

Public attitudes to personal carbon allowances: findings from a mixed-method study

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This article investigates public support for, and responses to, personal carbon allowances (PCAs) using questionnaires and semi-structured interviews in the English Midlands. The questionnaires showed that support for and opposition to PCAs were approximately equal. The effects on support of a number of factors were investigated, including household and dwelling variables, past energy behaviours, and the respondents' anticipated behaviours under an allowance system. Support was influenced by only three variables: (i) attitudes towards subsidies of renewable energy and energy efficiency measures in homes; (ii) anticipated behaviours regarding the use of public transport (and cycling); and (iii) anticipated behaviours regarding the sale of carbon units. Interviews explored the understanding of, the support for, and the opposition to PCAs, as well as trust and the effect of living alone. Among the interviewees, support for PCAs outweighed opposition. Understanding of PCAs was fairly good, but the buying of units was a topic that interviewees tended to misunderstand. A key finding is that public acceptability may not present an insurmountable obstacle to implementing personal carbon trading.

Keywords: energy demand; personal carbon allowances; personal carbon trading; public opinion; trust

Ce papier examine le soutien du public et les réponses face aux quotas de carbone individuels « personal carbon allowances (PCAs) » à l'aide de questionnaires et d'entretiens semi-structurés dans un district des Midlands en Angleterre. Les questionnaires ont permis d'identifier une part à peu près égale entre soutien et opposition au PCA. Un nombre de facteurs furent examinés pour leur effet sur le soutien public, notamment les différences relatives aux ménages et habitations, les attitudes antérieures par rapport à l'énergie, et les comportements anticipés des répondants dans un système de quotas. Seules trois variables avaient une influence sur le soutien public: d'abord, les attitudes envers les subventions à l'énergie renouvelable et l'efficacité énergétique dans les ménages, ensuite, les comportements anticipés face aux transports en commun (et le vélo), et dernièrement, les comportements anticipés par rapport à la vente d'unités de carbone. Les entretiens ont permis d'analyser le niveau de compréhension, le soutien et l'opposition au PCA, ainsi que la confiance et l'influence de vivre seul. Parmi les répondants, le soutien pour le PCA était plus fort que l'opposition. La compréhension du PCA était assez bonne, mais le processus d'achat d'unités était un sujet que les répondants tendaient à mal comprendre. Une conclusion clé est que l'acceptabilité publique ne représente pas forcément un obstacle insurmontable à la mise en œuvre de l'échange de carbone individuel.

Mots clés: confiance; demande énergétique; échange de carbone individuel; opinion publique; quotas individuels de carbone

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1. Introduction

Carbon emissions by individuals, from the home and in personal transport, constitute almost half of all carbon emissions in the UK, with emissions from homes being about one and a half times those from personal transport (Hillman and Fawcett, 2004; ONS, 2004; Defra, 2009). Per person emissions have been calculated, for carbon dioxide only, at 4.483 tonnes p.a. (Defra, 2007).

The contribution of homes (residential buildings) to climate change is internationally recognized (IPCC, 2007). Due to improved building standards, energy efficiency is better in newer housing (Verbeeck and Hens, 2005; BRE, 2006). Fuel consumption varies according to home tenure and built form, and tends to rise with floor area (BRE, 2005a), with other contributory factors being household income, occupant age and region (BRE, 2005b). In England, the energy efficiency of homes is improving, but only slowly (BRE, 2005b; ODPM, 2005; Defra, 2008b). A variety of energy efficiency measures such as loft insulation and low-energy lighting are used to reduce carbon emissions (CLG, 2006). The main energy efficiency grant schemes in England for private sector housing are WarmFront (NAO, 2003) and the Carbon Emissions Reduction Target (CERT) (OFGEM, 2009), but a key challenge is finding the homes that will benefit from energy efficiency improvements (EST, 2004) and persuading the occupants to take them (Armstrong et al., 2006; Wallace et al, 2010; Crosbie and Baker, 2010). The government's White Paper, 'The Low Carbon Transition Plan' (DECC, 2009b), emphasizes that future policies and targets for emissions by the public are split across several sectors. Thus the Home Energy Management Strategy (DECC, 2010), which encourages suppliers and local authorities to work together to ensure that homes receive appropriate energy efficiency measures, excludes electricity usage.

The Department for Trade and Industry (DTI) emissions projections estimated that the domestic sector would have a similar energy demand by 2020 but that transport energy demand would grow by around a quarter (Lords, 2005). The Energy White Paper (DTI, 2007) described opportunities for transport emission reductions greater than for homes, if long-term plans for the transport system and technology were put in place. However the Department for Transport (DfT) projections to 2020 show a domestic transport emissions reduction of 5% at most (DfT, 2008b).

Brand and Boardman (2008) found that, in transport terms, the top decile of people are responsible for 43% of emissions and the bottom decile for only 1%. Although the number of domestic transport journeys has not risen greatly since 1970, the average length of a journey has (DfT, 2008b). The UK Government has changed the annual tax on cars so that it reflects emissions per kilometre (Lane and Potter, 2006). Tyndall (2004a) was pessimistic about vehicle technology reducing emissions from transport and stated that emphasis needs to be put on behavioural change, especially a modal switch to public transport alternatives. However bus use is in decline (NAO and Audit Commission, 2005).

The UK Government is accused of having contradictory policies on aviation and climate change and, without interventions, emissions from flying are projected to rise (Bows and Anderson, 2006; CCC, 2009a). It has been reported that 68% of the European public agree with including the cost of climate change impacts in the price of air transport (EC DGE, 2005). Mayor and Tol (2007) modelled tourist behaviour and found that emissions would decrease under some taxation scenarios. The Environmental Change Institute (ECI, 2006) argued that the government needs to make flying less attractively priced. For the longer term, the ECI suggested more 'radical' solutions, such as PCA.

The discrepancies between the projections, as discussed above, for carbon emissions over the next decade (particularly in personal transport), indicate a potential policy vacuum for achieving maximum emissions reductions by individuals. The government plans a carbon emissions reduction of 34%, against 1990 levels, by 2022 (CCC, 2009b; HM Treasury, 2009). The Low Carbon Transition

Plan represents a broad plan across several sectors, but the government may need to find additional ways to motivate the public. Ockwell et al. (2009) describe the UK Government's emphasis on providing information, and question whether the UK Government has been successful in using communications to motivate people to change their behaviour in relation to carbon emissions.

