Public Perceptions of Climate Change and Energy Futures in Britain

Summary Findings of a Survey Conducted in January-March 2010

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Understanding Risk Working Paper 10-01

2010

Acknowledgement

Work in this report was jointly funded by the UK Economic and Social Research Council (grant RES-062-23-113) and the Leverhulme Trust (F/00 407/AG). The authors would like to thank Jacquie Burgess, Catherine Butler, Sara Cartwright, Adam Corner, Helena Cuneen, Patrick Devine-Wright, Dick Eiser, Liz Hawkins, Cassie Higgs, Mike Hulme, Hans Jensen, Branden Johnson, Chris Jones, Gary Kass, Nigel Knee, Annabelle Lillycrop, Irene Lorenzoni, Greg Maio, Kathryn Mearns, Tim O'Riordan, Karen Parkhill, Marc Poumadère, Jennifer Pride, Simon Roberts, Eugene Rosa, Dick Taylor, Paul Upham, David Vincent, Lorraine Whitmarsh, and Steven Yearley for comments and advice on the development of the survey.

This paper may be cited as Spence, A., Venables, D., Pidgeon, N., Poortinga, W. and Demski, C. (2010). Public Perceptions of Climate Change and Energy Futures in Britain: Summary Findings of a Survey Conducted in January-March 2010. Technical Report (Understanding Risk Working Paper 10-01). Cardiff: School of Psychology.

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Contents

Introduction and Policy Background

In this report we examine current perceptions of climate change and future energy choices in Britain. The report has two main aims. First, to examine public attitudes towards climate change and different forms of energy production, and second, to investigate how public views in relation to these issues have changed since the major survey conducted by the research team in 2005 (Poortinga, Pidgeon and Lorenzoni, 2006)[1].

Avoiding dangerous climate change is one of the most urgent environmental policy issues, and it appears increasingly likely that societies must undergo major transformations in order to avoid the worst of its potential impacts. In the UK the legally binding Climate Change Act sets an ambitions target of an 80% reduction in emissions of all greenhouse gases by 2050 compared to a 1990 baseline (Defra, 2008). Achieving such tough emissions reduction goals will necessitate significant changes to the ways we both produce and use energy: in particular a transition to lower carbon energy sources, the reconfiguration of supply networks, and changes to behaviour so as to decrease individual and community energy consumption.

Public perceptions and attitudes are critically important to many of these challenges. On the supply side, public acceptance of new and innovative energy facilities such as power stations and new grid infrastructure will play a key role. We know from a range of past case-studies that community opposition can lead to delays or even cancellation of plans and construction (Boholm and Löfstedt, 2004; Toke, 2005) and uncertainty associated with siting processes can bring negative psychosocial and health impacts in affected communities (Elliott et al., 1997). On the demand side, perceptions of the need to take mitigating action against climate change, and of the ability to act on this, will be key precursors to personal behaviour change and compliance with wider policies aimed to motivate such changes (Spence and Pidgeon, 2009; American Psychological Association, 2010).

Previous research on perceptions of climate change had indicated that public awareness of the issue is high (Defra, 2006) with the overwhelming majority in 2005 believing that the world's climate is changing and that action should be taken against it (Poortinga et al, 2006). However, perhaps paradoxically given the strengthening scientific evidence of the anthropogenic causes, more recent research suggests that the public in both the UK and US may have started to become somewhat more sceptical about the issue (DFT, 2010; Leiserowitz et al., 2010). In addition, the media controversy generated during the winter of 2009-2010 concerning e-mails from climate scientists at the University of East Anglia (BBC News, 2009a), and over glacial melting forecasts made by the Inter-governmental Panel on Climate Change (BBC News, 2009b), might additionally have served to reinforce uncertainty and scepticism amongst some sections of the public in both the UK (e.g. EDF/YouGov, 2010) and elsewhere. Accordingly, gaining an in-depth profile of public attitudes to climate change at this point in time is a critical task in understanding whether, and in what ways, these might be changing or not.

A further key factor in the energy policy debate is energy security. The goal of climate change mitigation must be achieved while also delivering reliable and secure energy supplies (DTI, 2006). Currently, most of the UK's energy is generated by a mix of fossil fuels and nuclear power, with only a small proportion using renewable sources (DTI, 2005). In addition, the majority of the UK's nuclear power stations (currently 13.5% of electricity supply) reach the end of their operational lives over the next two decades, as do many older

[1] The 2005 study 'Public Perceptions of Nuclear Power, Climate Change and Energy Options in Britain' involved a major national survey of attitudes in a representative sample of the British public aged 15+. A summary, including full details of the methodology is available at:
http://www.data-archive.ac.uk/doc/5357%5Cmrdoc%5Cpdf%5C5357userguide.pdf

coal-fired stations. This leaves Britain with a potential future shortfall on the electricity supply side (Defra, 2007). Accordingly, the 2008 White Paper on Nuclear Power laid out the former (Labour) Government's intention to allow the building of new nuclear power stations, not just as a low-carbon source of energy production but also in order to decrease dependence on imported energy from other countries (BERR, 2008). Regarding renewable supply technologies, the renewables obligation order for power companies commits suppliers to a major expansion of electricity from renewable sources (to 15.4% by 2015 DECC, 2009). We currently know very little about the factors which ordinary people might deem important for their own and collective energy security, and how such beliefs are be related to wider beliefs about energy more generally, climate change mitigation and preferences for future energy for sources.

