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Report 5: Public Understanding of and Attitudes Towards Climate Change

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Executive Summary

This review forms one part of the Foresight *International Dimensions of Climate Change* (IDCC) project. It addresses what we know about public attitudes to climate change, whether they are currently evolving, and provides pointers to ways in which the impacts of climate change and a move to a 'clean energy future' will influence public attitudes and behaviour. The review draws upon evidence from 3 types of data source: quantitative surveys, qualitative studies, and deliberative methods. Each illuminates a different aspect of attitudes.

Levels of concern and awareness about climate change have been steadily rising over the past 20 years in many nations. However climate change remains of lower importance when compared to views about other global or personal issues. Many people relate to climate change through a generic model of 'pollution' or their own direct experience of the weather. Knowledge of causes appears to have improved over time, while knowledge of consequences tends to focus on immediate physical impacts (melting glaciers, rising temperatures and sea levels, flooding etc.).

Powerful contextual barriers often act to prevent public engagement with, and action on, climate change. For example, climate change is viewed as a temporally and spatially distant issue by many people in the UK. That is, it is seen to threaten people in other places of the globe or those born far in the future, and as a result people do not always view this as personally threatening or relevant to them. People also ascribe primary responsibility for dealing with the issue to the international community and governments – viewing the issue as too big a problem for individuals to tackle alone. Equally, politicians fear they will be punished at the ballot box if they attempt to force people to accept radical change. This represents a serious 'governance trap' currently preventing progress. When asked whether they are personally prepared to do something the majority of people respond in the affirmative, although many will state (a) that it is currently difficult to

take appropriate action but (b) that they would respond if only given the right guidance, help or incentives from government.

A few studies successfully segments populations using statistical techniques to identify sub-groups: from those who are fully engaged with climate issues through to those who are doubting or denying. Cultural values also affect how people interpret climate change information: for example, in the USA views are sharply divided along partisan political lines.

Direct cross-national evidence is particularly fragmentary and at times inconsistent. While all nations show increases in concern over time, both concern and awareness remain low in some significant, and in particular some of the poorer, developing nations. Respondents across a range of nations nonetheless often express a strong desire for action now on climate change by governments. Support for the Kyoto protocol, and for the development of low carbon and energy efficient technologies, is also high in many nations. As a result there may be more of a consensus amongst global publics on the need, and means, to face up to difficult climate and energy choices than is often assumed by policymakers. However, many aspects of local context – including social, economic and environmental factors, over and above education and development levels – are needed to explain the considerable variation in knowledge and support for climate policies in many of the significant nations of the world. More research on this important issue is warranted.

Polling suggests, somewhat paradoxically, there may have been a very gradual decrease in climate change concerns in many nations since 2007. Possible explanations include issue fatigue, the impact of the global financial crisis, and the politicisation of the issue. However, the influence of ‘climate sceptic’ voices on public views may be less than is ordinarily assumed. Despite the controversies about UK and international climate science over the winter of 2009-2010, the ‘attitudes hour-glass’ remains well over three-quarters full in the UK as elsewhere.

The impact of extreme weather events, in the UK or overseas, may not presently hold the capacity to radically alter UK public views – at least up until about 2050. To do so would require establishment of a consistent narrative linking fundamental causes (emissions) to local and international effects (e.g. flooding). However, major weather-related disasters would open up ‘policy windows’ allowing legislators to take specific bold actions which would otherwise not be possible or politically acceptable. The extent to which such windows for action might appear in the UK might form one line of socio-political analysis linked to the UK Climate Risk Assessment.

Risk and uncertainty are set to become part of the common currency underpinning debates about climate change decision-making. As a result, engaging the lay public will need to draw upon the very best guidance already developed within the field of communicating risk. Attitudes towards climate change, sustainable behaviour and individual responsibility for action on climate change more generally, can be influenced but only as part of well-designed structural or financial interventions to encourage changed practices and behaviour, closely coupled with appropriately designed and evaluated (long-term) communication strategies. In addition, the ‘framing’ adopted when explaining novel climate measures, such as environmental taxation, will be critical to their reception and success.

The biggest risk to achieving ambitious climate mitigation and adaptation goals resides in the current national and international systems of governance – as such serious barriers to progress look set to remain, both in the UK and elsewhere, for a number of years to come.

1. Introduction

This review forms one part of the Foresight *International Dimensions of Climate Change* (IDCC) project which aims to improve our understanding of how climate change in other parts of the world could impact the UK to 2100. Its particular focus is to ask what we know about existing public attitudes to climate change, whether they are currently evolving, and to provide some pointers to how the impacts of climate change and a move to a 'clean energy future' (e.g. enforcing of low-carbon legislation) will influence public attitudes and behaviour across the world. The brief was to provide a short summary of what is currently known about these issues as background to the foresight IDCC project.

Four factors should be noted at the outset, which limit what can be realistically achieved in such a review.

1) The combined academic and grey literature on this topic, while reasonably contained in terms of focus, is considerable. In addition, many of the studies are difficult to compare directly, because of different sampling methodologies, questionnaire wording, and response scales used. Hence, this report cannot hope to extensively cover all past and existing studies or elaborate detailed results. Rather, core findings, based on existing reviews and prominent studies are drawn upon and noted.

2) Empirical evidence on baseline public understanding and attitudes to climate change in many of the developed nations (UK, USA, Western Europe) is relatively well documented, and forms the basis of a number of the conclusions drawn here. The project scoping document nonetheless asks for predictions of how attitudes will change 'across the world', and this presents immediate difficulties, given that we have only limited comparable survey data for many of the significant developing nations contributing to emissions and/or particularly vulnerable to climate impacts.

3) A consistent theme in any area of comparative attitudes research is that while the basic cognitive processes of individuals can be assumed to be broadly constant across nations and cultures, other important factors such as levels of knowledge/education, values, affective responses and associations, and above all the prevailing social context cannot be assumed to be consistent. Context includes such things as media reporting, social norms, science curricula in schools, local politics, current energy technologies and infrastructure, and is known to be particularly important for shaping attitudes as well as responses to surveys and other types of studies. However, the precise causality of any specific factor is much more difficult to establish.

4) The scoping document asks how might public views evolve in the future? While the long term trend in opinions *to date* is clear, how these will evolve over the next 50, 10 or even 5 years sets a much more challenging task - particularly as the impacts of climate change are themselves uncertain as are the other factors (media reporting and the increased use of the internet for information, world political developments, radical technology transitions) which might also be expected to impact future behaviour and opinions. Accordingly discussion is offered in the final 'Futures' section, of some of the factors which might influence public views in the years to come, although these very much represent personal observations.

2. Methodological Issues

The report is based primarily upon a review of the existing literature on climate change attitudes and perceptions, alongside examination of evidence from more contemporary studies. Two main sources have been used.

- Published reviews and other material appearing in the academic social and environmental sciences, as well as grey literature. Of

- An existing data-base of surveys and other studies of attitudes to climate change and energy held by the author in Cardiff¹. This data-base is by no means comprehensive but includes major climate attitude tracking polls in Europe and North America.

Our understanding derives from a range of quantitative studies ranging across traditional opinion polling, experimental studies (primarily within psychology, but also some behavioural economics), and more qualitative exploratory research utilising focus groups, semi- and unstructured interviews (primarily from environmental sociology or geography). Issues investigated by researchers include such things as concern, knowledge, attitudes, trust in scientists, framing impacts and communications, the balance between cognition and affect in reasoning, views of government and governance, temporal and spatial discounting of climate impacts, as

¹ This review is being conducted in parallel with a project by the author for the Economic and Social Research Council (Climate Leader Fellowships and the Living With Environmental Change Programme), on the impacts of climate uncertainties on public perceptions. Hence it draws upon some of the material assembled for that project.

well as the relationships with environmentally significant values and behaviours.

It is important to make clear that empirical sources also differ in quality and approach, while diverse disciplinary traditions (e.g. discursive sociology vs. experimental psychology) do not necessarily share comparable methodological or epistemological foundations. What is important, however, is that each study is conducted to meet quality criteria appropriate to its own methodological approach.

