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Executive summary

Introduction

This report describes a research project by a team from the University of Salford that sought to explore the possibility of accelerating householder behaviour to address dangerous climate change by investing in energy saving and flood protection measures. The work was carried out within the national 'Resilient Homes' initiative which has been promoted and funded by the Environment Agency. Work on the first Phase of the project was carried out between January and June 2009. This part of the project tested householder attitudes towards climate change, and their willingness to accept responsibility for addressing its threats to their property. It reviewed ways in which communities threatened by climate change in other parts of the world had been engaged to take action, and it described the literature on work by others that tried to understand the social psychology that has been helpful in choosing the right tactics to engage communities on these issues. In particular, the Salford team investigated acceptance of methods that would induce desired behaviour by using positive influencing. Specific questions about the attractiveness of non-cash rewards were put to a range of householders to see if there was support for a pilot programme that invited householders to buy insulation, efficient boilers and flood protection in exchange for free rewards including (among others) fruit and vegetables, gardening, further education, and journeys on buses and trains.

Climate change: the gap between understanding and the ability to take action

Governments face a double challenge, on both energy saving and flood protection to motivate householders to take action in reaction to dangerous climate change. On energy saving, carbon dioxide emissions from heating and servicing domestic buildings account for over a quarter of all green house gases emissions in the UK. While, according to the Government's targets, all new homes will produce zero net emissions by 2016, over 80% of the buildings standing in 2050 have already been built. Therefore, addressing the energy efficiency of the existing stock is crucial if the national targets of 80% cuts in green house gas emissions by the middle of the century are to be met.

In an average house, 61% of energy is used for heating, 23% for hot water and 13% for lighting and electrical appliances. Therefore, while actions aimed at changing residents' behaviour (such turning down thermostats and turning off lights when rooms are not in use) are beneficial, it is changes to the fabric of houses to reduce heat loss that will make the most significant reductions in carbon emissions. By 2005 only 65% of householders had installed one or more of the major energy saving

interventions such as loft or wall insulation and double glazing. For policy-makers this presents a challenge as the costs and responsibility to install energy-efficiency measures are carried largely by the property owners. Without the introduction of draconian measures to coerce householders to make changes to their property, the timely completion of this work is uncertain.

Protection against flooding is equally problematic. The 2009 report by the Environmental Agency suggests that there are over 5.2 million properties in England at risk of flooding. Just less than half a million of properties are at significant risk of riverine or coastal flooding (1 in 75 years) and the situation is likely to worsen as average global temperatures increase. While the Environment Agency is working on increasing the number of properties protected from flooding by building more and better structural defences, it is estimated that about half of the households currently in areas of significant risk of flooding may remain undefended. Therefore, property-level measures could be the only flood protection available for these houses. In addition, the efficiency of flood protection by structural measures is never absolute, and is likely to decline with the increasing unpredictability and severity of weather systems. Consequently, it will be necessary to install property-level flood protection for houses in areas that already have flood defences.

Property-level flood protection measures can be classified into those that increase the resistance of the house to flooding, and those that improve resilience. Resistance measures, such as air brick covers, raised thresholds and door guards are designed to keep water out of the property. Resilience measures, such as raised electrical fixtures, waterproof flooring and kitchens aim at minimising the damage to the house structure, interiors and furnishings in the likely event that water will enter the premises, thereby facilitating the quickest possible recovery.

At present, in areas of significant flood risk, the adoption of resistance and resilience measures is minimal (estimated as less than 5,000 homes). One disincentive for the house owners is the cost of property-level flood protection. But many householders simply do not think that flooding will affect them, even though they are well aware that they live in the threatened area. This suggests that, without the introduction of grants or incentives, property-level protection is not going to be a priority for householders.

Engaging householders on the implications of climate change for their premises

In order to persuade those that own houses to invest in the climate change mitigation and adaptation measures, they need to be aware of the risks. Moreover, householders need to consider the reduction of domestic energy consumption and the addition of flood protection to their dwellings as their own responsibility, rather than the duty of the authorities. This awareness and willingness to self-manage the effects of climate change can only be achieved by effective public engagement at the community level.

There is a significant amount of evidence of successful community engagement on climate change mitigation actions aimed at energy saving, partly due to local authorities being obliged by different policies and regulations to facilitate such engagement. However, there are far fewer examples of engagement on flood protection and management. This is due to a culture of overt trust in structural defences, reliance on relevant authorities for flood management, poor risk communication, and a general reluctance to believe that the worst can happen.

It has been recognised, both at the European level and in the UK (following the 2007 floods) that there is a need for a shift from defensive action against hazards to living with floods and better management of the risks. The first step towards increasing awareness of floods is effective risk communication. International and national examples show that communication of risk of flooding is best achieved through decentralised actions and easy to understand messages. In the UK, raising the awareness of people living in flood risk zones is an obligation of the Environment Agency and it is attempted by the means of leaflets, internet-based Flood Maps and the free service of Floodline Warnings Direct. However, these actions only reach a minority of the population living in flood risk areas, and only half accept these messages as a serious warning to change their behaviour.

There is a need to emphasise the responsibility of the house owners for flood protection of their properties. An example from the Netherlands shows how a successful public campaign is trying to shift the population towards personal responsibility. In the UK, following the recommendations in Pitt Review, the change in tactics towards emphasising personal responsibility is apparent. This change manifested itself in the series of pilot studies into grants for property-level flood protection carried out by DEFRA. However, these initiatives have been small scale to date. It is now more important, as the threat of flooding grows, to find a way of persuading more significant numbers of home owners in flood risk zones to protect their homes in a more effective and more urgent manner.

Reward-based methods as a means to accelerate sustainable behaviour

The literature provides examples of various approaches to changing people's behaviour to act in a sustainable manner. In the context of climate change, fact-based informational campaigns aiming at changing people's behaviour have not been effective. This is because behaviour does not change as a result of knowing more and because there is no clear cause and effect connection between climate change and the actions required to address it. While social norms (what other people do or are perceived to approve of) have a significant impact on the behaviour of individuals, this is dependant on an acute consciousness that the tide is turning and that new behaviour has become commonplace. At present, the indications that people are taking positive action to cope with impending dangerous climate change are not

strong enough (either from individuals or sources of authority such as business, government etc.) to provide the impetus to stimulate mass action.

Financial disincentives can influence sustainable behaviour, but they are not effective once the disincentive is removed. Also, their use is problematic in low income communities as they are inequitable. In the UK, the introduction of energy-use taxes would significantly increase the problem of fuel poverty unless complex counter measures were introduced to reverse this effect.

The evidence that would support the use of financial incentives in encouraging sustainable behaviours is mixed. It has been observed by different authors that offering financial incentives for one type of sustainable behaviour may either result in a "spillover" to other types of behaviour or, with equal probability, reduce the likelihood of engaging in other environmental behaviours unless more money is offered. However, the main reasons why direct financial reward many be counter-productive is that money-based schemes are expensive, and there is no control over the goods and services that the participants will buy with the reward money. Spending could easily go towards more frequent flights to holiday destinations rather than more solar panels. Pay as you save energy schemes may be attractive to some, but those already concerned about high energy bills will be worried that they will not be able to pay for energy saving measures in the future. These schemes also rely on efficient energy management of the home, something that is not a foregone conclusion. This scheme is also ineffective in motivating householders to invest in flood protection.

Non-financial incentives can be more effective in influencing sustainable behaviour than financial incentives. They can have an intrinsic value (increased consumption of fruit and vegetables for example) and can have a number of additional benefits. They can boost local economy (e.g. locally sourced fruit and vegetables and free meals at local restaurants can help local businesses), help in community development (e.g. free college courses can improve education levels, skills and employability) and contribute to meeting a variety of the Government's objectives (e.g. free fruit and vegetables can be used as part of the five-a-day campaign; passes for health centres can lower obesity, and social enterprise employed labour can help a number of hard-to-reach parts of society including long-term unemployed, disabled people, and ex-offenders).

Testing attitudes on reward-based methods

The overall goal of the Resilient Homes project was to examine the potential of a non-cash reward scheme to increase the adoption of energy-saving and flood protection measures by the house owners. In order to achieve this aim, the following objectives were set:

- To investigate the awareness of climate change and the perceived responsibility to take action among home owners;

- To explore the willingness of home owners to make flood protection and energy saving improvements to their homes;
- To look into the preparedness of home owners to accept a selection of non-cash rewards in return for making adaptation and mitigation changes;
- To identify the type of rewards preferred by the respondents;
- To identify what non-cash incentives are available.

Attitudinal surveys were carried out with 1,043 respondents living in flood risk areas in England and Wales (in a telephone survey) and with 101 respondents in case-study areas of Salford, Greater Manchester (door-to-door survey). Salford was selected as a case study due to large numbers of people living in flood risk areas associated with River Irwell and because of high deprivation levels in some locations making them a priority for action.

Two individual areas in Salford were surveyed: low income areas (in the Lower Irwell valley) and a mixed income area (Alder Forest). All of the areas were characterised by high percentage of elderly and retired people. Majority of the people were concerned about the impacts of climate change (68%), agreed that their houses contributed to climate change (76%) and that using less energy could make a difference to climate change (76%).

While significant flood defence works had been carried out in the Lower Irwell area, they only protect the areas up to 1 in 75 year probability. The more severe floods can breach the defences and people living there need to be prepared for this possibility. People in Alder Forest living in flood zone of Worsley Brook, one of the Irwell's tributaries, could suffer in the future from the increased risk of flooding. While most of the respondents were aware they lived in flood risk area, high numbers thought the probability of their house getting flooded in the future was low although half were subscribers to the Floodline Warnings Direct and 74% had flood insurance.

The respondents were asked whether they would consider installing of any of the following flood protection measures: air brick covers, door guards, raised electric fixtures, tiled flooring and concrete bottom of staircase. The results showed that raising electric fixtures and installing air brick covers and door guards were seen as useful while the least popular option was tiled flooring.

The acquisition of energy saving measures in the study area was less than the national average of 65%. Fewer than 50% of respondents had loft insulation, wall insulation, double glazing, efficient boiler or energy-saving appliances. The most desired measures were energy-saving appliances and energy-efficient boilers.

Less than half of the respondents said they would not pay for any of the climate change measures suggested in the survey. However, nearly a quarter of the respondents were prepared to invest over £500 to protect their houses. This suggests that even in the areas suffering from material deprivation, there is a potential for the

introduction of reward schemes.

The most popular non-cash rewards for investing in flood protection or energy-saving were vouchers for fruit and vegetables (51.7% of positive answers), followed by free meals at restaurants (44.2%), tickets for entertainment (33%) and vouchers for leisure and health centres (27%). The least popular reward was free bus travel, although this was to be expected in a sample dominated by older people who are already eligible to travel without charge.

Around a quarter of the respondents would not be persuaded to accept any rewards (regardless of value), and over half wanted to receive between 100% and 200% of the investment they would make. Nearly half of the respondents expressed an interest in participating in a reward scheme if it was offered in their area. This suggests a high degree of feasibility for such a scheme, even in areas suffering of material deprivation.

The majority of the national survey results were very similar to the responses from Salford, although there were also some significant differences. Just 40% of the Salford participants have double glazed windows compared to 85% of the England and Wales sample. Larger numbers in Salford were willing to accept non-cash rewards in return for investment in climate change mitigation and adaptation 75% compared to about 60% in the wider survey). However, of those 60%, the majority said they would accept the rewards up to 100% of their investment compared to up to 200% in Salford. These differences are likely to have arisen as a result of the higher numbers of people on low income in the Salford sample.

Analysis of differences in answers between the telephone survey respondents from four different social grades indicated that people from higher social grades were more aware of their contribution to climate change and possibility to make a difference. Those belonging to lower-income socio-economic grades were more concerned about the effects of climate change, including flooding.

The respondents who had previously experienced flooding were more concerned about climate change and more likely to have undertaken precautionary measures such as subscribing to Floodline Warning Direct or buying flood insurance. They also had more interest in installing flood resistance and resilience measures compared to those who had not been flooded before. However, more respondents who have been previously flooded also thought that the responsibility for protection of their houses rested with the Government. Finally, higher awareness of climate change also lead householders to be more willing to spend more money to protect their houses.

Reward-based schemes for the private rented sector and social housing

Tenanted properties form a significant proportion of housing stock in flood risk areas (30% in England and Wales and 70% in case-study area of Salford). Therefore, there

is a need to engage private and social landlords and their tenants on the possibility of installing property-level climate change adaptation and mitigation measures. The results of surveys and interviews with private and social landlords in flood areas in Salford indicate that most of the private landlords, and all of the housing managers responsible for stock in East Salford were in favour of additional works to houses to prepare them for climate change impacts. The main barrier to implementing this work high costs. However, the social landlords also said they had limited motivation to carry out flood adaptation work as this did not form part of the targets that they had been set by funding bodies. Many respondents were interested in the possibility for rewards in exchange for undertaking this work.

Focus groups carried out with social housing tenants suggested that their awareness of climate change was similar to owner-occupiers. Furthermore, they expressed no objection to the proposal that landlords should undertake work to their homes to improve energy conservation levels, or resist future floods.

Implementing a rewards-based behaviour change scheme

The research results suggest that there was a high level of awareness of climate change and willingness to do something about it among the respondents. The home owners were prepared to pay for improvements and would be motivated by non-cash rewards. Almost half of those interviewed would like to participate in a reward-based scheme. Therefore, the necessary conditions that would support a successful reward-based scheme to help householders protect their property against flooding exist in England and Wales.

The non-cash rewards can be classified into two types. The first would offer a spare place or seat in the (often public) provision of a service. Examples of this include buses, trains, leisure centres, and higher education courses. The cost of providing these rewards are far les than the cash cost of paying for the energy saving or flood protection equipment, but would be valued by the householder at their market price. The second type of reward is policy-supported provision. Examples of this would be fruit and vegetables which might be subsidised by the Government to boost the 5-a-day target. Another example would be landscaping and gardening if the labour costs were covered by the government as a way to offer people reliable employment to ex-offenders. The provision of reward-based incentives has the potential to cover a number of policy objectives in the same scheme, and the attitudinal work in this project suggests that these schemes are not only supported by householders, but also by many donor organisations that have offered to support the concept in the next pilot phase.

Recommendations

The most important recommendations from this research are as follows:

- There is a need for a combined strategy of climate change adaptation and mitigation which is aimed at householders and promotes prompt action to make physical changes to the fabric of their premises;
- The social psychology literature and attitudinal surveys carried out for this study supports the proposition that reward-based incentive schemes will motivate many householders to purchase energy-saving and flood protection measures for their homes. A variety of pilots should be commissioned to test this contention.
- Carefully selected non-cash incentives that can boost local economies help develop communities and aid delivery of current Governmental campaigns. These can be incorporated into reward schemes to ensure that the rewards have both an intrinsic and a motivational value. The Environment Agency with DEFRA should start to negotiate with other Government Departments to identify policy initiatives that have a good fit with reward-based climate change schemes.
- Social and private landlords and their tenants, representing a substantial minority of the housing stock need to be included in future energy and flood protection initiatives. Landlords are also likely to respond to motivation associated with rewards although the design of these schemes needs additional work in association with representative bodies.
- The low disposable income among owner-occupiers in deprived areas necessitates the need to extend the eligibility for energy-saving grants to include the installation of property-level flood protection. This is particularly important because of the high percentage of elderly people living in flood risk areas. Grants, initially with the same criteria that apply to energy conservation schemes, should be extended to those in significant flood risk areas.
- Innovative awareness-raising and education programmes should increase the interest in property-level flood protection measures and energy-saving improvements among property owners. This should include a public campaign emphasising that structural defences are not 100% reliable, and the extension of Floodline Warnings Direct to all people residing in flood risk areas. However, this should not be perused to the exclusion of community-level discussions and debates using local leaders and motivators. More work is needed by government to help these existing and emerging leaders to effectively engage with those around them to help them accept the threat of dangerous climate change, and take prompt action to reduce potential harm to their areas.

