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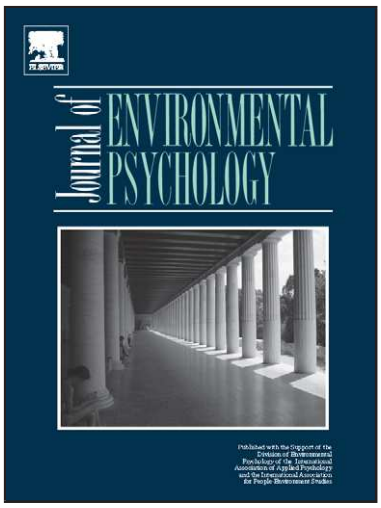

Behavioural responses to climate change: Asymmetry of intentions and impacts

Lorraine Whitmarsh

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Behavioural responses to climate change: Asymmetry of intentions and impacts

Lorraine Whitmarsh*

Tyndall Centre for Climate Change Research, School of Environmental Sciences, University of East Anglia, Norwich NR4 7TJ, UK

*E-mail: l.whitmarsh@uea.ac.uk

Abstract

In seeking to determine whether climate change mitigation strategies are effective, researchers and policy-makers typically use energy consumption as an indicator. UK government data shows that energy use amongst the public is rising, despite measures to encourage energy conservation. Yet, research to date has not explicitly asked which actions the public are taking with the express intention of mitigating climate change. Using Stern's (2000) classification of impact-oriented and intent-oriented behaviour research, the research described in this paper examines both actions taken 'out of concern for climate change' and energy conservation practices amongst the UK public. The findings show a clear divergence between actions prescribed by policy-makers (i.e. energy conservation) and those taken by the public to mitigate climate change (e.g., recycling). Furthermore, those who take action to conserve energy generally do so for reasons unconnected to the environment (e.g., to save money). Regression analyses highlight the distinct determinants of these two behavioural categories. These findings imply that surveys using energy reduction as an indicator of public response to climate change falsely assume that these can be equated; consequently, they will provide a distorted picture of behavioural response. Possible reasons for the asymmetry of intentions and impacts, and policy implications, are discussed.

Key words

Behaviour; climate change; intentions; impacts; energy conservation; recycling

Behavioural responses to climate change: Asymmetry of intentions and impacts

1. Introduction

1.1. Responding to climate change

Mounting scientific evidence suggests human-induced climate change may pose a significant threat to humans and the wider environment. Societies are faced with the imperative to act in terms of both adaptation to unavoidable impacts and mitigation to prevent more detrimental impacts through reduction of emissions primarily arising from energy use (IPCC, 2001). The UK Labour government has identified climate change as a priority issue, and positioned itself as a global leader in addressing it (King, 2004). In 2000, the government (DETR, 2000) outlined an ambitious voluntary target of a 20% reduction of carbon dioxide emissions from 1990 levels by 2010, and accepted the recommendation made by the Royal Commission on Environmental Pollution for a 60% cut in emissions by 2050 (RCEP, 2000). Their efforts to induce appropriate behavioural responses amongst the UK public focus on communication strategies and economic measures (DETR, 2000; DEFRA, 2006).

Naturally, policy-makers and others are keen to know whether their efforts to induce appropriate behavioural responses - namely, energy conservation - amongst the public are effective. The primary indicator of progress is through monitoring of carbon dioxide emissions, in turn derived from measures of energy consumption within each sector (DEFRA, 2006). These show that energy consumption in the UK has continued to rise in recent years. Energy use in transport is increasing the most rapidly; domestic energy consumption has risen slightly; and industrial energy demand is declining. Social surveys also show a rise in car use and an increase in the proportion of two-car households (Exley & Christie, 2003).

Furthermore, energy conservation measures are taken by a minority of the British public.

Surveys indicate around a third of the public regularly buys energy-efficient light bulbs (DEFRA, 2002; Norton & Leaman, 2004); although one survey found a higher proportion (51%) claims to have used energy-saving light bulbs 'in the last year or two' (Poortinga & Pidgeon, 2003). Furthermore, 42% of the population claim to have cut down on car use (DEFRA, 2002; Poortinga & Pidgeon, 2003), and 26% say they regularly use public transport (Norton & Leaman, 2004). By comparison, recycling is more commonplace than energy conservation amongst the UK public; around half the population regularly recycles household rubbish (DEFRA, 2002; Norton & Leaman, 2004).

Given this steady rise in energy consumption and apparent lack of public participation in climate change mitigation efforts, the UK government has recently been forced to admit that it will not reach its voluntary target of 20% reduction in carbon emissions by 2010 (DEFRA, 2006), undermining its attempts to persuade other countries to act. At the same time, a number of other EU countries are likely to fall short of meeting their targets agreed under the Kyoto Protocol (European Environment Agency, 2006).

The obvious question that arises from this analysis of the current situation is: why have strategies for mitigating climate change apparently failed to engender public support? Research on energy consumption behaviour highlights various psychological, social, economic and physical barriers to fostering energy conservation. Firstly, domestic energy use and travel choices are intrinsically related to social identity, status and norms (Layton et al., 1993; Steg et al., 2001; Exley & Christie, 2002; Black et al., 2001). Thus, changing these behaviours cannot be achieved simply through information provision and economic measures (Jackson, 2005). Secondly, institutional and physical structures constrain the possibilities for energy conservation. For example, transport infrastructure and urban design affect travel behaviour. Thus, those living in rural areas are most likely to drive because there are few alternatives available (DEFRA, 2002; Tanner, 1999). Similar

situational constraints exist for domestic energy conservation; for example, those living in rented accommodation may not be permitted to install insulation or more efficient appliances, or the cost may be too prohibitive for those on lower incomes (McKenzie-Mohr, 1994). Since climate change is a social dilemma, and the public perceives little mitigation action being taken by others, this is a further disincentive to individual energy conservation (Lorenzoni et al., 2007). Thus, government exhortations to reduce energy consumption will go unheeded if they are incongruous with the social and physical context of everyday life. Finally, as well as extrinsic barriers - such as financial costs, social values and physical infrastructure - past behaviour is one of the most intractable barriers to changing energy behaviours (van der Pligt, 1985; Kollmuss & Agyeman, 2002). For most individuals, energy consumption is habitual and an integral part of their everyday life.

