_3RD	-0.17	0.56	0.09	1	0.77	0.85
UNC_TOP	0.28	0.64	0.19	1	0.66	1.32
VALU_2ND	1.15	0.45	6.56	1	0.01	3.16
VALU_3RD	1.16	0.45	6.58	1	0.01	3.18
VALU_TOP	2.22	0.59	13.97	1	0.00	9.20
VERSION	-0.32	0.37	0.74	1	0.39	0.73

Action out of concern for climate change	B	S.E.	Wald	df	Sig.	Exp(B)
VERYIMP	3.56	10.81	0.11	1	0.74	35.21
VHIGHINC	-1.72	0.78	4.85	1	0.03	0.18
VOTEUNS	-1.01	1.02	0.97	1	0.32	0.36
VOTNOSAY	-0.57	0.64	0.79	1	0.37	0.57
VOTOTHER	0.42	1.26	0.11	1	0.74	1.52
WARD_B	0.17	0.61	0.07	1	0.79	1.18
WARD_F	-0.58	0.61	0.90	1	0.34	0.56
WARD_H	0.78	0.72	1.17	1	0.28	2.18
WARD_I	0.06	0.83	0.00	1	0.94	1.06
WARD_N	-0.81	0.69	1.39	1	0.24	0.44
WARDNSAY	0.79	0.84	0.90	1	0.34	2.21
WEATHERC	0.18	0.52	0.12	1	0.73	1.20
X22_1	-0.26	0.62	0.18	1	0.67	0.77
X22_16	1.34	0.59	5.08	1	0.02	3.81
X22_5	-1.46	0.82	3.20	1	0.07	0.23
X24	-0.90	0.63	2.07	1	0.15	0.41
X53_12	0.66	0.43	2.39	1	0.12	1.93
X53_15	1.11	0.65	2.93	1	0.09	3.02
X53_17	0.46	0.69	0.45	1	0.50	1.59
X53_20	0.92	0.78	1.40	1	0.24	2.52
X53_36	1.57	0.88	3.21	1	0.07	4.81
X53_38	0.59	0.69	0.74	1	0.39	1.81
X53_44	1.17	0.73	2.53	1	0.11	3.21
X73_2_17	0.44	0.44	1.01	1	0.31	1.55
X82_3_1	-1.32	0.86	2.33	1	0.13	0.27
X82_3_2	1.92	0.88	4.77	1	0.03	6.85
X91_10_7	0.39	0.68	0.33	1	0.57	1.48
X91_11_1	0.39	0.70	0.31	1	0.58	1.48
Constant	-10.58	11.00	0.93	1	0.34	0.00

APPENDIX 7.8 BINARY LOGISTIC REGRESSION ANALYSIS RESULTS FOR PREDICTING REGULARLY TURNING OFF UNUSED LIGHTS

Turn off unused lights (variable codes listed above)	B	S.E.	Wald	df	Sig.	Exp(B)
ACTION	-0.66	2.01	0.11	1	0.74	0.52
ACTION1	9.69	4.27	5.14	1	0.02	16201.91
ACTION11	-0.64	3.33	0.04	1	0.85	0.53
ACTION2	2.51	2.02	1.54	1	0.21	12.25
ACTION5	8.18	3.42	5.72	1	0.02	3575.00
ACTION6	7.42	3.60	4.26	1	0.04	1674.63
ACTION8	-2.10	2.24	0.88	1	0.35	0.12
ACTION9	1.77	2.64	0.45	1	0.50	5.87
AIR_AWAR	0.79	1.89	0.17	1	0.68	2.19
CAR_OWN	9.11	4.53	4.05	1	0.04	9000.87
CONCERN8	5.99	3.11	3.70	1	0.05	398.14
Constant	-13.25	7.63	3.02	1	0.08	0.00
EFFECT_U	5.19	2.38	4.75	1	0.03	180.08
ENV_ORGN	9.23	4.81	3.68	1	0.06	10198.75
FLOOD_U	-4.80	3.10	2.39	1	0.12	0.01
GEN_ALEV	5.32	4.28	1.54	1	0.21	205.38
GEN_DEGR	1.60	3.08	0.27	1	0.60	4.95
GEN_VOC	0.16	3.18	0.00	1	0.96	1.17
GENDER	3.60	2.15	2.80	1	0.09	36.70
GENGCSE	-4.43	2.94	2.27	1	0.13	0.01
GENNOSAY	16.61	152.83	0.01	1	0.91	16278300.68
GENOTHER	-7.88	4.18	3.55	1	0.06	0.00
GENPOSTG	15.29	8.25	3.44	1	0.06	4388626.77
HEALTH_F	-2.48	2.01	1.51	1	0.22	0.08
HEALTH_U	-4.22	2.98	2.00	1	0.16	0.01
HIGHINC	23.85	50.22	0.23	1	0.63	22831120468.39
LIBDEM	3.36	2.55	1.74	1	0.19	28.83
LOWINC	4.01	2.96	1.84	1	0.17	55.29
MEDINC	-2.85	3.23	0.78	1	0.38	0.06
MILE_2ND	-13.65	5.93	5.29	1	0.02	0.00
MILE_3RD	-8.05	4.94	2.66	1	0.10	0.00
MILE_TOP	-12.29	5.06	5.90	1	0.02	0.00
MILNOSAY	-9.05	5.19	3.04	1	0.08	0.00
NEP_2ND	-3.53	2.54	1.94	1	0.16	0.03
NEP_3RD	-5.44	3.01	3.28	1	0.07	0.00
NEP_TOP	0.70	3.54	0.04	1	0.84	2.01
NEWSPA1	-0.82	2.44	0.11	1	0.74	0.44
NEWSPA10	3.65	3.97	0.84	1	0.36	38.31
NEWSPA13	-1.74	2.90	0.36	1	0.55	0.18
NEWSPA2	0.15	1.46	0.01	1	0.92	1.16
NEWSPA3	1.92	3.40	0.32	1	0.57	6.79
NEWSPA4	-0.90	1.73	0.27	1	0.60	0.41
NEWSPA5	-0.95	2.81	0.11	1	0.74	0.39
NEWSPA6	-4.00	3.68	1.18	1	0.28	0.02
NEWSPA7	-4.90	4.64	1.11	1	0.29	0.01
NOSAY	-3.79	2.62	2.09	1	0.15	0.02
NOVOTE	10.64	5.91	3.24	1	0.07	41894.81
O18	33.58	75.47	0.20	1	0.66	383986356270470.00
O46_10_1	-1.15	2.91	0.16	1	0.69	0.32

Turn off unused lights	B	S.E.	Wald	df	Sig.	Exp(B)
O91_12	-3.89	4.56	0.73	1	0.39	0.02
O92_13	-6.00	3.39	3.12	1	0.08	0.00
O92_33	-3.94	2.67	2.17	1	0.14	0.02
O94_7	6.64	3.81	3.03	1	0.08	763.19
RESP_IND	-8.97	5.12	3.08	1	0.08	0.00
SOURCE5	3.77	2.23	2.85	1	0.09	43.41
TACKLE	0.73	1.64	0.20	1	0.66	2.07
TORY	7.82	4.13	3.58	1	0.06	2483.04
TRUS_TOP	6.04	3.15	3.67	1	0.06	418.09
TRUST_2	5.39	3.10	3.03	1	0.08	219.78
TRUST_3	-2.91	2.55	1.31	1	0.25	0.05
UNC_2ND	8.17	3.78	4.66	1	0.03	3516.88
UNC_3RD	5.19	3.36	2.38	1	0.12	178.60
UNC_TOP	8.62	3.98	4.69	1	0.03	5565.62
VALU_2ND	6.12	3.63	2.83	1	0.09	454.79
VALU_3RD	-2.09	2.95	0.50	1	0.48	0.12
VALU_TOP	-0.01	3.38	0.00	1	1.00	0.99
VHIGHINC	-6.88	4.40	2.45	1	0.12	0.00
VOTEUNS	-5.73	4.53	1.60	1	0.21	0.00
VOTNOSAY	3.29	3.25	1.03	1	0.31	26.94
VOTOTHER	6.33	104.09	0.00	1	0.95	563.18
WEATHERC	2.73	2.17	1.59	1	0.21	15.37
X24	5.06	3.39	2.22	1	0.14	157.19
X53_17	-11.50	5.67	4.12	1	0.04	0.00
X53_36	19.56	83.84	0.05	1	0.82	312991501.32
X62_18	22.66	52.73	0.18	1	0.67	6958342115.41
X91_10_7	-0.95	3.98	0.06	1	0.81	0.39

APPENDIX 7.9 BINARY LOGISTIC REGRESSION ANALYSIS RESULTS FOR PREDICTING REGULARLY BUYING ENERGY-EFFICIENT LIGHT BULBS

Buy energy-efficient bulbs (variable codes listed above)	B	S.E.	Wald	df	Sig.	Exp(B)
ACTION	-0.97	1.26	0.60	1	0.44	0.38
ACTION1	-0.79	0.58	1.86	1	0.17	0.45
ACTION11	2.25	0.94	5.78	1	0.02	9.52
ACTION2	0.80	0.62	1.66	1	0.20	2.22
ACTION3	3.11	0.98	10.10	1	0.00	22.50
ACTION6	2.44	0.60	16.39	1	0.00	11.42
ACTION8	2.67	0.75	12.72	1	0.00	14.38
ACTION9	2.32	0.96	5.89	1	0.02	10.17
AGE2534	-2.08	1.23	2.86	1	0.09	0.12
AGE3544	-0.47	1.20	0.15	1	0.70	0.63
AGE4554	-0.80	1.36	0.34	1	0.56	0.45
AGE5564	0.20	1.32	0.02	1	0.88	1.22
AGE6574	-0.69	1.42	0.24	1	0.63	0.50
AGE75	-1.19	1.50	0.63	1	0.43	0.31
AGENOSAY	0.73	2.10	0.12	1	0.73	2.07
AIR_AWAR	0.24	0.56	0.18	1	0.67	1.27
BROADSHE	-2.78	1.22	5.17	1	0.02	0.06
CAR_OWN	-0.22	0.80	0.08	1	0.78	0.80
CONCER10	-0.77	0.80	0.92	1	0.34	0.46
CONCER11	0.31	0.89	0.12	1	0.73	1.36
CONCER12	-0.79	0.95	0.70	1	0.40	0.45
CONCER13	1.28	0.88	2.13	1	0.14	3.59
CONCERN1	0.05	0.81	0.00	1	0.95	1.05
CONCERN2	0.16	0.77	0.04	1	0.83	1.18
CONCERN3	-0.56	0.93	0.36	1	0.55	0.57
CONCERN4	-1.06	0.82	1.68	1	0.19	0.35
CONCERN5	0.72	0.79	0.83	1	0.36	2.05
CONCERN6	-0.31	0.71	0.19	1	0.66	0.74
CONCERN7	-0.46	0.91	0.25	1	0.62	0.63
CONCERN8	-0.22	0.82	0.07	1	0.79	0.80
CONCERN9	-1.74	0.92	3.60	1	0.06	0.17
Constant	-4.39	3.58	1.51	1	0.22	0.01
EFFECT_U	-0.05	0.70	0.01	1	0.94	0.95
ENV_ORGN	-0.95	0.84	1.29	1	0.26	0.39
FAC_AVER	0.93	0.93	1.00	1	0.32	2.53
FAC_EXCE	-2.48	1.84	1.81	1	0.18	0.08
FAC_GOOD	0.10	1.03	0.01	1	0.92	1.11
FAC_POOR	-0.22	0.98	0.05	1	0.82	0.80
FACNOSAY	-0.21	1.00	0.04	1	0.84	0.81
FLOOD_U	0.85	0.71	1.43	1	0.23	2.33
GEN_ALEV	-0.83	1.03	0.65	1	0.42	0.43
GEN_DEGR	-2.67	1.09	6.01	1	0.01	0.07
GEN_VOC	-1.78	1.14	2.43	1	0.12	0.17
GENDER	0.33	0.60	0.29	1	0.59	1.38
GENGCSE	-0.96	0.88	1.19	1	0.28	0.38
GENNOSAY	6.75	15.11	0.20	1	0.66	852.30
GENOTHER	-2.32	1.15	4.05	1	0.04	0.10
GENPOSTG	-2.08	1.15	3.26	1	0.07	0.12
HEALTH_F	0.83	0.58	2.05	1	0.15	2.30
HEALTH_U	0.10	0.70	0.02	1	0.88	1.11