Regarding specific generating technologies, public perceptions of nuclear power do appear to have become less negative in recent years (Knight, 2005), in part due to the reframing of nuclear power as a possible solution to climate change and as a reliable and secure supply of energy. However, our previous research suggests that many people express only a 'reluctant' or at best ambivalent acceptance of nuclear power (Poortinga et al, 2006; Bickerstaff et al, 2008; Pidgeon et al., 2008), while given the choice people overwhelmingly favour renewable sources of energy generation over both nuclear and fossil fuels. Again, there is a need to establish whether the relative balance of public preference has shifted further in the light of the evolving policy discourses regarding climate change, energy security and low carbon energy proposals. And, as noted above, some of the proposed new infrastructure developments are likely to court local controversy, and in some places fierce public opposition – something which is well documented in the nuclear case from the past (Pidgeon et al, 2008) as well as with some, although by no means all, UK onshore wind developments (Bell et al, 2005).

This new survey builds upon the earlier work from 2005 (Poortinga et al., 2006), using a comprehensive nationally representative survey of public perceptions and attitudes towards climate change and related future energy options in Britain. Where key questions are replicated exactly from the previous survey, changes in public attitudes since 2005 are examined.

Issues examined in detail in this report include.

- Attitudes towards generic forms of electricity generation
- Concerns about the security of electricity supplies in Britain, using for the very first time an integrated and comprehensive set of energy security belief items
- Current beliefs about nuclear power, including perceived risks and benefits, trust in authorities, and attitudes to nuclear energy when set against climate change and energy security concerns.
- Beliefs about climate change, including perceptions of risks and benefits, levels of concern, perceptions of personal agency and temporal/spatial distance of climate impacts, willingness to pay and to change behaviour in order to combat climate change, and perceptions of current climate effects.
- Attitudes towards the building of new energy-generating facilities, towards geoengineering, and towards the proposed Severn Barrage tidal project

The present study also included a range of measures concerning: respondents' core values and environmental attitudes, which are known to be important in predicting risk preferences; as well as over-sampling in Wales and Scotland, and in two power generation locations (East Aberthaw in Wales, and Hinkley Point in Somerset). These additional aspects of the study are not reported here, but will be the subject of subsequent analyses and reported in future publications.

Ipsos MORI carried out the fieldwork and, on completion, provided Cardiff University with the survey data in data tables and SPSS. Cardiff University was responsible for the design of the questionnaire and the analysis, interpretation and reporting of the survey results.

We conclude this report with a number of key findings. A copy of the full questionnaire used, marked up with the raw Topline findings from Ipsos MORI for the core British sample, is included as an Appendix to this summary report.

The Survey

Procedure and Respondents

Ipsos MORI conducted interviews for this quantitative survey between 6th January and 26th March, 2010. A nationally representative quota sample of the British population aged 15 years and older (i.e. England, Scotland and Wales; n=1822) were interviewed face-to-face in their own homes. Table 1 shows a detailed breakdown of the sample.

Table 1: Characteristics of the 2010 Survey Sample (n=1,822)

Characteristic		%	Characteristic		%
Gender	Male	48	**Employment**	Working (full-time)	36
	Female	52	**Status**	Working (part-time)	13
				Unemployed	8
Age	15-17	3		Retired	27
	18-24	12		Looking after	7
	25-34	14		house/children	
	35-44	18		Disabled	3
	45-54	17		Student	7
	55-64	14		Other	*
	65-74	13			
	75 and older	9			
			Level of	No formal qualifications	18
			Education	GCSE/O-level/CSE	19
				Vocational qualification	11
				A-level or equivalent	18
				Bachelor degree or equivalent	19
Ethnic	White	93		Masters/PhD or equivalent	6
Background	Asian or Asian British	4		Still studying	1
	Black or Black British	2		Other	8
	Mixed	1		Don't know	*
	Other	*			
			Social Grade[2]	A	3
Number of	none	69		B	23
Children	One	16		C1	31
	Two	11		C2	21
	Three	3		D	14
	Four or more	2		E	9
	Don't know/refused	*			

Source: Cardiff University Climate Change and Energy Futures Survey 2010 (unweighted dataset, n=1822). Note: * denotes a value of less than 1% but greater than zero.

Computer Assisted Personal Interviews (CAPI) were conducted by fully trained and supervised MORI interviewers and took 30 minutes on average to complete. Interviewers introduced themselves as from Ipsos MORI the independent research organisation carrying out a survey on behalf of Cardiff University about the environment and how our energy is supplied now and in the future. Interviews were conducted at 315 sample points (including Scottish and Welsh booster samples), each of which represented a single output area.