The considerable literature on energy consumption and conservation behaviour provides some explanation, then, for the UK government's failure to foster energy conservation primarily through communication strategies and economic measures. However, this research does little to explain whether the public supports climate change mitigation or indeed whether they are taking action *they believe* to be effective in mitigating climate change. In this respect, it is important to consider whether measures of energy conservation behaviour can be considered adequate indicators for public response to climate change. This paper argues that understanding (the lack of) behavioural response to climate change requires both the perspective of behavioural impact *and* of the actors and their intentions.

1.2. Defining action in response to climate change: impacts versus intentions

In relation to the research that has been conducted to date on the public's behavioural response to climate change, an important distinction emerges between *impact-oriented* and *intent-oriented* behavioural research (Stern, 2000). Impact-oriented research is concerned with the actual impacts of behaviour on environmental issues; intent-oriented research examines behaviour from

the point of view of the motivation of the actor in respect of the environmental issue. Of course, these two categories can – and do – overlap (i.e., one's intended actions may be effective); but, for the reasons outlined below, it is vital to understand both intentions and impacts and why they often diverge. Previous research (e.g., Poortinga & Pidgeon, 2003; Norton & Leaman, 2004) has primarily addressed climate change action from the perspective of *impact* rather than *intent* - focusing on those actions that have been defined *by experts* as having the greatest impact on climate change (i.e. energy conservation) rather than on actions non-expert members of the public may conduct with the intention of mitigating climate change (e.g., recycling or aerosol reduction). Much more is known about pro-environmental intentions in general or in relation to other environmental issues (Gatersleben et al., 2002) than in relation to climate change. The research reported here goes some way to addressing the lack of research on public actions (energy-related or otherwise) that are taken with the express intention of mitigating climate change.

The distinction between intention and impact is salient for three reasons: first, it exposes whether and why people are investing their energies in 'futile activities' that they mistakenly believe will mitigate climate change (Read et al., 1994, p.980). Preliminary indications from the studies described in section 1.3 below are that the UK public may indeed be engaged in less-than-effective activities to mitigate climate change. This would suggest that surveys measuring energy reduction as an indicator of public response to climate change provide an incomplete picture of public behaviour. Where there is divergence between action intended to mitigate climate change and energy conservation, the reasons for this disparity need to be explored in order to channel public efforts appropriately and remove barriers to low-carbon lifestyles. Second, it allows for analysis of the *various* motivations or goals that may underlie decisions about energy use; often environmentally beneficial actions result from non-environmental concerns, such as a desire to save money (Stern, 2000; DEFRA, 2002). This, again, provides policy makers with valuable information

about how to encourage and enable energy conservation.

Third, applying an appropriate theoretical framework depends on the aims and measures applied within behavioural research. On one hand, research into environmental intent suggests there is a moral basis for pro-environmental action (e.g., Thøgersen, 1996; Gatersleben et al., 2002). Recycling, for example, tends to be predicted by environmental concern, at least before material incentives or supporting facilities are introduced (Schultz et al., 1995). As described in the Value-Belief-Norm (VBN) theory of intent-oriented environmental action (Stern, 2000), altruistic or self-transcendent values tend to activate personal norms to take pro-environmental action, if it is believed that environmental conditions threaten things the individual values and that the individual can act to reduce that threat (Stern et al., 1993; Nilsson et al., 2004; Snelgar, 2006).

On the other hand, impact-oriented environmental research demonstrates the complex behavioural ecologies and multiple motivations of energy use (e.g., the Attitude-Behaviour-Context model of Guagnano et al., 1995; see also Layton et al., 1993; Steg et al., 2001; Hines et al., 1986-7; Lindenberg & Steg, 2007), as well as the range of internal and external barriers that constrain the (pro-environmental) value-action relationship (Kollmuss & Agyeman, 2002; Tanner, 1999). Thus, the influences on environmentally-significant behaviour (e.g., energy use) are summarised by Stern (2000) as:

1. *attitudes, values and beliefs* - relating to environment, but also to other issues including comfort, aesthetics, quality, time spent with family, and so on;
2. *contextual forces* - including social, economic, institutional and political factors;
3. *personal capabilities* (e.g., knowledge and skills) *and resources*; and
4. *habit*.

In the context of energy use, habit and economic influences appear to be particularly salient (Clark et al., 2003; Poortinga et al., 2004; Verplanken et al., 1998). Indeed, Bamberg and Schmidt

(2003) tested three theories of behaviour (Theory of Planned Behaviour, Theory of Interpersonal Behaviour, and Norm-Activation Theory) which they argued are most relevant to energy consumption. In their study of driving behaviour they found (initially) perceived personal costs and benefits, and (subsequently) habit, determine car use, while morality *does not* exert a significant influence. Similarly, Kurz and colleagues' (Kurz et al., 2005) study of barriers to energy conservation found that energy was not conceptualised as a moral issue. UK studies show self-reported motivations for energy conservation tend to be unconnected to climate change (e.g., DEFRA, 2002; Poortinga & Pidgeon, 2003; Norton & Leaman, 2004). Of the 40% of the English public who claim to 'regularly cut down the amount of electricity/gas your household uses', 81% do so to save money while only 15% do so to 'help the environment/reduce pollution' (DEFRA, 2002). Similarly, of the 39% claiming to 'cut down car use for short journeys', most (59%) do so for exercise or to save money (25%), and only 17% do so for environmental reasons. Other research has found that financial motivations most commonly underpin energy conservation (Brandon & Lewis, 1999).