Contents

1 Introduction

Many polls and surveys over the past decades have sought to test people's acceptance that there is a looming and catastrophic environmental threat to the world caused by dangerous climate change. The intuitive assumption is that there is a poor understanding of the seriousness of the threat, and failure to accept that human influence has caused the problem. These attitudes, if confirmed, represent a significant obstacle for policy-makers attempting to motivate the public and business to act to protect against, or lessen the most dangerous effects of climate change. But the evidence from surveys and polls suggests that this is not the case.

In a survey in June 2007, MORI (Downing and Ballantyne, 2007) asked respondents to agree or disagree with the statement that human activity does *not* have a significant effect on the environment. While 69% disagreed, 28% agreed. A survey carried out three years earlier by Brook Lyndhurst (2004) found the exact same percentage (69%) who disagreed that climate change was being exaggerated with 24% agreeing that it was. Many other polls show similar results.

In the United States, a country that one might expect could be expected to have a sceptical view on the severity of the climate change threat, the numbers are very similar. A study by the University of Virginia found that three of out four Americans believed there was solid evidence that the Earth was warming, and that this was due either entirely, or in part to human activity (Rabe and Borick, 2008). The challenge for policy-makers, local authorities and environmental protection bodies such as the Environment Agency is to find a way of converting this attitude into behaviours that meet these threats.

The polls suggest that some people have completely accepted their new circumstances, and have chosen to take action on what they see as their collective responsibilities. Many others are inactive, as a result of doubts and a lack of confidence about what to do. A few are resisting with wilful descent, in the teeth of all the evidence being presented to them. We have to accept that there will always be some people who will never believe that the current rate we are consuming the Earth's resources is unsustainable. However, the survey data shows that there is also a substantial amount of awareness and good intention to do something to avoid the more apocalyptic scenarios that people have heard.

This gap between understanding and doing brought the University of Salford, the Environment Agency, and Salford City Council together to solve a series of problems that were all linked by the threat of climate change. The Environment Agency is tasked with making meaningful contact with householders and landlords in flood-threatened areas. The Council has been also been concerned about protecting housing in flood-risk areas of the Lower Irwell Valley, but has also been considering the best way to engage communities to take action on a wider range of threats that climate

change will bring. The University of Salford, through the work of Professor Erik Bichard, has been concerned with testing the theory that better sustainable behaviour can be accelerated by using positive influencing techniques and reward-based incentives in particular.

This report describes the outcome of Phase 1 of this project. It was carried out under the broader national Resilient Homes initiatives promoted and funded by the Environment Agency. Part of the aim of Phase 1 was to establish whether householders could be motivated to take action to mitigate the effects of climate change by using less energy, and/or to adapt to the consequences of climate change by protecting their property against flooding.

2 Climate change: the gap between understanding and the ability to take action

Key points

- Investing in energy conservation (mitigation) and protection against flooding (adaptation) are measures that householders understand. This suggests that mitigation and adaptation should be combined under one climate change strategy by bodies responsible for making policy for the built environment;
- One of the effects of climate change in the UK will be more frequent and severe floods. Currently 5.2 million properties in the UK, or one in six houses, are threatened by flooding; this includes half a million of properties at significant risk of flooding;
- It is possible to install property-level flood protection measures in individual houses but at the moment few householders have invested in these materials;
- Property-level flood protection can be achieved by using resistance measures (stopping water from entering the house) and/or resilience measures (changes inside the house allowing quick recovery after the flood).
- Greenhouse gases emissions from residential buildings constitute 27% of the total emissions in the UK;
- The housing stock in the UK is aging and has poor thermal efficiency. The installation of energy saving measures (loft and wall insulation, energy-efficient boilers, double glazing, "A"-rated appliances) may cover about two-thirds of the stock leaving over 10 million homes without loft or cavity wall insulation. A disproportionate number of these houses fall within low income areas;
- Increasing the uptake of the energy-efficiency measures will help to achieve governmental targets of emission reduction;
- The cost of both flood-protection measures and energy-saving improvements is currently the responsibility of householders. The Government's grant schemes are limited to small groups or areas.
- Incentivising the remaining homeowners will necessary to complete the installation of the main energy saving measures available on the market, and start the uptake of flood prevention measures.

2.1 The scale of the climate change problem in the UK

The UK, like every other country, produces green house gas emissions that contribute to the climate change. However, while many of the worst consequences of global

warming have been, or will be experienced in other parts of the world, the effects are now beginning to be observed in the UK. The Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC, 2007) tests a number of scenarios that are based on varying amounts of green house gas (GHG) emissions to the end of the century. The "low scenario" increase is 1.8 degrees Celsius with a likely range of 1.1 to 2.9 degrees Celsius. The "high scenario" increase is 4.0 degrees Celsius with a likely range of 2.4 to 6.4 degrees Celsius. The report forecasts that it is more than 66% certain that there will be an increase in droughts, higher intensities of hurricanes, and extreme high tides. It is more than 90% certain that there will be frequent warm spells, heat waves and heavy rainfall leading to flood events and the increased likelihood of floods in some areas in the UK has been recognised in the Planning Policy Statement 25: Development and Flood Risk (CLG, 2006a).

It is estimated that nearly half a million properties in England are currently located in areas subject to a significant (greater than 1.33% annual probability, or 1 in 75 years) risk of riverine and/or coastal flooding (DEFRA 2008a; EA, 2009). In addition, more properties are at risk of flooding from minor watercourses, culverts, surface run-off and groundwater (DEFRA, 2008a). The recent report by the Environmental Agency suggests that in total 5.2 million properties in England, or one in six homes, are threatened by flooding. This includes 2.4 million properties threatened by coastal and river flooding and a further 2.8 million affected by surface water flooding (EA, 2009). All together, over five million people live and work in properties that might be affected by flooding (EA, 2009). The Environment Agency (2006) report on environmental inequality with regards to flood risk revealed that in England there are disproportionate concentrations of deprived populations in zones at risk from sea flooding across nearly all of the affected regions. In the East of England and the South West this association is also true for river flooding. Therefore, while flood is a traumatic experience for everyone who experiences it, a significant proportion of people living in the flood risk area are particularly vulnerable (EA, 2006). The poorest people are less able to afford flood insurance and less able to pay for expensive repairs. The infirm and disabled are more vulnerable to the immediate flood hazard and to health risks due to polluted flood waters (DTI, 2004). Policy should therefore make this group a priority target for action for any scheme implemented by the Environment Agency (EA, 2009).

Government policy has, for some time, been directed at ‘mitigation’ measures to try to reduce the amount of GHG emitted to the atmosphere. More recently, greater attention has turned to an acceptance that changes approaching two degrees Celsius will be inevitable and will require both physical and social adjustments to current arrangements. These ‘adaptation’ measures are beginning to be addressed in local government through the national indicator system although concerted action on this is dependant on whether an authority opts to concentrate on this particular measure.

The debate about whether it is better to choose mitigation or adaptation strategies are beginning to look hollow. The Stern review describes the present costs of mitigation

as "bearable". But he also warns that if the decision to invest is delayed then the cost could escalate dramatically (Stern, 2006). This is because higher concentrations of GHG in the atmosphere will mean greater and more costly impacts. Consequently, there is a direct link between limiting emissions and the cost of protection against floods, both by traditional flood defence systems, and through individual, property-level improvements.

However, it is likely that even if mitigation strategies are put into place right now, there will still need to be investment in adaptation for changing environmental conditions. Avoiding investment to prepare for the inevitable consequences of global warming, including summer heat waves, more violent storms, droughts and floods would be a false economy. The challenge for decision-makers is to predict the rate of investment relative to the threat. There will also be difficult decisions about the merits of continuing to protecting some features of the built environment, or to accept that some may have to be abandoned to the elements. Both mitigation and adaptation measures, preferably pursued under a coordinated climate change strategy, will be important for local authorities in the future. For the existing housing stock, actions to minimise impacts and to protect or cope with future environmental changes are needed to be planned and implemented as soon as practicable in view of climate scientists forecasts of worsening conditions over the next decade.

2.2 Energy saving measures

The built environment has a significant impact on GHG emissions. Carbon dioxide (CO_2) emissions from heating and servicing buildings account for 45% of all emissions in the UK; and 27% of these emissions are produced by private homes (Figure 1). A national survey of CO_2 emissions indicated that in 38% of local authorities domestic emissions exceed those from industrial and commercial sources (DEFRA, 2008b). This suggests that focusing the efforts to reduce CO_2 emissions on domestic dwellings can bring tangible results in decreasing the overall emissions.

According to the Government's targets, all new homes will have to be zero-carbon rated, i.e. produce zero net emissions, by 2016. However, while building new homes to high standards is important, over 80% of the existing buildings will still be here in 2050 (Kelly, 2008). Therefore, importance of reducing emissions from existing housing is paramount to meet government targets of between 34% and 42% by 2020 (Climate Change Committee, 2008).

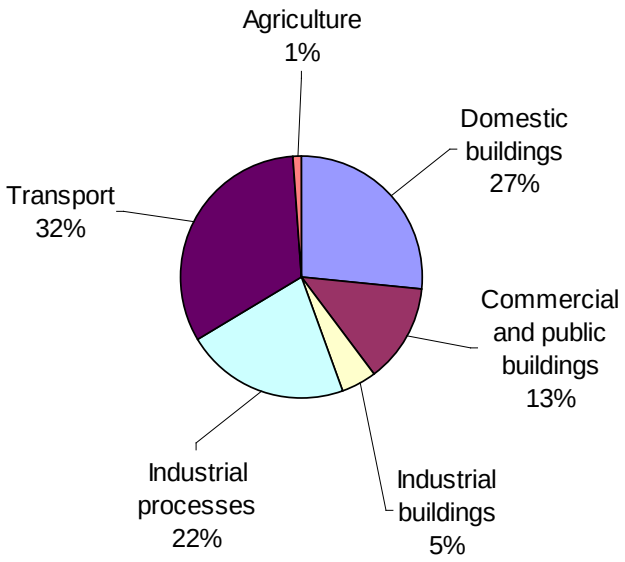

Figure 1 Carbon emissions by different sectors (source: Kelly, 2008).

The UK housing stock is old, with 62% of the homes built before 1965 and 39% built before 1944 (CLG, 2008). Consequently, thermal efficiency in these buildings is poor and among the worst in Europe. The energy efficiency can be evaluated with the Standard Assessment Procedure (SAP - the Government's recommended system for home energy rating). The SAP energy efficiency rating is based on the energy costs for space and water heating within each dwelling, representing a measure of the dwelling's energy efficiency. The average SAP rating for the stock in 2006 was 48.7, representing an improvement of only 0.6 SAP points since 2005 and just a 13 point increase since 1991. In 2006 9.5% of dwellings had a SAP rating of less than 30 and just 22.7% achieved a SAP rating better than 60 (DECC, BRE and EST, 2006).

Furthermore, the domestic electricity sector is consuming more year on year. Between 2005 and 2006, the domestic electricity sector noted the second largest increase in emissions (2.7 million tonnes) (DEFRA 2008b). With household energy demand still growing, household carbon emissions are likely to grow still further in future. A forecast from Cambridge Econometrics (2004) suggested that direct (mainly gas) household emissions will be 12 % higher in 2010 than in 2000, and those from household electricity will rise a further 2%.

In an average house, 61% of energy is used for heating, 23% for hot water, 13% for lighting and electrical appliances and 3% for cooking (EST, www.energysavingtrust.org.uk). Therefore, while changing residents' habits (such as turning the lights off, turning appliances and rechargers off at the socket) is undoubtedly beneficial, the main way energy consumption will be reduced is by making significant changes to the fabric of existing houses to reduce heat loss and make the energy use more efficient. Table 1 lists the improvements that could be

applied to houses with their approximate costs and savings.

The current level of implementation of these energy-saving measures is far from complete. In 1990 35% of houses had some energy saving interventions installed (270mm loft insulation; >60% of windows double glazed; >60% of rooms draught proofed or cavity wall insulation to modern standards). The emissions from housing at that time were 154 $MtCO_2$. In 2005 the rate of installation of these housing improvements went up to 65%, it only decreased emissions to 147 $MtCO_2$ (Kelly, 2008). The combination of increased consumption per house, and the efficacy of standard energy-saving measures show that new ideas will be necessary to solve the problems of existing houses in the future.

Table 1 Approximate costs and benefits of energy saving improvements for a three-bedroom, gas-heated, semi-detached house (source: The Energy Saving Trust)

	Physical improvements	**Cost (£)**	**Yearly savings (£)**	**CO_2 emission savings (kg)**
Heating and water heating	Cavity wall insulation	250 - 500	120	810
	Solid wall insulation: external	4,500	380	2,550
	Solid wall insulation: internal	From 42/m^2	360	2,410
	Loft insulation (270 mm)	300	160	1,050
	High-performance glazing	1,500 – 2,000	110	720
	Draught proofing: doors and windows	100	20	150
	Floor insulation	100	40	250
	Heating controls	150	140	910
	Efficient heating (condensing) boiler	1,000	130	870
	Hot water tank and pipes insulation	30	40	260
Lighting, appliances and cooking	Energy saving light bulbs	2 per bulb	40	170
	Energy-efficient washing machine	200 – 300	10	40
	Energy-efficient dishwasher	200 – 300	20	90
	Energy-efficient fridge freezer	200 – 300	30	140
	Energy-efficient kettle	60	Varying	Varying

*Based on 6 windows, www.doubleglazingontheweb.co.uk

However, the remaining potential for energy saving interventions even for these basic improvements is still significant. Approximately 10 million cavity-walled homes do not have wall insulation (Cavity Insulation Guarantee Agency, 2008); 12.9 million lofts do not have the recommended depth of insulation and 4.5 million boilers are G-rated (i.e. least efficient) (EST in the Guardian 12.02.2009). Victorian terraces, post-war semi-detached houses and 1960s tower blocks remain largely unimproved; 7 million solid walls need insulating (EST in the Guardian 12.02.2009) and there is little support for the owners of these properties to improve their energy efficiency. According to Stephen Howlett, the chief executive of Peabody Trust Association, a launch of a grant scheme for social landlords to support solid wall insulation (the most costly energy saving measure, see Table 1) is unlikely until 2015 (Howlett, 2009).

Consequently, a large-scale, whole-house improvement programme for the UK will take some time to complete. Indeed, the new Government's Heat and Energy Saving Strategy (DECC, 2009), is currently undergoing consultation, proposes that all homes should have received an energy-efficiency makeover by 2030, and all lofts and cavity walls should be insulated by 2015. However, the costs of this make-over are significant. For example, the Federation of Master Builders found that the average cost of energy-efficiency improvements would add about 15% to the final cost of refurbishment of old housing stock (Killip, 2008). The cost of implementation of energy-efficiency measures will be carried largely by the property owners. Due to the large costs of the improvements, and in the current economic climate, establishment of a motivational system will be necessary in order to help the property owners to implement these measures within the government's time frame, or sooner.