Buy energy-efficient bulbs	B	S.E.	Wald	df	Sig.	Exp(B)
HIGHINC	-1.38	0.97	2.03	1	0.15	0.25
LIBDEM	1.46	0.81	3.19	1	0.07	4.29
LOWINC	-0.08	0.72	0.01	1	0.91	0.92
MEDINC	-1.13	0.91	1.55	1	0.21	0.32
MILE_2ND	2.21	0.87	6.51	1	0.01	9.10
MILE_3RD	0.47	0.83	0.31	1	0.58	1.59
MILE_TOP	1.71	0.87	3.91	1	0.05	5.54
MILNOSAY	2.06	1.15	3.20	1	0.07	7.85
NEP_2ND	1.83	0.72	6.51	1	0.01	6.23
NEP_3RD	-1.39	0.76	3.40	1	0.07	0.25
NEP_TOP	-0.25	0.81	0.09	1	0.76	0.78
NEWSPA1	-1.97	1.00	3.90	1	0.05	0.14
NEWSPA10	-1.35	1.17	1.34	1	0.25	0.26
NEWSPA11	1.52	0.59	6.68	1	0.01	4.57
NEWSPA13	1.54	0.91	2.84	1	0.09	4.64
NEWSPA2	-2.22	1.02	4.77	1	0.03	0.11
NEWSPA3	4.59	1.14	16.11	1	0.00	98.90
NEWSPA4	2.68	1.02	6.85	1	0.01	14.60
NEWSPA5	-0.65	0.96	0.47	1	0.49	0.52
NEWSPA6	3.00	1.28	5.48	1	0.02	20.14
NEWSPA7	2.68	1.32	4.12	1	0.04	14.61
NOSAY	-1.47	0.80	3.39	1	0.07	0.23
NOTVIMP	0.23	1.17	0.04	1	0.84	1.26
NOVOTE	0.49	1.04	0.22	1	0.64	1.63
O16_15	-0.47	0.67	0.50	1	0.48	0.62
O16_5	0.84	0.65	1.67	1	0.20	2.32
O18	0.48	1.25	0.15	1	0.70	1.62
O32_1_20	1.85	1.43	1.68	1	0.19	6.36
O32_14	2.19	1.28	2.92	1	0.09	8.98
O32_2	2.10	1.10	3.66	1	0.06	8.15
O32_23	-3.24	1.25	6.69	1	0.01	0.04
O32_33	-1.66	1.01	2.70	1	0.10	0.19
O32_3621	3.10	1.19	6.75	1	0.01	22.26
O32_3634	5.45	1.67	10.63	1	0.00	233.67
O33_2	-0.40	0.63	0.40	1	0.53	0.67
O33_3	0.47	0.85	0.30	1	0.58	1.60
O33_5	-2.20	1.43	2.38	1	0.12	0.11
O41	-0.58	1.02	0.33	1	0.57	0.56
O43	-0.95	1.03	0.84	1	0.36	0.39
O43_1	4.92	1.17	17.76	1	0.00	136.80
O46_10_1	-0.82	1.26	0.42	1	0.52	0.44
O46_10_2	-3.14	1.06	8.77	1	0.00	0.04
O91	-1.20	1.03	1.36	1	0.24	0.30
O91_12	1.96	1.33	2.17	1	0.14	7.11
O91_19	0.19	1.26	0.02	1	0.88	1.21
O91_21	1.15	1.74	0.44	1	0.51	3.15
O92	0.28	0.72	0.15	1	0.70	1.32
O92_1	0.65	0.70	0.86	1	0.35	1.92
O92_10	2.51	1.09	5.24	1	0.02	12.25
O92_13	-1.99	1.25	2.54	1	0.11	0.14
O92_18	-0.36	0.78	0.22	1	0.64	0.69
O92_26	-1.69	0.88	3.68	1	0.06	0.18
O92_33	0.86	0.82	1.12	1	0.29	2.37
O92_35	1.62	1.06	2.32	1	0.13	5.03
O92_4	-1.05	0.66	2.48	1	0.12	0.35
O92_42	0.88	1.46	0.36	1	0.55	2.40
O92_43	-2.12	1.25	2.87	1	0.09	0.12
O92_6	-0.02	1.17	0.00	1	0.99	0.98

Buy energy-efficient bulbs	B	S.E.	Wald	df	Sig.	Exp(B)
O93_3	0.35	1.19	0.09	1	0.77	1.42
O94	0.93	1.09	0.72	1	0.40	2.52
O94_10	0.81	1.36	0.35	1	0.55	2.24
O94_11	-1.37	1.45	0.90	1	0.34	0.25
O94_2	0.49	1.06	0.22	1	0.64	1.64
O94_6	-0.04	0.76	0.00	1	0.96	0.96
O94_7	0.63	0.70	0.81	1	0.37	1.88
O95	-0.92	0.92	0.98	1	0.32	0.40
O95_1	1.58	1.55	1.03	1	0.31	4.84
O95_11	-1.34	1.06	1.60	1	0.21	0.26
O95_12	-2.72	1.61	2.86	1	0.09	0.07
O95_4	-1.08	0.93	1.35	1	0.25	0.34
O95_6	0.23	0.72	0.11	1	0.74	1.26
QUITEIMP	1.54	1.36	1.28	1	0.26	4.64
RESP_BUS	0.17	1.21	0.02	1	0.89	1.19
RESP_ENV	-0.71	1.28	0.31	1	0.58	0.49
RESP_IND	-2.68	0.97	7.61	1	0.01	0.07
RESP_LOC	5.02	2.81	3.19	1	0.07	152.03
RESP_NAT	-0.63	0.78	0.66	1	0.41	0.53
RESP_OTH	-1.68	0.83	4.15	1	0.04	0.19
RESPNSAY	0.32	0.83	0.15	1	0.70	1.37
SCI_ALEV	1.38	1.09	1.58	1	0.21	3.96
SCI_DEGR	3.24	1.13	8.19	1	0.00	25.48
SCI_VOCA	3.52	1.60	4.87	1	0.03	33.83
SCIGCSE	1.19	0.80	2.23	1	0.14	3.29
SCINOSAY	2.27	1.13	4.06	1	0.04	9.71
SCIOTHER	6.34	1.74	13.29	1	0.00	564.93
SCIPOSTG	4.60	1.60	8.29	1	0.00	99.11
SOURCE1	-0.98	1.21	0.66	1	0.42	0.38
SOURCE10	-0.03	0.50	0.00	1	0.96	0.97
SOURCE11	-1.75	0.91	3.74	1	0.05	0.17
SOURCE12	2.64	0.72	13.43	1	0.00	14.00
SOURCE2	-1.08	0.60	3.25	1	0.07	0.34
SOURCE3	0.89	0.79	1.28	1	0.26	2.44
SOURCE4	-0.50	0.86	0.34	1	0.56	0.61
SOURCE6	-0.61	0.63	0.94	1	0.33	0.54
SOURCE7	-0.72	0.76	0.88	1	0.35	0.49
SOURCE8	0.47	0.62	0.58	1	0.45	1.61
SOURCE9	0.48	1.01	0.22	1	0.64	1.61
TABLOID	3.44	1.26	7.43	1	0.01	31.31
TACKLE	-0.30	0.80	0.14	1	0.71	0.74
TORY	-0.57	0.78	0.53	1	0.47	0.57
TRUS_TOP	-2.17	0.86	6.31	1	0.01	0.11
TRUST_2	-1.19	0.74	2.60	1	0.11	0.30
TRUST_3	-1.77	0.78	5.22	1	0.02	0.17
UNC_2ND	1.61	0.77	4.44	1	0.04	5.02
UNC_3RD	-0.15	0.78	0.03	1	0.85	0.86
UNC_TOP	-1.58	0.95	2.77	1	0.10	0.21
VALU_2ND	-0.79	0.64	1.52	1	0.22	0.45
VALU_3RD	-0.41	0.67	0.38	1	0.54	0.66
VALU_TOP	-0.43	0.82	0.27	1	0.60	0.65
VALUE4_1	-0.30	0.26	1.37	1	0.24	0.74
VERSION	-2.54	0.63	16.35	1	0.00	0.08
VERYIMP	2.96	1.49	3.94	1	0.05	19.36
VHIGHINC	-0.71	1.22	0.34	1	0.56	0.49
VOTEUNS	-2.82	1.43	3.88	1	0.05	0.06
VOTNOSAY	0.38	0.84	0.20	1	0.65	1.46
VOTOTHER	-2.47	1.82	1.84	1	0.17	0.08

Buy energy-efficient bulbs	B	S.E.	Wald	df	Sig.	Exp(B)
WARD_B	-1.82	0.80	5.19	1	0.02	0.16
WARD_F	-0.29	0.86	0.11	1	0.74	0.75
WARD_H	-1.14	1.03	1.21	1	0.27	0.32
WARD_I	-0.24	1.07	0.05	1	0.82	0.79
WARD_N	-0.68	0.84	0.65	1	0.42	0.51
WARDNSAY	0.56	1.34	0.18	1	0.67	1.76
WEATHERC	-0.73	0.63	1.33	1	0.25	0.48
X22	3.59	0.91	15.54	1	0.00	36.37
X22_1	0.93	0.95	0.95	1	0.33	2.53
X22_11	-1.69	1.37	1.52	1	0.22	0.19
X22_13	-1.54	1.38	1.24	1	0.26	0.21
X22_14	4.71	1.77	7.07	1	0.01	111.01
X22_16	-0.63	0.95	0.44	1	0.51	0.53
X22_5	2.58	1.21	4.53	1	0.03	13.24
X24	-2.67	0.95	7.86	1	0.01	0.07
X51	-0.97	1.20	0.65	1	0.42	0.38
X51_2_1	1.70	1.40	1.47	1	0.22	5.48
X51_5	0.49	0.96	0.26	1	0.61	1.63
X51_6	-0.90	1.01	0.79	1	0.37	0.41
X51_7	0.64	1.31	0.24	1	0.63	1.90
X51_8	1.74	1.02	2.92	1	0.09	5.69
X53	-1.10	0.69	2.58	1	0.11	0.33
X53_12	-1.16	0.66	3.07	1	0.08	0.31
X53_15	-0.08	1.07	0.00	1	0.94	0.93
X53_16	2.68	1.24	4.67	1	0.03	14.52
X53_17	0.77	1.30	0.35	1	0.55	2.16
X53_18	-0.36	1.21	0.09	1	0.77	0.70
X53_20	-1.06	1.15	0.85	1	0.36	0.35
X53_36	-0.08	1.39	0.00	1	0.96	0.93
X53_38	-0.93	1.15	0.65	1	0.42	0.40
X53_44	4.00	1.36	8.61	1	0.00	54.59
X53_4535	-1.12	1.19	0.88	1	0.35	0.33
X53_7	2.20	1.10	3.98	1	0.05	9.01
X55	1.63	0.94	3.03	1	0.08	5.09
X61_1	-0.19	1.10	0.03	1	0.87	0.83
X62	-0.67	1.01	0.43	1	0.51	0.51
X62_1	1.70	1.46	1.35	1	0.24	5.50
X62_18	-1.37	1.17	1.37	1	0.24	0.25
X62_27	2.61	1.22	4.58	1	0.03	13.54
X63	-1.34	0.99	1.82	1	0.18	0.26
X63_8	2.06	0.98	4.45	1	0.03	7.85
X64	0.43	1.87	0.05	1	0.82	1.54
X73_2_17	-0.02	0.53	0.00	1	0.97	0.98
X82_3_1	-0.47	1.31	0.13	1	0.72	0.63
X82_3_2	-4.45	1.50	8.80	1	0.00	0.01
X91_10	1.37	0.99	1.92	1	0.17	3.95
X91_10_3	-0.61	1.23	0.24	1	0.62	0.55
X91_10_7	1.16	1.00	1.36	1	0.24	3.19
X91_11	3.84	1.68	5.25	1	0.02	46.44
X91_11_1	-4.17	1.39	8.97	1	0.00	0.02
X91_8	-0.88	0.81	1.19	1	0.28	0.41

APPENDIX 7.10 BINARY LOGISTIC REGRESSION ANALYSIS RESULTS FOR PREDICTING REGULARLY WALKING/CYCLING TO WORK

Walk/cycle to work (variable codes listed above)	**B**	**S.E.**	**Wald**	**df**	**Sig.**	**Exp(B)**
ACTION	0.2	0.775	0.065	1	0.798	1.219
ACTION11	2.11	0.671	9.852	1	0.002	8.224
ACTION2	3.61	0.678	28.312	1	0	36.932
ACTION3	2.6	1.222	4.529	1	0.033	13.464
ACTION5	-0.41	0.503	0.678	1	0.41	0.661
ACTION6	-1.2	0.546	4.787	1	0.029	0.303
ACTION8	0.7	0.773	0.821	1	0.365	2.015
ACTION9	2.87	1.101	6.782	1	0.009	17.597
AGE2534	-1.9	1.356	1.963	1	0.161	0.15
AGE3544	-1.65	1.314	1.579	1	0.209	0.192
AGE4554	-2.73	1.379	3.914	1	0.048	0.065
AGE5564	-3.48	1.435	5.879	1	0.015	0.031
AGE6574	-5.4	1.554	12.054	1	0.001	0.005
AGE75	-8.03	1.718	21.858	1	0	0
AGENOSAY	-7.61	3.09	6.059	1	0.014	0
AIR_AWAR	0.39	0.537	0.531	1	0.466	1.479
BROADSHE	0.08	1.02	0.006	1	0.936	1.085
CAR_OWN	-0.22	0.711	0.098	1	0.754	0.8
CONCER10	0.31	0.718	0.182	1	0.67	1.358
CONCER11	-1.1	0.702	2.444	1	0.118	0.334
CONCER12	2.89	0.896	10.389	1	0.001	17.944
CONCER13	0.54	0.698	0.598	1	0.44	1.716
CONCERN1	1.5	0.691	4.728	1	0.03	4.497
CONCERN2	1.14	0.64	3.185	1	0.074	3.132
CONCERN3	0.96	0.883	1.175	1	0.278	2.604
CONCERN4	0.14	0.688	0.04	1	0.842	1.147
CONCERN5	0.33	0.646	0.255	1	0.614	1.386
CONCERN6	0.19	0.621	0.094	1	0.759	1.21
CONCERN7	1.11	0.82	1.843	1	0.175	3.045
CONCERN8	0.31	0.789	0.157	1	0.692	1.367
CONCERN9	0.3	0.804	0.141	1	0.708	1.352
EFFECT_U	0.18	0.577	0.093	1	0.761	1.192
ENV_ORGN	-0.26	0.742	0.123	1	0.726	0.771
FAC_AVER	2.02	0.803	6.309	1	0.012	7.516
FAC_EXCE	2.63	2.531	1.076	1	0.3	13.807
FAC_GOOD	1.82	0.938	3.771	1	0.052	6.177
FAC_POOR	2.48	0.926	7.189	1	0.007	11.989
FACNOSAY	2.54	0.975	6.785	1	0.009	12.675
FLOOD_U	0.11	0.609	0.033	1	0.855	1.118
GEN_ALEV	-1.34	1.003	1.792	1	0.181	0.261
GEN_DEGR	-1.96	1.052	3.483	1	0.062	0.14
GEN_VOC	-0.85	1.098	0.596	1	0.44	0.428
GENDER	-0.9	0.565	2.519	1	0.112	0.408
GENGCSE	0.47	0.887	0.284	1	0.594	1.604
GENNOSAY	-1.46	2.319	0.394	1	0.53	0.233
GENOTHER	-0.14	1.033	0.019	1	0.891	0.868