- *Quantitative Surveys and Experiments* are better for eliciting broad constructs, and for tracking simple trends over time, but do not always yield identical findings or help us to answer why a participant holds a particular view. Current thinking also suggests that asking people about environmental or technological issues with which they are not generally familiar – of which climate change is a prime example – does not necessarily elicit stable or pre-formed attitudes, but rather that respondents are forced to *construct their preferences* (Lichtenstein and Slovic, 2006) based upon a range of broadly sensible, but also contextually sensitive, factors: such things as pre-existing knowledge and associations, direct observation and analogies, personal values, perceived societal norms, and cues present in the question framing itself. As a result question wording can be a major influence on survey responses, and tracking should only be done where identical questions are used and, ideally, identical sampling and survey administration procedures. For example, there is now evidence (Whitmarsh, 2009) that people respond somewhat differently when asked about ‘global warming’, a concept more in keeping with the initial public discussions of the issue in the 1960s and ‘70s (and the term still most commonly used in surveys conducted in the USA), as compared to when asked about the more generic idea of ‘climate change’. Equally, direct cross-country comparisons require very careful consideration of the

- *Conventional Qualitative Studies* utilise established social sciences techniques such as semi-structured interviewing (Bostrom et al, 2004) or group discussions (Stoll-Kleeman, O’Riordan and Jaeger 2001; Lorenzoni, Nicholson-Cole and Whitmarsh, 2007; Bickerstaff, Simmons and Pidgeon, 2008; Butler and Pidgeon, 2009). Systematic methodologies for eliciting and analysing qualitative data have a very long history in the social sciences (Pidgeon and Henwood, 2004) and offer, in contrast to surveys, far greater depth and insight into people’s own understandings of climate change, the frames and discourses people use to structure those understandings, and as a result can help to answer the underlying ‘why’ questions. By the same token it is more difficult to generalise findings from qualitative research, let alone to track changes in discourses over time.
- Finally, *Deliberative Approaches* tend to combine provision of structured information about the topic with group discussions (often involving domain experts), and can also incorporate value elicitation and decision-structuring techniques. Such approaches are particularly useful for developing recommendations, identifying key trade-offs, and formulating policy advice through extended processes of deliberation and dialogue between laypeople and experts (Dietz and Stern, 2008). Properly conducted deliberative processes take place over an extended period of time, and allow participants to develop and modify their views as they gain information about the topic. Consequently they are very costly to design, run and analyse, and tend to be rarer than surveys or more conventional qualitative approaches to eliciting views. There are relatively few well documented examples for climate change (exceptions being Kasemir, Jaeger, Jaeger, and Gardner, 2003;

There is considerable value in adopting a mixed-methods approach to climate attitudes research, by combining evidence from quantitative, qualitative and deliberative studies – as this often gives us a more complete picture than any one approach would alone, and is the strategy adopted here.

3. Public Attitudes - Core Findings and Drivers

3.1 Concern and Importance

We forget sometimes that climate change is not a particularly new issue for the public. Levels of concern about climate change have been increasing significantly since the early 1960s, particularly in Western European countries, where relatively high levels were reached even as far back as 20 years ago (see Lorenzoni and Pidgeon, 2006). In the European Union 76% of respondents in the 12 EC Member States were very / somewhat worried about the greenhouse effect in 1988, increasing to 89% in 1992 (INRA (Europe), 1992). Similarly, the 1992 Gallup Health of the Planet (HOP) survey indicated that more than half of the respondents in 13 out of 24

countries worldwide felt that climate change was a serious problem (Brechin, 2003), although of these 13 nations, 8 were European. In the ensuing two decades reported concern about climate change, when asked directly, has become widespread in Europe, the USA and elsewhere (see e.g. Leiserowitz, 2007a; Eurobarometer, 2008; Leiserowitz et al, 2008) although some key cross-national differences have also begun to appear (documented in section 3.7 below). Concern is also particularly high amongst the young, with a 2008 survey of 12-18 year olds by the UN Environment Programme in five countries finding very high levels, and greater optimism that something could be done about climate change, as compared to adults in the same countries (Leiserowitz, 2007a).

A further consistent key finding is that where judgements of other issues are also solicited climate change is invariably not the highest or most important priority for many people – other global/societal (world poverty, crime, terrorism, wars etc.), environmental (water pollution) or personal issues (health, finances, relationships) typically have a higher expressed importance for people (Bord et al, 1998; Poortinga and Pidgeon, 2003a; Nisbet and Myers, 2007). Theoretically, people may have only a ‘finite pool of worry’ to draw upon when considering all of the potential issues that they might attend to in life (Marx, Weber et al, 2007). This is important because any of these other issues may push environmental/climate concerns temporarily aside as personal circumstance, national events or media reporting make them more or less salient for people. Equally, some of the other issues which people care deeply about (long-term economic prosperity) are in fact related to climate change – but only in indirect ways.

3.2 Knowledge

We know that there is now widespread awareness that climate change is happening. People also recognise that humans are in part responsible for this. In a representative British survey conducted early in 2010 Spence, Venables et al (2010) find that 31% believe climate change is mostly or

entirely due to human activity, with a further 43% believing it is partly due to human activity and partly natural processes. By contrast, people's detailed knowledge is less certain, which they themselves recognise (Nisbet and Myers, 2007). When discussing 'knowledge' of climate it is important to recognise that climate change itself is a complex phenomenon, with multiple and interdependent causes (both social and environmental), areas of scientific knowledge which are still incomplete or contested, and impacts which are uncertain and often far in the future. Nor is climate change observable to individuals in any direct sense: even experts only understand it second-hand, through the concepts and language of science. As a result it is particularly difficult for people to conceptualise and relate climate change to their daily activities because as a complex science construct it is not easily translated into the language of popular culture (Ungar, 2000). Laypeople ordinarily form attitudes and beliefs through their direct experience and familiarity with a person, object or phenomenon, or through information received from mediated sources (family, friends, TV, print, and latterly the internet). Not surprisingly, then, many studies have shown that people tend to associate climate change with their most immediate or direct observations: that is, of daily or seasonal fluctuations in weather, something at odds with the scientific concept of 'average weather conditions (temperature, precipitation, atmospheric etc.) as measured over an extended period of time' (Bostrom and Lashof, 2007). Conflation of 'climate' with 'weather' contributes in no small part to the belief that climate change has natural rather than human causes. Other systematic misconceptions have also been documented.

Early qualitative research conducted in the USA (Kempton, 1991; Bostrom *et al.*, 1994) already gave some indication of how people's mental conceptualisations of climate change diverge from scientific understandings. Kempton's study illustrated how US citizens interpreted climate change in terms of four pre-existent categories related to: stratospheric ozone depletion, plant photosynthesis and respiration, generic 'air pollution', and experienced temperature/weather variations. Bostrom *et al* (1994) likewise found people's mental models confused

climate change with ozone depletion. Both issues rose to prominence at about the same time in the 1960s, and it is easy to see why people might reason that the hole in the ozone layer is letting through more sunlight and heat when prompted to describe a causal mechanism for climate change (Shepardson, Niyogi, Choi and Charusombat, 2010). However, very recent evidence also shows clearly that this erroneous belief is now weakening (Bostrom, Reynolds, and Hudson, 2009; Brechin, 2010).

Generally, individuals in the past have also held a limited understanding of the human contributions to a changing climate (Kempton, Boster and Hartley, 1995; Dunlap, 1998). Brechin's (2003) analyses of surveys undertaken in 1999 and 2001 show misunderstandings world-wide, even in nations considered to have strong environmental values (e.g. Germany). Of the respondents in 27 countries surveyed in 1999, very few indicated that burning of fossil fuels was the main anthropogenic contribution to global warming. The survey also shows that many respondents indicated deforestation and 'air pollution' as causes. Similarly, in the British study by Poortinga, Pidgeon and Lorenzoni (2006) air pollution was the most common cause of climate change cited by people unprompted. A mental model of generic 'pollution' would not necessarily help people to discriminate between the actual causes of climate change (burning of fossil fuels) and incorrect ones (e.g. particulate and sulphate emissions from cars and factories, which, while undesirable for other reasons, both serve to *reflect* sunlight). A qualitative evaluation study by EcoAmerica (2009) concludes, however, that discourses around 'preventing pollution' and 'protecting the air that we breath' do form persuasive arguments for many people, particularly when they are contextualised against a backdrop of improving national energy security. Such framings essentially work with (rather than against) people's pre-existing mental models of climate change.

Another common misconception reported for some time in the perceptions

literature is the association with generation of energy from nuclear power stations (Bord, Fisher and O'Connor, 1998; Hargreaves et al, 2003; Poortinga, Pidgeon and Lorenzoni, 2006). Upham et al (2009) also point out that alongside misconceptions there are some gaps in people's understanding of climate change causes, since few respondents in surveys mention domestic energy use, meat eating or food transportation as causes. Brechin (2010) concludes that knowledge across the globe has improved since 2001 – particularly with respect to the role played by fossil fuels. This almost certainly reflects the greater attention now being paid to climate change issues in the global media, school curricula and civil society more generally in many countries.

Finally, knowledge of the consequences of climate change has tended to focus on its immediate physical impacts (melting glaciers, rising temperatures and sea levels, flooding; see Lorenzoni, Doria et al, 2006) rather than other forms of social disruption, human health impacts, or secondary environmental outcomes such as rising ocean acidification. When asked about impacts people also tend to draw upon the associations they make with weather. Upham et al (2009) note that a debate now exists in the literature as to whether linking climate change to extreme weather events prompts people to greater concern and personal action regarding climate change (as something significant to be responded to) or alternatively to dismiss the seriousness of the issue (as just a freak weather event), with the evidence mixed on this point (see Bostrom and Lashof, 2007; Whitmarsh, 2008).

Not all misconceptions will matter of course. Rather, experience from risk communication research suggests that policy makers should concentrate upon reinforcing correct beliefs and challenging incorrect beliefs that might directly influence relevant behaviour (e.g. if someone believes that recycling domestic waste should be their main response to climate change), while at the same time stating the most effective actions people can take (see e.g. DEFRA, 2008; Dietz, Gardner, et al, 2009).