These theoretical and empirical insights highlight that the determinants of pro-environmental intent and environmental impact should not be conflated. This paper investigates *both* environmental intent and environmental impact and explores the divergence between them. Together, it is hoped that these two strands of investigation may contribute to the design of more effective climate change policies that aim to inform the public and change their energy consumption behaviour. The research described here explores and compares behavioural influences on environmental intent and impact within the same population. While this research is primarily exploratory, it is interpreted in terms of Stern's framework for environmentally-significant behaviour including the VBN model of pro-environmental intent. Before the current research is described, I present a brief review of the empirical literature on intent-oriented behavioural

response to climate change.

1.3. Intentions to respond to climate change

Whereas research has assessed the prevalence of conservation behaviours, it has not explicitly asked *which actions* the public are taking *with the express intention* of mitigating climate change. Some studies have, however, addressed the public's awareness of action strategies and willingness to respond to climate change. One study that asked US respondents what action they *could* take to prevent global warming, found that suggestions included reducing driving, political action, personal awareness, recycling and reducing aerosol use (Read et al., 1994). Significantly, reduced aerosol use is not amongst the actions exhorted by government and experts to tackle climate change, and reflects the tendency amongst the public to conflate ozone depletion and climate change (DEFRA, 2002; Hargreaves et al., 2003; Whitmarsh, in press-b). Indeed, there is little awareness of the contribution of everyday individual actions to the problem of climate change, or of the relationship between climate change and energy systems (Thompson & Rayner, 1998; DEFRA, 2002; MORI, 2005). The public's preferred action strategies for tackling climate change may thus reflect a lack of knowledge about the most effective mitigation strategies.

On the other hand, perceived barriers or disincentives to energy conservation (e.g., Black et al., 1985; Lorenzoni et al., 2007) may mean some individuals supporting climate change mitigation are simply *unwilling* to adopt certain actions, rather than being *unaware* of what to do. When provided with a list of alternative mitigation strategies, most British people claim they would recycle more household waste and improve home energy efficiency, while fewer would change their transport habits or pay more to travel (BBC, 2004). US researchers have found a similar resistance to changing driving habits, while there is generally a greater willingness to adopt domestic energy conservation practices (Bord et al., 2000; O'Connor et al., 2002; Fortner et al., 2000).

As suggested above, research into the antecedents of pro-environmental intentions and impact-oriented actions suggests we can expect the former to be attitudinally-determined while the latter will be determined by a range of motivations, demographic variables and contextual influences (Gatersleben et al., 2002). Studies examining the correlates of willingness to mitigate climate change (through individual action or policy support) suggest it is indeed determined by moral considerations (Poortinga et al., 2004; Nilsson et al., 2004), consistent with Stern's (2000) VBN theory of environmental intent: those who believe climate change threatens the non-human world, and who value it, tend to be willing to mitigate climate change. O'Connor et al. (1999) found that people with high *environmental values* (measured using the 'New Environmental Paradigm' scale; Dunlap et al., 2000) are more likely to express willingness to take voluntary and voting actions to mitigate climate change. *Perceived risk* also appears to be relevant (O'Connor et al., 1999; 2002). Bord et al.'s (2000) survey found that perceived societal risk of global warming moderates the relationship between knowledge and behavioural intentions to address global warming. Consequently, the lack of perceived threat from climate change (BBC, 2004; Lorenzoni et al., 2006; Whitmarsh, in press-b) may account for the lack of behavioural response to the issue amongst the UK public.

Other variables that determine willingness to mitigate climate change include *knowledge* of the causes of global warming (O'Connor et al., 2002; 1999; Bord et al., 2000) and higher level of *education* (O'Connor et al., 2002; 1999). Qualitative studies also suggest behavioural intentions to address climate change are influenced by *perceived responsibility* for causing and tackling climate change, as well as institutional relationships (Bibbings, 2004; Darier & Schule, 1999; Stoll-Kleemann et al., 2001). The present study examines the influence of these normative and other factors on intent-oriented climate change action.

1.4. Aims of the research

Using Paul Stern's (2000) classification, the research described in this paper examines both *impact-oriented* and *intent-oriented* action in response to climate change. The aims of the research reported here are twofold: first, to measure the prevalence, nature and determinants of intent-oriented action in response to climate change; and second, to measure the prevalence and determinants of impact-oriented action (i.e. energy conservation) in order to identify divergences between these two types of action. Building on the findings from earlier, exploratory interviews (Whitmarsh, 2005) and previous studies of climate change action discussed above, this study gives particular attention to moral obligation, values, risk perception, beliefs (about the reality and causes of climate change), as well as demographic variables, as correlates of action.

For this investigation, both qualitative and quantitative data have been gathered to elicit participant-defined climate change actions and allow for measurement of the prevalence and correlates of behaviour. The results described in this paper form part of a larger study of attitudes, knowledge and behavioural responses to climate change and flooding in the south of England (see Whitmarsh, 2005, in press-a, in press-b). This paper primarily discusses the findings relating to respondents' behaviour and focuses on results from a postal survey of residents of Hampshire, UK.

2. Methods

2.1. Participants

Participants comprised residents of Hampshire, a county in southern England[i]. In total, 1771 questionnaires were distributed during September and October 2003 across 6 wards in Hampshire using stratified random sampling. The sampled wards reflect a range of different socio-economic groups and settlement size (i.e. inner-city, sub-urban and rural). A response rate of 33.3% was achieved (N=589), which is comparable to response rates for similar surveys (e.g., Black et al., 2001). Comparison with census data indicates that the sample largely reflects the profile of the

selected ward populations in almost all respects[ii] (see Table 1). There is one notable exception: the survey sample is rather more qualified than the total ward populations: 15% of the sample has no formal qualifications compared to 24% of the total population. However, weighting the data to compensate for this disparity was found to make negligible difference (<1%) to responses.