1.1. Information sources on reducing carbon

The public in England has a variety of sources of information about reducing carbon emissions. The main provider is the Energy Saving Trust, giving advice on reducing emissions from the home and from cars, and basic information about climate change (EST, 2010). Gas and electricity suppliers are obligated to provide home energy efficiency advice, typically via quarterly bills, telephone helplines (generally resulting in brochures being posted out) and on their websites (OFGEM, 2003). Some retailers, selling products such as insulation, lighting and heating systems, also provide advice (B&Q, 2007, 2008; Homebase, 2007; Tesco, 2008, 2010). A strong focus of this advice is suggesting measures (such as insulation) and behaviours which will reduce carbon emissions. Many also provide guidance regarding grants for energy efficiency measures.

Regarding personal transport, the national journey planning tool Transport Direct (2010) covers public transport, car and plane use, and includes a tool for calculating carbon emissions. DfT use a technique called 'Smarter Choices' (DfT, 2005) to encourage people to avoid using their cars. It includes methods such as workplace (and school) travel plans, individualized travel planning, awareness campaigns, marketing of public transport information, and encouraging car sharing.

The public is also given product-specific information, usually in the form of an energy rating from A to G, often when purchasing an energy-using product. The European Community Energy Label is displayed on a wide variety of products at the point of sale, including such electrical items as refrigeration devices, washing machines, tumble dryers, lightbulbs and electric ovens (Defra, 2005). DfT has encouraged the car industry to introduce efficiency labels, and claims that these are available in most UK showrooms (Commons, 2006). Service engineers are obliged to advise on the efficiency of boilers that they service or repair, when customers ask (CLG, 2007). When any home is constructed, sold or rented, it is required to have an Energy Performance Certificate (EPC) as part of a Home Energy Report (DirectGov, 2010).

There is a wide range of carbon footprint calculators that the public can use in the UK and internationally (Bottrill, 2007; COIN, 2007; Padgett et al., 2008). The UK Government's online carbon footprint calculator is 'ACT ON CO₂' (Defra, 2007). Users can calculate their footprint from energy use in the home, and from journeys by car and air, although it leaves out carbon emissions resulting from the purchase of goods and services, or from government activity.

1.2. Knowledge, attitudes, behaviours and carbon emissions

The interrelationships between knowledge, attitudes, behaviours and actual carbon emissions are complex. Information provision, as discussed above, is only a first step in engagement of the public on climate change, and is unlikely to be sufficient to bring about reduced carbon emissions by individuals and households (Demos and Green Alliance, 2003; Ockwell et al., 2009). Abrahamse et al. (2005) emphasize that information, as such, does not change behaviours, although feedback does, perhaps because it can continuously influence the householder, whereas interventions that encourage behavioural change tend to have effects which decay with time. Thus real-time energy consumption information (smart metering) is effective at reducing consumption (Darby, 1999, 2006, 2008; OFGEM, 2006; Ueno et al., 2006). Meanwhile, Home Energy Reports have resulted in a disappointing level of installation of energy-saving measures (Parnell and Larson, 2005).

In the face of information which challenges current behaviours, consumers may demonstrate cognitive dissonance (Lorenzoni et al., 2007), failing to accept the information. This occurs particularly with transport matters. A majority of people believe that transport emissions contribute to climate change, and 45% of adults believe that air travel should be limited for the sake of the environment (DfT, 2008a). However, only one-third of the people who travel by plane more than twice a year have the same view. A flying culture seems to have become well-established in some parts of British society (Carbon Neutral Newcastle, 2005). Regarding car users, Hagman (2003) found that they present arguments on the advantages of car use in unquestionable and absolute ways, whereas scientific facts about the negative effects of car use are presented as relative and negotiable. The public link climate change and transport (Anable et al., 2006), but Poortinga et al. (2003) found that there is a preference for making energy savings in the home.

The attitude-behaviour gap is a major challenge in engaging the public on climate change (Lorenzoni et al., 2007; RSA, 2008; Wallace, 2009). The Department for Transport (DfT, 2007) found that a raised general awareness of climate issues does not necessarily result in substantial behaviour change by individuals. Drivers of polluting vehicles do not have lower levels of environmental concern compared with other drivers and, ironically, train commuters show no greater concern for the environment (Walton et al., 2004). Lane and Potter (2006) found that the purchase of lower-emitting vehicles does not correlate strongly with environmental awareness. Anable et al. (2006) argue that transport policies can either aim to change attitudes as a route to changing behaviour, or can change behaviour first without necessarily changing attitudes, concluding that a combination of both is desirable. Kollmus and Agyeman (2002) found there are numerous theoretical frameworks attempting to explain the gap between environmental knowledge and awareness, and pro-environmental behaviour; finding that the most influential analytical models only have partial validity in certain circumstances.

Furthermore, behaviours may not have a great effect on actual carbon emissions. Gatersleben et al. (2002) found that people who indicate they behave more pro-environmentally do not necessarily use less energy, and that, whereas pro-environmental behaviour is more strongly related to attitudes, household energy use is primarily related to income, household size, and similar variables, as discussed above (BRE, 2005a, 2005b). On a seemingly contradictory note, Brandon and Lewis (1999) found that attitude, more than income, brings about behaviour change regarding energy efficiency, although this of course may not translate into lower carbon emissions. Holden and Norland (2005) observed that overall energy use by households (within the home, in cars, and for flying) is affected by factors such as access to a garden, the size of the urban area, and the closeness of the home to its centre. Brand (2006) found that those from urban areas fly more than those from non-urban areas.

Reducing a household's carbon emissions faces further behavioural complications. People may assume that environmental behaviours and measures are equivalent, pick one or two easy ones to do, and then consider that their environmental obligations have been satisfied (CAT, 2007a). Additionally, rebound effects may reduce any carbon savings resulting from energy efficiency measures. These either involve increased level of service; for example, a more efficient heating system being used more, sometimes known as 'increased comfort take-up' (Martin and Watson, 2006; Shipworth et al., 2010; Summerfield et al., 2010). Alternatively, financial savings from carbon reduction measures are spent on other carbon-intensive activities or purchases (UKERC, 2007). The 'free rider effect' (Ockwell et al., 2009), whereby members of the public feel unwilling to act because others are not doing so, is a major barrier to behaviour change.

The difference between one-off behaviours (actions) and continuous behaviours may explain why behaviours do not necessarily translate into reduced carbon emissions. The Australian Greenhouse Office (AGO, 2000) and Barr et al. (2005) identify a split between people who make environmentally oriented purchase decisions (or one-off actions) and those who alter habitual behaviours in order to reduce household carbon emissions. Poortinga et al. (2003) found that, overall, the public prefers the former.