Walk/cycle to work	B	S.E.	Wald	df	Sig.	Exp(B)
GENPOSTG	-1.02	1.177	0.755	1	0.385	0.36
HEALTH_F	-0.45	0.63	0.516	1	0.473	0.636
HEALTH_U	0.47	0.683	0.47	1	0.493	1.596
HIGHINC	1.15	0.975	1.395	1	0.238	3.165
LIBDEM	-0.81	0.845	0.92	1	0.338	0.445
LOWINC	-0.23	0.739	0.094	1	0.76	0.798
MEDINC	0.86	0.808	1.137	1	0.286	2.366
MILE_2ND	-0.3	0.707	0.177	1	0.674	0.743
MILE_3RD	-2.17	0.725	8.94	1	0.003	0.114
MILE_TOP	-2.73	0.866	9.912	1	0.002	0.065
MILNOSAY	-2.24	1.02	4.838	1	0.028	0.106
NEP_2ND	0.29	0.72	0.158	1	0.691	1.332
NEP_3RD	2.64	0.79	11.195	1	0.001	14.042
NEP_TOP	1.37	0.836	2.686	1	0.101	3.939
NEWSPA1	2.65	0.959	7.632	1	0.006	14.144
NEWSPA10	-2.18	1.119	3.805	1	0.051	0.113
NEWSPA11	-0.07	0.471	0.022	1	0.883	0.933
NEWSPA13	1.61	0.948	2.896	1	0.089	5.015
NEWSPA2	-0.31	0.795	0.153	1	0.696	0.733
NEWSPA3	0.62	0.863	0.516	1	0.472	1.859
NEWSPA4	1.25	0.877	2.026	1	0.155	3.486
NEWSPA5	-0.68	0.946	0.515	1	0.473	0.507
NEWSPA6	1.88	1.013	3.429	1	0.064	6.523
NEWSPA7	0.93	1.143	0.661	1	0.416	2.532
NOSAY	1.28	0.74	2.991	1	0.084	3.595
NOTVIMP	0.46	1.211	0.146	1	0.702	1.588
NOVOTE	-0.4	0.899	0.198	1	0.657	0.67
O16_15	-0.33	0.578	0.322	1	0.57	0.72
O16_27	-1.7	1.213	1.968	1	0.161	0.182
O18	-1.66	1.005	2.724	1	0.099	0.19
O32_1_20	0.47	1.147	0.166	1	0.684	1.595
O32_16	2.12	1.042	4.139	1	0.042	8.333
O32_17	-2.46	1.336	3.393	1	0.065	0.085
O32_23	-1.33	1.28	1.077	1	0.299	0.265
O32_33	-0.67	1.099	0.372	1	0.542	0.511
O32_3621	2.62	1.044	6.288	1	0.012	13.706
O32_3634	0.79	1.429	0.309	1	0.578	2.213
O33_2	-1.17	0.664	3.079	1	0.079	0.312
O33_3	-2.58	1.049	6.043	1	0.014	0.076
O33_4	-0.37	1.307	0.081	1	0.776	0.69
O33_5	-3.44	1.941	3.137	1	0.077	0.032
O46_10_1	-1.46	1.253	1.353	1	0.245	0.233
O46_10_2	-0.07	1.097	0.004	1	0.947	0.93
O46_10_3	-0.2	0.573	0.123	1	0.726	0.818
O46_10_9	3.3	1.593	4.294	1	0.038	27.149
O46_13_2	-2.23	0.985	5.138	1	0.023	0.107
O46_1310	-1.65	0.868	3.596	1	0.058	0.193
O46_1312	0.34	0.75	0.202	1	0.653	1.401
O46_5_1	-4.17	1.259	10.989	1	0.001	0.015
O46_5_2	0.07	1.176	0.004	1	0.951	1.074
O46_5_7	-1.95	0.712	7.495	1	0.006	0.142
O91_12	-2.49	1.062	5.506	1	0.019	0.083
O92_13	0.65	1.052	0.382	1	0.537	1.915

Walk/cycle to work	B	S.E.	Wald	df	Sig.	Exp(B)
O92_33	-2.35	0.826	8.116	1	0.004	0.095
O92_35	-1	0.806	1.54	1	0.215	0.368
O92_6	1.27	1.09	1.361	1	0.243	3.566
O94_7	-1.23	0.649	3.611	1	0.057	0.291
O95_1	4.88	1.455	11.25	1	0.001	131.683
QUITEIMP	-0.38	1.311	0.083	1	0.773	0.686
RESP_BUS	0.06	1.216	0.002	1	0.962	1.059
RESP_ENV	1.02	1.051	0.937	1	0.333	2.765
RESP_IND	0.94	0.904	1.088	1	0.297	2.568
RESP_LOC	5.09	2.414	4.45	1	0.035	162.758
RESP_NAT	0.67	0.715	0.864	1	0.353	1.944
RESP_OTH	0.02	0.689	0.001	1	0.977	1.02
RESPNSAY	0.58	0.796	0.521	1	0.47	1.777
SCI_ALEV	-2.27	1.067	4.514	1	0.034	0.104
SCI_DEGR	0.79	1.032	0.585	1	0.444	2.203
SCI_VOCA	-0.15	1.415	0.011	1	0.917	0.863
SCIGCSE	-1.05	0.769	1.872	1	0.171	0.349
SCINOSAY	-0.22	0.913	0.056	1	0.812	0.805
SCIOTHER	-1.83	1.68	1.192	1	0.275	0.16
SCIPOSTG	1.39	1.325	1.1	1	0.294	4.015
SOURCE1	0.39	1.106	0.124	1	0.725	1.477
SOURCE10	-0.47	0.542	0.734	1	0.392	0.628
SOURCE11	-1.6	0.867	3.405	1	0.065	0.202
SOURCE12	1.87	0.649	8.298	1	0.004	6.484
SOURCE2	0.19	0.539	0.129	1	0.72	1.213
SOURCE3	0.84	0.722	1.367	1	0.242	2.324
SOURCE4	0.02	0.772	0	1	0.983	1.017
SOURCE5	0.05	0.714	0.004	1	0.948	1.048
SOURCE6	0.66	0.636	1.092	1	0.296	1.943
SOURCE7	-0.54	0.684	0.613	1	0.434	0.585
SOURCE8	-0.59	0.593	0.997	1	0.318	0.553
SOURCE9	2.66	1.184	5.043	1	0.025	14.267
TABLOID	0.46	0.994	0.211	1	0.646	1.578
TACKLE	1.65	0.736	5.025	1	0.025	5.208
TORY	-0.04	0.788	0.002	1	0.965	0.966
TRUS_TOP	-1.14	0.714	2.557	1	0.11	0.319
TRUST_2	-0.88	0.692	1.606	1	0.205	0.416
TRUST_3	0.27	0.66	0.166	1	0.683	1.309
UNC_2ND	-1.99	0.737	7.309	1	0.007	0.136
UNC_3RD	0.05	0.782	0.004	1	0.948	1.052
UNC_TOP	-1.1	0.892	1.512	1	0.219	0.334
VALU_2ND	-0.24	0.528	0.21	1	0.647	0.785
VALU_3RD	0.99	0.624	2.501	1	0.114	2.681
VALU_TOP	-0.55	0.803	0.462	1	0.497	0.58
VALUE4_1	-0.69	0.262	6.903	1	0.009	0.502
VERSION	-0.4	0.49	0.652	1	0.419	0.673
VERYIMP	-1.2	1.563	0.591	1	0.442	0.301
VHIGHINC	2.12	1.048	4.103	1	0.043	8.347
VOTEUNS	-0.59	1.188	0.243	1	0.622	0.557
VOTNOSAY	-1.74	0.909	3.667	1	0.055	0.175
VOTOTHER	-1.13	1.9	0.352	1	0.553	0.324
WARD_B	-0.17	0.896	0.035	1	0.852	0.846
WARD_F	-1.83	0.882	4.296	1	0.038	0.161

Walk/cycle to work	B	S.E.	Wald	df	Sig.	Exp(B)
WARD_H	-0.21	0.964	0.047	1	0.829	0.812
WARD_I	-1.94	0.989	3.849	1	0.05	0.144
WARD_N	-2.05	0.826	6.169	1	0.013	0.128
WARDNSAY	-0.38	1.355	0.079	1	0.778	0.683
WEATHERC	0.1	0.64	0.022	1	0.881	1.1
X22_1	1.19	1.012	1.381	1	0.24	3.286
X22_11	1.58	1.536	1.052	1	0.305	4.831
X22_13	4.95	1.453	11.592	1	0.001	140.578
X22_16	-1.44	0.831	2.994	1	0.084	0.237
X22_5	3.32	1.255	6.978	1	0.008	27.527
X24	-0.49	0.907	0.288	1	0.592	0.615
X51	-1.02	0.915	1.244	1	0.265	0.36
X51_2_1	0.23	1.24	0.033	1	0.856	1.253
X51_5	-2.47	0.871	8.07	1	0.004	0.084
X51_6	-1.03	0.98	1.103	1	0.294	0.357
X51_7	-0.72	1.185	0.373	1	0.541	0.485
X51_8	-0.69	0.876	0.624	1	0.43	0.5
X53_12	-2.23	0.711	9.857	1	0.002	0.107
X53_15	0.76	0.947	0.636	1	0.425	2.127
X53_16	-0.53	1.156	0.212	1	0.645	0.587
X53_17	-2.36	1.309	3.243	1	0.072	0.095
X53_18	0.49	1.048	0.219	1	0.64	1.634
X53_20	2.23	1.108	4.039	1	0.044	9.267
X53_36	0.11	1.224	0.008	1	0.927	1.119
X53_38	-0.67	0.986	0.46	1	0.498	0.512
X53_44	0.04	1.065	0.002	1	0.968	1.044
X53_4535	1.62	1.095	2.191	1	0.139	5.059
X53_7	-1.35	1.022	1.733	1	0.188	0.26
X62	-0.84	0.951	0.775	1	0.379	0.433
X62_1	5.72	1.62	12.484	1	0	305.814
X62_18	-0.86	1.021	0.713	1	0.398	0.422
X62_27	-0.33	1.134	0.087	1	0.768	0.716
X73_2_13	-1.42	1.53	0.859	1	0.354	0.242
X73_2_17	0.95	0.553	2.969	1	0.085	2.592
X73_3_4	0.24	0.695	0.122	1	0.727	1.275
X82_3_1	-0.12	1.199	0.009	1	0.923	0.89
X82_3_2	-2.56	1.464	3.064	1	0.08	0.077
X91_10_3	-1.46	1.462	0.993	1	0.319	0.233
X91_10_7	-2.4	1.111	4.676	1	0.031	0.091
X91_11	-1.13	1.296	0.76	1	0.383	0.323
X91_11_1	0.4	1.324	0.092	1	0.761	1.495
X91_8	0.9	0.818	1.203	1	0.273	2.453
Constant	-2.36	3.311	0.508	1	0.476	0.094

APPENDIX 7.11 BINARY LOGISTIC REGRESSION ANALYSIS RESULTS FOR PREDICTING REGULARLY USING PUBLIC TRANSPORT

Use public transport (variable codes listed above)	B	S.E.	Wald	df	Sig.	Exp(B)
ACTION	-2.082	1.36	2.359	1	0.13	0.125
ACTION1	7.268	1.72	17.92	1	0	1434.038
ACTION11	4.281	1.34	10.24	1	0	72.319
ACTION3	-0.122	2.1	0.003	1	0.95	0.886
ACTION5	2.44	1.11	4.829	1	0.03	11.471
ACTION6	5.794	1.29	20.28	1	0	328.196
ACTION8	-2.665	1.52	3.077	1	0.08	0.07
ACTION9	-0.481	1.69	0.081	1	0.78	0.618
AGE2534	5.21	2.61	4	1	0.05	183.131
AGE3544	3.356	2.41	1.936	1	0.16	28.679
AGE4554	2.767	2.81	0.973	1	0.32	15.913
AGE5564	4.934	2.98	2.739	1	0.1	138.999
AGE6574	5.205	3.19	2.658	1	0.1	182.198
AGE75	4.014	3.17	1.605	1	0.21	55.383
AGENOSAY	16.82	6.68	6.339	1	0.01	20156316
AIR_AWAR	-0.585	0.93	0.395	1	0.53	0.557
BROADSHE	5.613	2.03	7.684	1	0.01	274.018
CAR_OWN	-8.593	1.95	19.41	1	0	0
CONCER10	4.194	1.72	5.947	1	0.02	66.261
CONCER11	3.775	1.97	3.677	1	0.06	43.594
CONCER12	-1.69	1.82	0.86	1	0.35	0.185
CONCER13	1.447	1.42	1.045	1	0.31	4.25
CONCERN1	1.862	1.54	1.47	1	0.23	6.438
CONCERN2	2.228	1.53	2.134	1	0.14	9.28
CONCERN3	1.3	1.54	0.717	1	0.4	3.668
CONCERN4	-1.491	1.54	0.941	1	0.33	0.225
CONCERN5	0.873	1.45	0.362	1	0.55	2.395
CONCERN6	-0.152	1.26	0.015	1	0.9	0.859
CONCERN7	1.131	1.55	0.532	1	0.47	3.1
CONCERN8	0.384	1.32	0.084	1	0.77	1.468
CONCERN9	-0.549	1.61	0.116	1	0.73	0.578
EFFECT_U	-1.526	1.19	1.638	1	0.2	0.217
ENV_ORGN	-1.109	1.42	0.611	1	0.43	0.33
FAC_AVER	0.887	1.42	0.392	1	0.53	2.429
FAC_EXCE	2.286	3.1	0.545	1	0.46	9.84
FAC_GOOD	7.081	2.25	9.922	1	0	1188.847
FAC_POOR	-1.229	1.65	0.552	1	0.46	0.292
FACNOSAY	-7.492	2.18	11.87	1	0	0.001
FLOOD_U	0.078	0.98	0.006	1	0.94	1.082
GEN_ALEV	3.329	1.84	3.293	1	0.07	27.908
GEN_DEGR	3.291	1.86	3.141	1	0.08	26.868
GEN_VOC	2.633	2.13	1.525	1	0.22	13.912
GENDER	2.408	0.98	6.058	1	0.01	11.107
GENGCSE	-0.767	1.5	0.261	1	0.61	0.464
GENNOSAY	7.271	3.15	5.337	1	0.02	1437.918