2.2. Materials

Findings from depth interviews (see Whitmarsh, 2005) informed the scope of, and language used in, the quantitative survey[iii]. The questionnaire comprised 8 pages of qualitative and quantitative questions grouped into 4 sections. Section 1 addressed *general environmental concerns.* Section 2 explored *awareness, knowledge, attitudes, and (intent-oriented) behaviour* in relation to climate change. Knowledge and belief questions were in the first instance open-ended; these included 'What do you know about climate change?' and 'What do you think causes climate change?' Questions were subsequently closed, with binary or scaled response options. These included 'Do you think anything can be done to tackle climate change? [Yes, No, Don't know]'; and 'Who do you think should have the main responsibility for tackling climate change? Please tick one box only [International organisations; National government; Local government; Business and industry; Environmental organisations/ lobby groups; Individuals; Other]'. Perceived risk was measured with the question 'Do you think climate change is something that is affecting or is going to affect you, personally? [Yes, No, Don't know]'. This section included a battery of 37 attitude statements, to which respondents were asked how much they agreed or disagreed on a 5-point scale from 'Agree strongly' to 'Disagree strongly'. This battery included statements about moral obligation, responsibility, self-efficacy, interest, and beliefs about the reality and severity of climate change. Moral obligation was measured with the item: 'I feel a moral duty to do something about climate change'. Scepticism was measured and scaled[iv] with the items: 'The effects of global warming are likely to be catastrophic' (scores reversed), 'Recent floods in this country are due to

global warming' (scores reversed), 'Global warming is something that frightens me' (scores reversed), 'I do not believe global warming is a real problem', 'Flooding is not increasing, there is just more reporting of it in the media these days', 'Global warming is just a natural fluctuation in earth's temperatures', 'Claims that human activities are changing the climate are exaggerated', 'There is too much conflicting evidence about global warming to know whether it is actually happening', 'The media is often too alarmist about issues like global warming', 'The evidence for global warming is unreliable', 'I am uncertain about whether global warming is really happening', and 'It is too early to say whether global warming is really a problem'. Intent-oriented behaviour was elicited through two questions. Firstly, a closed question asked: 'Have you ever taken, or do you regularly take, any action out of concern for climate change?' [response options: 'Yes, No, Don't know']. An open follow-up question then asked for details of the action: 'If yes, what did you do/ are you doing?'

Section 3 measured *environmental values and (impact-oriented) actions*. Values were measured using a shortened[v] 'New Environmental Paradigm' (NEP) scale (Dunlap et al., 2000). In addition, a Pro-Environmental Value (PEV) scale[vi] was developed from three value statements used in previous UK attitude surveys (DEFRA, 2002): 'Jobs today are more important than protecting the environment for the future' (scores reversed), 'I am unwilling to make personal sacrifices for the sake of the environment' (scores reversed), and 'If my job caused environmental problems, I'd rather be unemployed than carry on causing them'. Impact-oriented behaviour was elicited through a closed question on regular environmentally-significant activities: 'The following is a list of activities that you may do. For each one that you do regularly, please indicate your reason or reasons for doing so. Tick as many as you feel apply.' The list included energy conservation measures, together with other actions: 'Walk or cycle to work', 'Use public transport', 'Turn off lights I'm not using', 'Buy energy efficient light bulbs', 'Buy organic food', 'Recycle glass',

'Recycle other items[vii]', and 'Take part in a campaign about an environmental issue'. Beside each activity, respondents could tick a box or use the space provided to indicate the reason or reasons for taking each action. Several pre-defined categories were included (based on the exploratory interview data and previous research): 'convenience'; 'to save money'; 'to protect the environment'; 'for my health'; 'habit'; and 'moral obligation'; and space was provided for other reasons. A question also addressed perceptions of public transport: 'How would you rate the quality of public transport in your local area?' with five response options ranging from 'excellent' to 'very poor', plus 'don't know'.

Section 4 comprised demographic measures (see Table 1) and space for additional comments. Science education is included as a separate variable to overall educational level, since the exploratory interviews and other research (Henriksen & Jorde, 2001) indicate scientists may have more knowledge about climate change but also be *less* concerned about it.

2.3. Procedure

The questionnaire and survey methodology was piloted with 20 people, including residents of sampled addresses. All questionnaire data were inputted into SPSS. To ensure reliability, every third questionnaire was checked for accurate data entry. NVivo was used for thematic coding of qualitative data. Coding included identifying scientifically-accurate responses ('carbon dioxide/CO_2', 'emissions/fumes', 'pollution', 'greenhouse gases', 'deforestation', 'fossil fuels', or 'vehicle emissions/fumes'), as well as other (non-scientific) responses, to the open question: 'What do you think causes climate change?'. Each coded response category was then used as a variable in SPSS for subsequent statistical analyses.

SPSS was used to produce descriptive and frequency statistics, and to perform Principal Components Analysis (PCA), Mann-Whitney tests and regression analyses. PCA was used to reduce the data and produce the scales described above. Mann-Whitney tests were used to compare

levels of energy conservation action and recycling amongst participants taking, and those not taking, intent-oriented action. Logistic regression analysis was used to determine the relative probabilistic influence of variables, identified as relevant from the empirical and theoretical review of intent-oriented behaviour above, on participants' behavioural responses to climate change and energy conservation behaviours. Since the dependent variables are dichotomous, logistic regression was used. All independent variables to be included in the regression were recoded into dichotomous variables (1 or 0) to facilitate interpretation of the results. Variables with the largest regression coefficients can then be said to have the greatest influence in predicting the dependent variable. The independent variables were: *Scientifically-accurate knowledge about the causes of climate change*; *Belief that climate change is real and human-caused* (using the Scepticism Scale, described above); *Belief that climate change can be tackled*; *Perceived individual responsibility for tackling climate change*; *Perceived risk from climate change*; *Environmental values*; *Moral obligation*; *Perceived quality of local public transport* (for the 'Transport-related energy-conservation' regression only); and *Demographic variables*.