2.3 Flood-protection measures

The economic cost of flooding in the areas located within 1 in 75 years flood risk zones is currently around £1.15 billion per annum. The majority (£747 million) of this is related to the damage done to the residential properties (DEFRA, 2008a). Some of the properties located within the flood risk zones are protected by the Environment Agency with flood defences such as storage basins, raised river embankments, coastal defences. However, there are increasing numbers of people who will not be protected. These include pockets of properties and places where defences would be particularly expensive or very difficult to implement. It is estimated that about half of the households currently in areas identified as at significant risk of flooding might remain undefended (DEFRA 2008a). Therefore, for these houses, property-level measures could be the only flood protection available. The Government's Foresight report "Future flooding" (Foresight, 2004) explained that, in the face of climate change, a portfolio of different responses (other than engineering works) was the most effective way to keep flood exposure in check. The Pitt Review (2008) set out the lessons learned from floods in 2007. Pitt (2008) suggested that building regulations should be revised to ensure that all new or refurbished buildings in high flood-risk areas are flood resistant or resilient (Recommendation 11) and also highlighted the importance of increased take-up of property-level flood protection measures by businesses (Recommendation 13). Also the 2009 Environment Agency's report on flooding in England directly recommends property-level flood protection as one of the methods of managing flood risk (EA, 2009).

Property-level flood protection measures can be classified into those that increase the resistance of the house, and those that improve its resilience (see Table 2). Resistance measures are designed to keep water out of the property, or minimise the amount that enters, by sealing potential water entry points. Therefore, resistance measures will form a barrier between the flood waters and the interior of the house. They include temporary instruments, applied only in the event of the flood (e.g. barriers, house-wrapping, toilet plugs, air brick covers, etc.) and permanent improvements to the

fabric of the house, making the house waterproof (e.g. raised thresholds and floors, waterproof doors, valves on waste water pipes).

The average cost of temporary property-level resistance measures (including demountable door guards and airbrick covers, sump pump systems and remedial works to seal water entry points) has been estimated by Entec and Greenstreet Berman (DEFRA, 2008a) as £4,000, while the cost of permanent resistance measures package (flood-proof doors, automatically sealing airbricks, external wall rendering/facing, sump pump systems and remedial works to seal water entry points) has been valued as £8,000. Temporary resistance measures reduce the costs of damage by about 50% if they are properly deployed prior to a flood. Additional investment in permanent resistance increases the proportion of prevented damage to between 65% and 84%, but these measures are not as cost-beneficial as temporary resistance measures due to the higher investment costs. Resistance measures have been estimated to be economically worthwhile for properties with an annual chance of flooding of 2% or above (DEFRA, 2008a).

Resilience measures aim at minimising the damage to the house structure, interior and furnishings in the likely event that water will enter the premises, thereby facilitating the quickest possible recovery (Pitt, 2008). The resilience measures are largely permanent and include replacing floor, wall, and furnishing materials with waterproof alternatives, and raising the electrical fixtures above the expected flood level (Table 2). According to DEFRA (2008a) a package of resilience measures consisting of flood resilient plaster, and waterproof kitchens and flooring is only economically worthwhile when installed in a building that has a greater than 4% annual risk of flooding or that has a greater than 2% annual risk and is in need of repair or refurbishment, as the cost of installing resilience measures can exceed £30,000. Table 3 shows the comparative cost of resilience measures against an unprotected dwelling calculated by the Association of British Insurers.

Implementing resilience measures is more effective than property-level resistance for deeper floods (above 60 – 90 cm), which would overwhelm barriers such as door guards and cause structural damage to the property if the water was held back. But it is less effective at reducing damage to personal possessions because, unlike installing resistance measures, it does not slow the ingress of water and so does not allow time for householders to move possessions to safety (DEFRA, 2008a).

At the moment the adoption of both resistance and resilience measures is minimal. A survey conducted for DEFRA by Entec and Greenstreet Berman (DEFRA, 2008a) found that in areas of significant flood risk only 16% of households and 32% of SMEs (small and medium sized enterprises) had taken any practical steps to limit potential flood damage (e.g. subscribed to a system of flood warnings). The Flood Protection Association, which represents the interests of some manufacturers and installers of flood protection products and systems, has reported that less than 5,000 homes have to date taken approved measures. There is little evidence that any of the

55,000 households affected by the 2007 floods have been repaired in a flood-resilient fashion (DEFRA, 2008a; Smith, 2009).

The survey of over a 1,000 householders carried out by Entec and Greenstreet Berman (DEFRA, 2008a) indicated that, while many of the house owners were interested in taking up some of the resilience and resistance measures, there were significant obstacles to adoption. Firstly, people tended to underestimate or deny the risk of flooding. Secondly, people were worried about the appearance of their property and concerned that such measures might adversely affect property values or make them hard to sell. Also, while the temporary resistance measures are the cheapest option, they can be difficult to fit and might not be suitable for elderly or disabled people. Thirdly, there was a low awareness of the flood resistance and resilience measures, coupled with the scarcity of information about available products and lack of quality assurance. Finally, and most importantly, many of the respondents were deterred from taking action because of the cost of these measures (DEFRA, 2008a). This suggests that there would be greater uptake of the flood-proofing measures with the introduction of grants or other incentives and rewards for house owners.

2.2 Recommendations

- Climate Change strategies need to combine both adaptation and mitigation measures to provide a coherent policy route to help house owners to act effectively against the effects of dangerous climate change;
- The priority mitigation efforts in relation to the built environment should focus on the existing buildings in order to deliver the biggest decrease in green house gases emissions;
- In particular, physical changes to the fabric of buildings need to be promoted to increase the energy efficiency;
- There is a need for better information about property-level flood protection measures to be provided for house owners in flood risk areas if the implementation of these measures is to increase;
- As cost of the mitigation and adaptation improvements is likely to be the greatest barrier for the house owners to implement them, a more inclusive system of grants and subsidies should be developed. Alternatively, new approaches such as incentivisation with non-cash rewards should be trialled.
- A disproportionate number of people on low incomes or benefits live in flood risk areas. Policies to help them to protect their houses, or to cope with the aftermath of flooding needs to be developed as a matter of urgency.

Table 2 Flood resilience and resistance measures

Measure	Temporary		Permanent	
	Resistance	Resilience	Resistance	Resilience
Door guards	+			
Air brick covers	+		+	
Sump and pump	+		+	
Sandbags (or other sacks)	+			
House wrapping	+			
Temporary barriers	+			
Furniture bags		+		
Drainage channels (where the driveway or garden slope towards the house)			+	
Flood-proof external doors			+	
External wall rendering/facing			+	
Raised door thresholds			+	
Floors raised above the most likely flood level (where ceiling height allows it)			+	
Toilet plugs	+			
Back flow valve on sewage pipe			+	
Dishwasher and washing machine fitted with valves to prevent flood water backing up			+	
Carpet/wooden floor replaced with concrete flooring covered in tiles or treated timber				+
Plastic skirting boards/tiling				+
Skirting boards made of solid timber painted with waterproof paint on both sides				+
Resilient plaster/timber panels on the walls; dado rail above them				+
Lightweight internal doors (easily removed)				+
Waterproof (plastic/uPVC/fibreglass) door frames				+
Doors and frames painted with oil-based or waterproof paint				+
Resilient windows and window frames (plastic, fibreglass)				
Resilient kitchen (Waterproof cupboards; Appliances on plinths; Raised, built-in oven)				+
Raised electricity sockets, phone and TV points				+
Raised fuse box and electricity meter				+
Bottom part of staircase made of concrete instead of timber				+
Change bath from plastic (with a stabilising chipboard) to a ceramic one				+
Move washing machine to the first floor				+

Table 3 Indicative costs of flood resilience measures for a three-bedroom bungalow (Source: Association of British Insurers)

Measure	Cost of restoration without flood resilience (£)	Extra cost of installing flood resilience (£)	Costs saved each deep flood (to 1m) (£)	Costs saved each shallow flood (to 5cm) (£)
FLOORS				
Replace sand-cement screeds on solid concrete slabs	840	170	560	560
Replace chipboard flooring with treated timber floorboards	675	725	535	535
Replace floor including joints with treated timber to make it water resistant	4340	730	3830	3830
Replace timber floor with solid concrete	4340	8160	3340	3340
Raise floor above most likely flood level	26350	18350	20800	17300
WALLS				
Replace mineral insulation within walls with closed cell insulation	510	385	420	420
Replace gypsum plaster with water resistant material, such as lime plaster	4600	3600	4000	4000
Install chemical damp-proof course below joist level	4340	4930	3415	3415
Replace doors, windows, frames with water-resistant alternatives	8375	6635	7525	3475
INTERIORS				
Mount boilers on wall	850	150	700	700
Replace ovens with raised, built-under type	550	200	450	450
Move electrics well above likely flood level	600	500	500	None
Move service meters well above likely flood level	1000	500	850	300
Replace chipboard kitchen/bathroom units with plastic units	4340	4930	3415	3415

3 Engaging householders on the implications of climate change for their premises

Key points

- Local authorities are obliged to engage local communities in energy-saving actions and this engagement is well documented;
- There is much less evidence on the engagement of local communities on flood protection and management, due in part to trust placed in structural defences, poor risk communication and low acceptance of personal responsibility by householders;
- There is a need for a shift from defensive action against hazards to management of the risk and living with floods;
- Sustaining people's awareness of floods is a critical point for organizing any community activities; therefore, effective risk communication is key;
- There is a need to emphasise the responsibility of the house owners for flood protection of their properties;
- A lack of awareness would hinder the take-up of a reward scheme that encourages investment in flood protection measures;
- Example of the Netherlands shows how a successful public campaign of risk communication can shift attitudes towards personal responsibility;
- Communication of risk of flooding is best achieved through decentralised actions, direct contact (e.g. Floodline Warnings Direct) and using local people as the main disseminators;
- The Pitt Review and studies commissioned by DEFRA endorse these recommendations as they also placed an emphasis on increasing personal responsibility for flood protection of houses.

3.1 Introduction

Implementing a reward scheme requires a number of conditions to be met. The first, and the most important of them, is to be able to engage the public. While there has been a lot of work done on engaging communities on energy saving, this is less evident in the case of climate change adaptation. Householders need to be aware of the flood risks and feel that they are personally responsible for the flood protection of their dwellings in order to reach the level of self-management on the community participation hierarchy (Figure 2). This section looks for evidence of this situation in the UK and in other countries. It cites some examples of how awareness and the acceptance of personal responsibility have been attempted.

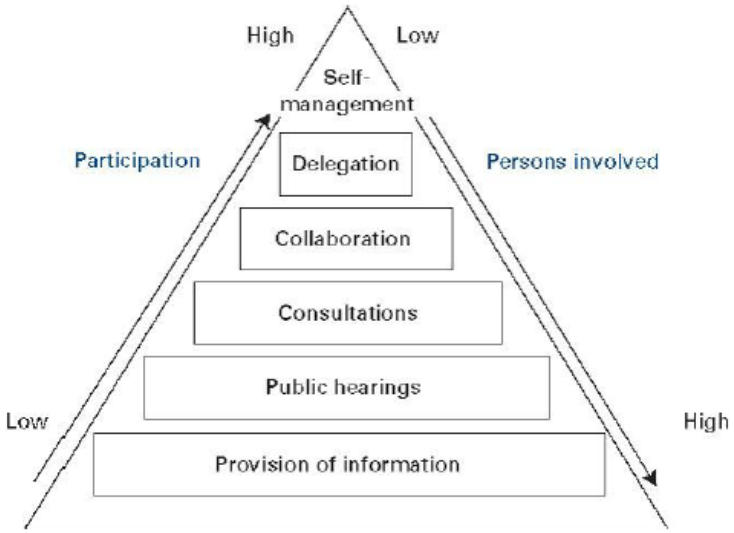

Figure 2 Levels of community participation (APFM, 2006)

3.2 Engaging communities on climate change mitigation

A review of attempts by different countries to engage communities revealed the following issues:

- Overt trust in structural defences. In the Netherlands, until recently, flood risk had been dealt with in the traditional "technical" way. This primarily meant raising the dikes or adding new ones. However, the 1993 and 1995 Rhine and Meuse River floods made it clear that these solutions were no longer sustainable (in particular in light of climate change) and that water management methods needed to change as a result. At first there was hesitation by local and national authorities to communicate risks to the public out of concern that this might cause panic. A representative of the Risk and Crisis Communication Unit of the Flooding Management Taskforce in the Netherlands put it in these words: *In former days, we did not speak so much of risk because it was considered to be inappropriate for a government to talk about risks while its main responsibility was to guarantee the safety and security of the people.*

- Poor risk communication. A study on the 1995 floods in Norway found that the perception of flood hazard by the general public was not realistic because of poorly communicated flood risk messages. Further, the results showed that people found it hard to understand flood threats, and this affected their ability to judge the degree of risk that they were facing (Krasovskaia et al., 2001).

- Low feelings of personal responsibility among house owners to protect their homes against flood damage. In many cases communities still rely on local or national authorities to take action in both preparing and responding to a flood event. For example, a survey of 6,000 households carried out in the south of the Netherlands indicated that even though the risk of flooding was perceived

as high, a majority of the respondents were not worried about flooding because they held the municipalities responsible for communicating the risks to them in time. A survey carried out in flood risk areas in Scotland (Werritty et al., 2007) indicated that 75% of the respondents felt that the main responsibility for flood protection should lie with the authorities.

In November 2002, an informal meeting of Water Directors of the European Union (EU), Norway, Switzerland and Candidate Countries was held in Copenhagen. The participants agreed to take an initiative on flood prediction, prevention and mitigation. A core group led by the Netherlands and France prepared "Best practices on flood prevention, protection and mitigation" on raising awareness of the floods, improving preparedness by authorities and the public and increasing the public participation[1]. The document recognised that while floods are part of nature, society has become more vulnerable to natural hazards due to human interventions into processes of nature and exposure to risk. Also, flood protection in form of structural measures is never absolute, and the unpredictability of nature as a result of climate change is increasing. Therefore, the approach to natural hazards requires a change of paradigm, i.e. shift from defensive action against hazards to management of the risk and living with floods. It also has been recognised by the EA (2009) that floods are part of nature and that it is not technically feasible or economically affordable for the State to prevent all properties from flooding. In order to do so it will be important to effectively engage the public into flood management, i.e. raise the awareness of the flooding; communicate risks effectively; and emphasise the personal responsibility for property-level flood protection.

3.2.1 Raising awareness of flooding

The paradigm shift from trust in the structural defences (resistance) to adaptation to the inevitability of flooding (resilience) is exemplified by recent efforts in the Netherlands. After centuries of successfully manipulating nature, in 2003 the Dutch started a multi-media public awareness campaign called 'The Netherlands Lives with Water' (Nederland Leeft Met Water) promoted by the Ministry of Transport, Public Works and Water Management, the Association of Provincial Authorities (IPO), the Association of Water Boards (UvW) and the Association of Netherlands Municipalities (VNG). The campaign aimed to increase the awareness of the Dutch society to the impact of climate change and of the water managers' efforts to deal with its consequences. Another important facet of the campaign was to ensure that the public will contribute to the efforts to keep the country safe and liveable in the future. The campaign highlighted the efforts that the national government, provincial authorities and water boards were undertaking across the Netherlands to keep the country safe and dry, but it also tried to explain the government's policy of 'giving water more room' .