Use public transport	B	S.E.	Wald	df	Sig.	Exp(B)
GENOTHER	11.99	3.1	14.95	1	0	160782.61
GENPOSTG	3.743	2.32	2.61	1	0.11	42.23
HEALTH_F	2.624	1.21	4.703	1	0.03	13.786
HEALTH_U	-2.316	1.39	2.785	1	0.1	0.099
HIGHINC	0.506	1.88	0.073	1	0.79	1.658
LIBDEM	0.515	1.84	0.078	1	0.78	1.674
LOWINC	0.518	1.37	0.143	1	0.71	1.678
MEDINC	-3.377	1.82	3.463	1	0.06	0.034
MILE_2ND	-3.569	1.54	5.383	1	0.02	0.028
MILE_3RD	-2.254	1.41	2.568	1	0.11	0.105
MILE_TOP	-0.032	1.34	0.001	1	0.98	0.969
MILNOSAY	3.801	2.04	3.478	1	0.06	44.766
NEP_2ND	-5.153	1.66	9.661	1	0	0.006
NEP_3RD	-2.856	1.46	3.805	1	0.05	0.057
NEP_TOP	-3.406	1.63	4.348	1	0.04	0.033
NEWSPA1	-3.509	1.55	5.11	1	0.02	0.03
NEWSPA10	4.44	2.23	3.96	1	0.05	84.765
NEWSPA11	-0.086	0.88	0.009	1	0.92	0.918
NEWSPA13	-2.757	1.54	3.2	1	0.07	0.063
NEWSPA2	4.226	1.83	5.323	1	0.02	68.419
NEWSPA3	-5.441	1.66	10.81	1	0	0.004
NEWSPA4	-2.055	1.39	2.198	1	0.14	0.128
NEWSPA5	-0.379	1.49	0.065	1	0.8	0.685
NEWSPA6	1.259	2.25	0.314	1	0.58	3.521
NEWSPA7	-4.592	2.22	4.274	1	0.04	0.01
NOSAY	-2.173	1.59	1.875	1	0.17	0.114
NOTVIMP	-5.208	2.45	4.506	1	0.03	0.005
NOVOTE	4.066	1.89	4.615	1	0.03	58.337
O16_15	1.734	1.28	1.831	1	0.18	5.661
O16_27	6.344	2.61	5.921	1	0.02	568.92
O18	-1.824	2.15	0.723	1	0.4	0.161
O32_1_20	4.671	2.54	3.373	1	0.07	106.834
O32_16	2.707	1.73	2.452	1	0.12	14.982
O32_17	4.86	3.41	2.026	1	0.16	128.984
O32_23	-1.414	2.59	0.298	1	0.59	0.243
O32_33	-1.78	1.6	1.234	1	0.27	0.169
O32_3621	0.641	1.65	0.151	1	0.7	1.899
O32_3634	0.345	2.2	0.025	1	0.88	1.412
O33_2	-0.1	1.1	0.008	1	0.93	0.905
O33_3	4.072	1.66	5.985	1	0.01	58.655
O33_4	2.376	2.02	1.387	1	0.24	10.759
O33_5	-7.415	3.14	5.581	1	0.02	0.001
O46_10_1	-3.745	2.16	3.013	1	0.08	0.024
O46_10_2	1.35	1.97	0.468	1	0.49	3.857
O46_10_3	-0.598	1.02	0.345	1	0.56	0.55
O46_10_9	-7.503	3.2	5.517	1	0.02	0.001
O46_13_2	5.633	1.91	8.726	1	0	279.601
O46_1310	-4.391	1.9	5.348	1	0.02	0.012
O46_1312	-1.476	1.51	0.953	1	0.33	0.229
O46_5_1	4.655	2.61	3.175	1	0.08	105.077
O46_5_2	3.739	2.19	2.921	1	0.09	42.065
O46_5_7	0.417	1.27	0.108	1	0.74	1.517
O91_12	-1.507	2.15	0.493	1	0.48	0.221

Use public transport	B	S.E.	Wald	df	Sig.	Exp(B)
O92_13	-4.064	2.17	3.51	1	0.06	0.017
O92_33	0.144	1.45	0.01	1	0.92	1.155
O92_35	5.023	1.71	8.663	1	0	151.888
O92_6	-4.1	2.16	3.613	1	0.06	0.017
O94_7	1.413	1.3	1.186	1	0.28	4.107
O95_1	-4.886	2.76	3.132	1	0.08	0.008
QUITEIMP	-2.752	2.55	1.162	1	0.28	0.064
RESP_BUS	-3.79	2.33	2.641	1	0.1	0.023
RESP_ENV	-12.41	4.15	8.95	1	0	0
RESP_IND	1.391	1.77	0.615	1	0.43	4.02
RESP_LOC	-3.825	6.51	0.346	1	0.56	0.022
RESP_NAT	-3.074	1.53	4.042	1	0.04	0.046
RESP_OTH	-3.829	1.73	4.894	1	0.03	0.022
RESPNSAY	-0.452	1.35	0.112	1	0.74	0.636
SCI_ALEV	-3.492	1.87	3.489	1	0.06	0.03
SCI_DEGR	-1.132	1.67	0.46	1	0.5	0.323
SCI_VOCA	-6.619	2.98	4.94	1	0.03	0.001
SCIGCSE	-1.786	1.37	1.692	1	0.19	0.168
SCINOSAY	-6.31	2.39	6.97	1	0.01	0.002
SCIOTHER	-21.41	6.19	11.96	1	0	0
SCIPOSTG	-4.424	2.69	2.709	1	0.1	0.012
SOURCE1	5.936	2.3	6.667	1	0.01	378.421
SOURCE10	-0.021	0.93	0	1	0.98	0.98
SOURCE11	3.385	1.65	4.232	1	0.04	29.525
SOURCE12	-1.894	1.45	1.701	1	0.19	0.15
SOURCE2	-1.507	1.05	2.065	1	0.15	0.222
SOURCE3	1.197	1.66	0.522	1	0.47	3.312
SOURCE4	0.794	1.47	0.292	1	0.59	2.213
SOURCE5	2.331	1.51	2.376	1	0.12	10.287
SOURCE6	-1.621	1.12	2.109	1	0.15	0.198
SOURCE7	-0.08	1.4	0.003	1	0.95	0.923
SOURCE8	0.752	0.97	0.6	1	0.44	2.122
SOURCE9	-5.417	1.98	7.477	1	0.01	0.004
TABLOID	-1.507	1.74	0.753	1	0.39	0.222
TACKLE	0.408	1.56	0.068	1	0.79	1.503
TORY	-2.915	1.79	2.651	1	0.1	0.054
TRUS_TOP	-1.117	1.42	0.616	1	0.43	0.327
TRUST_2	0.385	1.44	0.072	1	0.79	1.47
TRUST_3	-0.276	1.24	0.049	1	0.83	0.759
UNC_2ND	1.459	1.42	1.062	1	0.3	4.302
UNC_3RD	3.209	1.54	4.343	1	0.04	24.764
UNC_TOP	6.469	2.31	7.831	1	0.01	644.64
VALU_2ND	-2.001	1.12	3.205	1	0.07	0.135
VALU_3RD	-6.54	2.03	10.35	1	0	0.001
VALU_TOP	-2.714	1.67	2.633	1	0.11	0.066
VALUE4_1	0.457	0.48	0.901	1	0.34	1.579
VERSION	0.448	0.84	0.287	1	0.59	1.564
VERYIMP	-4.577	2.8	2.672	1	0.1	0.01
VHIGHINC	-3.057	2.24	1.859	1	0.17	0.047
VOTEUNS	1.245	2.05	0.37	1	0.54	3.471
VOTNOSAY	-0.534	1.89	0.08	1	0.78	0.586
VOTOTHER	2.135	3.48	0.377	1	0.54	8.456
WARD_B	2.526	1.37	3.406	1	0.07	12.507

Use public transport	B	S.E.	Wald	df	Sig.	Exp(B)
WARD_F	1.977	1.55	1.634	1	0.2	7.222
WARD_H	1.604	1.48	1.168	1	0.28	4.971
WARD_I	5.877	2	8.646	1	0	356.697
WARD_N	2.188	1.55	2.005	1	0.16	8.922
WARDNSAY	9.492	2.9	10.74	1	0	13247.181
WEATHERC	-0.977	1.21	0.65	1	0.42	0.376
X22_1	-4.7	1.89	6.193	1	0.01	0.009
X22_11	1.485	2.54	0.341	1	0.56	4.414
X22_13	-1.446	2.43	0.354	1	0.55	0.236
X22_16	5.854	1.83	10.2	1	0	348.604
X22_5	-10.07	3.37	8.931	1	0	0
X24	2.058	1.82	1.283	1	0.26	7.83
X51	3.83	2.22	2.972	1	0.09	46.066
X51_2_1	-4.346	2.47	3.097	1	0.08	0.013
X51_5	3.365	1.52	4.912	1	0.03	28.939
X51_6	-2.19	1.93	1.293	1	0.26	0.112
X51_7	5.614	2.15	6.79	1	0.01	274.104
X51_8	-1.212	1.7	0.508	1	0.48	0.298
X53_12	-1.506	1.25	1.449	1	0.23	0.222
X53_15	-0.27	1.72	0.025	1	0.88	0.764
X53_16	-1.133	2.28	0.246	1	0.62	0.322
X53_17	0.607	2.52	0.058	1	0.81	1.835
X53_18	6.818	2.63	6.704	1	0.01	914.506
X53_20	-4.222	2.47	2.922	1	0.09	0.015
X53_36	-5.834	2.14	7.442	1	0.01	0.003
X53_38	-2.352	2.08	1.273	1	0.26	0.095
X53_44	-4.544	2.12	4.59	1	0.03	0.011
X53_4535	4.949	2.65	3.479	1	0.06	141.033
X53_7	5.399	2.1	6.606	1	0.01	221.128
X62	1.009	1.56	0.42	1	0.52	2.742
X62_1	1.433	2.42	0.352	1	0.55	4.189
X62_18	-0.3	1.84	0.027	1	0.87	0.741
X62_27	0.449	1.62	0.077	1	0.78	1.567
X73_2_13	-1.392	2.96	0.221	1	0.64	0.249
X73_2_17	-0.128	1.02	0.016	1	0.9	0.88
X73_3_4	-0.523	1.24	0.178	1	0.67	0.593
X82_3_1	2.786	1.76	2.506	1	0.11	16.212
X82_3_2	7.939	2.64	9.047	1	0	2803.667
X91_10_3	7.852	2.65	8.808	1	0	2570.531
X91_10_7	-2.04	1.95	1.095	1	0.3	0.13
X91_11	1.73	2.55	0.461	1	0.5	5.643
X91_11_1	-1.937	1.98	0.957	1	0.33	0.144
X91_8	3.342	1.7	3.873	1	0.05	28.281
Constant	-11.47	7.52	2.326	1	0.13	0