[2] The social grades presented here reflect the social class definitions as used by the Institute of Practitioners in Advertising based on the occupation of the chief income earner. This classification is standard on all surveys carried out by Ipsos MORI. The classification is as follows: A: Higher managerial, administrative or professional (Upper Middle Class); B: Intermediate managerial, administrative or professional (Middle Class); C1: Supervisor or clerical and junior managerial, administrative or professional (Lower Middle Class); C2: Skilled manual workers (Skilled Working Class); D: Semi and unskilled manual workers (Working Class); and E: State pensioners, etc, with no other earnings (those at the lowest levels of subsistence).

Sample points were selected randomly from a stratified sample of output areas sorted by Government Office and council area. Output areas containing fewer than 80 postal address files were excluded from the sample. Interviewers approached selected addresses within the sample points until quotas were reached (gender and age figures were based on ONS 2007 mid-year population estimates while working status was based on 2001 Census data). Interviewers left at least 3 addresses between each call and conducted a maximum of 1 interview per address. No incentives were offered for participation. The findings from the overall British sample of 1,822 are based on a core sample of 1,528, to which the additional booster samples from Scotland (109) and Wales (185) were added. The data were then weighted to the profile of the known British population on the basis of gender, age, working status, social grade and ethnicity. Reported results (at a sample size of 1,822) are accurate to within +/- 2.6% (the full confidence intervals are: 1.6% at a 10% or 90% finding, 2.4% at a 30%/70% finding and 2.6% at a 50% finding). Similar data collection procedures were adopted for the survey conducted by MORI (now Ipsos MORI) in 2005. Full details of these are provided in the 2006 report (see Footnote 1).

Overview of Topics

This report covers a number of broad areas of enquiry which collectively provide a comprehensive examination of public attitudes towards climate change, energy security issues and energy futures.

- First, it examines general attitudes towards a range of sources of energy generation.

- This is followed by an examination of public concerns relating to the security of UK electricity supplies.

- Next, the report describes attitudes towards nuclear power on a number of measures, including concern, trust, and perceptions of risks and benefits. Variations in public perceptions of nuclear power, when presented in the context of climate change and energy security policy goals, are also presented.

- Subsequently, attitudes towards the building of new energy generating facilities are investigated.

- This is followed by an examination of attitudes towards climate change. In particular, this section addresses attitudes, beliefs and concern about climate change, perceptions of risks and benefits, levels of scepticism and uncertainty, perceived impacts, perceptions of personal agency and responsibility to act, and also the changes that individuals are prepared to make in the context of climate change.

- The final section of the report presents results from questions on awareness and attitudes towards geoengineering.

Throughout the report, the results of the present study are contrasted with those of a previous survey conducted for us by MORI (now Ipsos MORI) in 2005 for the University of East Anglia (Poortinga et al., 2006) on a range of key questions. These key questions were specifically included in the questionnaire to assess the changes in public attitudes since 2005.

Findings

Section 1: Favourability towards Different Forms of Electricity Generation

Previous research suggests that people tend to express a preference for renewable forms of electricity production over those based on the burning of fossil fuels and nuclear power. We asked how favourable or unfavourable people's overall opinions or impressions were in relation to eight different sources of electricity generation (biomass, coal, gas, hydroelectric, nuclear, oil, solar and wind)[3]:

- The renewable options were regarded most favourably with solar power viewed most positively (88% mainly or very favourable), followed by wind (82%) and hydroelectric (76%).
- Biomass stands out as the renewable technology with somewhat lower levels of support (57%).
- In contrast, gas was the most favoured form of fossil fuel based generation (56%), followed by coal (36%), and oil (33%).
- Just 34% had mainly or very favourable impressions of nuclear power.

These results can be compared with the responses to the same question from the 2005 survey by Poortinga et al. (2006).

- Compared with 2005, the data shows that impressions have changed very little. Attitudes to biomass are slightly more favourable as compared to 2005 (57% versus 53%), while favourability ratings of oil have decreased (from 39% to 33%).
- Overall, first impressions of renewable forms of electricity production remain very favourable while those of fossil fuels and nuclear power remain largely unfavourable.

Results indicate that renewables remain the most favoured forms of electricity production, whilst coal, oil and nuclear power are the least favoured.

[3] Appendix Topline Q1

Section 2: Concerns about Security of Electricity Supplies in Britain

Concerns about energy security are an important factor in determining public attitudes towards different forms of energy production. For example, renewable sources are sometimes perceived as intermittent and unreliable, whilst other forms of energy production, such as coal and nuclear power are more likely to be perceived to produce a steady 'baseload' level of supply. In addition, some of the potential dangers of reliance on imported energy have recently been reported in the media (e.g. BBC News, 2006; 2009c).

Whilst the concept of energy security itself is not new, levels of public concern about the security of domestic electricity supplies have rarely been directly and comprehensively investigated in previous surveys. Following an exploratory interview study and a review of existing literature and previous surveys, we developed six items to reflect a range of public concerns about energy security. Responses show that security of supply is indeed a major concern for the British public[4]:

- The public's greatest concern is that the UK will, in the future, become too dependent on importing energy from other countries (81% fairly or very concerned).
- The public are also concerned about future electricity prices. Over three-quarters (78%) of respondents are fairly or very concerned that electricity will become unaffordable in the future.
- Concern is also high that supplies of fossil fuels will run out (78% fairly or very concerned), and that in the future there will be power cuts (69% fairly or very concerned) or rationing of electricity (66% fairly or very concerned)
- A further 59% are fairly or very concerned that the supply of electricity will in future be affected by terrorist attacks.