Money may have a direct effect on behaviour, however, especially regarding one-off actions. Research conducted with 5,000 consumers across Europe showed the influence of money on the installation of energy-saving measures (LogicaCMG, 2007). Carbon Neutral Newcastle (2005) highlighted the need for additional financial incentives to encourage actions, including reductions in council tax, cheaper public transport, and grants. Shorrocks (1998) showed that higher subsidies (grants) improve the take-up of energy efficiency measures.

Thus, with respect to encouraging carbon emission reductions by individuals, policy interventions could benefit from concentrating on changing behaviour, in particular one-off actions, and from putting less effort into changing knowledge and attitudes. To achieve this, financial incentives (or even multiple incentives operating in parallel) would appear to have a good chance of motivating people, compared with other strategies.

1.3. Personal carbon allowances and other policy options

Three broad financial options exist that might directly or indirectly encourage the public to reduce their direct carbon emissions; these being carbon taxation and two forms of carbon trading, 'upstream' and 'downstream'. Taxation, which can be described as 'carbon taxes', already exists on home fuel and car fuel and, to a limited extent, on airline flights. Such taxation could be increased either by taxing the public more at the point of consumption, or by taxing or enforcing obligations at some point earlier in the supply chain, which would generally result in higher prices to the public (CERT is an example of an obligation of this type).

Upstream trading does not directly involve the public. The European Union Emissions Trading Scheme (EU ETS) is an example of a general upstream trading scheme. It currently indirectly affects the cost of electricity supplies to the public, as electricity generation from fossil fuels is included, i.e. 'traded' within the scheme. By comparison, the supply of gas, oil, etc to homes is not included, i.e. 'non-traded'; aviation fuels are to be 'traded' in the future. Other upstream trading proposals are more directly influenced by the public's carbon emissions. Upstream cap-and-trade schemes have been proposed for gas and electricity suppliers (NERA Economic Consulting, 2006; Sorrell, 2006; Climate Change Capital, 2007). Such a scheme would involve the suppliers trading with each other according to the emissions resulting from their own customers' use of gas and electricity, with an allowance per household (or per occupant). Pricing of supply services to customers would be a way for suppliers to acquire customers and influence their behaviours (e.g. the installation of energy efficiency measures) and consumption levels. However, such a scheme could not influence personal transport behaviours, and it may also lead to emissions from electricity being traded twice.

Downstream trading would be likely to take the form of some kind of personal carbon trading (PCT). PCT could provide an alternative or additional financial incentive to individuals to reduce their carbon emissions. PCT would address the free-rider effect, although it may also result in double trading of electricity and (shortly) aviation emissions (again through overlap with the EU ETS). Personal carbon allowances (PCAs) would encourage individuals to attempt to keep their carbon footprint within a per capita allowance of emissions, which would reduce

year by year. Every person would receive an equal allocation, and excess units could be sold to those who exceed their allowance. The allowance would cover 'direct' carbon dioxide emissions, i.e. those from household energy use, and from fuel for cars and airline flights (Tyndall, 2005; Bottrill, 2006; Fleming, 2007). PCAs are likely to be a policy option should existing and forthcoming policies fail to reduce direct emissions by the public. Further information on the concept can be found in this Special Issue of *Climate Policy*.

This article does not attempt to explicitly address carbon taxation or upstream trading, and instead concentrates on PCAs. Before the project commenced, there had been little previous work on attitudes to personal carbon allowances. The only known work was a YouGov survey for RSA (2006) which described a system only in very general terms. RSA later conducted research using a 6-hour 'citizen forum' with follow-up focus groups, collecting mainly qualitative data (RSA, 2008). Work by Harwatt (2008), which also took place in parallel with this project, was particularly focused on transport, giving only brief attention to home energy use. Other work taking place at the same time included that by Defra (2008a), IPPR (2008), von Knobelsdorff (2008) and Bristow et al. (2008a, 2008b).

The work by Bristow et al. was close to this research, having considerable quantitative aspects. Questions about support for PCAs were posed twice during the interviews, conducted at a variety of locations in south-east England, in which participants' household carbon footprints were calculated. Respondents were also asked questions about carbon taxation. The research by von Knobelsdorff also had similarities to this project, using a postal survey and having a sample of over 150 respondents. She asked the postal respondents for their reasons for their support or rejection of PCT, with practical and ethical reasons predominating. The research projects into support for personal carbon allowances by Defra and IPPR were rather more qualitative than quantitative, and compared PCAs with alternatives such as a carbon tax and upstream trading. Howell (2007), who investigated the public acceptability of PCAs using five focus groups, highlighted the need for quantitative work to be conducted with a larger sample.

Citing previous research regarding envisaged responses by members of the public to a system of personal carbon allowances is challenging. The best available comparisons are to research projects where respondents were asked about taking actions in response to the threat of climate change, one of the few being that by Carbon Neutral Newcastle (2005).

This research specifically investigated the public's willingness to accept PCAs, and how they would respond to them, through two complementary studies: a questionnaire-based quantitative study of a large number of households and an interview-based qualitative study of a smaller subset. The research was conducted in the Newark and Sherwood district of the English Midlands which has a population of about 106,000 across an area of approximately 650 km². The local authority has been active in promoting home energy efficiency (EST, 2004) and facilitated this research.

2. Questionnaire study

2.1. Methods

The questionnaire covered issues relating to energy use and carbon emissions by households, as well as PCAs. One question provided a brief description of the PCA concept and asked respondents to indicate what they thought of the proposal on a 5-point Likert scale (1 = support strongly, 3 = no feeling either way, 5 = strongly opposed). A further ten questions explored the likelihood

of specific responses if a PCA system was in place (respondents were asked to set aside their views about PCAs while answering these questions). Six of these statements asked about carbon reduction actions (e.g. making the home energy-efficient), the remaining four statements explored anticipated carbon trading actions. Further details are in the Appendix. Questions were also asked about the dwelling (e.g. number of bedrooms), the household (e.g. number of adults) and previous energy-related behaviours.

Distribution was to three distinct housing types. An estimated 524 questionnaires were posted to occupants of pre-1995 private housing as a follow-up to an annual local government home energy study (OPSI, 1995; EST, 2004)¹. Questionnaires were hand-delivered to 429 new homes (post-1995), and 403 council homes (homes owned and managed by the local government);² adding up to 1,356 homes in total. A reply-paid envelope was included.