The dependent variables used in the analysis were:

1. *Intent-oriented action*: For this variable, 1 identifies those respondents who answered 'yes' to the question 'Have you ever taken, or do you regularly take, any action out of concern for climate change?'(N=177). The statistically significant ($p>0.05$) independent variables displayed in Table 2 predict 57.3% of 'yes' responses and 88.6% of other ('no' or 'don't know') responses.
2. *Domestic energy conservation*: Here, 1 identifies respondents who stated that they regularly buy energy-efficient light-bulbs and turn off lights they are not using (N=380). The statistically significant ($p>0.05$) independent variables displayed in Table 4a predict 88.2% of positive responses and 33.2% of negative responses.

3. *Transport-related energy conservation*: Here, 1 identifies respondents who stated that they regularly walk/cycle to work and use public transport (N=144). The statistically significant ($p>0.05$) independent variables displayed in Table 4b predict 52.8% of positive responses and 93.9% of negative responses.

3. Results

The following sections detail the main (unweighted) findings relating to intent-oriented and impact-oriented action from the postal survey.

3.1. Intent-oriented behaviour

The postal survey indicates that less than a third of respondents (31.4%) state they take, or have taken, action explicitly out of concern for climate change. Of the remainder, 8.2% said they don't know whether they take/have taken action, and 60.4% said they have not taken action.

As Figure 1 shows, actions taken out of concern for climate change include both energy conservation behaviours and other environmental actions. Energy conservation actions taken include avoiding driving (8%), conserving energy (unspecified; 6.5%) and walking (4.6%). However, a much greater proportion of respondents state they recycle (17.7%) or conduct other (not energy-related) actions (e.g., using CFC-free products) (14.8%) out of concern for climate change.

A notable proportion of respondents (11%) indicated some constraint on acting out of concern for climate change (e.g., qualifying their response with 'when possible' or 'I try to...'), suggesting perceived barriers or constraints to environmental action.

As shown in Table 2, regression analysis suggests a moral basis for action out of concern for climate change. Strong moral obligation is the most salient positive correlate of action, while belief that climate change can be tackled and high PEV scores are also significant positive predictors. One knowledge variable (emissions/fumes as a cause of climate change) also exerts a significant positive

influence. Tabloid readers and non-voters are significantly less likely to take action out of concern for climate change. Other demographic variables, risk perception, and individual responsibility, are non-significant.

3.2 Impact-oriented behaviour

As Table 3 shows, the vast majority of respondents (95.7%) claims to turn off lights they are not using and two-thirds regularly buy energy-efficient light bulbs. In addition, more than four in ten respondents regularly walk or cycle to work, and over a third use public transport. Recycling is amongst the most popular actions taken by survey respondents.

When asked about the reason(s) for taking each energy conservation measure (see Table 3), respondents often cited multiple reasons. Furthermore, reasons vary according to the particular activity. Turning off unused lights and buying energy efficient bulbs are more often motivated by a desire to save money; to a lesser extent they are due to environmental concern. The reasons for walking/cycling to work are most commonly health-related; and using public transport is more likely to be for reasons of convenience. Although habit was identified as a reason for turning off unused lights by almost a third of respondents, this was not generally a popular reason for action. Consistent with the findings on intent-oriented behaviour, recycling is most commonly done to protect the environment, and to some extent out of moral obligation. In fact, Table 3 shows that moral obligation often accompanies 'environmental protection' as a motivation for action; this may suggest that the moral obligation that they identify *is* an obligation to the environment.

As expected, the regression analyses of impact-oriented environmental actions (Table 4) show demographic and contextual variables are the main influences. The strongest (positive, partially-significant) influence on *domestic energy conservation* is age; that is, older respondents are more likely to buy energy-saving light bulbs and turn off unused lights. Scepticism also has a partially-significant, negative influence. Moral obligation and PEV scores are positive, but non-

significant influences.

The strongest predictors of *transport behaviours* are car ownership and perceptions of public transport: those who do not own a vehicle and have positive views of public transport are much more likely to use alternatives to driving. Respondents who do not know about the quality of public transport are less likely to use it. Again, age is a strong (partially-significant) influence on transport-related conservation; however, here the influence is negative. This is perhaps unsurprising since those of retirement age are unlikely to walk/cycle *to work*. Newspaper readership is also significant; broadsheet readers are more likely to walk, cycle and take public transport. Other influences are ambiguous: while moral obligation and one knowledge variable (fossil fuels as a cause of climate change) are positive influences, scepticism also has a partially-significant positive effect.

3.3 Relationship between impact-oriented and intent-orient behaviours

Mann-Whitney tests (Table 5) show no significant difference in levels of energy conservation (using a combined score for all four energy conservation actions) amongst those taking action out of concern for climate change, compared with those not taking action; whereas (consistent with Figure 1) there is a significant difference in levels of recycling between these two groups.

4. Discussion

4.1. Asymmetry of intentions and impacts

An important distinction made in this paper was between 'intent-oriented' and 'impact-oriented' action (Stern, 2000). To date, research has explored impact-oriented climate change action (i.e. energy conservation), but has not examined those actions taken with the intention of tackling climate change. The research reported here has measured and compared the prevalence, nature and

determinants of intent-oriented and impact-oriented action in southern England, in order to identify divergences between these two types of action. The findings validate the a priori distinction between energy conservation and actions (energy-related or otherwise) that are taken with the express intention of mitigating climate change. The findings show a clear divergence between actions prescribed by policy-makers and those taken by the public to mitigate climate change. Less than one-third of respondents take action out of concern for climate change, but more commonly this is not direct energy conservation. Rather, recycling is the most popular activity[viii]. Conversely, action to reduce domestic or travel-related energy is more widespread but is generally done for reasons unconnected to the environment (e.g., to save money or for health). The proportions taking energy conservation measures are slightly higher than those recorded by previous UK surveys of energy conservation (e.g., DEFRA, 2002), but consistent with previous studies we find greater willingness to reduce domestic energy consumption than to change travel behaviours (e.g., BBC, 2004; O'Connor et al., 1999).