The majority of respondents were concerned about the future security of electricity supplies on these measures. In particular, concern is high in relation to future electricity prices, the potential consequences of running out of fossil fuel supplies and becoming over-reliant on imported energy from other countries.

[4] Appendix Topline Q7

Section 3: Beliefs about Nuclear Power

UK public perceptions of nuclear power appear to have become less negative in recent years (Knight, 2005), in part due to the reframing of nuclear power as a possible solution to climate change and as a reliable and secure supply of energy. However, our previous research suggests that many people express only a 'reluctant' acceptance of nuclear power (Poortinga et al, 2006; Bickerstaff et al, 2008; Pidgeon et al., 2008). In this section we investigate whether the balance of public preference has shifted further in the light of the evolving policy discourses regarding climate change, energy security, and the nuclear new-build proposals brought forward in the UK since 2008.

i. Risks and Benefits of Nuclear Power

We asked a series of questions relating to peoples' perceptions of the risks and benefits of nuclear power.

- Most people agree that there are risks to people in Britain from nuclear power (61%)[5], although this figure has fallen since the same question was asked in 2005 when agreement stood at 72%. Interestingly, more than half of people now agree that there are benefits to people in the UK from nuclear power (60%, compared with 49% in 2005)[6].
- Consistent with these data, the proportion of the sample who agree that the benefits of nuclear power either slightly or far outweigh the risks[7] has risen to 38%, compared with 2005 levels of 32%.

However, more than half (54%) of the sample remain either fairly or very concerned about nuclear power[8] (compared to 58% in 2005).

ii. Trust

We also asked people about their trust in the ability of the nuclear industry to run nuclear power stations safely, and their confidence in the British government's regulation of the nuclear industry[9].

- Only 39% of respondents consider that the nuclear industry can be trusted to run nuclear power stations safely[10]. However, this represents an increase in levels of trust of 8 percentage points from 2005.
- A total of 39% tend to agree or strongly agree that they have trust in the government to adequately regulate the nuclear industry. Again this represents an increase in trust from 2005, when 33% tended to agree or strongly agreed with this statement.

iii. Attitudes towards Nuclear New-build in Britain

We also assessed public opinion on the potential building of new nuclear power stations in Britain. Respondents were asked to choose between four scenarios representing different options on the replacement of Britain's existing nuclear power stations, and the building of additional domestic nuclear power stations[11].

- 17% (compared to only 9% in 2005) maintained that the number of nuclear power stations should be increased, while 29% (34% in 2005) were of the opinion that "we

[5] Appendix Topline Q6
[6] Appendix Topline Q6
[7] Appendix Topline Q2
[8] Appendix Topline Q5
[9] Appendix Topline Q6
[10] 39% *disagree* with the statement "I don't trust the nuclear industry to run nuclear power stations safely"
[11] Appendix Topline Q3

should continue using the existing nuclear power stations, and replace them with new ones when they reach the end of their life"

- 33% (compared to 34% in 2005) thought that "we should continue using the existing nuclear power stations, but not replace them with new ones when they reach the end of their life" while 13% (15% in 2005) were of the view that all existing power stations should be shut down now and not replaced with new ones.

On balance, preferences seem to have shifted slightly towards an expanded nuclear programme for the future, although the aggregate proportion wanting to replace nuclear (at current levels or with expansion) has changed little since 2005.

iv. 'Framing' Nuclear Power

a. Climate Change and Energy Security

Recent literature suggests that 'framing' energy choices (i.e. placing them in a specific context) can significantly influence levels of support (e.g. Bickerstaff et al., 2008; Asolabehere, 2007). Consistent with these studies, support for nuclear power is observed to rise when it is presented in the context of concerns about climate change and energy security.

- 56% of the sample (55% in 2005) tend to agree or strongly agree that they would be "Willing to accept the building of new nuclear power stations if it would help to tackle climate change"[12]
- 56% also agree with the statement "I am willing to accept the building of new nuclear power stations if it would help to improve energy security (i.e. a reliable supply of affordable energy"[13]
- In addition, 57% of respondents tend to agree or strongly agree with a statement expressing reluctant acceptance of nuclear power in order to help combat climate change and improve energy security, while 25% tended to disagree or strongly disagreed with this statement.[14]

b. The 'Energy Mix'

Support for nuclear power also rises when it is presented as part of the 'energy mix'[15].

- Most respondents (74%) tend to agree or strongly agree that "Britain needs a mix of energy sources to ensure a reliable supply of electricity, including nuclear power and renewable energy sources", compared to 63% in 2005.
- However, most respondents (58%) also tend to agree or strongly agree that "Britain needs a mix of energy sources to ensure a reliable supply of electricity <u>but this doesn't need to include nuclear power</u>" (emphasis added).