In methodological terms, there are longstanding arguments over the validity of direct attempts to measure lay-people's knowledge of a science or environmental risk topic through structured questionnaires (see discussion in Sturgis and Allum, 2004). The correct phrasing and calibration of questions is one challenge (too difficult and everybody looks stupid - too easy and everybody looks smart!), as is the interpretation of what constitutes a 'correct' responses where there remains legitimate scientific disagreement over a topic. Some have even argued that the very selection of traditional science questions displays a cultural bias, in privileging scientific knowledge as the one normatively appropriate 'truth'. For example, one could be very knowledgeable about aspects of climate change policy or economics, without necessarily knowing details of the underlying physics or chemistry.

In a related set of arguments, scholars within the tradition of sociology of scientific knowledge have also mounted a robust critique of the 'deficit model' of science communication: the simplistic idea that opposition to new developments in science and technology (nuclear power, biotechnology, stem cell technology etc.) arises merely because people lack the appropriate scientific training or knowledge. The simple conclusion which would follow, were this true, is that a greater effort should be made to educate people in science (Bodmer, 1985). While increasing scientific literacy is, of course, important for many reasons, researchers have pointed out that concerns about risks and the environment are not necessarily a function of ignorance, but often reflect differing cultural and value positions, or assumptions about wider institutional arrangements such as distrust in the governance and management of technology and its risks (e.g. Irwin and Wynne, 1995; Jasanoff and Wynne, 1998; Poortinga and Pidgeon, 2003b).

The principal conclusion to be drawn from these extensive debates about knowledge is that, whilst climate and carbon literacy may be desirable things in and of themselves in a modern society, merely making people more concerned about climate impacts, or more knowledgeable about the

science, is unlikely to lead to changed behaviour or different attitudes (Spence and Pidgeon, 2009). Indeed research has shown that there are a range of powerful influences, over and above lack of knowledge, which act as barriers to public engagement with climate change. These include: individual factors such as cognitive dissonance reduction (between espoused beliefs and current actions), perceived uncertainty, habits, feelings of fatalism and helplessness; and social factors such as lack of enabling initiatives, prevailing social norms, and lack of visible political or government action (Lorenzoni, Nicholson-Cole and Whitmarsh, 2007). One way of addressing these barriers is clearly through individual or community engagement and behaviour change initiatives at a local level, although these will have to be combined with appropriate structural, legal and fiscal instruments (Spence and Pidgeon, 2009). To this can be added the objective of fostering collective action across more extended spatial scales utilising the interconnected networks that now extend across our globalised world. Another route to change is to exploit that we know about existing actor-networks in the climate policy domain to link individual perceptions with actions at the wider institutional level. As Ockwell, O'Neill and Whitmarsh (2010) argue, one aim of climate communication and attitudes change efforts should be to foster grass-root demands for *institutional action*, in this way fostering direct public support (and political space) for more radical policy and government interventions.

3.3 Perceptions of Risk: The Importance of Spatial and Temporal Distance

Three decades of work on the psychology of risk perception indicate that the balance of perceived risks with tangible benefits is one of the factors which drives overall risk perceptions and judgements of a risk issue (for overviews, see Pidgeon et al, 1992; Slovic, 2000). At a very general level, asking about people's concern (as discussed above) is also a proxy measure for perceived risk. When asked directly, most people feel that climate change holds risks and that these outweigh any benefits. In a

survey in Britain in 2002 fully 55% thought the risks of climate change outweighed benefits, compared to only 14% who thought benefits outweighed risks (Poortinga and Pidgeon, 2003a). However, respondents also differentiated between aspects of the risk, characterising climate change as a moral issue (see also Bickerstaff et al, 2008), one with risks for future generations and something they did not have personal control over – all factors which have been associated with heightened levels of risk perception. As noted above also, the many facets of climate change are complex, making any evaluation of ‘risk’ particularly difficult even for expert analysis (Pidgeon and Butler, 2009), while the level of acceptable risk is in part a matter of the values particular groups in society hold - hence different individuals might legitimately disagree about what is acceptable (Lorenzoni, Pidgeon and O’Connor, 2005; Hulme, 2009).

Opinion polls and more in-depth studies also show that individuals distinguish between the effects of climate change on their personal lives and on wider society – with judgements that risks are higher for people who are spatially or temporally distant. Potential hazards arising from climate change to society are evaluated more highly than individual threats while several studies show that, although most Europeans are aware of the potential risks of climate change world-wide and the adverse consequences that may befall societies in general, they tend to attenuate the risks to themselves personally. Optimism biases such as this are not unique to climate change of course, being found with a range of health and other risks (see Armor and Taylor, 2002). In the USA, Bord *et al.* (1998) also conclude that global warming is generally not perceived to be personally threatening. Among a sample of US citizens, who were asked to rate the likely threat to themselves personally (i.e. during their lifetime) of various social and environmental issues, global warming featured lowest in perceived personal threat, while heart disease, cancer and car accidents were listed at the top. The authors therefore argue that respondents distinguish the personal and societal implications of threats, and that most of the non context-specific surveys which indicate high concern about climate change are in fact eliciting concern about societal impacts.

How risks and benefits are framed is also important. Some studies have shown that if benefits associated with current lifestyles are considered these can be felt to outweigh, on a personal level, the possible risks of climate change. When the overall effects on society are considered, these benefits are still considerable, but the perceived degree of harm is also higher (e.g. benefits from private car use, Zwick and Renn, 2002; car use, factories, energy use in Poortinga and Pidgeon, 2003a).

Perhaps the most important result from the risk perception literature is that climate change is a temporally and spatially distant issue for many people. That is, it is seen to threaten people in other places of the globe or those born far in the future (Upham et al, 2009; Leiserowitz et al, 2010a). As a result people do not always view climate as personally threatening or relevant to them, with one consequence that this may prevent people from forming strong affective associations with the issue ('affect' is now known to be an important component of risk perceptions: see Slovic et al, 2002). To some extent such judgements are a true reflection of the very real commons dilemma that climate change poses us all – something caused by small individual actions (which are personally and immediately beneficial) with wide ranging but diffuse and uncertain future global consequences. A number of psychological explanations can be advanced for this; evidence of any personal threat from climate change is difficult to come by in our day to day lives, or we might choose to deny that our actions will cause us future personal losses. Equally, psychological theory suggests that people construe future events in more general terms while immediate losses are construed in more concrete terms (Trope and Liberman, 2003). Finally, as Swim et al (2010) point out, we know from a long history of experiments in behavioural decision making that people at times place steep discount rates on costs born in the future compared to equivalent costs that will be born today. Such discounting effects are, however, also known to be context and task dependent (Lowenstein, Read and Baumeister, 2003). Whatever the root drivers of this phenomenon,

temporal and spatial distance poses a serious problem when attempting to motivate people to act now on mitigation.

3.4 Responsibility for Action

In nationwide surveys conducted in Britain in 2005 and 2010 only 8% and 10% respectively of respondents stated that the main responsibility for action on climate change lay with individuals and their families (Poortinga, Pidgeon and Lorenzoni, 2006; Spence, Venables et al, 2010). Rather, primary responsibility was overwhelmingly ascribed to powerful external actors such as the international community, national governments and businesses. In part this can be interpreted as people seeking to displace responsibility for major action onto others rather than to themselves as individuals, and in this way avoid what are perceived to be costly or difficult changes to behaviour and lifestyles. Qualitative research also confirms that people see responsibility for tackling climate change to lie primarily at the state actor level (Bickerstaff, Simmons and Pidgeon, 2008), even though, almost in the same breath, people will also state that they do not fully trust those actors. For many the issue is seen as too big a problem for them as individuals to even begin to tackle themselves, with inter-governmental agreement also seen as necessary to avoid other countries free-riding. Equally, politicians who may fear the electoral cycle are restrained from taking tough action on climate change believing they will be punished at the ballot box if they attempt to force people to accept radical change in lifestyles, new environmental taxes, or stricter legislation (Lorenzoni, O'Riordan and Pidgeon, 2008). This represents a complex and serious 'governance trap', with governments and governed seeking to lay responsibility with each other, and is at odds with current UK government policy which, alongside the adoption of low carbon technologies, also aims to foster individual responsibility and behaviour change in pursuit of energy demand reduction (e.g. the ActOnCo2 Campaign).

When asked whether they are personally prepared to do *something* about climate change the majority of people respond in the affirmative, although many will state (a) that it is currently difficult to take appropriate action but (b) that they would respond if only given the right guidance, help or incentives from government. There remains, then, a clear gap between peoples' expressed concerns and their willingness to change their behaviour significantly (the so called value-action gap). Also what people say they propose to do to help with climate change (e.g. increase their domestic recycling) might not always be the most efficient for cutting personal carbon emissions (cf also Dietz et al, 2009). Research on this problem from other domains such as health psychology, reviewed in Spence and Pidgeon (2009), suggests that habit is an important determinant of current behaviour, and that long-term behaviour change requires both effective 'downstream' communications to highlight why changing behaviours is important, coupled with 'upstream' structural changes (infrastructure, legislation, or financial) to encourage or force a different set of practices and patterns of behaviour. Changed attitudes then tend to follow the changes in behaviours, with examples of successful coupled interventions including the campaigns to increase seat-belt use in vehicles, or to restrict smoking in public places. However, in both of these cases it took many years to identify the problem, devise effective communication and structural/legislative changes, and fully change behaviours across society – a luxury we may not now have with climate change.