The research also found that both the self-reported motivations and correlates of intent-oriented action often differ from those of impact-oriented behaviour. While the former is related principally to moral considerations, the latter tends to be motivated by tangible benefits to the individual (e.g., saving money, improving health, convenience) and related to demographic and contextual variables (e.g., age, car ownership, perceptions of public transport). This is consistent with previous research on pro-environmental intentions and energy conservation (e.g., Brandon & Lewis, 1999; Gatersleben et al., 2002). Also as expected from previous studies (e.g., Gatersleben et al., 2002), actions which are easier to perform (e.g., recycling, turning off lights) are more likely to be linked to environmental attitudes, while actions which apparently require sacrifice (e.g., avoiding driving) are more dependent on conducive circumstances. For example, this study found environmental concern more often motivates recycling and domestic conservation than transport-

related conservation.

The regression findings from this study and those of previous studies of willingness to address climate change are, however, only partially consistent. Consistent with O'Connor et al. (1999; cf. Poortinga et al., 2004), this study found environmental values positively predict intent-oriented action. More salient an influence, however, was moral obligation to tackle climate change, which was not examined in previous surveys. Knowledge of causes was also shown to play some role in this study (cf. O'Connor et al, 1999, 2000). However, in contrast to O'Connor et al.'s studies, this research did not find perceived risk or education influenced intent-oriented action. The reasons for disparity may relate to differing research aims: the study reported here addressed *self-reported* behaviour, while previous studies have explored willingness to act. Differences in the measures used (e.g., perceived risk) or cultural context (US versus UK) may also be relevant.

Although this research did not specifically compare the efficacy of alternative theoretical models of behaviour, the findings do broadly support the VBN model of environmental intent and in particular the assertion by Stern (2000) that 'personal moral norms are the main basis for individuals' general predisposition to pro-environmental action' (p.413). The findings are also consistent with more complex ecological models of energy conservation, such as Stern's (2000) integrated framework. In particular, this research has shown that intent-oriented action is norm-based, while there are multiple motivations and contextual influences on energy conservation. Both categories of behaviour are also constrained by various social, physical and institutional barriers (see Lorenzoni et al., 2007).

The preference amongst the public for recycling as a strategy for tackling climate change (e.g., BBC, 2004) has been demonstrated by this research: recycling was the most commonly cited action taken out of concern for climate change; and recycling behaviour was more prevalent amongst participants taking intent-oriented climate change action. The divergence between actions

prescribed by policy-makers (energy conservation) and those taken by the public to mitigate climate change may be explained in a number of ways. First, there is incomplete understanding amongst the public about which actions are most effective in mitigating climate change (DEFRA, 2002; Whitmarsh, in press-b). On the other hand, there *is* widespread awareness of the role of driving in contributing to climate change (Whitmarsh, 2005; DEFRA, 2002; Hinds et al., 2002; Bibbings, 2004; BBC, 2004; Bostrom et al., 1994). Yet, the public are more willing to reduce their domestic consumption than to drive less (e.g., O'Connor et al., 2002). Therefore, information deficit is not the only barrier to fostering energy conservation.

Second, there is apparently also a motivational component to the difference in prescribed and reported mitigation actions. Energy conservation - while more effective than other actions - is viewed as more difficult and less favourable than other actions like recycling. It may be that commonly-practised impact-oriented environmental behaviours, like recycling, are readily cited by respondents as evidence of their positive contribution to mitigating climate change. Conversely, this survey found car owners were significantly less likely to suggest reducing car use as a means of tackling climate change (Whitmarsh, 2005). Thus, there may be a tendency to *over*estimate one's contribution to mitigating climate change, as well as to *under*estimate one's negative impact. This strategy effectively reduces the cognitive dissonance that arises from the inconsistency between knowing one's actions are environmentally damaging and not changing one's behaviour.

This research and previous studies (e.g., DEFRA, 2002) demonstrate that preferred impact-oriented environmental actions tend to be more financially rewarding and convenient than the alternatives. In fact, a much higher proportion of respondents claim they regularly conserve energy than say they take action out of concern for climate change. Crucially, this research confirms that energy reduction is more often motivated by economic self-interest and other tangible benefits than by environmental concern. Knowledge and availability of alternative courses of action are also

important in determining energy conservation for transport, as demonstrated in this research and elsewhere (Tanner, 1999). Perceived behavioural options also influence responses to other environmental issues (e.g., O'Riordan, 1976).

Finally, as noted elsewhere (e.g., Darier & Schule, 1999), there are significant social and institutional barriers to climate change action. Although not reported in this paper, this research found participants were unwilling to make sacrifices to their comfortable standards of living, when they perceived that responsibility for tackling climate change is not being shared by other people or organisations (see Lorenzoni et al., 2007; Whitmarsh, in press-b).

4.2. Policy implications

Policy interventions should focus on channelling public efforts into effective mitigation strategies and removing the barriers to energy conservation. First, there is evidently a need for improved communication efforts to emphasise and illustrate the role of personal energy use in causing climate change. Public education should explicitly challenge misconceptions and highlight which activities are most effective in mitigating climate change. Source of information is also relevant: we found tabloid readers are less likely to take mitigation action, perhaps because climate change is less often reported in this media (Hargreaves et al., 2003). There is evidently scope to target communication efforts at this group.

Second, political interventions should encourage and enable low-energy lifestyles through provision of incentives and appropriate physical (transport, planning) infrastructures. However, incentives should not solely be financial. Since a range of motivations (and barriers) underpin energy consumption and conservation, economic policies alone are insufficient to alter cherished and entrenched behaviours. Highlighting other tangible benefits, such as the health benefits of walking, for example, might offer one such means of encouraging alternatives to driving. The relative popularity of recycling highlights the need to provide facilities, such as kerb-side collection

to facilitate pro-environmental lifestyles.

Third, since moral obligation is a powerful determinant of pro-environmental action, measures aimed at influencing incentives should focus on strengthening normative motivations and weakening competing (egoistic) motivations (Lindenberg & Steg, 2007). There may also be a role for formal education to foster a sense of environmental 'citizenship' - the idea that environmental responsibilities accompany rights (Dobson, 2003). Ideally, informational, incentive-based, moral and structural approaches should be combined to foster long-term behaviour change (Abrahamse et al., 2005; Stern, 2000).