Analyses were conducted using Statistical Package for Social Scientists (SPSS). Frequencies, basic descriptives and tests of normality were conducted for all questionnaire statements. The PCA-related question was analysed as both a categorical and continuous variable based on use of the Likert scale (Robson, 2002; Grace-Martin, 2008). A χ^2 test for independence identified significant associations; group differences were then explored through Kruskal–Wallis and one-way analysis of variance (ANOVA) with Tukey HSD and Bonferroni post-hoc tests. In instances where group sizes were small, individual groups were merged (e.g. age bands of homes), and some instances of ‘don’t know’ responses were excluded from the analyses. All significance tests were two-tailed, at the 95% confidence interval (i.e. $p < 0.05$).

2.2. Results

A total of 334 questionnaires were returned (25%), although response rates varied by housing type (see Table 1). The higher response from pre-1995 households is perhaps unsurprising, given that questionnaires were addressed to specific households. Despite these differences, the final column (i.e. ‘homes in district’) suggests a similarity between response numbers as compared to figures for actual numbers of homes in the district. Results showed that 46% of the responding households contained a person aged over 60 years, 26% contained one person only, and 15% contained a person under the age of 16 years.

TABLE 1 Survey responses compared to homes in district

Survey	Households responding		Households in district	
	Number of responses	Percentage of all responses	Number of households	Percentage of all households
Pre-1995 private housing	247	74.0	38,002 ^a	75.5
Newer private housing	45	13.5	6,864 ^b	13.6
Council housing	42	12.6	5,500 ^c	10.9
Total	334		50,366 ^d	

^a See NSDC (1996).

^b It was assumed that the difference between the number of residences in 1996 and the time of the survey was accounted for by new private housing.

^c Newark and Sherwood Homes (2009).

^d In December 2008, the council tax department gave the number of residences as 50,366.

2.2.1. Support for PCAs

Of the 334 respondents, only 17 individuals did not answer the PCA-related question. The average response suggests that participants neither supported nor opposed the idea of PCAs ($M = 3.00$, $SD = 1.282$). The positively skewed distribution of responses (skewness = 0.157), however, provides further insight (see Figure 1). Moderate support was the most common response at 31% ($N = 97$). If moderate and strong responses are combined, the overall level of support (42%, $N = 133$) was greater than the overall level of opposition (37%, $N = 116$), with about one-fifth (21%, $N = 68$) indicating no feelings either way. These responses suggest that support is greater than opposition but that support tends to be moderate, whereas opposition is generally more equally divided between moderate (20%, $N = 62$) and strong (17%, $N = 54$) viewpoints.

2.2.2. Responses to PCAs

The next set of questions addressed the public's planned responses to PCAs. The section on 'Carbon reduction actions' in Table 2 shows that a large proportion of participants (more than half) responded positively to the idea that they would make their home more energy-efficient (with two-fifths claiming that it already was), and only 1% saying that they would not do this. Over one-third said they would probably improve their home's energy efficiency, and more than one-fifth said they would possibly do this. This statement also had the highest response rate, with 299 of the 334 respondents answering it, and the lowest proportion (just 2%) being unsure. Note that there are very few people in privately rented homes in the overall sample. The highest number of 'don't know' responses was found for the two statements relating to living near to work or working at home; these two items also had the lowest levels of response. A partial explanation for these response patterns may be the high proportion of retirees in the sample. With respect to transport choices, over one-third (33.7%) would be unlikely to use public transport (or cycle) and close to half (41%) would be unlikely to give up flying. Resistance to using a smaller or more fuel-efficient car was lower, with nearly two-fifths claiming that they already use one.

The section on 'Carbon trading actions' in Table 2 shows that two-thirds of respondents would probably or possibly keep units for car use, whereas the same figure for flying was well under

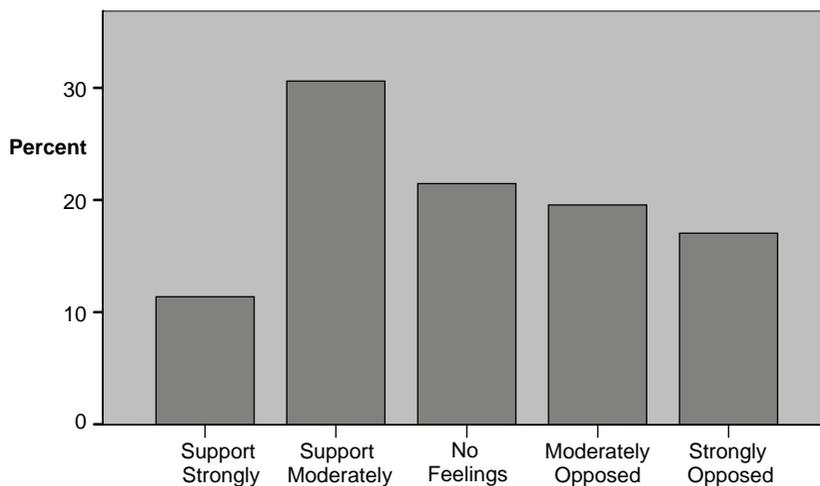


FIGURE 1 Support for personal carbon allowances.

TABLE 2 Behaviours in response to a PCA system

Question: Leaving aside your views on carbon allowances, how would you act if such a system was in place? Tick one column against each action.	Already do %	Probably %	Possibly %	Unlikely %	Don't know %	Total
<i>Carbon reduction actions</i>						
Use a small or fuel-efficient car	38.5	20.3	27.1	12.4	1.7	291
Use public transport or cycle	27.4	13.7	22.6	33.7	2.6	270
Make your home energy-efficient	40.5	35.5	21.1	1.0	2.0	299
Take holidays which don't involve flying	26.3	7.4	21.8	40.7	3.9	285
Live nearer your workplace, or get a job near to home	31.0	7.4	14.4	41.9	5.2	229
Work at home	15.5	7.1	15.9	56.2	5.3	226
<i>Carbon trading actions</i>						
Keep as many units as possible for car use	n/a	30.3	33.3	24.2	12.1	264
Keep as many units as possible for flying	n/a	7.7	21.0	61.3	10.1	248
Buy other people's units to enable you to use more energy	n/a	5.5	18.5	65.4	10.6	254
Try to use as few units as possible so you could sell them	n/a	14.8	25.2	47.4	12.6	270

one-third. Approximately one-quarter (24%) of respondents would probably or possibly buy more units for energy use under a PCA system, whereas two-fifths (40%) would probably or possibly sell units. Two-thirds (65%) indicated that they were unlikely to buy.

2.2.3. Factors influencing support for PCAs

Participants were analysed according to various mutually exclusive subgroups in order to explore whether support for PCAs differed between them. There were no significant differences in support for PCAs across a number of household, dwelling, previous behaviour, carbon reduction actions and carbon trading actions questionnaire variables. Table 3 provides details of participant groupings and gives statistical results (in all instances the p -value either exceeded 0.05 or the expected count violation exceeded 20%).