[1] The document is available on http://www.floods.org/PDF/Intl_BestPractices_EU_2004.pdf

Various visualisation tools and techniques were used in the campaign to encourage communities' involvement in prevention activities. The shift from verbal to visual methods is particularly effective in helping those with low literacy (including those in deprived areas or children) to participate (Krasovskaia et al., 2001). In the Netherlands, "The Netherlands Lives with Water" awareness campaign used the image of a "Water Ambassador" in the person of the popular weatherman Peter Timofeeff, who is seen as an appealing and likeable expert, to convey the message about climate change and the risk of floods in a highly visual form (Figure 3 and 4).

Other communication methods employed in the Netherlands include internet-based flood risk maps, including information on the extent of flooding and its character (potential depth, current velocity, duration of front migration and rate of water rise). Informative public campaigns are in place in form of websites and leaflets, which provide information on "how to prepare" and "how to respond".

Figure 3: A message from Peter Timofeeff on climate change (translation of the text: "With the climate change, it gets warmer and wetter")

Figure 4 Example of communicating water problems to a wider audience as it appeared in many Dutch newspapers (Source: Ministry of Transport, Public Works and Water Management, The Hague.)

Sustaining people's awareness of floods is a critical point for organizing community activities (APFM, 2008). Japanese cities located in flood risk areas use "Ubiquitous Flood Signs" to indicate the danger of flooding (either historical or projected) and to show evacuation routes and places of refuge (Figure 5). The signs are in form of pictograms so that foreigners and illiterate people can understand them easily (APFM, 2008).

Figure 5 Ubiquitous Flood Signs in Japan (APFM, 2008)

In the Netherlands, the zero metre above sea level line is marked on signs installed during the Dutch presidency of the European Union (from 1 July to 31 December 2004). In this way, people are made aware of their position relative to sea level. The signs are intended to raise awareness of the Dutch dependence on effective water management and to make foreign visitors aware of the fact that without water defences a great part of the Netherlands would be permanently flooded.

In England and Wales the Environment Agency offers people access to data on flood risk zones in form of the interactive online Flood Map (see Figure 6). Users can input their postcode on the website to check whether their house is threatened by flooding. The risk is classified into significant (1 in 75 year probability of flood); moderate (between 1 in 75 and 1 in 200 years) and low (less than 1 in 200 years). The Environment Agency has also produced educational leaflets "Preparing for a flood" and "After a flood", which offer practical advice on necessary actions to protect people and property against the flood and recovering from the flood. Floodline is a 24-hour telephone line which gives the public access to up-to-date information about flooding anywhere in England, Wales and Scotland (EA, 2009).

The Pitt Review includes a number of recommendations referring to the need to improve the communication of flood risks in the UK. Recommendation 61 proposes that the Environment Agency should work with local representatives to raise awareness in flood risk areas and identify a range of mechanisms to warn the public, particularly the vulnerable, in response to flooding. Recommendation 64 advises that Local Resilience Forums should continue to develop plans for presentation on doorsteps, coordinated by local authorities, to communicate flood warnings, and to provide information and assess welfare needs once flooding has receded (Pitt, 2008).

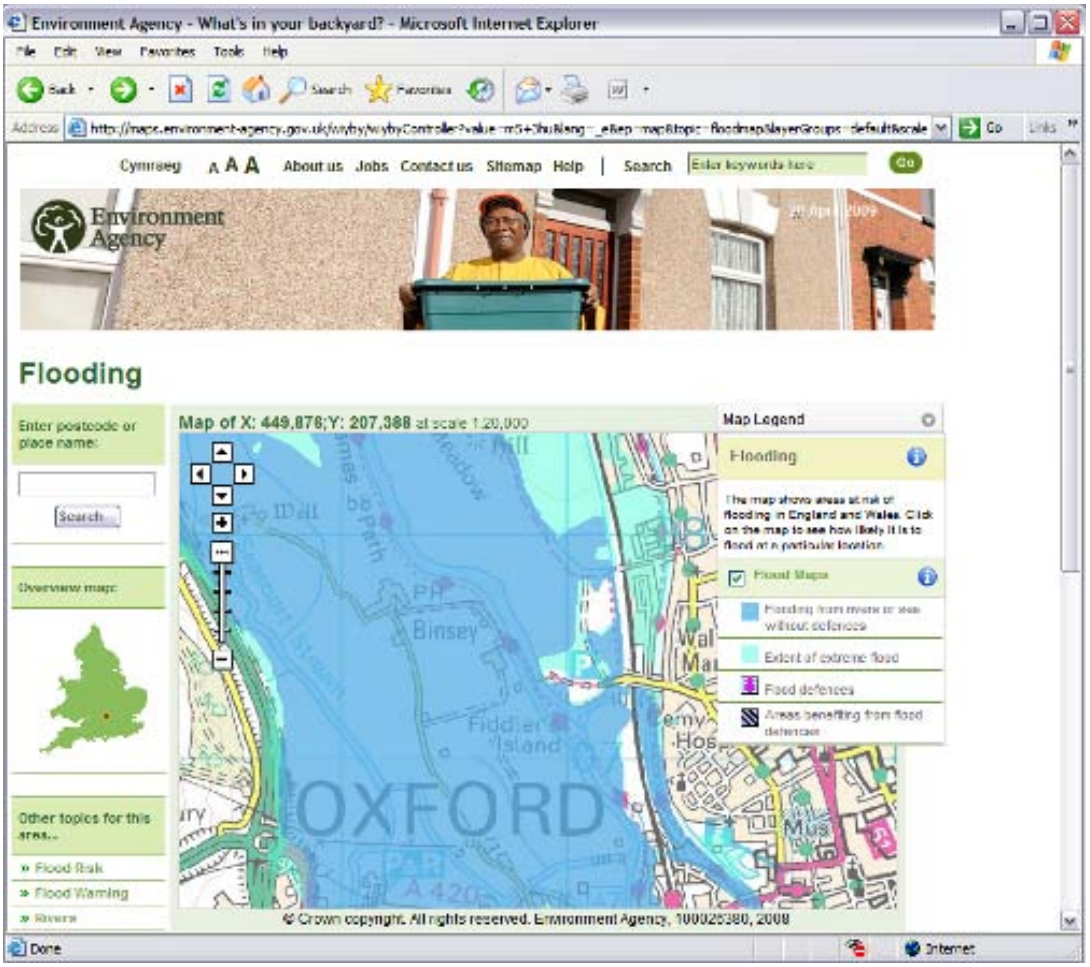

Figure 6 Screenshot of the Environment Agency Flood risk page, where users can type in their postcode or use the arrows and zoom scale to find out about flood risk in their location

3.2.2 Communicating risks effectively

Communicating the risks of flooding is a difficult task in terms of providing accurate information but at the same time not causing panic. According to the representative of the Risk and Crisis Communication Unit of the Flooding Management Taskforce in the Netherlands:

> *In the last 10 years, this perspective [not to talk about risks to guarantee the safety and security of the people] has been replaced by a more open and honest dialogue between the government and the public based on the belief that "knowing makes people alert and confident". Telling people what the risks are doesn't necessarily cause panic. On the contrary, people tend to appreciate openness which also increases their faith in the decision makers. By communicating the risks of flooding with the citizens, we try to ensure that they will improve their own means of protection in case things go wrong.*

The authors of the study in Norway (Krasovskaia et al., 2001) recognised that when the communities view the flood risk correctly, they are likely to support the allocation of the necessary funds for flood mitigation measures and will cooperate with the

authorities during a flood. Indeed, research in the Netherlands showed that the public assessed "The Netherlands Lives with Water" campaign as informative and believable. At the end of 2003, 82% of the population recognised the social importance of measures to protect against flooding, and 72% endorsed the proposition that this would have to involve 'giving water more room' and that they were as much responsible for ensuring their safety as the government.

Decentralising the information on flood risk and the advice from central to local authorities in India can be seen in the District Disaster Management Authorities set up to help to manage the process of disaster mitigation. This assists the authorities to consider the prevailing local conditions and manage the events accordingly (Express India, 2008). This can not only encourage the community to get involved in constructing preventive measures but also provides confidence and interest to support the community mitigation programmes. The decentralised approach is also applied in the Netherlands, where the local/regional authorities have the responsibility to remind the general public about what to do in the event of imminent floods (Aerts et al., 2007)

In the UK, information about approaching flood is provided by the Environment Agency in form of the Floodline Warnings Direct, where people living in the flood-risk area can subscribe to the free service and receive flood warnings by telephone, mobile, email, SMS text message, fax or pager. The warnings are issued by the local rather than national or regional offices. This more localised service was designed to give an improved service and more timely warnings to local people, with an increased emphasis on awareness of what the warnings mean, and what to do when they are received (EA, 2002). Currently 430,000 people subscribe to Floodline Warnings Direct (Smith, 2009). However, the Agency's profile is not very high and the public does not identify as well with it compared to the local council.

Werrity et al. (2007) based on their study of attitudes to flood risk in Scotland recommend that local authorities should mobilize communities in areas at risk of being flooded to assist in disseminating warnings, supplying emergency assistance, and, where appropriate, to join council staff in installing temporary or demountable defenses.

Flood Plan UK (2008) offers an example of exploratory work carried out in order to improve the engagement with communities on flood protection. In November 2008 a "Dry Run" workshop including councillors, emergency services, community group leaders and residents was carried out in Boroughbridge in Yorkshire in order to run through a flood scenario. The aim of the day was to get ideas for community actions on flood management in Boroughbridge. The conclusions of the workshop corresponded well with the findings of international experiences review, including the need for decentralisation of information and accurate communication of risks:

- There would be a lack of information on the risk of floods that would be available to the entire community; The information should be accurate and based on local knowledge, such as local people watching the river;
- The response from professional agencies is remote and impersonal and there is a need for a human face and someone local in charge.

3.2.3 Increasing the feeling of personal responsibility

In the Kiso River basin in Japan, flood protection has been coordinated by villages since the 14th century. Semi-circular dikes were constructed upstream from the villages as a protection against direct impact of floodwater. This semi-circle was then closed downstream to create a circular dike called "Wa-ju" in order to protect the fields from the flood water (Karan and Gilbreath, 2005). The dikes were managed by local communities and helped to develop community ties and ethical values through participatory decision-making in maintenance and upgrading (Takeuchi et al., 2008).

There are significantly fewer community-level examples of flood preparedness in urban areas in modern times. However, in the Netherlands, national and regional authorities are responsible for large-scale protection measures but the citizens protect their properties, and even take into account the heightened risk of floods in the design of new buildings. Examples of flood-proofing measures include raising the energy, heating and telecommunication installations as high as possible; use of water resistant building materials and waterproofing cellars.

The new public campaign in the Netherlands draws attention to the responsibility of individuals, and offers them the opportunity to contribute to risk reduction instead of sending the traditional message that the government will ensure their safety (Stokkom and Smits, 2002). While such an approach presents the withdrawal from the equity principle, where every Dutch citizen would have the same level of protection against being flooded, it significantly increases public awareness of the flood problem and motivates the people to act.

Recommendation 70 of the Pitt review directs the Government to establish a programme to support and encourage individuals and communities to be better prepared and more self-reliant during emergencies. This would allow the authorities to focus on those areas and people in greatest need (Pitt, 2008). Pitt considered that the focus should be shifted from informing the communities to empowering them to act. In particular, the importance of activating communities to invest in the community- and property-level flood protection measures was highlighted. Recommendation 24 suggests that the Government should develop a scheme which allows and encourages local communities to invest in flood risk management measures (Pitt, 2008). Also Werrity et al (2007) based on their study into the social impacts of flooding in Scotland recognized that in order to activate communities, a major educational effort needed to be undertaken to shift the acceptance of responsibility for flood alleviation away from being the domain of local or central government.

Following these recommendations, steps leading to more intense engagement with the communities on the community- or individual-led flood protection initiatives have been taken in the last two years. They include the nation-wide consultation carried out by Entec and Greenstreet Berman for DEFRA (2008a) on a representative sample of 1,131 householders and small businesses, where people's opinions on property-level flood resilience and resistance measures were investigated. The results showed that many respondents in areas of significant flood risk recognised the benefits of property-level measures, including the potential long-term financial savings, greater feelings of safety and reductions in the disruption caused by floods. On a smaller scale, the Environment Agency–funded research by McCarthy et al. (2008) in the Reach 4 area on the Lower Thames (between Walton Bridge and the tidal limit at Teddington) aimed to assess public attitudes to risk mitigation and to inform the decisions regarding the 'social feasibility' of introducing local flood protection measures, including flood protection measures on the level of a street or estate (McCarthy et al., 2008).

Recommendation 12 of the Pitt Review was that all local authorities should extend eligibility for home improvement grants and loans to include flood resistance and resilience products for properties in high flood-risk areas (Pitt, 2008). Consequently, a pilot grant scheme for the implementation of property-level flood resistance and/or resilience measures in 177 residential properties in six different areas in England was completed by DEFRA in June 2008. The pilot scheme included elements of community engagement that informed the citizens about the measures available, usually by organizing flood fairs. While such methods of consultation were considered useful in most pilot areas, there was some concern that they were focused on marketing of flood product suppliers. There were not any more advanced methods of public engagement reported.

Following the pilot scheme, in December 2008 a £5m property-level flood protection grant scheme was launched, building on the results of the pilot scheme and the consultation exercise carried out subsequently and involving local authorities and public agencies. The scheme is open to local authorities that can apply for the grants on behalf of the communities. However, the scheme stipulates that residents should be actively involved in planning and in the decisions around the selection of protection and resilience products and should be kept informed of the progress of the scheme (Harris, 2009).

The nation-wide consultation (DEFRA, 2008a) did show that the cost of purchasing flood protection materials was a significant obstacle for householders. The pilot study also indicated that the property owners were in general unwilling to bear costs of flood protection exceeding the level of the grant they had received. The bodies consulted by DEFRA on policy options for promoting property-level flood resistance and resilience measures generally also agreed that it was important to incentivise the actual implementation of the resilience and protection measures (DEFRA 2008c).

3.3 Recommendations

- The Environment Agency should invest in a closer relationship with the public in order to raise awareness of flood risks and personal responsibility in minimising damage to property. This should be done with the innovative use of visual aids and a famous, credible person to front the campaign;
- The provision of Floodline Warnings Direct should be increased to 100% of the people living in areas threatened by flooding;
- When talking to the public about flooding it should be emphasised that structural flood defences are not 100% reliable;
- Information about the possibility of installing property-level flood protection measures should be provided to people living in flood risk zones;
- Community leaders and local committees should be the main disseminators to the wider community.

4 Reward-based methods as a means to accelerate sustainable behaviour

Key points

- Methods of promoting sustainable behaviour that rely on fact-based campaigns, awareness raising and education have not been effective;
- Behaviour change efforts need to be directed towards bridging the understanding/acting gap, particularly for climate change where there is no clear cause and effect connection associated with the desired change, no sense of urgency, and limited visual cues that others are taking similar action.
- Social norms (i.e. what others approve of) have a significant impact on the behaviour of individuals;
- Financial disincentives (e.g. higher taxes, fares, prices etc. for unsustainable goods and services) may induce some sustainable behaviour, but they are not effective once the disincentive is removed. They also connect negative feelings to sustainable actions, and are inequitable for low income communities;
- Cash incentives or discounts can work, but they still leave a requirement to pay toward something that many will see as a lesser priority. Also, cash can be spent on goods and services that may reverse the gains achieved by the reward (additional flights for example);
- Subsidising sustainable goods (e.g. energy-saving appliances) is effective in increasing their attractiveness to buyers;
- Non-financial incentives have a precedent in other parts of the world;
- Rewards can be geared to have an effect on sustainable lifestyles irrespective of the specific behaviour targeted in the campaign. Examples including increased travel on public transport, an increased consumption of fruit and vegetable, the accelerated rehabilitation of ex-offenders, and the reduction of impermeable surfaces to mitigate flash flooding;
- Reward-based incentives are likely to work to induce one-off purchases such as insulation of flood prevention materials, but may not result in repeat behaviour (such as switching off lights in unoccupied rooms. However, successful incentives campaigns may help to raise awareness in some, leading to other self-motivated types of sustainable behaviour.