A clear conclusion to be drawn from the literature on responsibility is that there may be a stronger political mandate for government intervention on climate change, in the UK and other developed nations at least, than is sometimes assumed by politicians (Lorenzoni, O'Riordan and Pidgeon, 2008; cf also recent comments in the *New York Times* by Krosnick, 2010).

3.5 Values and Culture

Some researchers have segmented populations empirically along dimensions of concern and willingness to act, by using statistical clustering techniques to identify sub-groups of society: from those who are fully engaged with climate issues through to those who are doubting or denying. Leiserowitz and colleagues (2010b) segment US respondents into six distinctive groupings, ranging from a small and highly engaged 'Alarmed' group at one extreme (10% of the population in early 2010) to a 'Dismissive' group at the other (16%). In between are 4 groupings who all express some form of ambivalence about climate change ('Concerned', 'Cautious', 'Disengaged' or 'Doubtful': totalling almost 75% of the sample) with the implication that it is these individuals who might be most open to change in both their beliefs and behaviour. In a study conducted simultaneously in Italy and the UK Lorenzoni and Hulme (2009) report a similar spectrum of beliefs covering Denying, Doubting, Disinterested and Engaged (see also DEFRA, 2008). However, a disadvantage of statistical segmentation approaches is that they result in categories which are hypothetical (and hence should always be treated in that way), rather than in social groups as we customarily understand them. It is also difficult to relate such groupings to more theoretically validated cultural or ideological factors.

Regarding wider cultural factors, there is evidence that attitudes towards climate change are influenced by people's broader environmental beliefs, as well as political and ideological values, although the precise relationships are not always clear-cut. Generic concern about the environment, as measured for example through standardised instruments such as the New Environmental Paradigm (NEP), is positively related to concerns for climate change and greater support for climate measures (Dietz, Dan and Shwom, 2007; Spence, Poortinga et al, 2010). Such a relationship is to be expected, given that climate change is, for many people, symbolic of the wider threats posed to the environment by human activities and industrialised society, and would be predicted from the values-beliefs-

norms (VBN) model of environmental behaviours (see Dietz, Fitzgerald and Shwom, 2005).

In terms of traditional partisan politics, we also know that supporters of right-leaning parties tend to be more sceptical of global warming claims than supporters of left or green-leaning parties. In the USA, in particular, there is now a very wide gap between the beliefs of Republican and Democrat voters (see Dunlap and McCright, 2008). This difference is not simply a reflection of differing general philosophies toward the role of government. Partisan differences were negligible before the autumn of 1997 when the 2nd Clinton administration launched a campaign to build public support for the Kyoto Treaty. After the barrage of media coverage at those time, partisan differences increased significantly according to Krosnick et al (2000). Dunlap and McCright (2010) argue that the roots of this difference in US public views lie also in the actions of libertarian and right-leaning commentators, as well as the activities of the petroleum industry and affiliated parties, who have sought over the years to systematically highlight uncertainties in climate science (also Oreskes and Conway, 2010). Dietz et al (2007) also point out that political affiliation, while a strong predictor of policy support for climate measures in the USA, exerts its influence only indirectly. In particular, left-leaning individuals have higher environmental values and greater trust in statements and policies proposed by environmentalists, which are in turn both positively related to their support for climate measures.

Some evidence also exists that the cultural discourses of 'individualism' and 'egalitarianism' as described by the cultural theory of risk (Douglas and Wildavsky, 1982), which are known to link particular ways of life with perceptions of environmental risk, can also operate in relation to climate change (Leiserowitz, 2007b; Hulme, 2009). The theory argues that individualists fear threats to market choice (hence will oppose any government interventions which they feel will constrain their market activity) while egalitarians fear threats to shared resources and communitarian values, including those associated with the environment. Cultural position

is also known to influence the interpretation of new ambiguous information about climate change and other risk issues, in ways which serve to confirm individuals' pre-existing beliefs, hence fostering resistance to attitude change or even leading to a greater polarisation of views for those already at the extremes of opinion (Kahan, Bramen, et al, 2007). Fortunately, in the UK climate politics have been conducted, by and large, on a cross-party basis (Clayton, Pidgeon and Whitby, 2006) and this is also reflected in UK polling evidence which shows a much smaller impact of voting preferences on climate views compared to the US.

Overall the work on climate change beliefs and culture remains fragmented and under-theorised, and research in this area would likely benefit from more explicit reference to existing cultural and value typologies and theories, as developed for example by Schwartz (1992) or Hofstede (2001).

3.6 The Onset of 'Events' and The Social Amplification of Risk

As with many other environmental issues, the changing social context at any particular point in time (e.g. the activities of particular interest groups, or media reporting, or just the onset of events such as an exceptionally cold winter or hot summer), can serve to amplify or attenuate perceptions of risk (Pidgeon, Kasperson and Slovic, 2003). Various case studies have shown that events related to hazards interact in highly dynamic ways with psychological, social, cultural and institutional factors resulting in amplification or attenuation of individual and social representations of risk and danger. A key insight from that literature is that amplification or attenuation is rarely driven by any single factor – rather a series of factors need to be present in combination. Until quite recently climate change has, in lay perceptions, been an attenuated or 'hidden hazard' (Kasperson and Kasperson, 1991). In the Kaspersons' words, climate change became attenuated because it was both a value-threatening and an ideological hazard. In the US, and to some extent the UK, the actions of

commentators and companies (discussed in the section above) to undermine the case for climate change have also contributed to this situation.

However, hidden hazards may not remain so forever, and a key element of social attenuation and amplification processes is their dynamic nature, coupled with the way in which different institutions, such as the mass media, constantly seek to transform both scientific information and policy debates about risks. For example, Carvalho and Burgess (2005) analyse reporting of three UK broadsheets over 18 years and explain how communication about climate change is a multi-directional process delineated and shaped by the social learning of the producers and receivers of the information. The authors identify two main influences on the newspapers' discourses: the ideological stance of the reporting media themselves, and the political positions encapsulated by senior government officials' pronouncements on this topic. Smith (2005) also points to the tension between the practices and norms inherent in professional news journalism (for 'balance' – see also Boykoff and Boykoff, 2004) and the characteristics of trans-disciplinary issues such as climate change, which require long-term, consistent and cross-cutting coverage rather than reporting in the blazing and eye-catching form of a news-story, often by dramatising scientific uncertainty and political controversy (Zehr, 2000; Hargreaves et al, 2003), something we discuss briefly below. The distinctive framings being brought to bear on climate change within the media have also begun to receive significant attention from researchers (see Ereaut and Segnit, 2006, Nisbet, 2009).

It is no longer clear whether climate change can still be classed a hidden hazard. One would expect this situation to be changing given the amount of UK media and policy coverage that climate change has received since 2006, although against this many of the ideological and value-threatening aspects of the issue remain unchanged and most likely still act as a brake on increases in concerns and risk perceptions associated with this issue. As the events of the winter of 2009-2010 have also shown us, external

issues such as the inconclusive Copenhagen talks, the East Anglia e-mails controversy (see Russell et al, 2010), and reported errors in glacier melting forecasts in the last IPCC report, can all arise in unpredictable fashion to impact public perceptions (see the discussion of rising scepticism in section 3.8 below). Investigations of the dynamic nature of climate risk perceptions, and the factors which might be causing them to change or not, is clearly an ongoing research need.

3.7 International Comparisons

There is a small but expanding corpus of research directly comparing attitudes to climate change across different nations. The methodology behind such comparative work is difficult, costly and it remains the case that such surveys, almost by definition, contain a very restricted set of questions - typically awareness and knowledge items, measures of concern, and evaluations of general policy options. Key sources are Dunlap (1998), Bord et al (1998), Brechin (2003, 2010), Lorenzoni and Pidgeon (2006) and Leiserowitz (2007a). The comprehensive reviews in particular by Brechin and Leiserowitz ground a number of the main conclusions reported here, and readers are referred to these two sources for more details of the precise polling cited. To obtain an overall picture the results of several of these polls are considered in some detail.

The cross-national evidence is particularly fragmentary, with no one in-depth study being replicated in its entirety across more than one nation. The problems with surveys are writ large in cross-national efforts, in particular being reliant upon a restricted set of questions, and lack of comparability from poll to poll. Notwithstanding this, the evidence is that levels of knowledge and concern have both increased globally over the past 15 years, although climate change remains secondary in importance for people (and this is especially so since the onset of the global financial crisis in 2008). Possibly more significant is the finding that key country differences on some aspects have emerged over the past 15 or so years,

in ways not simply attributable to national levels of education or development. It is useful therefore to take a temporal perspective on the findings.

Data from the earliest cross-national poll, the 1992 Health of the Planet Survey, show a relatively limited awareness of climate issues, with other environmental issues such as air and water pollution being of greater concern (Dunlap, 1998). Respondents in this and other national studies of the time also showed very limited understanding of the causes of global warming, especially the role played by fossil fuels. Likewise, in the 1999 GlobeScan survey of 25 nations depletion of ozone was the single most cited cause of the greenhouse effect (Lieserowitz, 2007a), followed by air pollution from factories and cars. In a very few nations (e.g. India, Turkey, Argentina, Malaysia) loss of forests was cited as the main cause.