The three variables that did significantly influence PCA support are discussed below.

SUPPORT FOR PCAs, RENEWABLE ENERGY AND ENERGY EFFICIENCY

Significant associations were found between *Support for PCAs* and beliefs about subsidies for energy efficiency and renewable energy ($\chi^2(8) = 16.812, N = 284, p = 0.032$). Participants were asked whether government and local councils should (i) first complete the cheaper household energy efficiency measures and then assist renewable energy, or (ii) first complete the cheaper and the more expensive energy efficiency measures and then assist renewable energy, or (iii) switch significant resources now from energy efficiency to renewable energy subsidies (see question text in the Appendix). The small number of respondents who selected the fourth option ('taking other actions') were removed

TABLE 3 Variables for which no group differences were found (as regards support for PCAs)

Variable (question)	Response groups	χ^2	df	p-value	Expected count violation
Household					
Survey source	Housing: council, pre-1995 private, new private	13.984	8	0.082	13.3%
Number of adults	1 adult, 2 adults, 3 or more adults	13.185	8	0.106	
Over-60s present	No, Yes	4.956	4	0.292	
Dwelling					
Number of bedrooms	2 or fewer, 3 beds, 4 or more	12.796	8	0.119	
Wall sharing [built form]	Detached, Shared walls	5.193	4	0.268	
Tenure and age band	Council home, Pre-1900, 1900–1949, 1950–1965, 1966–1976, 1977–1995, Post-1995	30.737	24	0.162	14.3%
Previous behaviours					
Received energy efficiency grant?	No, Yes	6.973	4	0.137	
Ever switched electricity supplier?	Have switched supplier, Never switched supplier	2.881	4	0.578	
Carbon reduction actions					
Making home more energy-efficient	Already Do, Probably, Possibly, Unlikely	10.303	12	0.589	25%
Would use small or fuel-efficient car	Already Do, Probably, Possibly, Unlikely	13.954	12	0.304	
Would holiday without flying	Already Do, Probably, Possibly, Unlikely	12.545	12	0.403	20%
Would live nearer work or get job closer to home	Already Do, Probably, Possibly, Unlikely	25.648	12	0.012	25%
Would work at home	Already Do, Probably, Possibly, Unlikely	17.775	12	0.123	40%
Carbon trading actions					
Would keep units for car use	Probably, Possibly, Unlikely, Don't Know	11.819	12	0.460	
Would keep units for flying	Probably, Possibly, Unlikely, Don't Know	18.420	12	0.104	26.7%
Would buy carbon units	Probably, Possibly, Unlikely	11.012	12	0.528	40%

from analysis. Significant differences were found between these three response groups regarding support of PCAs using both Kruskal–Wallis ($\chi^2(2) = 13.39, p < 0.0001$) and ANOVA ($F(2,281) = 7.027, p = 0.001$). Post-hoc comparison using Tukey HSD (with almost identical results from Bonferroni) identified statistically significant differences between those who believed that government and local authorities should switch more resources to renewable energy ($M = 2.57, SD = 1.181$), compared with those who believed that resources should go to cheaper energy efficiency ($M = 3.21, SD = 1.234$) and with those who believed that resources should go to more expensive energy efficiency ($M = 3.09, SD = 1.370$). The difference was slightly more pronounced in supporters of cheaper energy efficiency than for supporters of more expensive energy efficiency measures. These findings suggest that supporters of renewable energy had a higher level of support for PCAs. The effect size (η^2) is 0.05, suggesting a medium effect of attitudes to the subsidy of renewable energy and energy efficiency on *Support for PCAs* (Cohen, 1988).

SUPPORT FOR PCAs AND USE OF PUBLIC TRANSPORT OR CYCLING

Significant associations were also found between *Support for PCAs* and respondents' preparedness to choose a low-carbon mode of transport: one of the carbon reduction actions ($\chi^2(12) = 44.361, N = 256, p < 0.0001$). Individuals responding with 'don't know' were dropped from the analysis as there were only a few. A Kruskal–Wallis ($\chi^2(3) = 24.76, p < 0.0001$) and ANOVA ($F(3,252) = 8.950, p < 0.0001$) identified significant differences, with the effect size of 0.10 suggesting a strong effect of preparedness to use public transport (or to cycle) on *Support for PCAs* (Cohen, 1988). Post-hoc comparisons using Tukey HSD (with almost identical results from Bonferroni) found statistically significant differences between individuals who were 'probably' going to adopt a low-carbon transport mode ($M = 2.17, SD = 1.134$) and both the 'already do' ($M = 3.07, SD = 1.386$) and the 'unlikely' ($M = 3.38, SD = 1.186$) groups. An additional difference was found between those unlikely to adopt such behaviour and individuals within the 'possibly' group ($M = 2.80, SD = 1.152$). Results suggest that those who are unlikely to choose a low-carbon transport mode or are already doing this behaviour are less supportive of the PCA concept.

SUPPORT FOR PCAs AND SELLING CARBON UNITS

Lastly, significant associations were found for selling carbon units, an action related to carbon trading ($\chi^2(12) = 38.677, N = 263, p < 0.0001$). A Kruskal–Wallis ($\chi^2(3) = 32.17, p < 0.0001$) and ANOVA ($F(3,259) = 12.290, p < 0.0001$) identified significant differences between the four response groups. Post-hoc comparisons using Tukey HSD (with almost identical results from Bonferroni) identified that respondents who were 'unlikely' ($M = 3.43, SD = 1.242$) to sell units had significantly lower *Support for PCAs* compared with the other three groups: those who would 'probably' ($M = 2.45, SD = 1.155$) or 'possibly' ($M = 2.55, SD = 1.049$) buy units, and those who stated that they 'didn't know' ($M = 2.72, SD = 1.143$). The difference for the 'unlikely' group was greatest in relation to the 'probably' group, followed closely by 'possibly' and then 'don't know'. The effect size, calculated using η^2 , was 0.125, suggesting a strong influence of the likelihood of selling units on *Support for PCAs* (Cohen, 1988).

2.3. Discussion of questionnaire results

The level of response to the questions about personal carbon allowances in the survey was high, despite the concept probably being new to the vast majority of respondents. Such a new proposal

being met with a balance of opposition and support was notable, as one might expect a new concept to be rejected fairly substantially. In fact, moderate support was the commonest view.