APPENDIX 7.12 BINARY LOGISTIC REGRESSION ANALYSIS RESULTS FOR PREDICTING LOWEST QUARTILE ANNUAL MILEAGE

Lowest mileage quartile (variable codes listed above)	B	S.E.	Wald	df	Sig.	Exp(B)
ACTION	-1.362	1.93	0.5	1	0.48	0.256
ACTION1	1.407	0.89	2.51	1	0.11	4.085
ACTION11	0.797	1.04	0.588	1	0.44	2.218
ACTION2	-2.025	0.86	5.564	1	0.02	0.132
ACTION3	0.135	1.89	0.005	1	0.94	1.145
ACTION5	-1.304	0.82	2.55	1	0.11	0.271
ACTION6	1.997	0.83	5.738	1	0.02	7.366
ACTION8	0.662	1.13	0.341	1	0.56	1.94
ACTION9	4.232	1.92	4.863	1	0.03	68.864
AGE2534	-1.211	2.1	0.334	1	0.56	0.298
AGE3544	-0.866	1.81	0.228	1	0.63	0.421
AGE4554	0.896	1.77	0.257	1	0.61	2.451
AGE5564	1.789	2.06	0.753	1	0.39	5.985
AGE6574	3.949	2.09	3.579	1	0.06	51.862
AGE75	7.878	2.41	10.68	1	0	2639.31
AGENOSAY	-0.571	3.18	0.032	1	0.86	0.565
AIR_AWAR	3.538	1.6	4.869	1	0.03	34.386
BROADSHE	-4.661	1.86	6.289	1	0.01	0.009
CONCER10	0.391	1.17	0.112	1	0.74	1.478
CONCER11	0.78	1.23	0.403	1	0.53	2.182
CONCER12	-5.059	1.7	8.867	1	0	0.006
CONCER13	-1.354	1.06	1.637	1	0.2	0.258
CONCERN1	0.005	1.11	0	1	1	1.005
CONCERN2	-1.015	1.07	0.899	1	0.34	0.362
CONCERN3	-1.322	1.24	1.137	1	0.29	0.267
CONCERN4	2.927	1.13	6.73	1	0.01	18.673
CONCERN5	-2.47	1.17	4.45	1	0.04	0.085
CONCERN6	-0.914	1.11	0.682	1	0.41	0.401
CONCERN7	-1.353	1.09	1.534	1	0.22	0.259
CONCERN8	0.805	1.07	0.571	1	0.45	2.236
CONCERN9	-2.276	1.24	3.398	1	0.07	0.103
EFFECT_U	-0.572	0.93	0.381	1	0.54	0.565
ENV_ORGN	-0.895	1.24	0.517	1	0.47	0.409
FAC_AVER	2.233	1.58	2.008	1	0.16	9.331
FAC_EXCE	9.645	3.32	8.428	1	0	15447.6
FAC_GOOD	3.743	1.77	4.468	1	0.04	42.222
FAC_POOR	2.968	1.66	3.204	1	0.07	19.457
FACNOSAY	2.795	1.88	2.223	1	0.14	16.37
FLOOD_U	0.618	0.92	0.45	1	0.5	1.856
GEN_ALEV	-2.763	1.81	2.325	1	0.13	0.063
GEN_DEGR	-0.629	1.77	0.127	1	0.72	0.533
GEN_VOC	3.582	1.87	3.665	1	0.06	35.942
GENDER	-0.565	0.93	0.369	1	0.54	0.568
GENGCSE	-0.209	1.33	0.025	1	0.88	0.811
GENNOSAY	-6.086	3.04	4.004	1	0.05	0.002
GENOTHER	0.376	1.51	0.062	1	0.8	1.456

Lowest mileage quartile (variable codes listed above)	**B**	**S.E.**	**Wald**	**df**	**Sig.**	**Exp(B)**
GENPOSTG	1.613	1.92	0.708	1	0.4	5.018
HEALTH_F	2.029	0.95	4.576	1	0.03	7.604
HEALTH_U	-2.363	1.06	5.017	1	0.03	0.094
HIGHINC	-2.728	1.56	3.05	1	0.08	0.065
LIBDEM	5.63	1.75	10.41	1	0	278.576
LOWINC	-0.509	1.07	0.227	1	0.63	0.601
MEDINC	-1.47	1.37	1.158	1	0.28	0.23
NEP_2ND	-0.447	1.11	0.162	1	0.69	0.639
NEP_3RD	-0.71	1.23	0.331	1	0.57	0.492
NEP_TOP	0.348	1.27	0.075	1	0.78	1.416
NEWSPA1	1.446	1.45	0.989	1	0.32	4.247
NEWSPA10	1.974	1.61	1.506	1	0.22	7.198
NEWSPA11	0.83	0.85	0.95	1	0.33	2.293
NEWSPA13	1.305	1.55	0.714	1	0.4	3.688
NEWSPA2	1.943	1.3	2.231	1	0.14	6.976
NEWSPA3	3.624	1.68	4.67	1	0.03	37.494
NEWSPA4	3.337	1.48	5.113	1	0.02	28.134
NEWSPA5	5.798	1.51	14.73	1	0	329.633
NEWSPA6	-4.231	1.85	5.212	1	0.02	0.015
NEWSPA7	1.37	1.7	0.649	1	0.42	3.934
NOSAY	-0.873	1.18	0.55	1	0.46	0.418
NOTVIMP	-4.337	1.94	4.995	1	0.03	0.013
NOVOTE	4.96	1.79	7.715	1	0.01	142.524
O11_1	-0.402	1.51	0.071	1	0.79	0.669
O18	2.419	1.74	1.934	1	0.16	11.231
O32_1_20	1.511	1.64	0.852	1	0.36	4.533
O32_3621	-2.924	1.55	3.563	1	0.06	0.054
O32_3634	0.928	2.01	0.214	1	0.64	2.53
O46_10_1	3.876	1.97	3.859	1	0.05	48.212
O46_10_2	-0.335	1.73	0.037	1	0.85	0.715
O46_10_3	-1.37	1.07	1.643	1	0.2	0.254
O46_1312	1.175	1.32	0.794	1	0.37	3.24
O81_12	-1.297	1.29	1.005	1	0.32	0.273
O81_8	-3.575	1.87	3.647	1	0.06	0.028
O91_12	6.633	1.9	12.15	1	0	759.773
O91_19	-5.733	2.69	4.549	1	0.03	0.003
O91_21	-3.9	2.83	1.9	1	0.17	0.02
O92_10	0.898	1.27	0.499	1	0.48	2.454
O92_13	4.482	1.73	6.715	1	0.01	88.401
O92_33	3.399	1.28	7.02	1	0.01	29.932
O92_35	0.803	1.16	0.481	1	0.49	2.232
O92_6	-0.469	1.45	0.105	1	0.75	0.625
O94_7	1.701	0.97	3.092	1	0.08	5.477
O95_1	-2.353	2.23	1.118	1	0.29	0.095
QUITEIMP	-7.205	2.25	10.28	1	0	0.001
RESP_BUS	-5.57	2.1	7.022	1	0.01	0.004
RESP_ENV	-6.658	2.68	6.174	1	0.01	0.001
RESP_IND	0.575	1.33	0.188	1	0.66	1.777
RESP_LOC	-17.8	61.8	0.083	1	0.77	0
RESP_NAT	-2.409	1.3	3.458	1	0.06	0.09
RESP_OTH	1.321	1.18	1.252	1	0.26	3.747
RESPNSAY	-1.687	1.09	2.405	1	0.12	0.185

Lowest mileage quartile (variable codes listed above)	B	S.E.	Wald	df	Sig.	Exp(B)
SCI_ALEV	-2.007	1.64	1.492	1	0.22	0.134
SCI_DEGR	-0.547	1.6	0.117	1	0.73	0.579
SCI_VOCA	4.046	2.19	3.428	1	0.06	57.174
SCIGCSE	0.922	1.29	0.511	1	0.48	2.515
SCINOSAY	1.809	1.58	1.304	1	0.25	6.105
SCIOTHER	-3.02	2.27	1.77	1	0.18	0.049
SCIPOSTG	-1.725	2.5	0.476	1	0.49	0.178
SOURCE1	6.393	1.92	11.07	1	0	597.708
SOURCE10	-2.146	1.01	4.558	1	0.03	0.117
SOURCE11	0.421	1.29	0.108	1	0.74	1.524
SOURCE12	-1.665	1.06	2.47	1	0.12	0.189
SOURCE2	-0.35	0.82	0.181	1	0.67	0.705
SOURCE3	0.513	1.23	0.174	1	0.68	1.67
SOURCE4	1.583	1.28	1.538	1	0.22	4.871
SOURCE5	-1.425	1.12	1.632	1	0.2	0.241
SOURCE6	-1.288	1.02	1.597	1	0.21	0.276
SOURCE7	2.006	1.2	2.811	1	0.09	7.434
SOURCE8	0.534	0.81	0.438	1	0.51	1.705
SOURCE9	5.499	1.66	10.93	1	0	244.365
TABLOID	-3.732	1.69	4.878	1	0.03	0.024
TACKLE	-0.255	1.18	0.046	1	0.83	0.775
TORY	1.454	1.56	0.869	1	0.35	4.281
TRUS_TOP	-0.076	1.05	0.005	1	0.94	0.927
TRUST_2	-0.429	1.14	0.142	1	0.71	0.651
TRUST_3	-1.296	1.03	1.573	1	0.21	0.274
UNC_2ND	0.607	1.14	0.282	1	0.6	1.836
UNC_3RD	1.459	1.23	1.404	1	0.24	4.302
UNC_TOP	-0.7	1.4	0.249	1	0.62	0.497
VALU_2ND	-1.155	0.98	1.39	1	0.24	0.315
VALU_3RD	1.71	0.96	3.202	1	0.07	5.531
VALU_TOP	3.599	1.43	6.317	1	0.01	36.564
VALUE4_1	0.699	0.41	2.927	1	0.09	2.012
VERSION	-1.937	0.86	5.075	1	0.02	0.144
VERYIMP	-6.43	2.19	8.601	1	0	0.002
VHIGHINC	-3.835	1.97	3.782	1	0.05	0.022
VOTEUNS	0.197	3.08	0.004	1	0.95	1.218
VOTNOSAY	3.763	1.66	5.159	1	0.02	43.093
VOTOTHER	6.359	2.83	5.047	1	0.03	577.908
WARD_B	-0.471	1.33	0.125	1	0.72	0.624
WARD_F	1.09	1.19	0.845	1	0.36	2.973
WARD_H	-0.825	1.64	0.252	1	0.62	0.438
WARD_I	2.906	1.65	3.121	1	0.08	18.292
WARD_N	1.405	1.23	1.303	1	0.25	4.074
WARDNSAY	3.687	2.06	3.197	1	0.07	39.907
WEATHERC	2.298	1.05	4.809	1	0.03	9.959
X22_1	2.405	1.73	1.934	1	0.16	11.075
X22_16	-0.551	1.3	0.18	1	0.67	0.576
X22_5	2.19	2.23	0.966	1	0.33	8.933
X24	-3.044	1.55	3.862	1	0.05	0.048
X51	1.767	1.73	1.04	1	0.31	5.851
X51_2_1	-2.808	1.81	2.399	1	0.12	0.06
X51_5	1.822	1.49	1.492	1	0.22	6.182

Lowest mileage quartile (variable codes listed above)	**B**	**S.E.**	**Wald**	**df**	**Sig.**	**Exp(B)**
X51_6	-0.807	1.73	0.217	1	0.64	0.446
X51_7	-3.676	2.96	1.542	1	0.21	0.025
X51_8	-2.412	1.31	3.396	1	0.07	0.09
X53	2.901	1.12	6.736	1	0.01	18.19
X53_12	0.382	0.98	0.153	1	0.7	1.465
X53_15	2.591	1.78	2.121	1	0.15	13.342
X53_16	-3.165	2	2.498	1	0.11	0.042
X53_17	-0.965	1.75	0.306	1	0.58	0.381
X53_18	-2.109	2.25	0.878	1	0.35	0.121
X53_20	-7.842	2.71	8.351	1	0	0
X53_36	2.066	1.98	1.091	1	0.3	7.896
X53_38	-1.884	1.81	1.08	1	0.3	0.152
X53_44	1.553	1.86	0.698	1	0.4	4.727
X53_4535	0.061	1.78	0.001	1	0.97	1.063
X53_7	-7.881	2.55	9.546	1	0	0
X55	-0.338	1.44	0.055	1	0.82	0.713
X61_1	5.889	1.78	11.01	1	0	361.164
X62	0.597	1.53	0.151	1	0.7	1.816
X62_1	-0.471	1.92	0.06	1	0.81	0.624
X62_18	-1.427	1.65	0.746	1	0.39	0.24
X62_27	2.318	1.99	1.362	1	0.24	10.158
X63	-1.249	1.47	0.719	1	0.4	0.287
X63_8	-0.325	1.36	0.058	1	0.81	0.722
X64	2.236	2.61	0.736	1	0.39	9.353
X73_2_13	-3.03	1.98	2.336	1	0.13	0.048
X73_2_17	-0.113	1.05	0.012	1	0.91	0.893
X73_2_7	-2.261	1.21	3.507	1	0.06	0.104
X81	-1.303	1.56	0.702	1	0.4	0.272
X81_15	-8.568	3.67	5.46	1	0.02	0
X82	1.035	1.17	0.777	1	0.38	2.815
X82_14	-2.123	2.24	0.896	1	0.34	0.12
X82_20	-8.172	2.54	10.37	1	0	0
X82_22	4.516	1.49	9.247	1	0	91.432
X82_26	-4.558	1.68	7.352	1	0.01	0.01
X82_3_1	6.058	2.02	8.958	1	0	427.551
X82_3_2	-0.547	2.28	0.058	1	0.81	0.579
X91_10_3	1.351	2.65	0.261	1	0.61	3.862
X91_10_7	1.254	1.91	0.433	1	0.51	3.503
X91_11	-4.849	2.2	4.871	1	0.03	0.008
X91_11_1	1.076	1.55	0.482	1	0.49	2.933
X91_8	0.3	1.51	0.04	1	0.84	1.349
Constant	-17.93	5.57	10.36	1	0	0

APPENDIX 7.13 BINARY LOGISTIC REGRESSION ANALYSIS RESULTS FOR PREDICTING OTHER ENVIRONMENTALLY-RELEVANT ACTIONS

Binary logistic regression analyses were conducted to determine the influences on other environmental actions (i.e. not energy reduction).