Brechin (2003) reports that in the Environics International study of 15 nations conducted in 2001 understanding, while still low, had improved somewhat but with no large differences in climate change knowledge between developed and developing nations. Support for the Kyoto protocol was, however, higher in European countries compared to in the USA, in part reflecting the emerging transatlantic differences in the politics of climate change. Concern was also much lower in the US than in many other countries around the globe. As discussed above (section 3.5), political polarization had begun to emerge in public attitudes within the USA just prior to this (Krosnick et al, 2000; Dunlap and McCright, 2008). A GlobeSpan survey in 2001 found evidence that, with the sole exception of China, people in developing countries were far more worried about climate change posing a 'direct threat to you or your family over the next decade' compared to either European or US respondents. As Leserowitz (2007a) comments, this latter finding most likely reflects (a) the reality of long-term vulnerability in adaptive capacity in many developing nations, as well as (b) the belief held by people living in Europe and the USA that the most severe impacts of climate change will fall on other people and at other times.

Some detectable differences between European nations do appear to have begun to emerge at the turn of the millennium. Lorenzoni and Pidgeon (2006) report greater concern about climate change amongst the Southern European nations in Eurobarometer polling conducted in 2002 – something which probably reflects the associations respondents made between climate change and localised weather impacts, and a realistic assessment of the future impacts on weather of increasing temperatures in the Mediterranean region, compared to, for example, those envisioned for Scandinavian countries or northern Scotland (also Palutikof, et al, 2004). This study therefore suggests that we should not overlook the importance of geographical and cultural influences, even within a single nation or region, on public perceptions of climate change.

Between 2000 and 2006 those reporting climate change a ‘very serious threat’ had increased substantially in research by GlobeScan, with majorities now in 17 of the 22 countries polled (Leiserowitz 2007a). A similar trend is observed from the Pew Global Attitudes Project which shows much higher concern for the ‘environment in general’ in 2007 compared to 2002. Regarding whether climate change is a very serious problem, respondents in some of the most vulnerable nations (e.g. Brazil, Bangladesh) voiced the highest concern in the 2007 Pew poll. However, when compared to many of the other nations polled, far fewer people in Britain, the USA, Russia and China considered climate change to be a very serious problem. Brechin (2010) points out the worrying implication of this – that the latter three are the World’s biggest producers of greenhouse gasses. The finding of rising concern (and perceived seriousness) over the last decade also has to be set against the fact that climate change remained of secondary importance to economic and other problems in most nations. Brechin also concludes, more optimistically, that the period 2001-2008 saw improved understanding of the issues across the globe: in particular regarding the role played by burning fossil fuels, and a clear decrease in belief in ozone as a cause in several surveys. However, this improvement in knowledge is variable, with much lower levels of self-reported knowledge and awareness remaining in many of the poorer

nations of the world (also found in a 2009 Gallup survey reported in Pugliese and Ray, 2009), accompanied by lower levels of support for climate action and policies when knowledge is low.

Our understanding of attitudes and beliefs in many of the developing nations most vulnerable to climate impacts is particularly patchy. Some contextually-grounded qualitative work does exist from a development studies perspective, but tends to focus upon climate change as one of a range of environmental stressors, as well as local adaptive capacity and response (e.g. Tompkins, 2005; Hageback et al, 2005; Mustelin et al, 2010). A survey of 132 residents in Nairobi, Kenya concluded that climate change appears as a 'drop in the ocean' compared to the problems of poverty, unemployment, crime and corruption (Shisanya and Khayesi, 2007). The qualitative study *Africa Talks Climate* in 10 African nations (BBC World Services Trust, 2010) reports that, while most participants were aware that their weather was changing, there were low levels of awareness and knowledge of the causes and impacts of climate change, especially amongst rural dwellers. However, drought, deforestation and flooding were key environmental concerns for many Africans, while respondents in rural areas felt that migration would be their only practical long-term response to climate change. Common frames of reference used for understanding the issue were the emphasis placed upon trees (which many Africans believe will attract rain), faith or religion (participants in some countries felt that the will of God determines adverse weather), conflation with the ozone problem and general 'air pollution', and the direct heating effects of local activities. Additionally, Brechin (2010) reports that in India, where climate vulnerability and public concern are both high, support for climate policies is relatively low, while both China and Russia have low levels of public concern comparable only to the USA. All of these studies illustrate that, while we might now know enough to explain patterns of beliefs and perceptions currently in the USA (and much of Western Europe), many localised contextual factors, over and above education and development levels, are needed to explain the considerable variation in knowledge and support for policies in many of the significant nations of the

world (also Brechin, 2010). Accordingly, both Brechin (2010) and Leiserowitz (2007a) recommend further detailed cross-cultural research on the factors - psychological, cultural, geographical, economic and political - which might help us to explain differences in patterns of attitudes and knowledge in significant regions of the world.

A number of the international surveys also ask about support for a variety of climate measures – although again the types of measures and question wording differ in different polls. Summarising these studies, respondents across a range of nations often express a strong desire for action now on climate change (as opposed to a ‘wait and see’ approach) on the part of national governments and the international community. Support for the Kyoto protocol, and for the development of low carbon and energy efficient technologies, has also been high in many nations. Brechin (2010) documents results from the 2008 WorldPublicOpinion survey of energy preferences, where a clear majority in 21 nations favoured deployment of renewable energy (solar and wind) – a result consistent with recent detailed surveys of energy preferences in Britain (Poortinga, et al, 2006; Spence, Venables et al, 2010). Attitudes to nuclear energy by contrast differed markedly across nations, ranging from 14% of respondents in Germany wanting more emphasis on nuclear (and 63% wanting less), to China where fully 63% wanted more emphasis (and only 10% less). In Britain people appear more evenly divided on the question of new nuclear power (41% more emphasis versus 29% less), a result again consistent with detailed national survey (Pidgeon, Lorenzoni and Poortinga, 2008) and site-based work (Pidgeon, Henwood, et al, 2008).

The WorldPublicOpinion survey also frames several of its questions in terms of the costs of policies. Although mention of costs does reduce the attractiveness of some options, levels of support for renewable energy remain robust even when people are informed of initial higher costs (many believing that renewable energy will be cheaper in the long-run). Commenting on this, Brechin (2010) concludes that there may be more of a consensus amongst the public cross-nationally on the need, and means, to

face up to difficult climate and energy choices than is often assumed by policymakers. A 2007 BBC World Service poll of 21 countries finds that large majorities in all countries think that people will definitely or probably need to change their lifestyles to reduce emissions. It also asks about raising taxes to curb the use of fossil fuels – and finds, not surprisingly, mixed results. What is significant in this poll, however, is that support for such taxes, averaged over the 21 nations, rises substantially (from 50% to over 75%) if their use is specified: either to improve energy efficiency, or to lower other taxes so that the overall burden remains the same. Leiserowitz similarly reports that a 2001 GlobeScan survey found strong support across 28 nations for a rise in petrol prices ‘if the money were used to cut air pollution’, and concludes that under the right circumstances many publics would be prepared to consider higher fuel prices. This points out, once more, the ways in which different framings for tradeoffs in surveys can elicit different responses, and also suggests a need for further research, specifically into the conditions under which particular monetary trade-offs to tackle climate change might be acceptable (or not) to people in Britain and elsewhere.

As discussed in the introduction, more in-depth deliberative and qualitative work allows participants to form a considered opinion when presented with information about an issue. However, we have very few comparative studies using such methodologies, not least because of the difficulties of conducting such work simultaneously in two or more nations and then developing suitable and systematic comparative data analysis. One exception was the cross-European ULYSSES integrated participatory assessment project – which sought views on climate change in several European countries using focus group and other techniques during 1997-8 (Kasemir, Jaeger, Jaeger and Gardner, 2003). This research showed that participants wanted more information about climate change, but that they also thought that governments should go further than the provisions allowed in the Kyoto protocol.

A major deliberative exercise coordinated by the Danish Board of Technology – unique in scale and number of countries involved – ran simultaneously in 38 countries across the world on September 26th 2009, in the run up to the COP15 Copenhagen conference (the WorldWideViews on Climate Change Project, 2009). Groups of 100 people met in each country, and were provided with the same information, comprising a detailed 40 page booklet and a 10-15 minute video. They then debated possible policy responses and voted on a range of predefined questions (covering climate consequences, urgency and long-term goals, dealing with emissions, and the economy of technology and adaptation) as well as questions that participants themselves defined. As such this can be considered a large-scale experiment in climate risk communication and information provision. The organisers report that what stands out clearly across the exercise is that these citizens, as a result of learning more about climate change and debating the issues involved, wanted strong and rapid action from their governments at the COP15 negotiations, recommending also that their governments follow this up with reductions beyond current commitments. They also called for enabling initiatives such as information provision and positive market incentives to motivate citizens to act, international action and commitments, fair burden sharing between poorer and richer nations, and an international financial system to pay for technology transfer. Participants were also prepared to accept rises in the price of fossil fuels, although many felt that the burden for this should fall on richer countries.