4.1 Motivating Choices for Government

Historically there have been a limited number of tactics aimed at changing homeowners' behaviour towards the environment. One has been fact-based campaigns, often communicated through public information routes such as short television messages, leaflets or billboards. These mass marketing tactics were based on

the success of past campaigns that required a major societal shift such as trying to get more people to wear seat belts in cars, or to practice safe sex in reaction to the threat of AIDS.

Unfortunately, fact-based campaigns to change behaviour in reaction to climate change have not been effective (Futerra, 2005). To understand this, it is necessary to explain why people may posses attitudes towards issues, but then fail to act on them. Much of this work has been done by social and organisational psychologists. In their book 'Positively Responsible', Bichard and Cooper (2008) explain that one avenue of investigation is to understand how attitudes are formed. Arnold (2005) describes work that found that different components, some of which fit together but others that don't, mean that changing attitudes is difficult, but not impossible. Secord and Backman's (1969) seminal work defined attitudes as 'certain regularities of an individual's feelings, thoughts and predispositions to act toward some aspect of his environment'. They describe three components of an attitude including an emotional or 'affective' part, a thoughtful or 'cognitive' part, and willingness to act or 'behavioural' part. However, they say that an attitude should not be confused with a guarantee that the individual will act upon it. In other words, it is possible that holding an attitude, even if it is a strong one, will not necessarily be manifested in specific behaviour.

It was Ajzen and Fishbein (1980) that showed the relationship between attitudes and behaviour. Refined later into the theory of 'planned behaviour' (Ajzen and Madden 1986) this work explained that in order to behave in a certain way, an individual needed to form the intention to act, based on a belief that the action was going to be effective. In other words, people seem to be able to calculate before acting. However, the authors argue that the intention itself is formed from two other factors. The first is the attitude, borne from the mix of emotions, thought and a predisposition to do something about it. But the other factor is a concern about how other people will react to their beliefs or actions.

To change behaviour to fasten seat belts or protect against sexually transmitted diseases, the reluctance to give up personal preferences must be weaker than the belief that to ignore the advice would be socially unacceptable. Significantly, the message for these examples is that by not acting, the individual is likely to face death, but also may cause the death of others.

However, with a threat like climate change, there is no clear cause and effect connection associated with behaviour change, either for the individual or the implications of the individual's action on others. The consequences of failure to act are not strong enough to conquer the person preferences that allow the individual to discount or ignore the message to change.

4.2 The Social Physiological precedents

4.2.1 Climate change and psychology

Reviewing the body of academic research that has examined the behavioural aspects of resource conservation programs reveals a wide variety of studies. These studies have produced a large body of scientific findings, and there are hundreds of research cases that point to several core principles of behaviour change leading to more sustainable outcomes. The methods that have been employed to change unsustainable behaviour can be divided into five broad approaches:

- Education
- Awareness
- Normative influence
- Stages of change, and
- Financial incentives.

4.2.2 The Education Campaign

One of the most commonly used approaches to reducing resource consumption is the information campaign (sometimes referred to as an education campaign). The approach is based on the assumption that people fail to act because they don't know what to do, or that they don't know how to do it (Schultz, 2002). Based on this assumption, programs often aim to change behaviour by distributing information designed to educate individuals about the issue and what to do about it. The basic premise of this knowledge-deficit model is that increasing knowledge about resource consumption will produce a corresponding change in behaviour. Unfortunately, a large body of scientific research is clear in showing that behaviour is not a direct result of knowing more (Syme et al., 2000).

Information campaigns take many forms, but they almost always involve mass media and advertising. The messages are delivered to a target audience using a passive media like television, radio, or print. The messages generally involve a generic plea to residents to take action, or do their part. Indeed, there are hundreds of print, radio, and television advertisements across the UK that are intended to educate individuals about socially responsible behaviours. Unfortunately, these broad messages intended to spur residents to action are unlikely to be effective at changing behaviour (Staats et al., 1996).

Education campaigns fail because they ignore the motivations for behaviour. People engage in behaviours for reasons (e.g., external pressures or financial motives), and simply knowing *what* to do is not a reason to take action. Although education campaigns can positively increase knowledge or attitudes, they are largely ineffective

at creating lasting changes in behaviour (Abrahamse et al., 2005; Schultz & Tabanico, 2008).

4.2.3 Awareness messages

Unlike education campaigns, awareness messages aim to produce behaviour change by highlighting the severity of a problem or issue. While the awareness approach often advocates for specific behaviours, the emphasis is squarely on *why* to do it, and not just what to do. The approach is most widely used in the health domain, where campaigns to raise awareness of specific diseases or issues are commonplace (e.g., obesity, dangers of tobacco use, safe driving, and so forth), but it is also common around issues of risk, like climate change or flood preparedness. Unlike education campaigns, the awareness approach provides a motivational basis for behaviour. That is, awareness campaigns are often linked to a valued object, and behaviour change will result in reducing the threat to the valued object.

From a psychological perspective, research in this area has been guided by the norm-activation model of prosocial behaviour. The basic tenant of the model is that an individual will engage in a protective action if he or she perceives a threat to a valued object (termed Awareness of Consequences), and also accepts a personal responsibility for the welfare of the valued object (termed Ascription of Responsibility; Schwartz, 1977; Schwartz & Howard, 1981). The initial model proposed by Schwartz has been extended into the environmental domain by examining the extent to which an individuals values nature, and the degree to which they are aware of the harmful consequences that specific actions have for the natural environment (Stern & Dietz, 1994; Stern et al., 1999).

The model has been tested through a number of empirical studies (cf., de Groot et al., 2007; de Groot & Steg, 2008; Steg et al., 2005; Bamberg & Schmidt, 2003; Schultz et al. 2005). From this research, we find that individuals who value nature (biospheric values) are more likely to engage in efforts to protect the environment, particularly when these values are activated through Awareness of Consequences and Ascription of Responsibility. Interestingly, the results do not show that a concern for self-interest (including here financial self interest) provides a motivational basis for environmentally responsible behaviour (Schultz & Zelezny, 2003).

4.2.4 Normative Tactics

The basic norm-activation framework has been tested many times, but the model has not been used to develop behaviour change campaigns. Conceptually, programs that make salient a potential threat to a valued object (whether self, another person, family, or nature) should prompt behaviours intended to protect that valued object. For example, protecting one's home from flood, messages that make salient the potential threat to the home, the value of the home to them personally, and their personal

responsibility, should motivate protective actions. But this has yet to be demonstrated empirically.

Promoting behaviour change has a strong element of social pressure. Individuals are motivated to conform to the standards and norms of their groups, and efforts to promote behaviours perceived as deviant are often faced by strong resistance. Yet, individuals are also motivated to differentiate themselves from the group, and to establish themselves as autonomous individuals. In fact, these two basic pressures of affiliation and differentiation have been used to model a wide range of social behaviours (Couzins et al., 2005; Couzins, 2007).

Within psychology, social norms are defined as the common and accepted behaviours within a group. They are an individual's beliefs about the level of behaviour within a particular group, or the level of approval for the behaviour (Cialdini et al., 1990; Cialdini & Trost, 1990; 1998). The academic research literature has distinguished between two types of social norms. Descriptive norms refer to an individual's perception of what is commonly done in a particular situation. In contrast, injunctive norms refer to an individual's beliefs about what others in the group approve (or disapprove) of doing. For example, a resident might believe that others would disapprove of using air conditioning (injunctive norm), but at the same time believe that most other people *do* use air conditioning in the hot summer months (descriptive norm).

In recent years, the normative feedback approach has emerged as an effective alternative to the more traditional (and largely ineffective) methods of raising awareness or educating residents about ways to reduce resource consumption. The emerging findings and evaluations of the norms approach suggest that providing individuals with normative information – information about what others do or approve of doing – can have profound effects on behaviour. In part, this results from a direct motivational force resulting from social pressure, and in part from the legitimizing influence of collective decisions. Furthermore, when incorporated into mass media campaigns, conveying normative information can produce significant changes in behaviour (Aitken et al., 1994; Schultz, 1999; Schultz et al., 2007).

One example is a field experiment in which California residents were provided with normative feedback about the level of energy consumption among other households in their community, along with a comparison to their own level of consumption (based on actual meter readings). This information caused an 8% reduction in total household energy consumption among residents who were consuming more than the average. Because residents who were initially consuming *less* than the average will tend to increase their energy use as a result of the normative feedback (to be more in line with the descriptive norm), the experiment introduced an additional element that would eliminate this negative effect. Residents who consumed less than the average received a smiley face on the feedback card (social approval), whereas residents who consumed more than the average received a sad face (disapproval). This added injunctive element (information about what others are doing) successfully ensured

that households that consumed low levels of energy continued to do so even after receiving normative information indicating that others in their community consumed more than they did. Importantly, the normative information approach resulted in more energy conservation than any of the standard appeals that are often used to stimulate energy conservation: environmental protection, social responsibility, and financial savings (Schultz et al., 2007, 2008). Norm-based tactics are core to 'competition' scheme that rely on 'teams' assuming that underperformance will be an unacceptable outcome. One example was the Institute for Public Policy Research and British Gas in the "Green Streets" project, where a one-year competition is run between neighbourhoods – eight houses from one street in eight different cities. Each of the streets has been provided by the British Gas with £30,000 worth of energy-saving measures. The street that delivers the greatest carbon savings across the year will receive a prize of £50,000 to spend on a community project of their choice (DECC, 2009). However, such community-level initiatives to date have been rare; consequently, DECC (2009) promotes more intense community engagement in the Heat and Energy Saving Strategy.

4.2.5 Stages of Change

Unlike the prior approaches to changing behaviour, stages of change models view goal-directed behaviour as a sequential process. From this perspective, individuals are classified into different stages along the behavioural continuum, from precontemplation, contemplation, preparation, action, and maintenance. The stages are ordered such that each successive step is closer to the criterion behaviour, and individuals move through the stages in a sequential manner. In addition, the barriers that prevent an individual from moving from one stage to the next are viewed as similar, though there are different barriers at each step (Weinstein, Rothman, & Sutton, 1998).

The most widely used stages of change theory is the Transtheoretical Model (TTM) of Prochaska and DiClemente (1983). Though widely used in the health domain, particularly with regard to smoking cessation, the TTM has been extended to a number of other areas, including behavioural aspects of resource consumption (Bamberg, 2007). The TTM has been tested in multiple arenas, including both descriptive studies that characterize the process of change, and experimental studies that attempt to induce change. While descriptively the model generally does a good job of depicting the change process (Lippke et al., 2009; Prochaska et al., 1994), its success in inducing behaviour change has been less clear (Adams & White, 2004; Noar et al., 2007). While programs aimed at encouraging individuals to move from one stage to the next have produced significant results, the effects tend to be small.

4.2.6 Financial Incentives and Disincentives

Final strategies for reducing resource consumption generally introduce and increase in the cost-benefit ratio (Hassett & Metcalf, 1995; Kalinowski, et al. 2006; Samuelson & Biek, 1991). Research has consistently shown that people identify self-interest (financial or other personal costs) as a primary motive for environmentally responsible behaviour. In addition, applied research has found that as the costs of a commodity like energy or petroleum increase, the rate of consumption tends to decrease (cf. Anderson et al, 1985). Similarly, offering a financial incentive to adopt a new technology or engage in energy-saving activities can also provide a motive for behaviour change (Allen et al., 1993). However, despite the clear behavioural effect of incentivising a behaviour, there are number of important considerations.

First, it's important to clearly differentiate between different types of incentive structure. Offering a cash incentive operates differently (from a psychological perspective) to reducing the cost by an equal amount, though both have the same bottom line effect. In this regard, the psychological literature has differentiated *push measures* (incentives) from *pull measures* (disincentives).Pull measures aim to make environmentally negative behaviour more expensive, and consequently less attractive. On the other hand, push measures aim to make environmentally friendly behaviour less expensive, and thereby more attractive. In general, push measures are viewed as less acceptable than pull measures (Schade, 2003; Steg et al., 2006).

Financial disincentives are particularly problematic in low income communities. They are prone to misinterpretation often borne out of miscommunication. This results in the taxpayer (the public or business) being unaware or mistrustful of the reasons given for higher prices. Not only is this counter to the persuasion part of the strategy, but it sets up a dangerous pre-conception for future sustainability policies.

Environmental taxes in Europe have been imposed on waste, air travel, virgin aggregate and fuel, to name a few. A number of north European countries have introduced household carbon or energy taxes. Finland and Denmark introduced carbon taxes in 1990 and 1992 respectively, concentrated on households, with extensive rebates for industry and power. This resulted in reductions of carbon emissions up to 10 per cent (Dresner and Ekins 2006).

Some business and public sector bodies in the UK have benefited from the Climate Change Levy. Imposed in 2001, the scheme adds about 15% to gas and electricity bills. However, there is up to an 80% rebate on this charge in return for meeting energy or carbon savings targets. The result is a net saving when cheaper energy bills are included in the calculation.

However, few people would be aware of the diminished threat of climate change, the land saved from mining, or the slower rate of landfill deposits as a result of paying more for petrol, houses or garbage disposal as a direct result of these higher prices. What actually results is a smouldering resentment among business and the general

population, that the government is using the flimsy argument that there is 'something wrong with the environment' to hose them for more money. If any change in behaviour is achieved, it reverts right back again as soon as the disincentive is removed giving governments very little room for manoeuvre in any future economic plan.

However, there is mixed evidence for the differential effectiveness for either of these two approaches (cf., Pitts & Wittenbach, 1981), and some scholars have argued that the disincentives associated with pull measures have a greater potential for long-term sustained changes in behaviour (Geller, 2002). Despite the ability of pricing to motivate behaviour change, the approach comes with a number of drawbacks. First are the political and public backlashes against artificially increased prices, along with issues of equity and fairness across different segments of the population. Second, and just as important, is the potential for pricing to eventually undermine long-term efforts to reduce resource consumption (Thogersen, 1996). Psychological research has clearly shown that receiving an external incentive for an activity, even an activity that we originally enjoy, can reduce the intrinsic motivation for the behaviour (Deci & Ryan, 1985).

In examining the research on incentives used to promote resource conservation behaviour, there is also consistent evidence of a *rebound* effect (also called an over-justification effect in the research literature). That is, the changes in behaviour produced by a large incentive or disincentive tend to be short-lived, and once the incentive is removed, behaviours typically return to their original levels (or in some cases, to lower levels). Rewarding people for actions that they already want to do can lead them to make an external attribution for the behaviour. Thus, we might expect that if the energy crisis ends and costs return to low levels, energy saving behaviour will also return to baseline. In fact, if the incentive efforts used to promote conservation were especially effective, we might expect conservation behaviour to fall below baseline. Even people who were once conserving for reasons of social responsibility or environmental protection are now conserving for self-serving reasons--once the extrinsic incentive is removed, the individual is no longer motivated to conserve.