In conclusion, this research has shown that the extent of the UK public's behavioural response to climate change is typically in terms of actions which require little effort or sacrifice, notably recycling and domestic energy conservation. Unfortunately, the largest contribution to climate change is in respect of transport activities, such as driving (DEFRA, 2006); yet, even those who claim to be mitigating climate change are rarely altering their travel behaviour. Evidently there are still significant barriers to achieving low-energy lifestyles. While improved *communication* to inform and engage the public forms one component of an effective climate change strategy, the findings discussed here clearly indicate a need for wider *structural* changes to facilitate and motivate reduced energy use. Currently, the UK government is doing more to educate the public than to remove structural barriers to behaviour change (DEFRA, 2006). Finally, this research has implications for future studies of public response to climate change. Asymmetry of both the type and determinants of each category of action found in this research implies that surveys using energy conservation as an indicator of public response to climate change falsely assume that these can be equated; consequently, they will provide a distorted picture of public behaviour.

4.3. Limitations and areas for further work

While this research provides a novel contribution to the field of climate change behaviour, it

suffers from several limitations. First, social desirability can affect survey responses in environmental research (e.g., Snelgar, 2006). In particular, self-reported measures of behaviour may be over-reported. However, alternative methods of measuring behaviour, such as taking readings of domestic energy use, are costly and intrusive and may reduce the sample size. Future research could overcome these limitations by offering incentives for participants where objective measures of behaviour are used. Second, the current research was restricted in geographical scope to southern England, and there were slight differences between these survey findings and those of previous national surveys (DEFRA, 2002). Future research should extend this type of study on behavioural response to climate change to a representative nation-wide study.

Third, this study has adopted a primarily exploratory rather than theory-driven approach since this area of research has received very little attention. Analysis of the qualitative and quantitative survey data remained open to significant themes and relationships that emerged; and these were interpreted in relation to previous empirical findings and theoretical frameworks. Further work should focus on identifying the relationships between relevant theoretical constructs, with a view to testing different theoretical models of behaviour in the context of climate change action. This research has indicated that appropriate frameworks include Stern's (2000) VBN model of intent-oriented environmental behaviour and an ABC-type model of impact-oriented action. Since the determinants of each energy conservation action are distinct, however, as Stern (2000) points out 'each target behavior should be theorized separately' (p.421).

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[i] Since one of the aims of the main research project (see Whitmarsh, 2005) was to explore the role of flooding experience in response to climate change, these sites were selected due to their recent history of severe flooding, and because of the willingness of local flood victims to participate in the research.

[ii] Although the sample is demographically representative, survey respondents may have been more motivated than non-respondents to complete the questionnaire due to personal interest in environmental issues. The extent of behavioural response to climate change may therefore be somewhat lower within the general population.

[iii] In particular the interview data exposed that 'climate change' and 'global warming' are understood in different ways; consequently, a split-survey design was employed whereby half the sample was given a 'climate change' questionnaire version, and the other half given a 'global warming' version. In all other respects the two questionnaire versions were identical. (Findings relating to the differences in understanding of these two terms are detailed in: Whitmarsh, in press-b. In short, 'global warming' is more often associated with human causes, ozone depletion, the greenhouse effect and heat-related impacts; whereas 'climate change' is more readily associated with natural causes and a range of impacts. Further, the term 'global warming' evokes more concern than the term 'climate change'. Finally, more people consider individual or public action to be an effective means of tackling 'global warming' than do so for 'climate change'. No differences emerged between the two questionnaire versions in respect of the behavioural variables). In this paper, I use the term 'climate change' as a short-hand for either climate change or global warming.

[iv] PCA with Varimax rotation for the 37 attitudinal statements produced 8 components with eigenvalues over 1. The first component included these 12 statements about scepticism, and explained 28.8% of the variance. When scaled it was found to be reliable (alpha=0.66).

[v] The pilot indicated that a number of people had difficulty interpreting nine of the fifteen NEP items, so these items were excluded from the final questionnaire. The shortened version included the statements: 'Humans have the right to modify the natural environment to suit their needs'; 'Humans are severely abusing the planet'; 'Plants and animals have the same rights as humans to exist'; 'Nature is strong enough to cope with the impact of modern industrial nations'; 'Humans were meant to rule over the rest of nature'; 'The balance of nature is very delicate and easily upset'. Principal Components Analysis of the shortened NEP scale shows it to be reliable (Cronbach's alpha = 0.72).

[vi] PCA with Varimax rotation of the NEP statements and these three statements showed they form two distinct components; the second component comprised these three statements which reflect higher environmental values relative to other (economic/material) values. When scaled, this factor was found to be moderately reliable (Cronbach's alpha=0.51) and therefore is used to complement the shortened NEP scale as a measure of environmental values.

[vii] In Portsmouth and the surrounding area, most households have a kerbside recycling service for paper, card, cans and plastic bottles. Glass is not included in the collection service and must be taken to designated recycling centres. Since recycling glass involves more effort than recycling most other items, this item is included as a separate variable in the questionnaire.

[viii] Although recycling can reduce energy used for production, depending on the process involved it is not as effective as many conservation practices such as walking instead of driving. Furthermore, in order to reverse rising energy consumption and achieve the requisite cuts in emissions, energy conservation will be required *in addition to* indirect measures such as recycling.