The findings from both of the cross-national deliberative studies outlined here – while occurring more than 10 years apart – are congruent with the findings on policy support from the cross-national polling. Taken together they indicate a significant underlying public desire for decisive action from both national governments and the international community. They also point to the usefulness of employing more deliberative approaches to eliciting citizen views on global climate policy (see also Corner and Pidgeon, 2010).

3.8 Changing Attitudes, Rising Scepticism?

2007 saw the publication of the IPCC 4th Assessment Report which stated with a high degree of certainty that anthropogenic activities were altering the earth's climate, as did the prominent 2006 UK Stern Report on the economics of climate change. While one might expect these reports and surrounding discussions to be followed by a further *increase* in concern, perversely this seems not to have been the case. If anything scepticism, and with it lowered concern about the anthropogenic causes of climate change, has been gradually rising between 2007 and mid-2009. In the UK in August 2009 only 76% were very or fairly concerned about climate change compared to 81% in August 2006 on an identical tracking survey for the Department for Transport (DFT, 2010) while similar trends have been reported in Europe (Eurobarometer, 2009), the USA (see Dunlap and McCright, 2008), and in cross-national polling (HSBC, 2009). Note that all of these studies, showing a gradual decline in concern, were conducted *prior* to the onset of the climate e-mail controversy of the winter 2009-10, a point which needs to be born in mind when interpreting results from more recent studies.

Potential reasons for this gradual trend since 2007 include:

- **Issue fatigue**, as climate change has come to be extensively discussed in the UK and worldwide media following the IPCC 4th Assessment and the Stern reports. At the same time it is increasingly used as a justification for policy proposals in a wide range of sustainability domains not all immediately recognisable as being climate-related (transport, housing, food, social, defence and overseas aid policy etc.).
- **The impacts of the 2008-9 financial crisis** on the personal importance of climate change and the environment. This might be because environmental issues are temporarily driven out of sight for many people by more pressing concerns (the 'finite pool of worry' hypothesis; Weber, 2010). Alternatively people may believe, rightly or wrongly, that economic

- **Cognitive dissonance**, expressed as a resistance to home truths as the anthropogenic nature and scale of climate change impacts becomes much clearer. A collective failure to admit that lifestyles today might now need to change in radical ways may well have combined with a degree of denial brought about by some of the more catastrophic and emotive portrayals of future climate impacts .
- **Politicisation and distrust** of communications about climate change – with less trusted actors (politicians, media, major companies) now far more prominent than scientists in communicating with people about the issues, particularly as the debate moves on from the underlying science to consider policy responses.
- **‘Climate sceptic’ agendas** gaining greater prominence, as various groups and individuals continue with their long-standing attempts to highlight uncertainties in climate science. For Britain this hypothesis is less plausible for the period prior to the onset of the University of East Anglia e-mail controversy in late November 2009, but perfectly possible as an explanation for further changes in beliefs after that point. Prior to the East Anglia controversy, reporting of climate change in the mainstream UK media following the Stern and IPCC 4th reports had more or less

- **Uncertainty transfer** – a very subtle process, where uncertainty over one aspect of climate science and policy spreads to generate uncertainty and scepticism about a different aspect. In particular, the increasing discussion of the many uncertainties associated with climate impacts and adaptation measures may, perversely, increase the uncertainty that some people feel over the reality and anthropogenic causes of climate change. Although not necessarily a serious issue at this point in time, such uncertainties are increasingly being framed explicitly in risk terms for policy and decision-making purposes, as for example with the UK Climate Projections '09. Hence, this may well set a number of very difficult challenges for climate communicators over the coming decades.

In addition to the medium-term rise in scepticism (2007-2009), the mass media are known to be a source of attenuation and amplification of risk perceptions. The very concerted attention during the debate about the University of East Anglia e-mails and the IPCC glacier assessments in the winter of 2009-2010 would also be expected to further impact beliefs about climate change, by adding to the recent decline in belief. A BBC/Times Populus poll conducted in December 2009 and then repeated in February 2010 appears to confirm this, finding a clear short-term decline in the numbers in Britain who believe that climate change is happening (BBC, 2010), while a YouGOV/EDF (2010) poll conducted in May 2010 also finds a drop of one quarter (from 37% in 2009 to 29% in 2010) in those who think climate change is a serious and urgent problem needing radical steps. Other more comprehensive surveys conducted in early 2010 in both Britain and the US (Spence, Venables et al, 2010; Lieserowitz et al, 2010a) also seem to confirm a decline in belief, with less people now believing in climate change and its seriousness, across a range of measures, than did a few years ago. It is important to note here that, in interpreting the latter two studies, the longer-term influences (fatigue, the recession, distrust etc.) are likely compounded with any impacts of the short-term media reporting. Additionally, the UK survey which was conducted by Ipsos-Mori for Cardiff

University between January and March 2010, while the e-mail controversy was at its height and in the wake of the unusually harsh UK winter, found that fully 78% still believed that the world's climate was changing (Spence, Venables et al, 2010). The climate attitudes hour-glass might be not now be half-empty as some have attempted to claim, but despite everything remains over three-quarters full, a point echoed about US public opinion recently by the political scientist Krosnick (2010).

What we do know about events such as the climate e-mails affair is that the impacts of media amplified stories and controversies such as this are often relatively short-lived in terms of impacts on attitudes and behaviour (e.g. the change in travel patterns following both the September 11th and the July 7th terrorist attacks were transitory) and confound any longer-term trends which might be present. This suggests that, without further major controversy, we might expect belief in climate change to gradually recover to the earlier trend levels - something already beginning to happen in US data collected in early June 2010 (Leiserowitz et al, 2010a). We shall not know the full impacts of these events on attitudes for some time yet, and whether any will prove permanent. Amplification events are, however, also known to have secondary consequences (see Pidgeon, Kasperson and Slovic, 2003), and one unfortunate outcome might well be for some UK media to revert to its traditional practice of 'balance' in reporting climate stories – hence, for a period into the future, giving a false impression regarding the overwhelming scientific consensus on the anthropogenic causes of warming. It is also the case that the main effect of many of the media reports about the e-mail controversy might simply be to reinforce the existing views of those in society who have already take up sceptical positions (a phenomenon called cultural polarization, as discussed in section 3.5 above), rather than to prompt any fundamental shift in the attitudes of the far larger segments of ambivalent and concerned groups amongst the British or global publics – many of whom have probably not even heard of this controversy at all (see e.g. Krosnick, 2010; Leiserowitz et al, 2010c). Again, further research is warranted on this important issue.

4. Futures Implications – Governance, Climate and Sustainability

This paper has reviewed the long-term trend in opinions and attitudes towards climate change to date. While there remain gaps in the evidence-base, for example with respect to developing nations, the pattern is a fairly consistent one. However, how attitudes will evolve over 5, 10 or 50 years sets a much more difficult task - particularly as the impacts of climate change are themselves uncertain, as are the important contextual factors such as media reporting, political events, decarbonisation and adaptation efforts, or future development of geoengineering 'solutions', all of which might impact opinions. Accordingly this section must be treated with due caution and realism – it does not represent what will happen or even what is most likely to happen. In the same way that, as Mike Hulme (2009) has pointed out, we will not know the future of our climate until it finally arrives; we are unlikely to be able to fully envision the future society which will have to live with that climate. This brief discussion offers the author's thoughts on this matter, drawing also upon some of the analysis in Lorenzoni, O'Riordan and Pidgeon (2008), Spence and Pidgeon (2009) and Pidgeon and Butler (2009).

A first point to make is that a considerable challenge already exists for both governments and communicators in making climate change a salient issue for people in the UK – one which is sufficiently motivating to make mitigation a focus of everybody's lives and actions. There currently exists a very real gap between people's expressed concerns about the environment and their actions (the value-action gap). What also seems clear is that context matters in constraining action and belief. Context shapes and constrains both attitudes and behaviour, and what is possible both now and in the future. If the relevant context does not change (or changes only very slowly) then attitudes and behaviour towards the environment are unlikely to undergo radical change either.