Similar quantitative work in this area was conducted by Bristow et al. (2008a, 2008b). Participants' household carbon footprints were calculated, and questions about support for PCAs were posed twice (before and after PCAs were explained). The results for the second occasion, by which time the respondents understood PCAs in greater detail, are compared with this research project's figures in Table 4, along with results from a project conducted by von Knobelsdorff (2008). There were 317 answering the question in this survey, 207 in the Bristow et al. survey, and 152 in von Knobelsdorff's postal survey (note that her description for 'No feelings' was 'Mixed feelings').

There are similarities across the three studies with respect to level of support. There are also similarities in responses for 'support', 'no feelings' and 'opposition' between this study's and Bristow et al.'s study findings. These three quantitative studies show that support for PCAs exceeds two-fifths, as well as exceeding opposition. Findings from these studies differ from recent more qualitative work conducted by the Institute of Public Policy Research (IPPR, 2008, 2009a, 2009b), which claims lower levels of support for PCT.

Participants' willingness to consider a range of carbon reduction actions in response to a PCA system varied. Only a small proportion of respondents indicated that they were *unwilling* to improve their home's energy efficiency should a system of PCAs be introduced. However, many of the respondents had not yet already implemented all the available low-cost energy efficiency measures, e.g. insulation (Wallace, 2009).

Regarding transport and travel, overall there was less enthusiasm for taking steps to reduce carbon emissions. However, being prepared to change to a lower-carbon transport mode (i.e. to use public transport or to cycle) was associated with greater support for personal carbon allowances. The anticipation of being able to make carbon savings by using public transport or cycling had a greater influence on *Support for PCAs* than the actual use of these transport methods (the 'already do' group).

The explanation for the greater support for personal carbon allowances among those who support subsidies for home renewable energy, at the expense of home energy efficiency, may be that ordinary members of the public are much less likely to be informed about the costs and paybacks (in terms of both reduced energy costs and reduced carbon emissions) for the two types of measure, and are unaware that energy efficiency is generally a less expensive way of achieving reduced carbon emissions than renewable energy generation, although the latter arguably achieves greater popular attention when climate change is discussed. Thus those who have positive attitudes regarding reducing carbon emissions may therefore be more likely to respond positively to the idea of home renewable energy measures as well as responding positively to personal carbon allowances. Information sources such as the Energy Saving Trust's energy savings assumptions (EST, 2009) and the ACT ON CO₂ methodology (Defra, 2007) do not even list 'savings' from home renewable energy measures.

TABLE 4 Comparison of projects: support for PCAs

Support for PCAs	This project (%)	Bristow et al. (%)	von Knobelsdorff (%)
Support	42	43	44
No feelings/Mixed feelings	21	22	43
Opposed	37	34	13

One possible explanation about the finding that those who are 'unlikely' to sell units have lower *Support for PCAs*, might be that those people who perceive that they have high footprints, or perceive that they would have to suffer a drop in the quality of life, would be inclined to be less supportive of a scheme that would penalize them financially. Another possible explanation is that some might find the concept of trading hard to understand, and may therefore think that they would not trade.

3. Interview study

To further explore some of the issues identified through the questionnaire, a qualitative study was designed. Other qualitative work in the subject area includes that by Carbon Neutral Newcastle (2005), which conducted focus groups in north-east England to research public attitudes about responding to climate change. When investigating attitudes to PCT, the Institute of Public Policy Research used comparisons with carbon taxation and with upstream trading (also described as 'limits on fuel and energy suppliers') (IPPR, 2008). The data collection techniques included a discussion group, and three deliberative workshops in different parts of England. Defra used a similar comparison of options, and used focus groups (Defra, 2008a).

3.1. Methods

The second stage of data collection involved interviewing 15 households, some of which involved more than one person being interviewed simultaneously, resulting in a total of 21 adult interviewees. A key aim was the gathering of views about PCAs. Semi-structured interview questions produced qualitative information for analysis. Each interviewed household also provided quantitative data, entered into a spreadsheet on a laptop computer, in order to calculate a carbon footprint (as well as data about possible measures to reduce that footprint). This assisted with gathering of views about personal carbon allowances, as the calculation, performed during the interview, helped to determine whether a household was likely to be in surplus or deficit under a system of PCAs. An allowance of 5.056 tonnes was determined as appropriate for adults, and half of that for children (Wallace, 2009).

Households were recruited by two main methods. Just under half were drawn from participants in an annual local government home energy survey and, for new and council homes, from the appropriate postal surveys conducted by this study. The second method was an advertisement on the home page of the local government website, which offered respondents the chance to have their carbon footprint calculated.

The flow of the interview was as follows. PCAs were described using an electronic slide-show, and interviewees were then asked about their support for them. Their current carbon footprint was then calculated, and compared to the per person national average. The interviewees were then asked if their view of personal carbon allowances had changed. The footprint was revisited, this time considering carbon-saving measures that might be used to reduce it. Interviewees were then asked again whether their views of personal carbon allowances had changed.

The interviews took place between July and November 2007 in the interviewees' homes, so there was the opportunity to make observations about the home (and vehicles). Names have been changed to conceal identities. The interviews were recorded on a digital sound recorder and averaged nearly 2.5 hours each. Qualitative data analysis (QDA) was performed using the software tool NVivo version 7 (QSR, 2010).

The interviews were analysed primarily through template analysis, i.e. '*a priori*' themes were identified before the interviews took place (King, 2007). However, the semi-structured nature of the interviews meant that it was possible for themes to emerge, using a 'grounded theory' approach (Robson, 2002).

3.2. Results

The findings from the interviews cover understanding of PCAs, opposition, support, trust (including the effect of social class) and living alone. Trust was an emergent theme; all the others having been identified through template analysis. Further results are explored by Wallace (2009).

3.2.1. Understanding PCAs

The interviewees' understanding of PCAs was good. Even some of the quotes below, showing interviewees' misunderstandings, demonstrate that interviewees had already understood much of the concept.

Understanding the background issues was a concern for Alfred (male, 64):

To be honest it's the first time I've ever heard [PCAs] explained. I don't have a lot of time to read things. Every time you switch on the TV, they're on about carbon neutral, carbon footprint. I think 'What are you talking about?'

The most significant misunderstandings about PCAs revolved around some of the cap-and-trade aspects of such a system. Four interviewees struggled to understand the buying of units. Helen (female, 66) said:

There are people who just don't care about anyone else ... they'll find ways around, as you say, buying them from other people.

There is presumably some confusion caused by substituting the concept of rationing for that of tradable allowances. Jim (male, 70) also looked upon the idea of buying extra allowances as somehow cheating the system. Leonard (male, 69) showed similar confusion. Melanie (female, 36) misunderstood in almost the opposite way, not realizing that there is a limit to the number of units available for purchase.