- The first dependent variable distinguishes those respondents who claim, in question 26 (see Appendix 4.2), to **regularly buy organic food** (1 indicating regular action, N=250; 0 indicating no regular action, N=324). The results are based on an analysis of 574 cases (97.5%; 2.5% of cases were excluded due to missing data), which predicts 89.7% of cases (87.2% of 'regular action' cases, and 91.7% of 'no regular action' cases).
- The second dependent variable examined distinguishes those respondents who claim, in question 26, to **regularly recycle glass** (1 indicating regular action, N=492; 0 indicating no regular action, N=82). The results are based on an analysis of 574 cases (97.5%; 2.5% of cases were excluded due to missing data). This model predicts 96.3% of cases (98.8% of 'regular action' cases, and 81.7% of 'no regular action' cases).
- The third dependent variable distinguishes those respondents who claim, in question 26, to **regularly recycle other (non-glass) items** (1 indicating regular action, N=535; 0 indicating no regular action, N=39). The results are based on an analysis of 574 cases (97.5% of all cases; 2.5% of cases were excluded due to missing data), which predicts 98.4% of cases (99.3% of 'regular action' cases, and 87.2% of 'no regular action' cases).
- The fourth dependent variable distinguishes those respondents who claim, in question 26, to **regularly take part in an environmental campaign** (1 indicating regular action, N=101; 0 indicating no regular action, N=473). The results are based on an analysis of 574 cases (97.5%; 2.5% of cases were excluded due to missing data), which predicts 97.2% of cases (90.1% of 'regular action' cases, and 98.7% of 'no regular action' cases).

The output from these regression analyses are presented below:

1) Regularly buy organic food

	B	S.E.	Wald	df	Sig.	Exp(B)
ACTION	4.428	1.759	6.339	1	.012	83.771
ACTION1	-1.329	.903	2.165	1	.141	.265
ACTION11	7.906	1.688	21.923	1	.000	2713.074
ACTION2	4.101	1.183	12.010	1	.001	60.376
ACTION3	-2.542	1.660	2.343	1	.126	.079
ACTION5	4.371	1.179	13.751	1	.000	79.094
ACTION8	1.203	1.377	.762	1	.383	3.329
ACTION9	-3.670	1.864	3.879	1	.049	.025
AGE2534	10.573	3.244	10.624	1	.001	39054.704
AGE3544	9.074	2.916	9.682	1	.002	8728.168
AGE4554	13.128	3.319	15.647	1	.000	502768.614
AGE5564	14.556	3.695	15.520	1	.000	2096318.461
AGE6574	10.749	3.166	11.524	1	.001	46580.863
AGE75	18.122	4.386	17.071	1	.000	74177546.783
AGENOSAY	18.220	4.872	13.986	1	.000	81808880.787
AIR_AWAR	-2.717	.956	8.084	1	.004	.066
BROADSHE	-2.778	1.738	2.555	1	.110	.062
CAR_OWN	4.045	1.659	5.947	1	.015	57.120
CONCER10	-1.748	1.313	1.773	1	.183	.174
CONCER11	-4.071	1.457	7.806	1	.005	.017
CONCER12	2.633	1.514	3.023	1	.082	13.910
CONCER13	1.299	1.340	.940	1	.332	3.664
CONCERN1	1.397	1.169	1.429	1	.232	4.044
CONCERN2	2.831	1.261	5.041	1	.025	16.955
CONCERN3	-2.631	1.353	3.782	1	.052	.072
CONCERN4	-1.348	1.211	1.238	1	.266	.260
CONCERN5	-2.778	1.328	4.377	1	.036	.062
CONCERN6	2.277	1.205	3.571	1	.059	9.747
CONCERN7	8.201	1.919	18.261	1	.000	3644.204
CONCERN8	-3.836	1.477	6.746	1	.009	.022
CONCERN9	2.885	1.354	4.537	1	.033	17.897
Constant	-22.081	6.836	10.433	1	.001	.000
EFFECT_U	-4.653	1.303	12.752	1	.000	.010
ENV_ORGN	4.459	1.424	9.802	1	.002	86.406
FAC_AVER	2.027	1.256	2.605	1	.107	7.593
FAC_EXCE	-6.387	3.641	3.078	1	.079	.002
FAC_GOOD	.738	1.570	.221	1	.638	2.092
FAC_POOR	.245	1.328	.034	1	.853	1.278
FACNOSAY	-1.032	1.327	.604	1	.437	.356
FLOOD_U	-2.118	.975	4.720	1	.030	.120
GEN_ALEV	5.588	1.956	8.163	1	.004	267.257
GEN_DEGR	14.676	3.351	19.185	1	.000	2363199.513
GEN_VOC	7.855	2.364	11.035	1	.001	2577.336
GENDER	-2.948	.999	8.702	1	.003	.052
GENGCSE	7.074	2.121	11.120	1	.001	1181.040
GENNOSAY	-10.485	4.219	6.176	1	.013	.000
GENOTHER	-5.887	1.816	10.505	1	.001	.003
GENPOSTG	12.164	3.224	14.235	1	.000	191763.065
HEALTH_F	-.440	.824	.285	1	.594	.644
HEALTH_U	.603	1.114	.293	1	.588	1.827
HIGHINC	5.425	2.217	5.990	1	.014	226.956
LIBDEM	-6.172	1.665	13.739	1	.000	.002
LOWINC	4.245	1.353	9.848	1	.002	69.737
MEDINC	7.405	2.087	12.593	1	.000	1644.271
MILE_2ND	-1.967	1.135	3.000	1	.083	.140
MILE_3RD	-8.720	2.109	17.096	1	.000	.000
MILE_TOP	-7.361	1.883	15.276	1	.000	.001
MILNOSAY	-8.288	2.345	12.489	1	.000	.000
NEP_2ND	3.789	1.265	8.974	1	.003	44.230
NEP_3RD	5.288	1.584	11.139	1	.001	197.864
NEP_TOP	3.633	1.486	5.981	1	.014	37.824
NEWSPA1	.316	1.349	.055	1	.815	1.371
NEWSPA10	-.566	1.427	.157	1	.692	.568

	B	S.E.	Wald	df	Sig.	Exp(B)
NEWSPA11	-.147	.660	.049	1	.824	.863
NEWSPA13	6.385	1.744	13.397	1	.000	592.701
NEWSPA2	-5.222	1.719	9.232	1	.002	.005
NEWSPA3	6.684	1.974	11.466	1	.001	799.723
NEWSPA4	.155	1.466	.011	1	.916	1.167
NEWSPA5	-4.712	1.480	10.139	1	.001	.009
NEWSPA6	15.295	3.531	18.765	1	.000	4392763.321
NEWSPA7	8.237	2.419	11.599	1	.001	3780.050
NOSAY	5.857	1.659	12.467	1	.000	349.631
NOTVIMP	-1.595	1.888	.714	1	.398	.203
NOVOTE	-5.480	1.731	10.019	1	.002	.004
O11_1	-3.324	1.766	3.542	1	.060	.036
O11_10	.740	1.174	.398	1	.528	2.097
O12_5	-.928	1.205	.594	1	.441	.395
O12_7	4.502	1.721	6.846	1	.009	90.212
O16_15	.046	.919	.003	1	.960	1.047
O16_22	.876	1.313	.445	1	.505	2.401
O16_24	-4.438	1.793	6.125	1	.013	.012
O16_27	-1.093	1.995	.300	1	.584	.335
O18	-7.375	2.400	9.446	1	.002	.001
O32_1_20	-2.311	1.798	1.652	1	.199	.099
O32_16	2.580	1.955	1.743	1	.187	13.202
O32_17	-13.245	3.359	15.548	1	.000	.000
O32_23	-.506	1.807	.078	1	.779	.603
O32_33	7.247	2.116	11.735	1	.001	1404.560
O32_3621	-1.845	1.940	.905	1	.342	.158
O32_3634	3.923	2.541	2.384	1	.123	50.539
O33_2	-.557	.846	.433	1	.510	.573
O33_3	-4.316	1.905	5.131	1	.023	.013
O33_4	-2.482	1.941	1.636	1	.201	.084
O33_5	4.386	2.596	2.855	1	.091	80.335
O46_10_1	1.926	2.067	.868	1	.351	6.864
O46_10_2	-7.623	2.488	9.390	1	.002	.000
O46_10_3	.071	.779	.008	1	.928	1.073
O46_10_9	-2.670	2.596	1.058	1	.304	.069
O46_13_2	-4.239	1.539	7.587	1	.006	.014
O46_1310	2.536	1.687	2.259	1	.133	12.630
O46_1312	1.313	1.536	.730	1	.393	3.717
O46_5_1	4.664	2.370	3.871	1	.049	106.056
O46_5_2	.887	2.313	.147	1	.701	2.428
O46_5_7	-1.066	1.111	.919	1	.338	.345
O91_12	-4.986	2.128	5.489	1	.019	.007
O92_13	-2.104	1.404	2.247	1	.134	.122
O92_33	-.112	1.135	.010	1	.921	.894
O92_35	-3.463	1.374	6.350	1	.012	.031
O92_6	-4.520	1.893	5.700	1	.017	.011
O94_7	.507	.864	.345	1	.557	1.661
O95_1	10.442	2.899	12.969	1	.000	34252.562
QUITEIMP	.967	1.937	.249	1	.618	2.631
RESP_BUS	5.448	1.745	9.746	1	.002	232.341
RESP_ENV	5.669	2.540	4.983	1	.026	289.743
RESP_IND	.014	1.897	.000	1	.994	1.014
RESP_LOC	-15.974	59.838	.071	1	.790	.000
RESP_NAT	5.098	1.483	11.818	1	.001	163.751
RESP_OTH	2.713	1.566	3.000	1	.083	15.072
RESPNSAY	1.754	1.198	2.145	1	.143	5.777
SCI_ALEV	-.613	1.454	.178	1	.673	.542
SCI_DEGR	-6.600	1.998	10.909	1	.001	.001
SCI_VOCA	-5.113	2.646	3.734	1	.053	.006
SCIGCSE	-.726	1.014	.513	1	.474	.484
SCINOSAY	-3.208	1.700	3.562	1	.059	.040
SCIOTHER	-14.033	4.780	8.617	1	.003	.000
SCIPOSTG	-10.602	2.942	12.989	1	.000	.000
SOURCE1	-3.404	1.721	3.914	1	.048	.033
SOURCE10	.380	.895	.180	1	.671	1.462
SOURCE11	-4.750	1.742	7.433	1	.006	.009

	B	S.E.	Wald	df	Sig.	Exp(B)
SOURCE12	-1.267	1.057	1.436	1	.231	.282
SOURCE2	1.825	.938	3.784	1	.052	6.203
SOURCE3	2.731	1.174	5.411	1	.020	15.342
SOURCE4	.578	1.193	.234	1	.628	1.782
SOURCE5	1.459	1.179	1.533	1	.216	4.303
SOURCE6	1.180	.823	2.055	1	.152	3.255
SOURCE7	-1.766	1.212	2.122	1	.145	.171
SOURCE8	-.073	.777	.009	1	.925	.929
SOURCE9	-2.629	1.734	2.300	1	.129	.072
TABLOID	7.032	2.034	11.950	1	.001	1132.362
TACKLE	2.722	1.226	4.932	1	.026	15.214
TORY	-7.069	1.795	15.503	1	.000	.001
TRUS_TOP	2.035	1.184	2.952	1	.086	7.650
TRUST_2	.278	1.010	.076	1	.783	1.321
TRUST_3	4.916	1.375	12.789	1	.000	136.434
UNC_2ND	-4.378	1.464	8.949	1	.003	.013
UNC_3RD	-.586	1.168	.251	1	.616	.557
UNC_TOP	-1.217	1.451	.703	1	.402	.296
VALU_2ND	-.923	.930	.985	1	.321	.397
VALU_3RD	4.252	1.201	12.543	1	.000	70.276
VALU_TOP	.338	1.189	.081	1	.776	1.402
VALUE4_1	-.760	.370	4.209	1	.040	.468
VERSION	1.910	.867	4.853	1	.028	6.755
VERYIMP	4.843	2.609	3.445	1	.063	126.817
VHIGHINC	16.476	3.710	19.725	1	.000	14304647.388
VOTEUNS	-4.127	2.289	3.250	1	.071	.016
VOTNOSAY	-7.871	1.988	15.678	1	.000	.000
VOTOTHER	4.896	5.133	.909	1	.340	133.700
WARD_B	-.636	1.054	.364	1	.546	.529
WARD_F	-.383	1.239	.095	1	.758	.682
WARD_H	2.816	1.542	3.336	1	.068	16.717
WARD_I	1.248	1.496	.697	1	.404	3.485
WARD_N	-.368	1.215	.092	1	.762	.692
WARDNSAY	-5.654	2.406	5.522	1	.019	.004
WEATHERC	-3.515	1.234	8.117	1	.004	.030
X22_1	2.122	1.748	1.473	1	.225	8.349
X22_11	5.974	2.151	7.713	1	.005	393.248
X22_13	4.041	2.259	3.200	1	.074	56.883
X22_16	6.656	1.833	13.190	1	.000	777.661
X22_22	11.277	2.721	17.173	1	.000	78958.551
X22_5	-2.908	2.031	2.050	1	.152	.055
X24	3.143	1.590	3.907	1	.048	23.171
X51	-3.461	1.800	3.695	1	.055	.031
X51_2_1	10.916	2.494	19.163	1	.000	55061.614
X51_5	-1.335	1.186	1.268	1	.260	.263
X51_6	-3.333	1.895	3.091	1	.079	.036
X51_7	.377	1.949	.037	1	.847	1.458
X51_8	-4.851	1.748	7.698	1	.006	.008
X53_12	-2.102	1.115	3.555	1	.059	.122
X53_15	-3.101	1.706	3.305	1	.069	.045
X53_16	.890	1.797	.245	1	.620	2.435
X53_17	-4.630	2.793	2.748	1	.097	.010
X53_18	-5.528	2.303	5.760	1	.016	.004
X53_20	11.585	3.161	13.434	1	.000	107420.768
X53_36	1.841	2.495	.544	1	.461	6.303
X53_38	3.163	1.757	3.241	1	.072	23.631
X53_44	.840	1.893	.197	1	.657	2.317
X53_4535	.646	1.785	.131	1	.717	1.909
X53_7	-8.819	2.493	12.517	1	.000	.000
X62	-3.561	1.610	4.890	1	.027	.028
X62_1	-3.752	3.066	1.497	1	.221	.023
X62_18	-5.296	2.241	5.585	1	.018	.005
X62_27	.291	2.352	.015	1	.902	1.338
X63	.215	1.879	.013	1	.909	1.239
X73_2_13	-.725	3.208	.051	1	.821	.484
X73_2_17	-1.391	.885	2.470	1	.116	.249