Will changing climate impacts matter in shifting perceptions, as the first and most obvious contextual variable? In the short-term (up to about 2050) probably not, for a number of interrelated reasons. Currently, as discussed above, people view climate impacts as distant from them personally in both time and space. They also often associate 'climate' with their own direct observations of the weather. A plausible hypothesis here is that, as disrupted UK weather patterns become more evident through media reports and direct observation, particularly if a series of such events occurs relatively rapidly, people will begin to see climate impacts as personal to them. Estimates differ on the extent of likely global mean temperature rise over the course of the coming century, although it seems increasingly likely that without radical mitigation measures global temperature change will not be limited to the 2° rise conventionally seen as the threshold for 'dangerous' climate change (see Oppenheimer, 2005; Lorenzoni, Pidgeon and O'Connor, 2005). We may well see rises of this order as soon as 2050, and further mean global temperature rises that breach this limit (say 3-4° or worse) by 2100. Even under such a scenario, observable² physical impacts in the UK during the first half of this century would involve a gradual rise in the frequency of prolonged hot dry spells in summer, more instances of water restrictions, increased (but localised) flooding events, coupled with a greater frequency and intensity of rain in the West and North West. Some aspects of land use might also have to change over time. Many of these impacts will be difficult and expensive to adapt to, but most will be gradual rather than exceptional, cumulative rather than catastrophic, and many will be unlikely to be significantly out of the range we ordinarily experience through annual (or even day-on-day) fluctuations in weather. Even major flooding, as in 1953, has occurred in the recent past: it is only relative *risk* which will increase. Since individuals and social systems are particularly ill-suited to respond to gradual changes in their environments, it is not at all clear that short-term UK climate impacts, on their own, are likely to significantly shift public motivations, or to impact the lifestyle identities which currently drive unsustainable behaviours. And as discussed above

² The report ignores less directly observable, though probably equally important impacts such as species loss, changed land-use, or population migration.

the evidence is mixed on the impacts of extreme events such as flooding on climate beliefs. It remains to be seen, for example, whether the multiple UK and European flood events throughout the years 2000-2009 are now feeding through to more fundamental changes in attribution. The possibility for short-term change probably only exists where multiple visible events are also associated with development of consistent media and other discourses, which explicitly link these impacts to climate change and its anthropogenic causes - something which would also need to be expressed and communicated effectively in risk terms. Beyond 2050 (and under the 3-4 degree scenario) it becomes far more difficult to envisage a situation where climate change remains a hidden or secondary concern for most people. Equally, so many other factors may have changed by then (see below) so as to render predictions almost impossible.

Climate impacts occurring in more vulnerable locations across the globe over the next 40 years (e.g. in Africa or Asia) are, of course, likely to be of a different order to those occurring in the UK. But even these events might only serve to reinforce the existing belief that climate change is a matter for other countries and peoples, and for the UK just traditional disaster relief and emergency development aid. Major loss of life occurring in distant countries rarely generates the same level of emotional or cognitive engagement that individual, identifiable deaths do (Slovic, 2007). Where external climate disasters do have a potential to shift beliefs, it is more likely to be with respect to adjusting society's long-term moral compass, towards incorporating a greater concern for fairness and equity for both other people and the environment. Expressing climate change to resonate with people's (moral) norms and values, even if this means transcending scientific uncertainty by couching it in terms of environmental, social and economic sustainability, is part of the challenge. In addition, technologies and approaches which genuinely embed within our everyday activities transparent linkages between behaviour and the environmental damage being caused will also have an important role to play. All of this suggests a clear need for effective communication allied to community and other forms of engagement (e.g. via NGO networks) around climate change objectives.

Some have argued that framing climate change in catastrophic, emotive terms may itself be counterproductive, by encouraging audiences to switch off or become habituated to the messages that they receive (Moser, 2007; Hulme, 2008; O'Neill and Nicholson-Cole, 2009). However, while fear can lead to rejection and denial of messages, in other domains such as health protection fear communications are found to work in changing both attitudes and behaviour but only if they are accompanied by other factors such as perceived personal vulnerability, appropriate levels of social support, and above all practical actions that people can take to establish a level of control over the risk (Spence and Pidgeon, 2009; 2010).

In summary, establishing climate salience (or the equivalent of placing society on a 'war footing' in its climate response; see Clayton, Pidgeon and Whitby, 2006) is unlikely to come about in the near-term simply because of a recognition that physical climate impacts are directly occurring within the UK, even when some of these are severe. Achieving this would need a consistent framing, or narrative, linking climate risk, impacts and ongoing events (see Nisbet, 2009). Such reframing is probably more likely to depend upon policymakers and stakeholders addressing factors other than the impact events themselves. Equally, other major global uncertainties which could impact before 2050 – conflict, continued economic recession, overpopulation and migration patterns, resource depletion and 'peak oil' – hold a far greater potential to influence future attitudes and behaviour towards the environment, climate and decarbonisation policies. This clearly cautions against basing forecasts about how society will evolve under the climate threat *solely* upon climate-oriented projections (e.g. the IPCC scenarios). For example, if depleting oil leads to sharply raised fossil fuel prices, pressures for radical energy conservation measures will also increase (see also the *Hartwell Paper* by Prins et al, 2010).

What major climate disasters are more likely to lead to is the opening up of temporary opportunities, or 'policy windows' as they have been termed by Kingdon (1984), which would then allow legislators the license to take

specific bold actions which they ordinarily believe would not otherwise be possible or politically acceptable. Past examples in the environmental and health arena include the introduction of the Clean Air Act after the London smog, and the development of the Thames Flood-Barrier after the 1953 East Anglia flooding. Of course disasters can also lead to ill-judged regulatory responses (Hood, Rothstein and Baldwin, 2001), but what Kingdon's model suggests is that there is merit in policy actors evolving *in advance* solutions to anticipated climate events (even though the political will to implement them might not currently be there). Risks, unfortunately, do bring policy opportunities, and the extent to which such windows for action might appear in the UK as a result of the occurrence of key climate-attributable events might form one line of socio-political analysis linked to the UK Climate Risk Assessment. In effect, envisaged solutions can become rapidly translated into practical options for action following a major disaster or near-miss. Radical change does depend upon the willingness of governments of the day (regional/local and national) to adapt policies in the light of the changed circumstances. Even here pressure for change may be limited to bolstering adaptation (e.g. better flood defences) rather than stronger mitigation to address underlying causes, given the close linkage between on-the-ground adaptation measures and demonstrable, local, human and environmental protection. What people are likely to care about most, in the aftermath of a climate-related disaster involving major loss of life or service disruption, would be any suggestion of government or corporate neglect in preparing for such events (see contributions to Hood and Jones, 1996).

Perhaps better communication about climate change will impact beliefs and practices? An enduring assumption of much public policy in the environmental domain is that information provision is a sufficient condition for people to change their behaviours in an environmentally beneficial way. Risk and uncertainty framings are likely to be particularly important for this. While climate science and modelling has always acknowledged and incorporated complex uncertainties and gaps in its understanding, policy documents of the past have preferred to avoid risk. However, the 4th IPCC

report in 2007 did adopt explicit (defined) likelihoods in describing scenarios and impacts, while the 2009 scenarios for the UK Climate Impacts Programme incorporate likelihood-based regional impact predictions to aid adaptation decision-making for the very first time. The UK Climate Risk assessment will, likewise, advance the policy and public debate about climate uncertainty around adaptation. Risk and uncertainty, then, are set to become part of the common currency underpinning debates about climate change decision-making (Pidgeon and Butler, 2009). As a result, engaging the lay public about climate change will need to draw upon the very best guidance already developed within the field of communicating risk. These include such things as: avoid overly technical or patronizing language; choose risk terms with care, to contextualize numbers and risks in everyday terms, but without raising spurious comparisons; recognize diversity of audiences; avoid distrusted communication channels or parties; treat communication as dialogue (so as to learn as well as inform); combine information about harmful outcomes with actions which can help people to avoid the risk; and (always) evaluate communication impacts (see Fischhoff, 1995; 2007).

The reality of climate communication is complicated by cultural and political differences in beliefs - such that it is unwise to assume that there is any single public opinion on climate change (e.g. DEFRA, 2008; Hulme, 2009) just multiple 'publics'. Communication design has to recognise this. There are also multiple barriers to change that mean that many people fail to act in a sustainable manner even when they accept a message. For example an individual may lack the funds to buy a more energy efficient product, may feel that they have other, more immediate priorities, or simply be reluctant to change their current habits and lifestyle (Lorenzoni, Nicholson-Cole and Whitmarsh, 2007). A useful distinction drawn within the health intervention literature is between upstream and downstream interventions (Maio et al, 2007). Downstream interventions refer to communications designed to change existing values and beliefs whilst upstream interventions refer to external structural changes including legal constraints and physical changes to the environment that themselves force,

encourage, or more gently nudge people towards different practices and lifestyles. In reality a successful policy or campaign will often involve elements of both, and there is no reason to suspect climate change interventions will be any different in this regard. The change in attitudes towards wearing seat belts, or against smoking in public places, for example, only fully came about after legislation first forced people to change their behaviour (coupled with long-term communication strategies to state why that change was necessary). What these and other examples suggest is: (a) that attitudes towards climate change, sustainable behaviour and individual responsibility for action on climate change more generally, can be influenced but only as part of well-designed structural interventions coupled with appropriately designed and evaluated (long-term) communications; and (b) public discord does not inevitably follow a change that legislators originally hesitate over, as beliefs and practices themselves often accommodate over time to externally imposed changes in behaviour. On this latter point we have also discussed evidence from different studies suggesting the conclusion that many people may currently be *ahead* of the political process in wanting bold, visible and demonstrably effective action on climate change from governments and other societal actors (Lorenzoni, O’Riordan and Pidgeon, 2008). Set against this, climate change and its causes are always likely to remain something of a hidden issue for most people in their day-to-day lives – and most of the time people will not particularly care about the precise details of climate policy as long as government actions are not seen as excessive or unfair. What may be more important in the future will be the engagement of the various engaged stakeholders - business, national and local authorities, NGOs and activist groups, media and scientists - in a way that effective climate policies can then be developed and fully implemented.