The affluent would buy more. It doesn't tackle the nub of the problem ... decreasing what you use.

This opinion overlooked the declining cap on the number of units available (which would be decreasing each year). On the whole, there was little indication that interviewees would trade irrationally, e.g. using the whole of their allowance and nothing more. This is possibly because the footprints calculated during the interviews, and discussion of measures to reduce footprints, might have discouraged such viewpoints.

Four interviewees mistakenly believed that carbon accounts would be based on recording vehicle mileages rather than on the petrol or diesel purchased. Jim said

I think it would be hard to control because not everyone would tell the truth. You see if I've got a car, how many miles do I do a year? If I want to impress you, I say 8,000 – when I've probably done 12,000.

Two interviewees had concerns because they tended to think about the current situation, rather than one which might exist in several years, when a system of personal carbon allowances might be introduced. Metering and billing were of concern to Nick (male, 38). When the interviewer spoke about the likelihood of smart metering being widespread by that time, he was reassured.

Dave (male, 43) questioned the point of environmental protection, and provocatively suggested, if action to protect the environment was being taken, it ought to be drastic:

They keep making environmentally friendly washing machines which are using less electricity but why make them at all, why not stop making them? ... Somewhere along the line you've got to make that sacrifice whether it's in fifty years' time...

In 50 years' time, it is likely that electricity will be less carbon-intensive (DECC, 2009b), thus Dave's concerns may be excessive – or perhaps an excuse for inaction on his part.

Confusion with taxation might have been expected to come up, but there was only one comment, from Philip (male, 67):

Look at alcohol. It's reasonably taxed but really rather cheap by comparison with what people earn.

3.2.2. Support for PCAs

The balance of support for, and opposition to, PCAs was approximately reflected in the interviews. Of the 20 interviewees whose views were gathered, six demonstrated opposition to PCAs, with a further three not being clearly supportive. Ten people were supportive, but only one of those was recorded as a strong supporter. Two households were divided. There were only two examples of someone changing their view, even after their footprints had been calculated by the interviewer. Janet maintained her view:

Interviewer: After the first year, if you didn't take any measures, you'd be in shortfall ... Does that alter your view of PCAs?

Janet: No, not really ... it's a way of making people sit up and take notice.

There was little in the way of surprise at the concept, with only Leonard expressing such views: 'You are saying that there would be a control put on this?'. After some explanation, he was still perturbed: 'It's very radical, this approach'. Philip projected opposition onto others:

There will be some people who will say that it will be an infringement of their rights.

Pete (male, 59) made a point about the systems for PCAs:

I don't think that this country, or very few countries, have got the infrastructure, to be able to be seen to administer that openly and fairly.

Dave also makes the point 'it's just a load more bureaucracy'.

Nick was the only interviewee to directly talk about carbon taxation as an alternative to PCAs. Dave gave a strong hint in favour of intervention, for example suggesting that large four-wheel-drive vehicles should no longer be made. Only one interviewee made any point about living in a non-urban location. Melanie, who was against PCAs and thought they would be generally unfair said: 'The local Co-op is so expensive, so you have to drive everywhere for everything'. Melanie

and her family had recently moved from an affluent city suburb to a small and attractive town in Nottinghamshire, mainly for the children's education. Melanie later picked up on the theme of having room for manoeuvre:

I think there are other ways for it to be done ... A lot of people are not going to be able to reduce things ... You have to be able to catch the train, to catch the bus.

Susan (female, 38), from a household with a large footprint, was opposed to PCAs:

Susan: I don't like being told what to do, and I don't see why I should be charged any more for what I do. But I do agree we need to do something, and there are some people who are worse than others ... Where is that money going to go, and what is it going to do?

Interviewer: Well, it would go to other people who are emitting less, basically.

Susan: I don't see why I should have to pay for other people, that's what I find more frustrating.

Interviewer: Would you rather that money go to taxation then, or not be charged at all?

Susan: I don't think I should be charged at all. My [gas and electricity] in particular, are extortionate.

Susan lived in a large new home, and revealed that later in the week she was purchasing a new car costing over £20,000. These facts did not fit well with the concern about gas and electricity bills.

Cautious supporters included these:

Helen (F, 66): I think it's just going to be a huge, huge thing to work out, and hugely expensive thing to do, providing the computers don't crash. But I think that, given that everything comes together and works, that's good.

Lynne (F, 44): I think it sounds a good idea, from what I've understood, I've never heard of this before.

June (F, 35): I think it would be a really good idea, but it will disadvantage the disadvantaged.

Similar comments suggesting concern for the vulnerable were made by several other interviewees.

3.2.3. Trust

There was surprisingly little raised by interviewees regarding potential distrust in the organizations that might administer the system. Pete, however, was critical, and his point, made before the banking crisis, was:

I wouldn't trust the banks to do it ... At the moment I've got difficulty in trusting any one organization to do it ... Central government have got an appalling record with computer systems.

Nick condemned all public sector bodies:

I think you leave it to business ... Any public organization is over-managed ... I work in the [public sector], I see this every day. And local councils – there's too much money on management and not enough on solving, on doing the actual job.

Individuals also came in for some suspicion. Jim said:

But ... a new professional – a carbon exchanger/trader. This might defeat the object.

Meanwhile Helen was concerned about fraud, people who would

find a crafty way around it, make up their cards or something. Perhaps I've just got a suspicious mind.

Nine interviewees commented upon class issues, with comments being directed at the rich (five comments) or the poor (six comments). The poor were treated in a rather more derogatory fashion, with three references to people taking from the system (to the extent that people might resent those on certain welfare benefits receiving a carbon allowance). Even the least unkind comment was an incorrect assumption by June (female, 35) that the poor would be worse off under a system of personal carbon allowances. One comment about the poor by Lynne was double-edged:

I could well say I'll just not go to work, I'll just go on the social security, what an awful lot of people do ... I'd really object to having to pay another tax ... that I wouldn't be able to afford because I'm a single parent.

3.2.4. Living solo

Four interviewees lived alone. Jim, in his small council bungalow, had a very low footprint. For the other three, high footprints were partly attributable to flying. Helen's bungalow was modestly sized, with a modern boiler and a good level of insulation, and she had a small car. Philip and Leonard would lose out significantly under a system of PCAs. Philip's home was larger than Helen's and he was perturbed by his footprint, which was 4.3 tonnes over the allowance:

I'm supposed to be a modest user ... even if I took maximum effort, it wouldn't reduce it to an average footprint. But where is the waste? You've got to run a car in the country. You've got to warm a house.