Support for nuclear power in the context of the 'Energy Mix' may be due to a perception that renewable sources of electricity production, while preferable to many people, are unable to fully meet future demand[16]. Hence:

- Over half of respondents (55%) tend to agree or strongly agree that "We need nuclear power because renewable energy sources alone are not able to meet our electricity needs" (compared with 48% in 2005)

[12] Appendix Topline Q21
[13] Appendix Topline Q21
[14] Appendix Topline Q6
[15] Appendix Topline Q21
[16] Appendix Topline Q21

- However, 70% of respondents also tend to agree or strongly agree that “We shouldn’t think of nuclear power as a solution for climate change before exploring all other energy options” (compared with 74% in 2005).
- In addition, the majority of respondents (71%) agree or strongly agree that “Promoting renewable energy sources, such as solar and wind power, is a better way of tackling climate change than nuclear power” (compared with 78% in 2005).

Overall, these results suggest that opinion remains divided on the issue of nuclear power. In general, attitudes appear to have become somewhat more positive across a range of items when compared with the 2005 results, although the majority of people are still concerned about nuclear power and public trust in the government and nuclear industry remains relatively low. Specific responses are heavily dependent on item wording with higher levels of support noted when nuclear power is presented in the context of climate change or energy security. What is evident, however, is that there remains a clear preference for renewable sources of energy production over nuclear power.

Section 4: Attitudes towards the Building of New Energy-generating Facilities

i. Coal, Wind, and Nuclear Power Stations

A number of new energy generating facilities will need to be built in the UK in the near future as Britain's existing nuclear and coal-fired power stations reach the end of their operational lives. We asked respondents how they would vote in a referendum on whether to build new nuclear power stations, new wind farms, and new coal-fired power stations in Britain[17].

- The least popular options were coal-fired power stations (50% would probably or definitely vote against, 36% would probably or definitely vote in favour) and nuclear power stations (46% would probably or definitely vote against, 41% would probably or definitely vote in favour).
- In contrast, 82% would probably or definitely vote in favour of building new wind farms in Britain (12% would probably or definitely vote against).

We also asked to what extent respondents would support the possibility of new energy generating facilities being built *within 5 miles of their own home*[18].

- In this context, approximately 60% of the public either tend to oppose or strongly oppose the building of both nuclear and coal-fired power stations. However, strength of opposition is greater towards new nuclear power stations being built close to people's homes (39% strongly oppose it) than to coal-fired power stations (29%).
- Most respondents (73%) would tend to support or strongly support the building of a new wind farm within 5 miles of their home (16% opposed or strongly opposed).

ii. The Proposed Severn Tidal Barrage

Finally, we investigated people's attitudes to the proposed Severn Barrage[19]. This development could generate a significant proportion of the country's electricity needs through harnessing the power of the tides in the Severn Estuary, but it could also be expensive and have significant environmental impacts.

- Explained in this context, responses indicated that 39% of the public would slightly or strongly favour the construction of a barrage. However, a significant proportion of the population (24%) are slightly or strongly opposed to the proposition, and over one quarter (26%) are neither in favour nor against it[20].

Public support for the construction of renewable energy from wind is very high, and even within 5 miles of a respondent's home, with most people willing to accept the building of a new wind farm. By contrast coal-fired and nuclear power stations are far less popular, which many people state they would oppose, particularly if the proposed development is close to where they live[21]. General support for the proposed Severn Barrage is currently somewhat lower than it is for wind.

[17] Appendix Topline Q38
[18] Appendix Topline Q25
[19] We acknowledge that there are several different barrage proposals. Here we asked about attitudes towards a barrage generally without providing specific details of the various proposals under consideration.
[20] Appendix Topline Q28
[21] Although suggestive of a 'Not In My Backyard' (NIMBY) response, we emphasise that concerns relating to the derogatory nature and limited utility of the concept have led some researchers to suggest that it should be abandoned (e.g. Devine-Wright, 2005; Wolsink, 2006; Devine-Wright and Howes, *in press*).

Section 5: Beliefs about Climate Change

Previous research suggests that the majority of people in the USA and Europe are concerned about climate change and believe that the world's climate is changing (Lorenzoni and Pidgeon, 2006; Upham et al., 2009). However, some recent studies have suggested that the long-term trend in concern about climate change may have peaked some three to four years ago (e.g. Leiserowitz et al., 2010; Department for Transport, 2010), and others have pointed to possible rising scepticism about the anthropogenic causes of climate change in Britain (Whitmarsh 2008).

The present data was also collected just after the extensive media reporting of e-mails from scientists at the University of East Anglia Climatic Research Unit (CRU), and also just followed reports that data on the rates at which Himalayan glaciers are melting were misinterpreted by the IPCC (BBC News, 2009a, b). The extent to which the changes (from 2005) in our data documented below represent immediate public responses to these specific very recent incidents over the winter of 2009/10, or the broader long-term trends identified in other polling cannot therefore be stated with certainty. Most likely the results are influenced to some extent by both factors.

i. Perceptions of Risks and Benefits, and Concern about Climate Change

We asked respondents to indicate the extent to which they agreed that there are risks and benefits to people in Britain from climate change.