One exception to the above analysis may well be attitudes towards environmental taxation, where there tends to be less support for measures which impact people personally, than for other - e.g. technological – options (see e.g. Nisbet and Myers, 2007; Spence, Venables, et al, 2010), particularly amongst those on the political right. The UK transport fuel

protests in 2000 illustrated how disruptive action can be rapidly mobilized around opposition to environmental taxation. In that example, however, it was clear that successive governments, Conservative and Labour, had failed to properly explain to people why the fuel escalator was in place. Indeed, much of the current discourse surrounding climate change denial is bound up with wider beliefs about opposition to state intervention and personal taxation. The extent to which measures are framed in this way or in alternative terms (e.g. as contributing towards dedicated decarbonisation policies, or as part of a climate compensation fund), and more critically the extent to which they are perceived to be fair, are all likely to impact upon the ways in which they are received (see e.g. Thaler and Sunstein, 2008; Nisbet, 2009; Brechin, 2010). It is also not at all clear from the literature – in part because this issue is not well studied – whether members of the public grasp the full scale of changes necessary if the UK is to meet its tough emissions targets by 2050. When asked what they are doing about climate change the answer is often ‘recycling’, and recycling rates have indeed increased dramatically across the UK in the past 10 years. While worthwhile activity in and of itself, recycling is not necessarily the best way of effecting major reductions in our personal carbon emissions (DEFRA, 2008; Dietz et al, 2009). It may well be that a radical reframing of public opinion would come about if the true nature and scale of the problem were made clearer to people.

By contrast to climate impacts and direct communications, powerful contextual factors shaping our behaviour, practices and attitudes towards the environment and climate change are far more likely to arise from future societal responses to the climate threat. These will include system-wide changes to major energy infrastructure and technology (UKERC, 2009), availability of more sustainable and energy efficient goods and services, changes to transport infrastructure, rising energy prices, and various adaptation measures. All of these hold the potential to change not only people’s behaviour, practices and lifestyles (some quite quickly) but with this also beliefs about climate change. Indeed, to work as intended many of the planned new technologies and low carbon interventions will *depend*

upon people changing their behaviour and beliefs (see Spence and Pidgeon, 2009), whether this is through uptake of home efficiency programmes, use of electric vehicles and 'eco-driving', the acceptability of new nuclear power or onshore wind, or the acceptance of new fiscal regimes.

One area of energy and climate policy where we do have considerable empirical experience concerns public attitudes to energy production. Energy system change bears upon multiple long-term national policy goals, including the transition to a low carbon economy, energy security and affordability, and mitigating wider environmental impacts. Significant interrelated transformations in the way the UK supplies, manages and consumes its energy will be essential if these aims are to be attained (DECC, 2009; UKERC, 2009). Public values, attitudes and acceptability will be of critical importance in these processes of whole energy systems transformation, with the potential to present both opportunities and challenges for the delivery of energy policy and change across multiple areas. Demand side shifts will involve behaviour change to decrease energy consumption as well as the uptake of new energy management technologies such as interactive smart metering. On the supply side considerations relate to major infrastructure siting (e.g. acceptability, equity) and the lifestyle changes implied in new supply configurations (e.g. an all electric future). We have considerable understanding of public (un)acceptability of single technologies such as wind (Bell et al, 2005) or nuclear power (Rosa and Clark, 1999; Pidgeon, Lorenzoni and Poortinga, 2008), and insights into individual behaviour-change options (e.g. Dietz et al, 2009, Upham et al, 2009). However, there is scant evidence regarding potential public responses to the sorts of whole energy-system transformations (e.g. to all electric homes or transportation) which are now being discussed as serious options for 2050 and beyond. Public attitudes towards innovative technologies, as well as towards whole energy-system change, are therefore important areas for future research. In a similar fashion, we can only speculate at this stage how some of the more radical technological proposals for addressing climate change, such as climate

geoengineering, will interact with public views if they are ultimately developed and deployed. Will such technologies prove a wake-up call for people, leading to recognition of the scale and seriousness of the problem, or will they lead to a situation insurers describe as 'moral hazard', where people believe that the pressure to mitigate carbon emissions is reduced because of the promise of an easy technological solution (Royal Society, 2009; Corner and Pidgeon 2010)? Again there is a need for more detailed empirical work on this issue.

In their thoughtful analysis of why most countries have not moved further down the route of deep emission cuts, despite the overwhelming scientific evidence of climate change, Compston and Bailey (2008) argue that the failure is essentially a political one (also Giddens, 2009). They cite six factors underlying this: the perception that individual countries can do little on their own; the influence of climate sceptics; a shortage of viable technical and economic solutions; the problem of economic competitiveness between nations; fear of electoral retribution; and structural obstacles within government. Based upon their analysis it would appear that the greatest challenge for many countries around the world in the face of the growing threat of climate change will be one of governance, rather than merely of individual attitudes and behaviour. The UK has begun to address some of these political barriers through moves to reach cross-party consensus on climate targets in Parliament, the Climate Change Act and creation of the Climate Change Committee, and by placing energy and climate policy under the same ministerial portfolio. However, more does need to be done, and substantial political and economic barriers in the UK remain (including, for example, the separation of adaptation and mitigation policy), to which could be added a failure of the theory of ecological modernisation – the somewhat questionable assumption that growth in the global economic system would automatically be accompanied by better levels of environmental protection. The economist Tim Jackson has argued that the financial and ecological crises share the same underlying systemic origins, and that in order to face up to our major environmental and sustainability challenges we need a new economic paradigm stressing

'prosperity without growth' (Jackson, 2009). As a final remark, one could add that we also need to devise a democracy which votes for uncertain, but possibly vital future pathways that will maintain a sustainable planet for all. Achieving such a democracy will have to involve a genuine dialogue with electors and civil society more widely, on terms that neither patronises them nor minimises the considerable stakes involved.

[14,515 words]

5. Potential Risks

Table 5-1: Risks Summary Table

Risk/Scenario	Global/Regional Implications	Implications for UK (opportunities as well as threats)	
		Direct	Indirect
Successive UK governments fail to take necessary action because of misunderstanding of public desire for bold action on climate, coupled with a fear of the ballot box	UK suffers reduced influence on the international climate stage	Short-termism dominates decision-making	High risk of failing to meet domestic climate targets Insufficient UK adaptation measures UK climate governance processes come under intense scrutiny from external stakeholders. Calls for reform prompt civil disobedience, with a risk to the democratic process itself
Many UK citizens fail to take responsibility for their own environmentally damaging behaviour – citing fatalism instead Behaviour change interventions insufficient or ineffective in required timelines Moral hazard dominates behaviour as tech-fixes are promised by over-optimistic scientists and engineers		Public concern fails to grow. Societal and individual behaviour change is far too slow	Risk of failing to meet domestic climate targets.
Failure of government to win the argument for a fundamental reorientation of social values (away from individual wealth creation and economic growth, and towards environmental protection and human wellbeing)		Decarbonisation initiatives have to be promoted on a case-by-case basis	
Internal resistance to environmental taxes because of failure to	UK suffers reduced influence on the	Civil unrest and conflict	Climate policy suffers continual reversals, and as a result inconsistency

'design in' hypothecation and/or fairness	international climate stage		
Gradual changes in UK climate fail to motivate UK citizens to action – too few UK disasters to count prior to 2050		Lack of urgency and concern for local impacts of climate change Insufficient public pressure for adaptation measures	Risk of failing to meet domestic climate targets. Insufficient investment in adaptation measures
Major disasters (drought, floods) in developing countries externalised in the UK and other nations through 'traditional' disaster narratives	Failure to foster adaptive capacity for vulnerable countries. Increased conflict and war over environmental resources Mass movements of vulnerable populations	UK overseas response and planning remains within 'emergency response' and aid frames	Spiralling overseas aid budget Pressures for inward migration to the UK
UK climate politics becomes as deeply polarized as currently in the USA	UK withdraws from, loses influence in, or is thrown out of efforts to seek international climate consensus	Public views polarize Legislatory gridlock	Social conflict and democratic deficit High risk of failing to meet domestic climate targets
Major public opposition to renewable energy infrastructure developments (wind farms, Severn Barrage etc.)		Failure to meet renewable energy targets	UK-based renewable energy companies fail to thrive and relocate Lost markets overseas
Unintended social consequences of whole energy-system change Currently an 'unknown-unknown' – hence requires further research and horizon scanning		Could be negative or positive	e.g. industrial disasters follow hurried implementation of novel electricity supply technology, leading to public outcry e.g. 'localising' society around micro-generation technology builds social capital

Reduction in science education (esp. in the developing world) during severe economic times	Public concern remains low in vulnerable nations Failure to build adaptive capacity in vulnerable nations		
Fragmented international response (e.g. India goes it alone) reinforces fatalism at home	Failure of international climate negotiations Major climate 'tipping points' reached before 2100 Heightened risk of international conflicts	Onset of major climate impacts in the British Isles after 2050	UK deploys climate cooling (geoengineering) technologies unilaterally, with attendant risk of international sanctions
Global events other than climate change (e.g. peak oil, prolonged economic depression, wars) disrupt, force or constrain UK government actions		Presents both risk and opportunity – but some key disruptive events very difficult to predict or control	

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