	B	S.E.	Wald	df	Sig.	Exp(B)
X73_2_7	-2.708	1.342	4.068	1	.044	.067
X73_3_4	1.369	1.041	1.729	1	.189	3.931
X81_15	-1.608	2.277	.499	1	.480	.200
X82_20	3.296	1.509	4.771	1	.029	27.010
X82_22	-3.517	1.377	6.529	1	.011	.030
X82_26	2.799	1.523	3.377	1	.066	16.426
X82_3_1	-3.169	1.973	2.580	1	.108	.042
X82_3_2	-4.157	2.649	2.462	1	.117	.016
X91_10_3	-6.935	3.180	4.757	1	.029	.001
X91_10_7	-11.513	2.679	18.474	1	.000	.000
X91_11	2.694	1.881	2.050	1	.152	14.784
X91_11_1	-5.810	2.054	8.005	1	.005	.003
X91_8	-1.239	1.413	.769	1	.380	.290

2) Regularly recycle glass

	B	S.E.	Wald	df	Sig.	Exp(B)
ACTION	36.250	19.470	3.466	1	.063	5537224767306150.000
ACTION1	9.582	5.001	3.670	1	.055	14497.455
ACTION11	11.663	6.011	3.764	1	.052	116248.954
ACTION2	10.701	5.371	3.969	1	.046	44394.281
ACTION3	8.882	7.108	1.561	1	.211	7203.647
ACTION5	13.803	6.326	4.761	1	.029	987930.986
ACTION6	-2.897	2.386	1.474	1	.225	.055
ACTION9	46.612	20.762	5.040	1	.025	175054946439571900000
AGE2534	-28.755	14.374	4.002	1	.045	.000
AGE3544	-30.013	14.370	4.362	1	.037	.000
AGE4554	-17.529	9.540	3.376	1	.066	.000
AGE5564	-33.573	15.923	4.446	1	.035	.000
AGE6574	-10.578	6.464	2.678	1	.102	.000
AGE75	-11.024	8.107	1.849	1	.174	.000
AGENOSAY	15.306	434.384	.001	1	.972	4439104.732
AIR_AWAR	-7.303	4.663	2.453	1	.117	.001
BROADSHE	13.613	6.477	4.418	1	.036	817011.389
CAR_OWN	15.862	8.391	3.573	1	.059	7742731.444
CONCER10	14.451	7.091	4.153	1	.042	1887926.751
CONCERN1	-10.346	5.311	3.795	1	.051	.000
CONCERN4	6.975	4.269	2.669	1	.102	1069.081
CONCERN5	27.975	13.175	4.509	1	.034	1410875778599.677
CONCERN8	-8.849	5.362	2.723	1	.099	.000
Constant	31.387	19.513	2.587	1	.108	42762086074040.850
EFFECT_U	-12.862	6.138	4.391	1	.036	.000
ENV_ORGN	-19.256	8.487	5.148	1	.023	.000
FAC_AVER	-3.273	3.446	.902	1	.342	.038
FAC_EXCE	-29.557	15.494	3.639	1	.056	.000
FAC_GOOD	-18.801	9.011	4.353	1	.037	.000
FAC_POOR	-9.849	5.799	2.884	1	.089	.000
FACNOSAY	.600	4.094	.021	1	.884	1.822
FLOOD_U	10.554	5.682	3.450	1	.063	38336.633
GEN_ALEV	1.945	3.674	.280	1	.596	6.997
GEN_DEGR	11.521	7.122	2.617	1	.106	100860.364
GEN_VOC	34.117	15.319	4.960	1	.026	655635724209818.000
GENDER	1.041	2.581	.163	1	.687	2.833
GENGCSE	-2.190	4.325	.256	1	.613	.112
GENNOSAY	31.962	412.481	.006	1	.938	76055471982512.500
GENOTHER	-1.929	8.124	.056	1	.812	.145
GENPOSTG	3.898	5.478	.506	1	.477	49.284
HEALTH_F	12.825	6.395	4.021	1	.045	371245.670
HEALTH_U	-24.850	11.405	4.748	1	.029	.000
HIGHINC	-1.939	6.003	.104	1	.747	.144
LIBDEM	.105	2.604	.002	1	.968	1.111
LOWINC	-7.902	5.478	2.081	1	.149	.000
MEDINC	-5.054	4.877	1.074	1	.300	.006
MILE_2ND	19.571	9.615	4.144	1	.042	316069039.026

	B	S.E.	Wald	df	Sig.	Exp(B)
MILE_3RD	7.708	4.482	2.958	1	.085	2226.751
MILE_TOP	-1.295	3.116	.173	1	.678	.274
NEP_2ND	1.786	2.612	.467	1	.494	5.963
NEP_3RD	11.405	6.005	3.608	1	.058	89801.822
NEP_TOP	10.618	5.009	4.494	1	.034	40867.189
NEWSPA1	-21.213	10.254	4.280	1	.039	.000
NEWSPA10	-.463	4.399	.011	1	.916	.630
NEWSPA11	-2.525	2.288	1.218	1	.270	.080
NEWSPA13	-19.477	10.778	3.265	1	.071	.000
NEWSPA2	22.204	10.501	4.471	1	.034	4397778840.926
NEWSPA3	-7.423	4.611	2.591	1	.107	.001
NEWSPA4	-21.899	10.420	4.417	1	.036	.000
NEWSPA5	-8.206	5.689	2.080	1	.149	.000
NEWSPA6	-24.746	11.623	4.533	1	.033	.000
NEWSPA7	-12.707	6.622	3.682	1	.055	.000
NOSAY	-18.219	10.135	3.232	1	.072	.000
NOTVIMP	-2.803	5.790	.234	1	.628	.061
NOVOTE	7.554	4.692	2.592	1	.107	1908.970
O16_15	15.224	7.860	3.751	1	.053	4088219.936
O16_5	-2.488	2.803	.787	1	.375	.083
O18	15.602	8.848	3.109	1	.078	5966545.069
O33_2	15.587	7.402	4.434	1	.035	5879250.960
O33_3	14.802	8.270	3.203	1	.073	2681559.842
O46_10_1	3.793	5.244	.523	1	.469	44.391
O46_10_3	12.959	6.922	3.505	1	.061	424564.558
O92_13	-9.684	5.676	2.911	1	.088	.000
O92_35	5.010	5.130	.954	1	.329	149.864
O92_6	-19.549	10.149	3.710	1	.054	.000
O94_7	-30.867	14.153	4.757	1	.029	.000
O95_1	-24.041	12.506	3.696	1	.055	.000
QUITEIMP	-11.883	7.699	2.382	1	.123	.000
RESP_BUS	50.240	27.571	3.320	1	.068	6591879770216210000000
RESP_ENV	-3.361	3.759	.799	1	.371	.035
RESP_IND	17.990	9.887	3.311	1	.069	65013629.386
RESP_LOC	-18.034	10.634	2.876	1	.090	.000
RESP_NAT	5.820	4.348	1.792	1	.181	337.078
RESP_OTH	14.633	7.045	4.314	1	.038	2264201.936
RESPNSAY	-7.685	4.630	2.755	1	.097	.000
SCI_ALEV	-12.748	6.446	3.911	1	.048	.000
SCI_DEGR	-11.269	5.930	3.611	1	.057	.000
SCI_VOCA	52.175	25.359	4.233	1	.040	45626939596713400000000
SCIGCSE	-15.672	7.389	4.498	1	.034	.000
SCINOSAY	23.670	11.990	3.897	1	.048	19044349397.147
SCIOTHER	-7.195	7.088	1.030	1	.310	.001
SCIPOSTG	-40.937	19.231	4.531	1	.033	.000
SOURCE1	-5.287	3.899	1.838	1	.175	.005
SOURCE10	-6.934	3.522	3.877	1	.049	.001
SOURCE11	11.498	9.611	1.431	1	.232	98539.041
SOURCE12	-5.240	3.194	2.691	1	.101	.005
SOURCE2	9.642	4.758	4.106	1	.043	15401.929
SOURCE3	-6.813	4.683	2.116	1	.146	.001
SOURCE4	18.612	10.732	3.007	1	.083	121079087.352
SOURCE5	17.556	8.231	4.550	1	.033	42138279.989
SOURCE6	10.251	5.321	3.711	1	.054	28305.595
SOURCE7	-13.652	7.117	3.679	1	.055	.000
SOURCE8	-10.529	6.186	2.897	1	.089	.000
SOURCE9	-2.368	8.795	.073	1	.788	.094
TABLOID	-14.009	8.914	2.470	1	.116	.000
TACKLE	-24.231	11.797	4.219	1	.040	.000
TORY	-10.423	6.144	2.878	1	.090	.000
TRUS_TOP	-15.461	7.025	4.844	1	.028	.000
TRUST_2	-8.229	4.913	2.805	1	.094	.000
TRUST_3	-.675	3.593	.035	1	.851	.509
UNC_2ND	.174	2.304	.006	1	.940	1.190
UNC_3RD	3.365	3.606	.871	1	.351	28.942
UNC_TOP	-7.623	4.787	2.536	1	.111	.000

	B	S.E.	Wald	df	Sig.	Exp(B)
VALU_2ND	.599	3.659	.027	1	.870	1.820
VALU_3RD	-.018	2.682	.000	1	.995	.982
VALU_TOP	-4.969	4.925	1.018	1	.313	.007
VALUE4_1	.935	1.005	.866	1	.352	2.548
VERYIMP	.313	5.432	.003	1	.954	1.368
VHIGHINC	-8.019	6.409	1.565	1	.211	.000
VOTEUNS	12.634	7.013	3.245	1	.072	306948.617
VOTOTHER	-16.376	11.018	2.209	1	.137	.000
WARD_B	-10.741	5.679	3.577	1	.059	.000
WARD_F	-18.240	8.537	4.565	1	.033	.000
WARD_H	-35.700	16.036	4.956	1	.026	.000
WARD_I	-16.439	8.780	3.506	1	.061	.000
WARD_N	-19.075	8.626	4.891	1	.027	.000
WARDNSAY	29.408	16.458	3.193	1	.074	5909499447737.950
WEATHERC	-8.209	4.182	3.854	1	.050	.000
X24	7.178	4.485	2.561	1	.110	1310.215
X53_12	5.943	4.108	2.093	1	.148	381.159
X53_20	-24.031	10.429	5.310	1	.021	.000
X53_36	5.489	8.444	.423	1	.516	242.131
X53_44	-16.766	7.723	4.713	1	.030	.000
X62_18	-4.690	5.707	.675	1	.411	.009
X63_8	-6.996	7.899	.785	1	.376	.001
X64	-30.076	16.992	3.133	1	.077	.000
X73_2_17	-3.490	2.604	1.796	1	.180	.030
X91_10_7	-19.035	8.384	5.155	1	.023	.000
X91_8	1.082	5.316	.041	1	.839	2.949

3) Regularly recycle other items

	B	S.E.	Wald	df	Sig.	Exp(B)
ACTION	.262	2.043	.017	1	.898	1.300
ACTION1	4.788	2.190	4.779	1	.029	120.094
ACTION11	9.982	5.242	3.626	1	.057	21623.137
ACTION2	-.994	2.242	.196	1	.658	.370
ACTION3	4.632	3.006	2.374	1	.123	102.692
ACTION5	6.251	2.486	6.322	1	.012	518.586
ACTION6	-.270	1.646	.027	1	.870	.763
ACTION8	8.983	2.885	9.696	1	.002	7970.118
AGE2534	-.409	2.643	.024	1	.877	.664
AGE3544	-3.276	2.941	1.241	1	.265	.038
AGE4554	-1.434	2.955	.236	1	.627	.238
AGE5564	2.142	3.497	.375	1	.540	8.520
AGE6574	3.461	3.228	1.150	1	.284	31.840
AGE75	11.054	6.077	3.308	1	.069	63197.983
AGENOSAY	15.610	156.906	.010	1	.921	6013848.901
CAR_OWN	3.833	2.560	2.243	1	.134	46.213
Constant	-9.263	5.640	2.698	1	.100	.000
EFFECT_U	-2.211	1.683	1.724	1	.189	.110
ENV_ORGN	-.410	2.801	.021	1	.884	.664
FLOOD_U	-3.868	2.964	1.703	1	.192	.021
GENDER	2.779	1.691	2.702	1	.100	16.111
HEALTH_F	.802	1.819	.194	1	.659	2.230
HEALTH_U	1.102	2.305	.229	1	.632	3.011
HIGHINC	4.093	2.989	1.875	1	.171	59.892
LIBDEM	-7.609	3.322	5.247	1	.022	.000
LOWINC	-1.926	2.676	.518	1	.472	.146
MEDINC	3.094	2.731	1.284	1	.257	22.072
MILE_2ND	1.732	3.071	.318	1	.573	5.653
MILE_3RD	-2.480	1.822	1.852	1	.173	.084
MILE_TOP	-.731	2.133	.117	1	.732	.481
NEP_2ND	-2.069	2.001	1.070	1	.301	.126
NEP_3RD	-3.893	2.262	2.962	1	.085	.020
NEP_TOP	-1.508	1.778	.719	1	.396	.221
NOSAY	-3.499	3.518	.989	1	.320	.030