- Two-thirds of respondents (66%) tend to agree or strongly agree that there are risks to people in Britain from climate change[22]. This represents a decrease of 11 percentage points compared to 2005.
- Nearly one fifth (18%) of people tend to agree or strongly agree that there are benefits to people in Britain from climate change – an increase of 5 percentage points from 2005[23].
- Most people (71%) remain either fairly or very concerned about climate change[24]. However, on a similar question asked in 2005, fully 82% expressed concern about this issue.

ii. Scepticism and Uncertainty

The survey included a series of questions assessing people's perceptions of the reality of climate change and its causes.

- The majority of respondents (78%) consider that the world's climate is changing (15% did not)[25]. However, this has to be compared to the 2005 survey when fully 91% believed this (and only 4% did not). These results are consistent with those from similarly worded questions in recent UK and US surveys (BBC, 2010; Leiserowitz, 2010) which also suggest that public confidence that climate change is happening may be decreasing[26].
- People most commonly consider that climate change is caused by a combination of human activity and natural processes (47%). Only 31% feel that climate change is caused mostly or entirely by human activity, and 18% consider that it has mostly or entirely natural causes[27].

[22] Appendix Topline Q11
[23] Appendix Topline Q11
[24] Appendix Topline Q8
[25] Appendix Topline Q9
[26] On the question 'Do you think global warming is happening?' Leiserowitz (2010) reports a fall from 71% agreement (in 2008) to 57% (2010) in the US. In the UK, the BBC report a fall of 8% (from 83% to 75% agreement) between November 2009 and February 2010, on the question 'From what you know and have heard, do you think that the Earth's climate is changing and global warming taking place?'
[27] Appendix Topline Q10

- The sample is split on whether the seriousness of climate change is exaggerated with 40% either tending to agree or strongly agreeing with this statement and 42% disagreeing[28].
- Only 28% tend to agree/ strongly agree they are uncertain that climate change is really happening, compared to 59% who tend to/strongly disagree with this statement.[29]
- Significantly, given the recent UK media profile of climate change issues, fully 57% nonetheless endorse the statement that most scientists agree that humans are causing climate change while a much smaller group (21%) disagree with this.[30]
- Regarding future climate impacts there is, understandably, far greater uncertainty among respondents with fully 69% agreeing (15% disagree) that it is uncertain what the effects of climate change will be.[31]

iii. Personal Agency and Perceived Responsibility

We also assessed the extent to which the public feel motivated and personally able to act in response to their concerns about climate change.

- Most people (71%) tend to agree or strongly agree that it is their responsibility to help to do something about climate change, and 63% tend to agree or strongly agree that they can personally help to reduce climate change by changing their behaviour[32].
- However, consistent with the 2005 data, most respondents consider that taking action against climate change is difficult[33], and regard national governments (32% selecting this option) and the international community (30%) as being mainly responsible for taking action[34]. Only 10% (8% in 2005) considered individuals and their families as mainly responsible for taking action.

iv. Behavioural Changes

We also asked a series of new questions designed to investigate the behavioural changes that people are prepared to make in relation to climate change.

- Most people (68%) state that they would probably or definitely vote in favour of a proposal to spend taxpayers' money on British projects designed to tackle climate change[35].
- In addition, 65% of people tend to agree or strongly agree that they are prepared to greatly reduce their energy use to help tackle climate change[36], and over half of respondents (52%) are willing to pay up to £10 more per month on their energy bills in order to ensure that their electricity comes primarily from renewable sources[37].
- Slightly less than half of respondents (44%) are prepared to pay significantly more money for energy efficient products[38].

[28] Appendix Topline Q11
[29] Appendix Topline Q11
[30] Appendix Topline Q11
[31] Appendix Topline Q11
[32] Appendix Topline Q12
[33] Appendix Topline Q12
[34] Appendix Topline Q20
[35] Appendix Topline Q38
[36] Appendix Topline Q41
[37] Appendix Topline Q39
[38] Appendix Topline Q41

These results show that although the majority of respondents believe that climate change is happening, levels of concern have fallen since 2005, and less than one-third of the population currently consider it to be a purely man-made phenomenon. However, most people consider that it is their responsibility to take action against climate change, and that they personally can help to make a difference. In addition, most people say they would be willing to pay more for renewable energy and for projects designed to tackle climate change.

Section 6: Geoengineering

Geoengineering refers to large-scale engineering projects designed to combat global climate change and has been advocated as a so-called 'Plan-B' climate control option should conventional mitigation and adaptation efforts fail (Royal Society, 2009). Geoengineering represents an important 'emerging technology' because of its potential wide-ranging global, governance and ethical implications (Corner and Pidgeon, 2010). Such approaches fall into two main categories: technologies to extract and store carbon dioxide from the air (Carbon Dioxide Reduction or CDR), and approaches to reduce incoming solar radiation (Solar Radiation Management or SRM). These technologies are novel and are presently unfamiliar to people, but nevertheless just starting to enter the policy debate. There is, therefore, value in gauging potential responses to these possibilities as 'baseline' measures against which future changes might be observed.