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Table 1. Demographic profile of survey respondents

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

Newspaper readership	Any tabloid	**261**	**44%**	30%	37%	53%	75%	42%	34%
	Any broadsheet	**280**	**48%**	65%	59%	31%	13%	52%	61%
Own or regularly drive a car/ van		**482**	**82%**	78%	74%	82%	62%	92%	93%
Member of environmental organisation		**84**	**14%**	11%	23%	9%	5%	16%	16%

Table 2. Regression analysis for intent-oriented behaviour (action out of concern for climate change)

Dependent variable:	***Action out of concern for climate change***				
Independent variables (comparison groups in brackets)*	**B**	**S.E.**	**Wald**	**df**	**Sig.**
Political party most likely to support (Labour):					
Liberal Democrat	-0.31	0.30	1.09	1	n.s.
Conservative	-0.32	0.30	1.18	1	n.s.
Would not vote	-0.88	0.42	4.26	1	0.04
Newspaper regularly read (none)					
Broadsheet	0.17	0.26	0.43	1	n.s.
Tabloid	-0.89	0.25	12.67	1	0.00
PEV score (bottom quartile):					
2nd quartile	0.70	0.31	5.00	1	0.03
3rd quartile	0.61	0.31	3.91	1	0.05
Top quartile	1.03	0.38	7.48	1	0.01
Possible to tackle climate change (no/don't know)					
Yes	1.08	0.33	10.85	1	0.00
Moral obligation (disagree strongly):					
Moral obligation - disagree	0.26	0.92	0.08	1	n.s.
Moral obligation - neither agree nor disagree	0.81	0.70	1.33	1	n.s.
Moral obligation - agree	1.93	0.68	8.05	1	0.00
Moral obligation - agree strongly	2.83	0.76	13.79	1	0.00
Causes of climate change (all other):					
CO2	0.56	0.48	1.33	1	n.s.
emissions/fumes	1.12	0.52	4.65	1	0.03
pollution	0.34	0.28	1.51	1	n.s.
GHGs	-0.23	0.59	0.15	1	n.s.
deforestation	-0.03	0.40	0.00	1	n.s.
fossil fuels	0.56	0.39	2.04	1	n.s.
car fumes	0.15	0.36	0.18	1	n.s.
Constant	-3.96	0.92	18.55	1	0.00

* Statistically significant variables listed; all other independent variables not significant at 0.05 level

Table 3. Prevalence of, and motivations for, environmentally-significant behaviours

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

Key: Most popular reason; Second most popular reason

Table 4. Regression results for energy conservation behaviours

4a) Domestic energy conservation: buy energy efficient light-bulbs and turn off unused lights

Dependent variable:	***Regularly buy energy efficient light-bulbs and turn off unused lights (combined)***				
Independent variables (comparison groups in brackets)*	**B**	**S.E.**	**Wald**	**df**	**Sig.**
Age (16-24)					
25-34	0.13	0.44	0.09	1	n.s.
35-44	0.40	0.41	0.96	1	n.s.
45-54	0.56	0.42	1.80	1	n.s.
55-64	1.05	0.42	6.45	1	0.01
65-74	1.20	0.44	7.54	1	0.01
75 or over	0.58	0.46	1.60	1	n.s.
Scepticism score (bottom quartile):					
2nd quartile	0.63	0.30	4.38	1	0.04
3rd quartile	0.49	0.32	2.34	1	n.s.
Top quartile	0.15	0.35	0.18	1	n.s.

* Statistically significant variables listed; all other independent variables not significant at 0.05 level

4b) Transport-related energy conservation: walk/cycle to work and take public transport

Dependent variable:	*Regularly walk/cycle to work and take public transport (combined)*				
Independent variables (comparison groups in brackets)*	**B**	**S.E.**	**Wald**	**df**	**Sig.**
Age (16-24)					
25-34	-0.53	0.60	0.79	1	n.s.
35-44	-0.76	0.56	1.89	1	n.s.
45-54	-0.95	0.57	2.76	1	n.s.
55-64	-0.79	0.55	2.02	1	n.s.
65-74	-1.21	0.61	3.95	1	0.05
75 or over	-1.95	0.66	8.82	1	0.00
Newspaper regularly read (none)					
Broadsheet	0.69	0.31	4.84	1	0.03
Tabloid	0.05	0.28	0.03	1	n.s.
Moral obligation (disagree strongly):					
Moral obligation - disagree	-1.87	0.92	4.09	1	0.04
Moral obligation - neither agree nor disagree	-0.77	0.50	2.35	1	n.s.
Moral obligation - agree	-0.18	0.50	0.13	1	n.s.
Moral obligation - agree strongly	0.09	0.63	0.02	1	n.s.
Causes of climate change (all other):					
CO2	-0.13	0.56	0.05	1	n.s.
emissions/fumes	-1.13	0.79	2.09	1	n.s.
pollution	-0.21	0.32	0.40	1	n.s.
GHGs	-0.89	0.76	1.37	1	n.s.
deforestation	-0.59	0.53	1.23	1	n.s.
fossil fuels	-1.05	0.54	3.79	1	0.05
car fumes	-0.16	0.41	0.15	1	n.s.
Scepticism score (bottom quartile):					
2nd quartile	0.22	0.38	0.34	1	n.s.
3rd quartile	0.81	0.41	3.90	1	0.05
Top quartile	0.82	0.47	3.12	1	n.s.
Own or regularly drive a car/van (yes)					
No	2.44	0.35	48.23	1	0.00
Public transport quality (very poor)					
Poor	0.45	0.49	0.84	1	n.s.
Average	0.36	0.46	0.59	1	n.s.
Good	1.25	0.49	6.44	1	0.01
Excellent	2.33	1.06	4.82	1	0.03
Don't know	-1.95	0.77	6.37	1	0.01

* Statistically significant variables listed; all other independent variables not significant at 0.05 level

Table 5. Levels of energy conservation and recycling action amongst those taking action, and those not taking action, out of concern for climate change (Mann-Whitney test results)

	Action out of concern for climate change	N	Mean Rank	Sum of Ranks	Mann-Whitney
Four energy conservation actions (walk/cycle, take public transport, turn off lights, buy low-energy bulbs)	No, don't know	399	283.47	113106.50	33306.5 p=.061
	Yes	184	310.49	57129.50	
	Total	583			
Either recycle glass or other items	No, don't know	404	281.08	113556.50	31746.5 p=.000
	Yes	185	325.40	60198.50	
	Total	589			

Figure 1. Actions taken by survey respondents 'out of concern for climate change'