Another consideration is the possibility for behavioural spillover. Financial incentives are often seen as a way to introduce a new class of behaviours, and once the person begins adopting the new actions, the effect will spill over to other behaviours in the domain (Thogersen, 1996; Thogersen & Olander, 2003). For example, offering an incentive for a person to recycle beverage containers could potentially spill over to other materials, or even to other environmental behaviours. In addition, the spillover to extend across context, such that a person who is offered an incentive to recycle beverage containers at home also begins recycling at work. Unfortunately, the research evidence for spillover (and the related foot-in-the-door effect) is weak (Burger, 1999). In fact, the data available to date show just as many instances of negative spillover - that is, instances where engaging in an environmental behaviour *reduces* the likelihood of other environmental behaviours (Crompton, 2008). In

addition, there is evidence that getting paid to engage in a new behaviour eliminates the motivation to comply with subsequent requests, and undermines changes in perceptions of self that have been linked with spillover (Burger & Caldwell, 2003).

This evidence does not seem to have dissuaded both the public authorities and the private sector to offer money in return for a hoped for change in behaviour. There are many examples that show how people can be financially incentivised to be more sustainable. Almost all of them have relied on cash or cash equivalent rewards in return for the required behaviour change.

A selective examination of recent reward schemes in the UK and the US reveals a UK Department of Transport scheme for employees to purchase tax-free bicycles through their employers. The internet search engine company Google is offering cash incentives to their employees to purchase hybrid cars. The London congestion charge exempts low emission and renewable fuel vehicles. The think tank IPPR suggests that employers located at the edge of cities or on industrial parks should be given money to provide shuttle buses for staff (Retallack et al., 2007).

Public authorities have always tried to entice developers into their area with fast-track and grant-based incentives. Recently this has extended to climate change incentives. In the UK, these still have main pull levers where developers are asked to incorporate anything from 10% to over 30% of energy needed to power their proposed buildings from renewable sources. US cities like Santa Monica in California have had a 'Sustainable City Plan' effective since 1994. In 2005, the city announced that it would speed up or 'expedite' planning approvals, and offer financial incentives of up to $35,000 for developers that registered their building for LEED certification. San Jose, Sacramento, and other Californian cities offer free parking for hybrid cars. Many US cities have high occupancy lanes that reward drivers that carry multiple passengers with faster journeys and California also allows single occupants of hybrid or alternative fuel cars in these lanes.

Other push incentives are simple based on economic interventions in the market and are designed to place sustainable goods on a competitive footing. One example is the purchasing of energy-efficient fridge-freezers in the European Union. The most efficient 'A' rated models increased from 3% of market share in 2001 to 70% just three years later (Sustainable Consumption Roundtable, 2006). This was achieved largely by price support (effectively a subsidy from the energy producers) which made efficient models competitive with less efficient ones. This allowed price editing by the retailers, some of whom would not stock anything less than 'C' rated units. Finally, the manufacturers saw what was going on, and voluntarily increased the efficiency of their ranges.

Another example is feed-in tariffs that allow micro-generators of renewable energy to sell their excess power into the national grid at higher than market values. This dramatically cuts the time between initial investment in the hardware, and the point where the investor begins to make money. The preferential tariffs were introduced in

Germany in 1999. Since then most European countries have adopted them. Anyone in Germany that wants to generate electricity from solar, hydro and wind sources gets a guaranteed price which is four times the market rate for a 20 year period. This can ensure a payback period of less than 10 years, and a return on investment of more than 8%. Germany has 200 times more solar energy panels than the UK, largely because off the delay in the introduction of these tariffs. The UK Secretary of State for Energy and Climate Change announced in October 2008 that the country would introduce a fee-in tariff by 2010.

Beyond these market interventions, there are many reward-based ideas that have been developed to incentivise consumers to make sustainable choices. Incentives to reduce energy consumption in homes could involve rebates on annual local taxes, or tax breaks for householders investing in micro generation. In the UK, drivers already pay less road tax if they drive fuel efficient cars, but they also pay more if they drive inefficient models. Incentives in the future could roll together payment for environmental pollution and carbon damage, physical (road) damage, accident cover and congestion charging into a single addition at the pump, in the ultimate pay as you drive charge.

Even air travel could benefit from incentivising the passenger. Air travel is the thorniest of problems for governments seeking to limit greenhouse gas emissions. Taxes have been imposed in a number of European countries, but with no real expectation that this will dissuade travellers. The air industry is putting great store on the fuel efficiencies of new planes, increasing the number of passengers per flight, and it is considering ways to reduce time spent taxiing and circling airports waiting to land. While all these things are to be welcomed, the problem with efficiencies is that they only pay off in a static economy. If increases in air travel continue, on their present trajectory, then efficiencies will be overtaken by growth. However, there is no reason why passengers should not be incentivised to limit the weight that they bring onto planes. Rather than charging for extra bags, the carriers should also reward passengers for travelling light. The pricing structure between short-haul and high-speed trains could also benefit from the same approach that led to the phasing out of inefficient refrigerators.

There are also existing schemes, and new ideas associated with energy efficiency incentives and flood-protection issues. The Mayor of London has offered £100 to people who accept an offer of subsidised insulation material for their homes. Public sector bodies such as the Energy Saving Trust (2005) have argued that a rebate on local taxes could be paid to those that invest in energy efficiency materials such as loft and wall insulation. In addition, a rebate on the tax imposed on a new house could be available if it was an energy efficient building.

In the USA, the National Flood Insurance Program (NFIP), established in 1968 is an example of a financial incentive scheme set up to motivate people to get involved in flood management. This federal programmed offered property owners in participating communities a discount on flood insurance in exchange for actions aiming at

floodplain management, which can reduce future flood damage. Currently 20,100 communities voluntarily adopt and enforce local floodplain management ordinances that provide flood protection building standards for new and existing development (FEMA, 2009).

4.2.7 Grants and Behaviour Change

Fuel poverty is a term used to describe a situation whereby a household would need to spend more than 10% of its income on heating in order to obtain an adequate level of warmth. As a result of respective 65% and 44% price rises of residential gas and electricity between 2002 and 2006 (Boardman, 2007), in 2006 there were approximately 3.5 million households in fuel poverty in the UK (DEFRA 2008b). The present government has made a repeated commitment not to tax the household use of energy to keep prices down (Dresner and Ekins 2006).

But the UK Government also funds schemes providing grants of up to £2,700 to eligible households to improve their heating and energy efficiency. In England the scheme is known as Warm Front, in Northern Ireland it is Warm Homes, in Scotland it is Warm Deal and the Central Heating Programme and in Wales it is the Home Energy Efficiency Scheme. From the Warm Front scheme's inception in June 2000 to the end of April 2008, over 1.7 million households in England had received assistance with a range of heating, insulation and other energy efficiency measures. In 2007/8, over 100,000 households received a new heating system; 30,000 were provided with cavity wall insulation; and 58,000 were provided with loft insulation (DEFRA and BERR, 2008). However, the grants are only available to the elderly and those in receipt of certain benefits.

Local energy suppliers and local authorities also offer grant schemes. For example Salford City Council and E.ON Plc offer private households free loft and cavity wall insulation; however, similarly as in the case of the Warm Front scheme, these improvements are only available to residents over 70 or on certain qualifying benefits. Consequently, households on low income who do not claim benefits might not be eligible for this sort of grants.

In terms of owner-occupier property-level flood protection, the availability of grants is rather limited. In December 2008 Secretary of sate Hilary Benn announced the launch of a £5 million property-level flood protection grant scheme for local authorities that will help properties in areas with a high risk of flooding that do not benefit from community-level defences. The grant scheme provides for up to £7,000 to be spent on flood risk mitigation measures for any one property with the proviso that the average amount of grant must not exceed £4,500 per property participating in the scheme (see also section 3). Such initiatives are also present at the local level. For example, Gloucester City Council is offering a grant of up to £500 to help towards the cost of flood defence measures. The grant is available to Gloucester City residents that were flooded in June/July 2007 (Gloucester City Council, 2009). Similar grant

schemes are also run by Cheltenham Borough Council and Warwick District Council. However, the overall availability of these grants is very limited.

4.2.8 Non-Financial and Cash-Equivalent Rewards

Given the evidence, the offer of rewards for better sustainable behaviour does not look very promising. However, rewards do not necessarily have to be associated with a direct financial payment. Offering people goods or services in exchange for better behaviour has, as we will show, bourn favourable results. However, this may not satisfy those that argue that any kind of reward is ill suited to promoting recurring behaviours. But this may not be as significant as it appears when an analysis of the behaviours that domestic consumers are being asked to display is made.

While there are a wide range of examples where cash rewards have been offered in return for behaviour change, but there are far fewer that use non-financial or cash-equivalent rewards to produce these changes. One example of a non-financial reward in return for lowering energy consumption was shown in an experiment conducted in Iowa (Pallack et. al, 1980) and recounted by Robert Cialdini in his book 'Influence' (Cialdini, 2007). The researchers asked people who heated their homes with gas to conserve energy and gave them some advice on how to do this. They agreed to try but did not manage to save much more energy compared to a control group when the researchers monitored their progress. However, another group were not only given advice about how to conserve energy, but they were also told that they would have their names published in the local paper as an example of public spirited people who were prepared to support the environment. When this group was monitored it was found that they had saved more energy as a result of this motivation. This was not the end of the experiment though. Later, the researchers told the families that it was now not possible to put their names in the papers, but if they were willing, they should continue with their energy conservation efforts. When the final assessment were made, it was found that these families saved more energy (15.5% compared to the control group) after they were told they would not be publicised than before (12.2%) when they had expected to see their names in the paper.

Cialdini's theory is that, like other 'foot-in-the-door' techniques, the people who were originally motivated by a reward developed other reasons for saving energy after their behaviour was induced to change. He considers that they might have justified saving energy to avoid dependence on foreign oil, or to save money, or because they were proud of what they were doing and liked their new self image. Whatever the reason, these new 'legs' were able to bear the weight of their new behaviour even after the 'publicity leg' was knocked away.

To a certain extent this contradicts the theory that reward-based behaviour change is ineffective. The Pallack experiment did result in more than 12% improvement in performance. It also suggests that removing the reward would not result in a reversion to previous behaviour. Indeed, Pallack's work showed that the opposite may occur. If

this was shown to be a consistent finding, then this would be good news for policy-makers worried about the cost of open-ended reward-based schemes, because it would be in the interest of the scheme to remove the rewards after a time to ensure optimum results.

Interestingly, as we have shown, while there are many examples of cash-based rewards, there are almost none associated with non-cash or cash equivalent rewards. There should be no reason why householders could not be rewarded with goods and services if their quarterly energy bill was less than it was during the comparable period the previous year, or if they invested in measures that would protect their house against damaging flood waters. The lack of examples of this nature is probably rooted in the difficulty in implementing them. Public policy tends to rely on the things that government can easily give or take away. This generally reduces down to either money or rights. It does not relate to goods and services which would require negotiations with third parties.

Returning to the issue of recurring behaviours, if cash-equivalent rewards can have an effect then they could be applied to the inducement of one-off purchases that are the necessary precursor of continuing behaviour associated with the use of these purchases. It is true that some behaviours need to be regular and constant in order to make lasting reduction in resource consumption. Switching off lights and appliances at the socket, or rechargers when not in use are examples of this. Regular travel choices to walk short distances or forgo single occupancy car journeys in favour of public transport are others. But many of the causes of fossil fuel consumption result from the use of inefficient machines which can be rectified by the more efficient items. These include cars, boilers (heating units), air conditioners, washing machines, clothes dryers and dish washers. Large improvements in energy efficiency can also result from the purchase of other high cost materials or services such as new or improved roof, wall or floor insulation, and renewable energy technology (including solar water and electric systems, micro-wind heat pump etc.).

One final benefit that may accrue from the adoption of cash-equivalent rewards is the effect the rewards themselves have on the local economy. To understand this, it is necessary to explore the motivations and precedents behind alternative community currencies.

4.3 Alternative Currencies and Sustainable Behaviour

4.3.1 Three Types of Alternative Currencies

Throughout history money has had a number of manifestations. These include coins and tokens, resources such as tobacco, pelts, and shells and on to today's paper and electronic currencies. In addition to these, there is a variety of currencies, including loyalty card points, air miles, stamps, store and credit cards, book tokens, computers

for schools vouchers, stamps for paying telephone and fuel bills etc. We have multiple, not single moneys (Zelizer 1997). 'Alternative', 'local' or 'complementary' currencies are just another manifestation of our multiple monies.

'Alternative' currencies are generally set up by people who want to develop an alternative economy outside what they see as an exploitative or unsustainable mainstream economy. They often have explicitly political objectives. 'Local' currencies aim to encourage the growth of locally-owned businesses and jobs by using a currency that circulates around a geographically defined area. This has the effect of keeping wealth in a contained area or community, rather than leaving to go somewhere else. 'Complementary' currencies operate alongside conventional money. They have no local specification and they can be used anywhere. People use complementary currencies to achieve a specific objective or reward a specific form of behaviour. Buying goods at retail stores is often rewarded by points to use either in-store, or for other goods and services provided by other retailers.

4.3.2 Some examples of alternative currencies and non-cash economic systems

Beyond the multiple mainstream complementary currencies like air miles and store points, there are four kinds of alternative, local or complementary currencies. Local Exchange Trading Schemes (LETS), or Green Dollars were among the first of the modern wave of alternative currencies, Members of the network are given the right to issue currency themselves to pay other members of the network for goods and services, backed by their commitment to earn that money back by providing goods and services to others. Money is issued by writing a cheque or phoning details of the transaction to a treasurer, who records all the transactions on a computer. A directory lists all the network members, what they want and offer, and people get in touch with each other by phone. There are no notes of coins. Sometimes the currency has a name that reflects the local area (Manchester Bobbins, Ilkley Warfes, Bath Olivers, Brighton Brights), a name that stresses that the currency is alternative, unlike conventional money (Bristol's Favours, Manchester's Bobbins). The founder of LETS, Michael Linton, argued that this was likely to dissuade businesses from joining – he preferred the more neutral green dollar or Manchester Pound. The currency has generally been aligned to conventional money in value, with a recommended minimum hourly wage. One Bobbin is worth roughly one pound, and the recommended hourly rate is six bobbins an hour.

A second currency is Time Money, which offers one Time Credit for one hour's work, irrespective of what is done. It attracts people who want to build community feeling and who value equality, but no business participation. But selling goods (as opposed to providing services) is harder with time-based money because of the required valuation of goods into person hours. Time money has worked well when involving people who would not otherwise have volunteered because they value helping others. However, research suggests that participants are rarely incentivised by

accumulating credits that they can later spend and often just donate the time. Time money also works better for people who have more needs than they could realistically be expected to pay back – for example very elderly people or people with more severe (but nor incapacitating) mental health problems (Cahn, 2000; nef, 2008). Unlike LETS where people contact each other by phone, Time Banks employ a broker who puts people in touch with each other, and assesses if a need is likely to be met from the Time Bank. Where it can't be met, social and health services are alerted. Thus, Time Banks are better at looking after vulnerable people.

Time money projects aimed at building community cohesion in places with very few employment opportunities have benefitted from the UK government's decision to exempt time money from assessments of benefit entitlements. Other Time Banks have been used to encourage people with health problems to engage in therapeutic work, to run community gardens, and to reward pupils in danger of dropping out of schools with time credits they trade in for time on computers.