- Three-quarters (75%) of respondents had either not heard of geoengineering, or knew 'almost nothing about it'. Only 7% of respondents knew 'a fair amount' or more about geoengineering[39].
- Nevertheless, nearly half (47%) of respondents would tend to support or strongly support geoengineering approaches to tackling climate change in principle, with only 4% tending to oppose or strongly opposing. However, 50% of respondents were either unsure (i.e. stated 'neither support nor oppose') or did not have an opinion on the issue[40].
- Support for the CDR-type approach (i.e. 'Developing technology to extract the gases that cause climate change from the air and store them') is slightly greater (47% tend to support or strongly support) than support for the SRM philosophy (i.e. 'Developing technology to reduce global temperatures by reflecting sunlight back into space') (40% tend to support or strongly support)[41].

The results presented here must be interpreted with extreme caution. How can respondents on the one hand say they know nothing about an issue, but on the other express a favourable opinion? Such results raise the important question of the beliefs and knowledge people draw upon to construct such preferences and survey responses when they hold so little knowledge of a technology. Responses, for example would be expected to be sensitive to question wording. Parallels exist with recent surveys of attitudes, mostly positive, towards nanotechnologies (see Pidgeon et al, 2009; Satterfield et al, 2009), where general beliefs about the generic usefulness of new technology appear to dominate responses rather than judgements about the characteristics of nanotechnology *per se*.

Accordingly, one would not necessarily expect such beliefs to remain constant as more information about geoengineering is provided in the media, research and public policy domains. As such the current findings should be treated primarily as baseline measures of self-reported knowledge and general opinion.

Unsurprisingly, the concept of geoengineering is largely unfamiliar to most people. Of the individuals sampled for this survey, slightly less than half were broadly supportive of geoengineering projects in principle, and particularly of air capture and storage. However, these results must be interpreted with extreme caution and as such the current findings should be treated primarily as baseline measures.

[39] Appendix Topline Q22
[40] Appendix Topline Q23
[41] Appendix Topline Q24

Main Findings and Conclusions

This report describes the findings of a nationally representative British survey (n=1,822) of current public attitudes towards climate change and energy production. It is novel in including a series of detailed items on both topics, as well as in exploring for the first time a range of questions exploring beliefs about energy security. A further key objective of the research was to investigate how a subset of these attitudes might have changed since we last conducted a similar survey in 2005.

Fieldwork for the survey was conducted during January-March 2010. As such the survey represents the first major UK academic study of climate beliefs to be conducted following the stalled international climate negotiations at Copenhagen in December 2009. The fieldwork also came immediately after a period of intense media and political controversy surrounding climate science and climate scientists in the UK and elsewhere.

The survey has covered a large number of items (reported in the Appendix) some of which we do not comment upon in this initial report. In addition, further statistical analyses are required to explore the many important relationships between items (which will be the subject of future academic publications). Therefore, this report aims to summarise only the main descriptive findings of the survey as we see it, and also provides some brief overall policy conclusions.

Beliefs about Different Forms of Electricity Generation

Results indicate that renewable sources remain the most favoured forms of electricity production, whilst coal, oil and nuclear power are the least favoured.

Regarding the specific issue of nuclear power, which was a main focus of our 2005 survey and has also risen in UK policy importance since that study, our results suggest that British public opinion remains divided on this issue. Across many of the items, attitudes to nuclear power appear to have become somewhat more positive when compared with the 2005 results. However, the majority of people are still concerned about nuclear power and public trust in the government and nuclear industry remains relatively low. Specific responses are heavily dependent on item wording with higher levels of support noted when nuclear power is presented in the context of climate change or energy security concerns. What is evident, however, is that there remains a clear preference for renewable sources of electricity production over nuclear power. We interpret this, as we did earlier (Pidgeon et al, 2008), as reflecting only a qualified support (or 'reluctant acceptance') of nuclear power.

Concerns about Security of Electricity Supplies in Britain

The majority of respondents were concerned about the future security of electricity supplies across the range of measures used in the survey. In particular, concern is high in relation to becoming over-reliant on imported energy from other countries, future electricity prices, and the potential consequences of running out of fossil fuels.

Attitudes towards the Building of New Energy Facilities

Public support for the construction of renewable energy from wind is very high, and even within 5 miles of a respondent's home most people were willing to accept the building of a new wind farm. By contrast coal-fired and nuclear power is far less popular amongst the general population, developments which many people say they would oppose, particularly if the proposed development is close to where they live. General support for the idea of a Barrage across the Severn Estuary is currently somewhat lower than for wind energy.

Beliefs about Climate Change

Our results show that although the majority (78%) of respondents believe that climate change is happening, the absolute number who believe this has fallen significantly since our last survey (91% in 2005). Similarly, overall levels of concern have fallen since 2005, as have risk perceptions. The current data also show that just under one half (47%) consider climate change to be a product of both human and natural activities, while just under one-third (31%) consider climate change to be mostly or entirely a man-made phenomenon.

Although direct comparability of the current items with those from a range of earlier studies is limited (making any extent of recent changes in levels of opinion difficult to judge), it does appear that some uncertainty about aspects of climate change remains amongst segments of the British population. These findings are compatible with those of other recent studies from both North America and the UK, which also point to a possible increase in 'climate scepticism' and uncertainty regarding anthropogenic climate change amongst the general population.