	B	S.E.	Wald	df	Sig.	Exp(B)
NOTVIMP	2.568	2.584	.987	1	.320	13.038
NOVOTE	-4.103	2.360	3.023	1	.082	.017
O18	2.129	3.100	.471	1	.492	8.403
O46_10_1	-.463	3.925	.014	1	.906	.630
O92_13	22.747	84.299	.073	1	.787	7566683123.587
O94_7	-.011	1.620	.000	1	.994	.989
QUITEIMP	4.286	2.678	2.561	1	.110	72.682
SCI_ALEV	-9.279	4.486	4.278	1	.039	.000
SCI_DEGR	-7.575	4.361	3.018	1	.082	.001
SCI_VOCA	-16.104	6.424	6.285	1	.012	.000
SCIGCSE	-4.971	3.021	2.708	1	.100	.007
SCINOSAY	-4.258	4.280	.989	1	.320	.014
SCIOTHER	-6.675	117.708	.003	1	.955	.001
SCIPOSTG	-7.039	4.855	2.102	1	.147	.001
TACKLE	1.379	1.536	.806	1	.369	3.971
TORY	-6.236	2.841	4.820	1	.028	.002
VALU_2ND	-1.429	1.505	.903	1	.342	.239
VALU_3RD	12.507	6.852	3.331	1	.068	270124.640
VALU_TOP	2.954	2.647	1.246	1	.264	19.186
VERYIMP	8.145	4.166	3.822	1	.051	3445.399
VHIGHINC	1.052	2.708	.151	1	.698	2.863
VOTEUNS	5.766	82.113	.005	1	.944	319.388
VOTNOSAY	-6.013	3.273	3.375	1	.066	.002
VOTOTHER	12.244	130.415	.009	1	.925	207785.536
WARD_B	4.330	2.861	2.290	1	.130	75.934
WARD_F	6.635	3.048	4.738	1	.030	761.324
WARD_H	9.434	4.053	5.417	1	.020	12501.122
WARD_I	-.606	2.430	.062	1	.803	.545
WARD_N	5.523	3.517	2.466	1	.116	250.431
WARDNSAY	1.413	4.219	.112	1	.738	4.107
WEATHERC	.276	2.272	.015	1	.903	1.318
X24	1.153	2.883	.160	1	.689	3.167
X53_20	9.615	4.635	4.303	1	.038	14988.394
X53_36	-9.821	5.826	2.841	1	.092	.000
X53_44	-5.689	3.541	2.581	1	.108	.003
X62_18	23.624	70.624	.112	1	.738	18179566162.377
X73_2_17	2.439	1.763	1.914	1	.167	11.459
X91_10_7	-.176	2.001	.008	1	.930	.839

4) Regularly take part in an environmental campaign

	B	S.E.	Wald	df	Sig.	Exp(B)
ACTION	-.377	3.832	.010	1	.922	.686
ACTION1	21.382	11.006	3.774	1	.052	1932375882.006
ACTION2	33.875	17.922	3.573	1	.059	515152496873269
ACTION3	-48.650	27.502	3.129	1	.077	.000
ACTION5	33.187	17.360	3.655	1	.056	258715366620691.6
ACTION6	30.512	17.224	3.138	1	.076	17839424185464.870
ACTION8	30.532	17.416	3.074	1	.080	18197205846003.580
ACTION9	40.164	21.047	3.642	1	.056	277465753973662700
AGE2534	-32.894	17.603	3.492	1	.062	.000
AGE3544	-23.091	13.708	2.838	1	.092	.000
AGE4554	-29.627	15.932	3.458	1	.063	.000
AGE5564	-32.702	18.805	3.024	1	.082	.000
AGE6574	-22.517	13.229	2.897	1	.089	.000
AGE75	-30.301	18.190	2.775	1	.096	.000
AGENOSAY	-15.497	10.911	2.017	1	.156	.000
AIR_AWAR	-15.571	7.650	4.143	1	.042	.000
CAR_OWN	1.780	5.176	.118	1	.731	5.929
CONCER10	-47.823	26.743	3.198	1	.074	.000
CONCER11	-23.632	13.176	3.217	1	.073	.000
CONCER12	-22.368	14.093	2.519	1	.112	.000
CONCER13	-17.742	11.130	2.541	1	.111	.000
CONCERN1	-17.080	10.581	2.606	1	.106	.000

	B	S.E.	Wald	df	Sig.	Exp(B)
CONCERN2	-20.066	11.373	3.113	1	.078	.000
CONCERN3	-12.744	8.209	2.410	1	.121	.000
CONCERN4	-32.216	17.774	3.285	1	.070	.000
CONCERN5	6.562	4.616	2.021	1	.155	707.966
CONCERN6	2.039	3.418	.356	1	.551	7.685
CONCERN7	-25.546	15.124	2.853	1	.091	.000
CONCERN8	-6.935	6.662	1.084	1	.298	.001
CONCERN9	.962	5.198	.034	1	.853	2.618
Constant	-111.622	60.162	3.442	1	.064	.000
EFFECT_U	9.499	6.270	2.295	1	.130	13347.622
ENV_ORGN	35.298	18.179	3.770	1	.052	2137346317109449
FLOOD_U	34.078	18.390	3.434	1	.064	630776620930162
GENDER	13.870	7.275	3.635	1	.057	1056052.363
HEALTH_F	-15.937	8.602	3.432	1	.064	.000
HEALTH_U	21.244	11.528	3.396	1	.065	1683263527.355
HIGHINC	-1.443	4.837	.089	1	.765	.236
LIBDEM	7.599	7.209	1.111	1	.292	1996.790
LOWINC	2.827	3.980	.505	1	.477	16.900
MEDINC	1.997	3.983	.251	1	.616	7.369
MILE_2ND	-11.276	7.639	2.179	1	.140	.000
MILE_3RD	18.745	11.027	2.890	1	.089	138276103.757
MILE_TOP	33.933	15.953	4.525	1	.033	545407734580095
MILNOSAY	10.147	7.355	1.903	1	.168	25506.664
NEP_2ND	-19.742	11.479	2.958	1	.085	.000
NEP_3RD	-36.988	19.265	3.686	1	.055	.000
NEP_TOP	-8.239	5.835	1.994	1	.158	.000
NEWSPA1	17.332	10.637	2.655	1	.103	33661735.380
NEWSPA10	8.176	6.593	1.538	1	.215	3553.235
NEWSPA11	-3.039	2.736	1.234	1	.267	.048
NEWSPA13	.751	5.206	.021	1	.885	2.119
NEWSPA2	10.567	5.978	3.125	1	.077	38840.862
NEWSPA3	32.505	16.478	3.891	1	.049	130823318340382.5
NEWSPA4	-7.428	4.856	2.340	1	.126	.001
NEWSPA5	13.983	9.993	1.958	1	.162	1182680.533
NEWSPA6	-8.153	7.108	1.315	1	.251	.000
NEWSPA7	-6.113	6.387	.916	1	.339	.002
NOSAY	-22.000	14.525	2.294	1	.130	.000
NOTVIMP	-19.534	10.604	3.394	1	.065	.000
NOVOTE	-34.243	18.216	3.534	1	.060	.000
O16_15	20.006	9.771	4.192	1	.041	488214896.669
O16_27	-6.541	8.385	.609	1	.435	.001
O18	-9.458	6.981	1.836	1	.175	.000
O32_1_20	-24.718	15.405	2.575	1	.109	.000
O32_16	30.288	16.319	3.445	1	.063	14258402117648.650
O32_17	-14.129	7.851	3.239	1	.072	.000
O32_23	-174.183	370.538	.221	1	.638	.000
O32_33	-52.464	28.338	3.428	1	.064	.000
O32_3621	-6.881	5.354	1.652	1	.199	.001
O32_3634	65.230	37.075	3.096	1	.079	21324091476603340000000000 000
O33_2	10.105	7.411	1.859	1	.173	24461.062
O33_3	26.395	14.259	3.427	1	.064	290427669655.807
O33_4	-14.683	9.967	2.171	1	.141	.000
O33_5	-8.767	11.382	.593	1	.441	.000
O46_10_1	-28.707	15.423	3.465	1	.063	.000
O46_10_3	9.511	6.660	2.039	1	.153	13505.863
O46_13_2	-7.202	5.258	1.876	1	.171	.001
O46_5_1	-15.689	10.563	2.206	1	.137	.000
O46_5_2	-18.904	13.732	1.895	1	.169	.000
O46_5_7	-40.370	22.674	3.170	1	.075	.000
O91_12	-23.753	13.603	3.049	1	.081	.000
O92_13	7.367	6.925	1.132	1	.287	1582.089
O92_33	-31.308	16.466	3.615	1	.057	.000
O92_35	19.825	12.596	2.477	1	.115	407388563.693
O92_6	45.910	23.731	3.742	1	.053	86757839892213300000
O94_7	7.317	5.918	1.529	1	.216	1506.320

	B	S.E.	Wald	df	Sig.	Exp(B)
QUITEIMP	-26.554	14.212	3.491	1	.062	.000
RESP_BUS	-28.665	18.717	2.345	1	.126	.000
RESP_ENV	31.316	17.556	3.182	1	.074	39844150353025.160
RESP_IND	3.446	6.490	.282	1	.596	31.360
RESP_LOC	59.312	2520.006	.001	1	.981	5737142051722080000000000
RESP_NAT	-1.107	4.677	.056	1	.813	.330
RESP_OTH	35.966	19.221	3.502	1	.061	4169102538001651.000
RESPNSAY	-10.855	6.968	2.427	1	.119	.000
SCI_ALEV	33.159	18.739	3.131	1	.077	251564937379540.800
SCI_DEGR	27.925	17.706	2.487	1	.115	1341170494634.954
SCI_VOCA	14.219	8.427	2.847	1	.092	1496520.884
SCIGCSE	23.878	13.971	2.921	1	.087	23452126329.755
SCINOSAY	63.267	34.392	3.384	1	.066	2994997748101913000000000000.000
SCIOTHER	66.874	35.093	3.631	1	.057	11042140842845170000000000000000
SCIPOSTG	48.718	27.772	3.077	1	.079	1438560836046082000000
SOURCE5	-7.098	5.697	1.553	1	.213	.001
TACKLE	7.796	7.387	1.114	1	.291	2431.946
TORY	7.528	6.511	1.337	1	.248	1858.685
TRUS_TOP	22.384	11.136	4.041	1	.044	5264798063.511
TRUST_2	20.158	10.454	3.718	1	.054	568171696.817
TRUST_3	-2.742	4.643	.349	1	.555	.064
UNC_2ND	33.936	18.722	3.286	1	.070	547287661513022
UNC_3RD	23.213	14.304	2.634	1	.105	12063976759.250
UNC_TOP	25.651	15.149	2.867	1	.090	138079706537.245
VALU_2ND	-13.863	7.504	3.413	1	.065	.000
VALU_3RD	-22.765	12.475	3.330	1	.068	.000
VALU_TOP	-32.135	17.185	3.497	1	.061	.000
VERYIMP	-4.617	7.087	.424	1	.515	.010
VHIGHINC	-22.440	13.903	2.605	1	.107	.000
VOTEUNS	-43.887	22.477	3.812	1	.051	.000
VOTNOSAY	-2.283	6.146	.138	1	.710	.102
VOTOTHER	41.621	24.151	2.970	1	.085	1190425459548063000
WARD_B	19.776	11.707	2.854	1	.091	387886752.245
WARD_F	1.620	4.960	.107	1	.744	5.054
WARD_H	-6.500	4.957	1.720	1	.190	.002
WARD_I	7.292	7.238	1.015	1	.314	1469.208
WARD_N	27.165	15.415	3.106	1	.078	627645491160.509
WARDNSAY	-9.520	7.409	1.651	1	.199	.000
WEATHERC	4.095	3.485	1.381	1	.240	60.045
X22_1	-13.994	9.925	1.988	1	.159	.000
X22_16	-38.537	21.451	3.228	1	.072	.000
X22_5	-.765	6.297	.015	1	.903	.466
X24	24.902	13.188	3.566	1	.059	65275401173.562
X53_12	27.869	14.585	3.651	1	.056	1269129032839.298
X53_15	4.529	6.779	.446	1	.504	92.684
X53_17	4.744	7.506	.400	1	.527	114.925
X53_18	-42.574	22.828	3.478	1	.062	.000
X53_36	-81.787	42.999	3.618	1	.057	.000
X53_44	28.253	14.095	4.018	1	.045	1862933151665.632
X53_7	-39.889	21.818	3.342	1	.068	.000
X62	21.722	12.729	2.912	1	.088	2715764508.381
X62_1	-.251	7.591	.001	1	.974	.778
X62_18	48.658	24.564	3.924	1	.048	1355313868162008000000.000
X62_27	44.928	22.503	3.986	1	.046	32499464530304680000.000
X64	67.891	35.544	3.648	1	.056	30524401762786260000000000000.000
X73_2_13	.210	5.458	.001	1	.969	1.234
X73_2_17	-4.916	3.241	2.301	1	.129	.007
X73_3_4	-21.154	10.590	3.990	1	.046	.000
X82_3_1	4.995	7.984	.392	1	.531	147.747
X82_3_2	-22.684	14.689	2.385	1	.123	.000
X91_10_3	-45.686	24.170	3.573	1	.059	.000
X91_10_7	7.434	6.137	1.467	1	.226	1693.191
X91_11	4.600	8.007	.330	1	.566	99.493

	B	S.E.	Wald	df	Sig.	Exp(B)
X91_11_1	41.781	21.949	3.623	1	.057	1396548700315681000.000
X91_8	-44.431	23.928	3.448	1	.063	.000