The third currency is alternative paper currency, which is the easiest for business to use, and requires no complicated central accounting procedure. Paper currencies have been used in the US (where tax regulations make LETS unviable), Argentina, Germany, and recently in the UK in a number of Transition Towns (Totnes and Lewes, for example). American currencies like Ithaca 'Hours' are denominated in time multiples, with one hour being linked to 12 dollars an hour (the local minimum wage). These attract political and environmental memberships who want to strengthen the local economy, and a large number of businesses who cater to an alternative crowd (Maurer 2003).

Finally, there are a range of electronic forms of complementary currencies operated as loyalty cards by businesses. The *Nu Spaarpas* (discussed below) suggests that this might be the best form of alternative currency to incentivise sustainable behaviour amongst large numbers of people. Millions are familiar with Tesco Clubcards, so it would not be seen as quirky and second rate in comparison with alternative currencies. The currency is dependant on the involvement of the banks or a card reader company, and the cost of electronic currencies can, therefore, be prohibitive. The Germans have partnered with regional banks to experiment with electronic forms of regional money. In Massachusetts, the involvement of a local bank in the Berkshares currency has been crucial in giving this experiment credibility. In Kenya, very poor farmers transfer money via SMS messages in their mobile phones to a convenient place where they can withdraw their money – a service provided by Vodafone.

4.3.3 Alternative currencies to incentivise sustainable behaviour.

Curitiba, Brazil is a city developed explicitly around the provision of public transport. The city has dedicated express bus lanes and bus stop 'tubes' that enable large numbers or people to enter and leave the bus quickly. It has introduced a pay-in-

advance system with a set social fare that subsidises the poor living in the urban fringes, and there is easy exchange between express and local feeder buses.

Curitiba also has a 'garbage that is not garbage' and garbage exchange programme. The 'garbage that is not garbage' programme is aimed at those in formal settlements who are encouraged to separate their waste. The garbage exchange programme operates in the informal settlements which are not served by sanitation vehicles given the poor state of the roads. To deal with the waste disposal and to ensure residents of the outer squatter settlements get into the city on public transport the city 'buys' the recycling with bus tickets and dairy and agricultural produce (Rabinovitch 1992). Thus, bus tickets and food are used to incentivise recycling by offering spare provision on public transport systems. Residents who recycle get something tangible in return – bus tickets and food.

In Rotterdam, the Netherlands the *Nu Spaarpas* is a 'green loyalty point' currency which was piloted from May 2002 to September 2003. 'Green points' were earned when residents separated their waste for recycling, used public transport, or used locally owned shops. Points could be redeemed for public transport tickets or discounts on sustainable products such as organic, energy-efficient and fair-trade goods, bicycles, green financial products, renewable energy, rental, repairs and second-hand goods. Consumers could also spend points on public transport, or on leisure activities around the city, such as going to the cinema. Card scanners in participating shops, paid for by those businesses and managed by a partner bank, fed data into a central set of accounts.

According to the organisers, by the end of the pilot period, 10,000 households had the card, over 100 shops were participating, and 1.5 million points had been issued. The number of points issued and cashed was however much lower than foreseen because the system came up to speed much later than expected and the number of places to spend the points was still quite limited at the end of the pilot (van Sambeek and Kampers 2004).

The main barriers to success faced during the project related to creating publicity material that successfully attracted participants, and (as has been the case elsewhere) persuading retailers to take part and install the card scanners – although a pilot of only just over one year is a very short time to test a project like this. Many alternative currency projects take some time to gain wide acceptance.

4.4 Behaviour change, incentives and the Green New Deal

The accountants Price Waterhouse Cooper estimate that a 50% reduction in global carbon emissions will require an annual expenditure of 3% of global GDP (Guardian, 2008). In his report 'Prosperity without Growth?', Tim Jackson (2009) explains the UK this expenditure equates to around £45 billion a year. The 2008 commitment to

'green stimulus' was £535 million, of which more than half was earmarked for new railway carriages.

The challenge for governments is finding the money to accelerate investment in large scale projects such as retrofitting the entire existing building stock to limit greenhouse gas emissions. Jackson is attracted to the 'energy service model' for the housing sector. This challenges the public sector to join a reluctant private sector in finding the front-end money for householders to buy energy-saving measures like insulation, efficient boilers, and even renewable energy technology. The return on this investment could then come from a share of the longer-tern energy savings, or sales into the national grid.

The energy service idea is attractive, but like many existing powers given to local authorities, it assumes an existing source of capital that often does not exist, or is being prudently held in reserves. There is also the uncertainty of the rate and scale of the savings, as efficient use of technology is significant in this regard. An alternative idea would be to tap into the small reserves of money held in each household, with the promise of 're-payment in a matter of weeks in return for the purchase of the required materials. To be effective, policy that reached millions of homes in less than 5 years will need a range of approaches and at times of economic difficultly, individual savings increases. A scheme that could make use of these private reserves without requiring risk to obtain a successful outcome would be more likely to achieve policy-maker's goals.

4.5 Summary of the non-cash rewards vs. cash incentives/grants debate

Non-cash or cash equivalent rewards have a number of advantages over cash incentives and grants. When people are offered cash for sustainable behaviour (effectively free or subsidised goods or services), they obtain the object of the campaign, and have more disposable income. There is a feel-good factor to this tactic, but no control over how that additional income will be spent. There is evidence in the manufacturing sector that money saved on energy bills is often re-invested in additional manufacturing capacity, thus increasing the energy consumption of the company. House holders have the choice to buy less sustainable options such as larger car, or a flight that they would not have chosen if they had not be rewarded with money.

Secondly, non-cash incentives are cheaper than money as they can utilise voids where the supply of goods or services is greater than demand for them. Examples of this include offering un-used seats on buses, places on college courses and spare tickets to sporting or entertainment events and spare capacity in leisure centres. These voids cost the provider a fraction of the market value to offer, but retain their value for the scheme participant who would not be afforded entry regardless of availability. Therefore, even if the market value of this type of rewards exceeds the value of

investment the recipient made into sustainable behaviour, the economic feasibility of the reward scheme can still be maintained.

A further advantage is the added value of directed non-cash rewards to support Government policy. Using vouchers for fruit and vegetables as a reward could be linked to the campaign promoting eating five portions of fruit and vegetables a day. Vouchers for local sport centres can support the fight with rising levels of obesity. Free bus and train passes can help people discover (or rediscover) the advantages of public transport over car journeys and, therefore, promote greater use of public transport in the future. Garden landscaping by ex-offenders not only improves these people's skills and employability but also improves the image of the area, what is particularly important in areas of regeneration.

Furthermore, the incentive donors also can benefit from participating in the scheme. This can happen, firstly, by improving their green credentials through participation in the scheme. Secondly, they can expect additional revenue. For example, people using free seats at entertainment and sport events are likely to spend money on food and drinks; restaurant can expect another visit from the customers who received one free meal etc

Finally, non-cash incentives can result in wider environmental benefits, help in community development and can boost local economies. For example, using locally sourced or organically produced fruit and vegetables as rewards can support local farmers, reduce carbon emissions from transport and promote pesticide-free farming. Supporting local restaurants to provide free covers as rewards can help them survive the recession. Offering free college courses to people can attract other associated with the reward scheme to improve their own education, skill base and employability. All of these benefits would be magnified if they accrued in communities suffering from multiple deprivations.

4.6 Recommendations

- Financial disincentives should be avoided as the preferred policy option to change behaviour for better sustainable outcomes. This policy is inequitable (it disproportionately affects lower income households) and requires adjusting policies to address fuel poverty in the case of energy. In addition, the short-term effectiveness of this method, the lack of clarity about where additional income will be spent, and the negative connotation of pricing people out of bad behaviour suggests that alternative policies should be sought.
- Expansion of the eligibility for energy-saving grants beyond the elderly and those on benefits, and the inclusion of flood protection measures to housing should be implemented as reward-based behaviour requires temporary front-end spending by participants;

- Non-cash incentives that can boost the local economy, help develop communities and aids delivery of current Governmental campaigns should be considered by HM Treasury, DCLG and DEFRA to accelerate certain parts of the domestic sector to invest in measures that will protect them against dangerous climate change.

5 Testing attitudes on reward-based methods

Key points

- Attitudinal investigations were devised to assess the possibility of increasing the adoption of low carbon and flood protection measures by house owners through the application of reward-based methods;
- Methods of inquiry included a representative survey (1,043 respondents) of people living in flood risk areas in England and Wales (telephone survey), and a door-to-door survey of 101 respondents in Salford, Greater Manchester;
- Salford was selected as a case study due to the concentration of people living in flood risk areas of low income communities;
- While flood defence work in Lower Irwell Valley has reduced the flood probability to 1 in 100 years, the Environment Agency is committed to helping householder to protect their properties, including the purchase of flood protection materials and works;
- Two individual areas in Salford were surveyed: Lower Irwell and Alder Forest.

5.1 Aim and objectives of the project

The overall goal of this part of the 'Resilient Homes' project was to determine the scope for increasing the adoption of low carbon and flood protection measures by the public, using reward-based methods. University of Salford ran an attitudinal test on the willingness of house owners to carry out works to make their properties resistant or resilient to flooding, and to consume less energy. This willingness, or lack of interest, was further tested by asking if attitudes changed when incentives, based on non-cash rewards, were offered. In order to achieve this aim, the following objectives were set:

- To investigate the awareness of climate change and the perceived responsibility to take action among home owners of different socio-economic status (SES);
- To explore the willingness of home owners to make flood protection and energy saving improvements to their homes;

- To look into the preparedness of home owners to accept non-cash incentives and rewards in return for making changes to housing;
- To identify the types of rewards preferred by the respondents;
- To compare the results for home owners in Salford with the nationally sampled respondents in order to exclude any area-related bias;
- To identify what non-cash incentives are available in case-study area.

The outcome of this work would provide a better understanding of, firstly, the ways housing can be protected against climate change, and, secondly, the willingness of house owners to accept the incentives and alter their properties.

Meeting these objectives also will allow assessment of the feasibility of Phase 2 of the 'Resilient Homes' project, i.e. potential to set up a pilot reward scheme for 200 houses, and will provide necessary baseline information for the implementation of this scheme. Phase 2, if shown to be viable by the attitudinal survey, is due to start in the autumn of 2009.

5.2 Methods

Firstly, the national telephone survey questioned 1,043 house owners living in the 1 in a 75 years or higher flood risk zone in England and Wales. The survey was conducted on behalf of the University of Salford by the market research company mruk. Firstly, the national flood risk zone data was obtained from the Environment Agency in form of a list of postcodes in the significant flood risk areas. The respondents were sampled from the postcodes where at least 80% of the postcodes in 1 in 75 years flood risk zone and the remaining postcodes in flood risk zone higher than 1 in 200 years and the sampling was stratified according to four social grades. The survey was carried out over a four week period in late April and May 2009.

Secondly, a door-to-door questionnaire survey was carried out with home owners residing in Salford, Greater Manchester, by experienced local community representatives, who were employed on behalf of the University of Salford by the Broughton Trust. This part of the research was divided into two separate surveys: firstly, in low income areas, and, secondly, in area of medium (mixed) socio-economic status. These two main case-study areas are described in more detail in sections 5.3.3 and 5.3.4. The survey was carried out between March and May 2009. The questionnaire used in the survey is included in Annex 1, and the telephone survey questionnaire included minor changes due to different interviewing method.

Mixed tenure in the case study areas also prompted an investigation into attitudes of private and social landlords operating in the area. These are reported in Annex 2.

5.2.1 Flood risk in Salford

The city of Salford has experienced flooding for the last 150 years and more than 10,000 of its properties are in a high-risk flood zone, at risk of flooding once every 100 years (CABE, no date). The main source of flood threat in Salford is the River Irwell and its tributaries. Figure 7 presents the extent of 1 in 100 years flood risk zone and 1 in 1,000 years flood risk zone. The flood risk areas were delineated using the Environment Agency Flood Zone Map in the Strategic Flood Risk Assessment for Salford (JBA Consulting and Salford City Council, 2005), which also incorporates the effects of climate change on the severity and frequency of flooding (see Section 1.1).

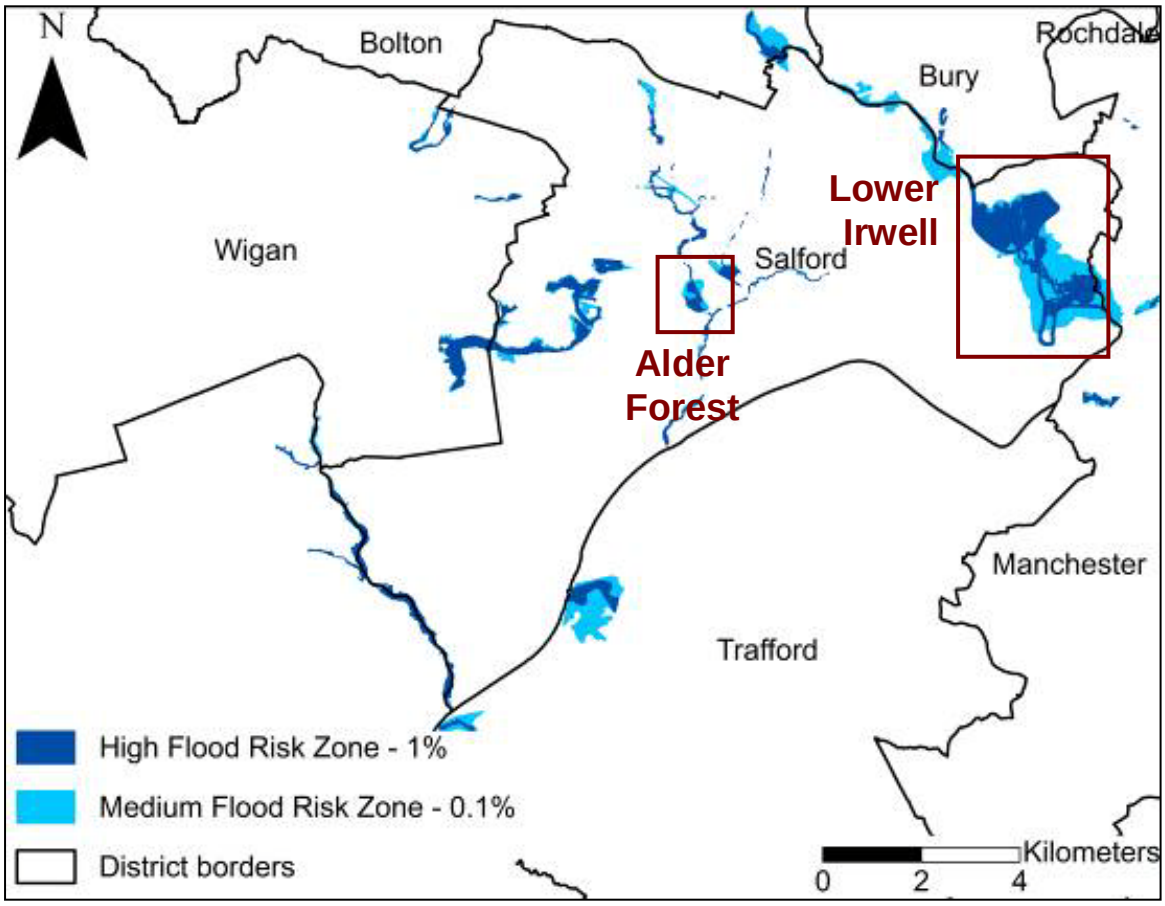

Figure 7 Location of case-study areas in Salford

The lower reaches of the Irwell have flooded many times in its history. The best documented floods occurred in 1866 (Hampson, 1930) and 1946 (Douglas, 1998). In 1866, the "year of the great flood", £1 million of property was damaged, 450 ha of land was flooded and 700 people had to be rescued from wrecked homes. In 1946, 5,300 properties were inundated. Less widespread flooding also occurred in 1954, when 600 properties were flooded; 1980 and 2007.