Most people do consider that it is their responsibility to take action against climate change, while just over half believe they can personally help to make a difference. In addition, most people say they would be willing to pay more for renewable energy and would vote in favour of spending tax-payer's money on projects designed to tackle climate change. However, as in our 2005 research many people still believe that the main responsibility for taking action against climate change lies with national governments and the international community, rather than with individuals and their families. This most likely reflects a broader public belief that climate change is too difficult a global problem for ordinary people to tackle as individuals, coupled with a desire for governments to take a clear and decisive leadership role on this issue.

Geoengineering

Unsurprisingly, the concept of geoengineering is largely unfamiliar to most people. Of the individuals sampled for this survey, slightly less than half were broadly supportive of geoengineering projects in principle, and particularly of air capture and storage. However, these results must be interpreted with extreme caution, given the low levels of familiarity with the issue: in particular, they cannot tell us how people will view geoengineering if given more detailed information. As such the current findings should be treated primarily as baseline measures for comparison with future studies.

Overall Conclusions and Implications

The energy and policy landscape, as well our understanding of climate science, have moved on considerably since our last survey conducted in 2005. Not only are scientists more certain about the anthropogenic causes of climate change, but in the UK as well as elsewhere the need to decarbonise our activities at the individual, community and energy systems levels is a message that many politicians and other policy makers have now fully taken on board. The UK in particular was the very first country to commit, on a cross-party basis, to legally binding targets for greenhouse gas reductions and to independent procedures for monitoring progress, as enshrined in its Climate Change Bill. All of this might lead one to expect that public attitudes should have become more (rather than less) firm about climate change and its risks since our last survey in 2005.

We should stress that belief in climate change and levels of concern about the issue remain high in the current survey. But the data do appear to show an opposite trend to our prediction, a finding which is consistent with other emerging evidence showing a small but significant decline in certainty about climate change amongst the public in recent years. All of this sets a challenge for interpreting our findings. We can only suggest possible reasons

here. Perhaps people's greater attention to economic rather than environmental issues in the wake of the global financial crisis in 2008 has impacted levels of concern. Equally, the fact that climate change has moved beyond its early portrayal in the media as a pure 'environmental' or science issue, to enter the realm of national and international politics, might have led some to conclude they cannot fully trust what is now being said about this (as discussion now routinely involves less trusted actors such as politicians or those with a financial stake in future energy developments). There may even be a role, with some respondents, for processes termed in psychological research as 'cognitive dissonance': that is, where people modify their beliefs about uncomfortable or unwelcome truths to avoid facing a need to change their current behaviour. Finally, it could simply be that people have become fatigued or bored of constantly hearing about climate change narratives in the media and elsewhere. Only further research will fully resolve some of these important questions.

For policy, it is clear that our results point to a need, currently, for considerable caution when designing communications, community engagement and other interventions around climate change objectives. We cannot assume (if we ever could) that the basic science message of anthropogenic climate change is accepted unequivocally and by everybody.

We also know that there are a range of external contextual factors which can serve to amplify or attenuate perceptions of environmental risks (see Pidgeon, Kasperson and Slovic, 2003). As noted above, the survey was conducted shortly after the unsuccessful Copenhagen talks, and also commenced at a time when e-mails from climate scientists at the University of East Anglia were still a matter of headline political debate and news in the UK. The results, particularly those regarding scepticism, are therefore also likely to reflect to a certain extent the impacts of these key media events. We cannot say what proportion of the decline in belief in climate change is due to the longer-term factors noted above, and what proportion is driven by the media controversy during the winter of 2009-10. Nor do we know the extent to which the recent media comment will reinforce the longer term trends or alternatively prove merely a temporary phenomenon (as some risk amplification events have done in the past). Only by placing this survey in the context of future climate opinion-tracking will we resolve some of these important questions.

Regarding energy policy the results mirror our earlier findings, showing a very clear preference amongst the public for renewable sources of electricity. The nuclear issue has also moved considerably in policy terms over the past 5 years, with the former (Labour) government clearly signalling its support for nuclear new-build. While our results do show a modest change in attitudes towards nuclear energy over this period it remains the case that there is no obvious or clear current mandate for this technology amongst the public at large, when compared, for example, to the levels of support given to renewable energy. However, support for nuclear power is highest when the issue is framed in terms of climate change and energy security, or when it is seen as part of an energy mix including renewable energy.

As a final comment, people also express what appear to be surprisingly high levels of concern about energy security. As the current survey is, we believe, one of the very first to consistently address this topic in a nationally representative sample more research is clearly needed here. We would in particular recommend more qualitative work to probe in greater depth the precise reasons for people's expressed concerns. One policy implication of this, taking the survey results as a whole, is that it may well be that climate scepticism will prove less important for policy than is currently assumed by the science and energy policy communities. Our combined results imply that very broad support still exists for an energy policy framed around future security of supplies coupled with the need to promote a long-term renewable energy strategy in response to climate change.

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