If he were to install all suitable measures, he would be left with a deficit of over 1.5 tonnes. However Leonard's 'deficit' could only be reduced to 5.4 tonnes. He thought about moving, as did Cathy. Her daughter would eventually be going to university, leaving her with just her own allowance:

There were three of us ... It's not the sort of thing you change on a whim, your house.

Another single parent, Lynne, who had a very long commute, said:

I don't want to move yet because my children are at school and they're doing their exams ... Your circumstances dictate how you live and where you stay.

She supported the idea of half allowances for children.

4. Discussion and conclusions

Both the questionnaires and interviews showed that there is a notable level of support for PCAs, with support higher than opposition in the interviews, and support and opposition closely balanced in the questionnaire findings. Other research confirms the findings from the questionnaire (see, e.g., Bristow et al., 2008a, 2008b). The questionnaire showed that support (and opposition) seems to be fairly homogeneous, with little in the way of group differences according to household, dwelling or behavioural factors, or to carbon reduction or carbon trading actions. Group differences could only be found for attitudes to using public transport (in response to a system of PCAs), for attitudes about subsidy of renewable energy (as opposed to energy efficiency), and for intentions towards selling carbon units.

Most interviewees stuck to their opinions about PCAs. Moderate support (often citing concerns) predominated over strong support. Reasons for opposition to PCAs included systems and bureaucracy, the vulnerable, having easily achievable means of reducing footprints, and there being better ways of achieving emissions cuts (investments and interventions). Some of the work done on attitudes to PCAs thus far has tended towards comparing it with carbon taxation. Among the interviewees there was little suggestion of carbon taxation as an alternative to PCAs, which may have a bearing on future projects investigating both PCAs and carbon taxation.

There were some organizations that might not be trusted to run or be associated with a system for PCAs, but distrust was on the whole not a major issue, although the costs of a system may in future emerge as a public acceptability issue. Respondents mentioned the rich and the poor when discussing PCAs, but those living alone would be more likely to be at a disadvantage under a system of PCAs. Lone parents would also be at a potential disadvantage unless they are given allowances for their children.

Most of the interviewees' misunderstandings of the proposed system of PCAs involved failure to fully grasp certain key aspects relating to 'cap-and-trade' and the declining cap. This was not surprising, given that the interviewees had not come across PCAs before the interview took place. In particular, the idea of buying units was one that interviewees tended to struggle with. The survey also showed that buying units was not popular. This, and interviewees' confusion regarding the concept, may need further research, and could affect the design of a PCT system.

The UK Government used the findings of its initial study into PCAs, including work on public attitudes (Defra, 2008a), to justify its decision to not pursue PCAs further at that stage (DECC, 2009a). That research into attitudes was primarily qualitative in nature, with a small sample size, and its findings do not reflect the results of this research project nor those of Bristow et al. (2008a), which both show notable levels of support for PCAs. Whether PCAs are the right solution to addressing climate change is a political and policy issue. If they were deemed the right approach, there would be many problems to overcome (logistic, legal, equity etc). However, this and other research projects suggest that public attitudes to PCAs may, in themselves, not be a major barrier to implementation. To date, most of the academic and government work on public attitudes to personal carbon allowances has been conducted in the UK. More research into public attitudes and potential responses to PCAs, using larger samples to address issues of representativeness, is needed both in the UK and elsewhere, to establish the public acceptability of this approach.

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Notes

1. This estimate is drawn from figures available from the local authority who distributed the 'Pre-1995 private housing' questionnaire.
2. The survey form was also distributed electronically via the Tenants' Association to an unknown number of recipients, and around eight responses were received by this method.

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Appendix: Postal survey questions

Personal carbon allowances

Almost all human activity involves using energy – or 'power' or 'fuel'. In most cases, this involves using a fossil fuel: oil, gas or coal. Sometimes they are used indirectly in the form of electricity. Using fossil fuels adds carbon dioxide – a greenhouse gas – into the atmosphere which, the vast majority of scientists believe, causes climate change (also known as global warming or the greenhouse effect).

Some electricity comes from nuclear power stations. However, this produces waste which is radioactive and therefore dangerous to human health and the environment for thousands of years, although it does not produce any carbon dioxide.

Only a small amount of our energy currently comes from renewable sources, such as wind or wood, which do not put extra carbon dioxide into the atmosphere. Therefore many believe that energy use needs to be better managed to cut 'carbon emissions'.

What do you think of such proposals? Tick one:			
Support them strongly	<input type="checkbox"/>	No feelings either way	<input type="checkbox"/>
Support them moderately	<input type="checkbox"/>	Moderately opposed to them	<input type="checkbox"/>
		Strongly opposed to them	<input type="checkbox"/>

Leaving aside your views on carbon allowances, how would you act if such a system was in place? Tick one column against each action (note, only a selection of actions can be given here):

	Probably	Possibly	Unlikely	Don't know	Already do this
Use a small or fuel-efficient car	<input type="checkbox"/>				
Use public transport or cycle	<input type="checkbox"/>				
Make your home energy-efficient	<input type="checkbox"/>				
Take holidays which don't involve flying	<input type="checkbox"/>				
Live nearer your workplace, or get a job near to home	<input type="checkbox"/>				
Work at home	<input type="checkbox"/>				
Keep as many units as possible for car use	<input type="checkbox"/>				
Keep as many units as possible for flying	<input type="checkbox"/>				
Buy other people's units to enable you to use more energy	<input type="checkbox"/>				
Try to use as few units as possible so you could sell them	<input type="checkbox"/>				

It has been suggested that everyone in the UK should be given an annual 'carbon allowance' to allow them to buy units of household energy/power, vehicle fuel, and airline mileage. If a person does not use all their units, they could sell them to other people who need more units.

Energy efficiency and renewable energy

We are interested in your views on the relative merits of household energy efficiency, and renewable energy in homes.

Energy efficiency involves the better use of energy supplies. Some household energy efficiency measures are cheaper, such as insulating cavity walls, but others are more expensive, such as insulating older pre-1930s solid walls (using 'insulated dry-lining' or external cladding).

Renewable energy is energy generated from environmentally friendly sources, and domestic systems include small wind turbines, wood boilers, and electric or hot-water solar panels. Currently they can be expensive per unit of energy supplied.

Should government and local councils... (<i>tick only one</i>):	Tick
Switch significant resources <i>now</i> from <i>energy efficiency</i> to <i>renewable energy</i> subsidies	
Complete cheaper household <i>energy efficiency</i> measures first and then assist <i>renewable energy</i>	
Complete cheaper <i>and</i> more expensive <i>energy efficiency</i> measures first, and then assist <i>renewable energy</i>	
Take other actions, please specify:	

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