To alleviate the problem of flooding, flood controls have been implemented in the Lower Irwell Valley. The raised river embankments provided flood protection to a one-in-40 year standard. The addition of the new water storage basin at Littleton

Road in Lower Kersal increased the protection to a one-in-75-year standard. The basin functions as a public open space and is only used as a flood defence when water levels are high. The basin, which has a capacity of 650,000m^3, fills automatically via a simple overtopping side weir and is designed to protect 3,300 properties (CABE, no date). The cost of the work was around £11 million (Penning-Rowsell, 1999) and the defenses proved successful on 22 January 2008, when the worst flooding to hit the region in thirty years caused the Irwell to burst its banks further downstream in the centre of Manchester (CABE, no date).

However, concerns have been raised that a 1 in a 100 year flood would breach these defenses and cause some £55 million of damage to property (Douglas, 1998). The Environment Agency stated that raising the defences any further would have a detrimental impact on landscape and accessibility and could make existing sewer flooding problems worse. There are also concerns over the impact of water flows through Manchester City Centre and the Ship Canal and the associated increased public safety risk should the defences be breached (Douglas, 1998).

Figure 8 presents the location of two case-study areas in Salford: the Lower Irwell flood risk area (inhabited by low-income community) and Alder Forest flood risk area (medium-income community), which is threatened by flooding from one of River Irwell's tributaries, Worsley Brook.

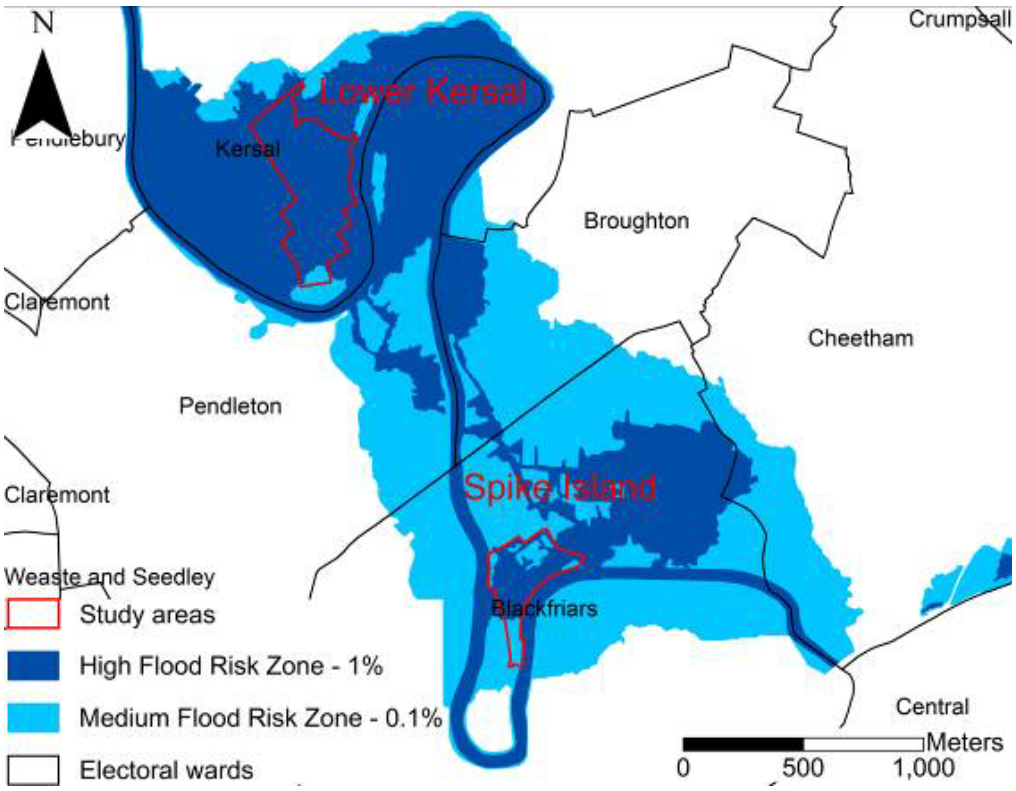

Figure 8 Case-study areas in Lower Irwell flood risk zone: Lower Kersal and Spike Island

5.2.2 Low-income areas in the Lower River Irwell flood risk zone

Two distinct low income areas can be identified within the Lower Irwell Valley. These are referred to in this study as Lower Kersal and Spike Island, shown in Figure 8. Both areas are situated in one-in-100-year flood risk zone behind flood defences in a meander belt of the Irwell. Both areas have been described as being "of social and economic strategic importance to the City of Salford" (JBA and Salford City Council, 2005) and they are sites of potential development under schemes such as New Deal for Communities and the Pathfinder Project (Housing Market Renewal Fund).

Lower Kersal is located within both the Housing Market Renewal Pathfinder boundary and the Charlestown and Lower Kersal New Deal for Communities area and contains 674 properties. The area is characterised by low income and according to the Mosaic neighbourhood classification (Experian, 2009) they fall into the bottom 15 types in terms of wealth (Table 4). Many houses on the council estate in Lower Kersal were seriously flooded in 1946 and 1980 and several properties had over a metre of water over their ground floors. The entrance doors of many houses on the estate are located below the level of the road (Douglas, 1998).

Table 4 Mosaic types in Lower Kersal (Experian, 2009)

Number of properties	Mosaic type	Mosaic description	Wealth rank
245	D24: Coronation Street	Young families with limited incomes living in cheap terraced housing	49/61
199	G42: Low horizons	Tenants reliant on city councils for housing and transport, where few neighbours have bought their homes	58/61
119	G43: Ex-industrial legacy	Settled but poor older people in low-rise social housing, often found in declining industrial areas	52/61
65	H44: Rustbelt resilience	Workers reliant on manufacturing employment living in low value terraced houses	50/61
30	F35: Bedsit beneficiaries	Childless couples and singles renting in city centres from private or public landlords	48/61
16	H47: New town materialism	Young families with local light industry or factory jobs have confidently exercised their right to buy.	51/61

The Spike Island area contains 228 homes. Properties in the area are predominantly two- or three-bedroom family houses, which were built in the 1970s for the local authority using a Wimpey "no fines" construction method and to a Radburn layout. However, the area also contains a number of cottage flats and larger four bedroom houses. Of the properties in the area, 199 are owned by the local authority, while the remainder are owner-occupied having been bought from the Council under the Right to Buy policy devised in the 1980s. Like Lower Kersal, Spike Island faces a range of challenges in relation to deprivation. Table 6 presents the socio-economic status of properties in the area as described by the Mosaic types (Experian, 2009). The history of flooding in Spike Island is similar to Lower Kersal. The area is adjacent to a major

new build regeneration scheme planned to provide up to 1,400 new homes until 2011. These new dwellings are designed to incorporate flood mitigation measures.

Table 5 Spike Island area characteristics (Experian, 2009)

Number of properties	Mosaic type	Mosaic type description	Wealth rank
117	G42: Low horizons	Tenants reliant on city councils for housing and transport, where few neighbours have bought their homes	58/61
46	D24: Coronation Street	Young families with limited incomes living in cheap terraced housing	49/61
24	F37: Upper floor families	Low income young families with children in small, hard to let blocks of public sector purpose built flats	56/61
21	E32: Dinky developments	Singles and childless couples in cul-de-sacs of small, often brownfield-site, newly built town houses	32/61
20	G43: Ex-industrial legacy	Settled but poor older people in low-rise housing, often found in declining industrial areas	52/61

5.2.3 Alder Forest: medium income area in flood risk zone

The second area selected for the house-to-house survey is located in the Winton area of Salford and is referred to in this study as Alder Forest. It is adjacent to the junction of M60 and M602 motorways (Figure 11).

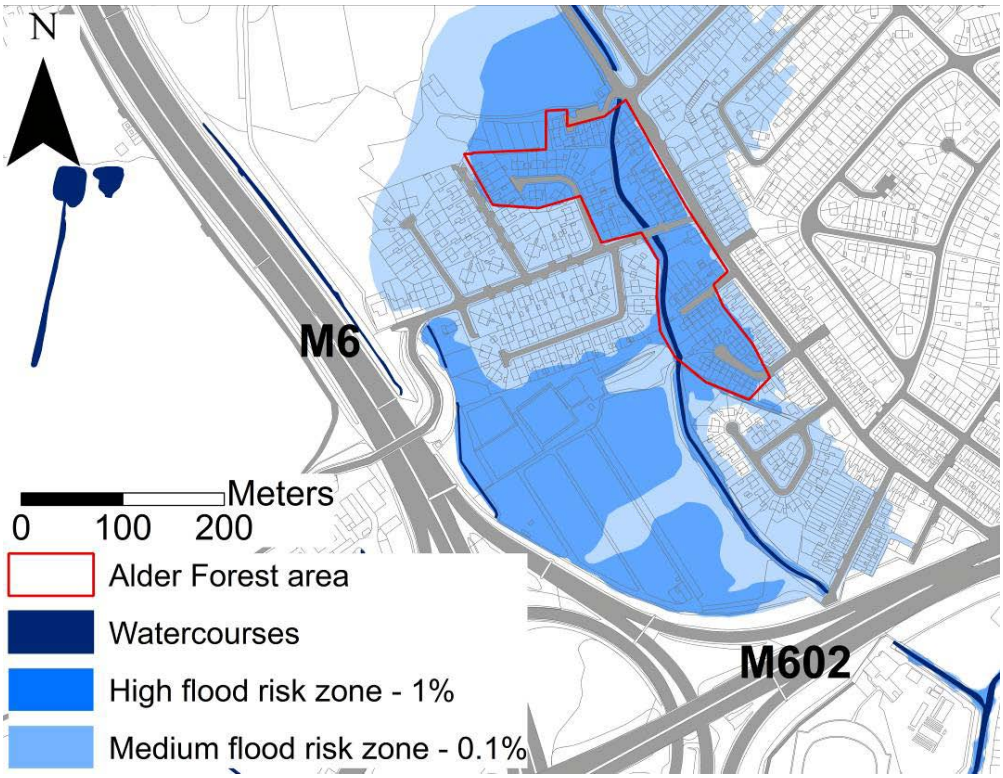

Figure 9 Alder Forest case study area. Background map: Ordnance Survey MasterMap

Flooding occurs from a tributary of the River Irwell, Worsley Brook. Entrances to houses are located below the Worsley Road level, which increases the threat of flooding as the road cannot be used as temporary flood storage. As a result, 87 properties in the area are located within 1 in 100 years (1% annual probability) flood risk zone. The Alder Forest area is characterised by presence of terraced and semi-detached owner-occupied houses, whose residents enjoy medium socio-economic status according to the Mosaic types (Experian, 2009) identified in the area (Table 6).

Table 6 Alder Forest area characteristics (Experian, 2009)

Number of properties	Mosaic type	Mosaic type description	Mosaic wealth rank
36	C18: Sprawling subtopia	Middle aged, middle income owner occupiers in repetitive, semi-detached housing	17/61
32	D21: Respectable rows	Younger service workers enjoying a reasonably prosperous lifestyle in relatively small terraces	27/61
9	G43: Industrial legacy	Settled but poor old people in low-rise social housing, often found in declining industrial areas	52/61
6	C19: Original suburbia	Upper white collar owners in established suburban housing	10/61
4	C15: Close to retirement	Older couples and families reaping the benefits of their industrious working lives	8/61

5.3 Attitudes of owner-occupiers in Salford

Key points

- The survey resulted in 101 questionnaires completed (32% response rate);
- Both survey areas were characterised by high percentage of elderly and retired people;
- Majority of the people were concerned about the impacts of climate change (68%), agreed that their houses contributed to climate change (76%) and that using less energy could make a difference (76%);
- Most people were aware they lived in flood risk area but they thought the probability of their house getting flooded was low;
- Half of the eligible respondents were subscribers to the Floodline Warnings Direct and 74% had flood insurance;
- The respondents would consider both flood resilience measures (raising electric fixtures) and resistance improvements (air brick covers and door guards). Tiling the floor was the least popular improvement;
- There was a general low level of implementation of energy-saving measures and the highest number of respondents would consider investing into energy-saving appliances and energy-efficient boilers;
- Nearly half of the respondents were not willing to pay anything for the flood-protection and energy-saving improvements to their houses. However, nearly a quarter of the respondents would invest over £500;
- The most popular non-cash rewards for investing in flood protection or energy-saving were vouchers for fruit and vegetables (51.7% of positive answers), followed by free meals at restaurants (44.2%), tickets for entertainment (33%) and vouchers for leisure and health centres (27%). The least popular reward was free bus travel;
- Around a quarter of the respondents would not be persuaded to accept any value of rewards offered; over half would like to receive between 100% and 200% of the investment they have made;
- Nearly half of the respondents were interested in participation in the actual reward scheme, what proves its feasibility.

5.3.1 Information about the respondents

In both case study areas the total of 317 houses was surveyed, resulting in 101 completed questionnaires (31.9% response rate). Within this sample, 43 respondents were living in the Lower Irwell area (34 in Lower Kersal and 9 in Spike Island) and 58 in the Alder Forest area. The response rate was much higher Alder Forest (69.9% out of 83 houses surveyed) compared to Lower Irwell (22.6% out of 234 houses).

Half of the respondents were over 60 years old, 30.8% were between 40 and 59 and 18.7% were between 26 and 39 years old. The respondents in Alder Forest were slightly younger than in Lower Irwell (Figure 10). Over three-quarters of respondents lived in households with no children.

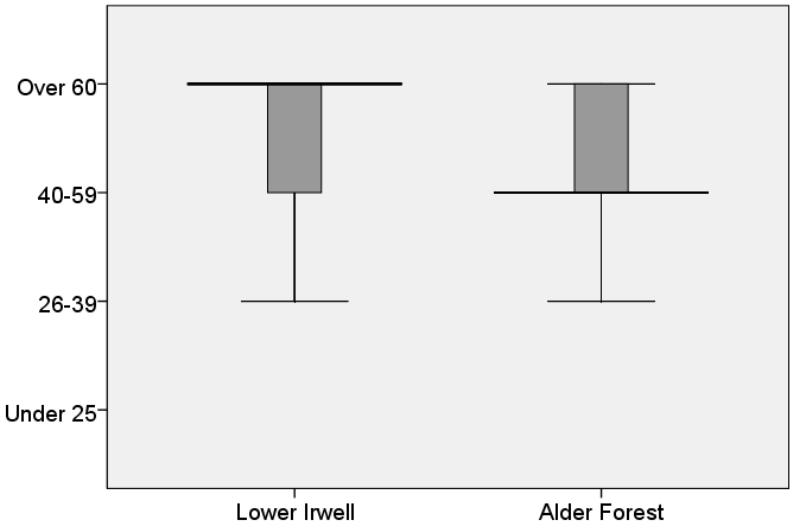

Figure 10 Median age in Lower Irwell and Alder Forest

Over two-thirds of the respondents lived in three-bedroom houses (mainly in Alder Forest) and over a quarter inhabited two-bedroom houses (mainly in Lower Irwell). Only five respondents lived in four-bedroom houses or larger (all of them in Alder Forest). More than 52% of respondents have lived in their house for over 20 years, 25.6% have lived there lived between 11-20 years (Figure 11).

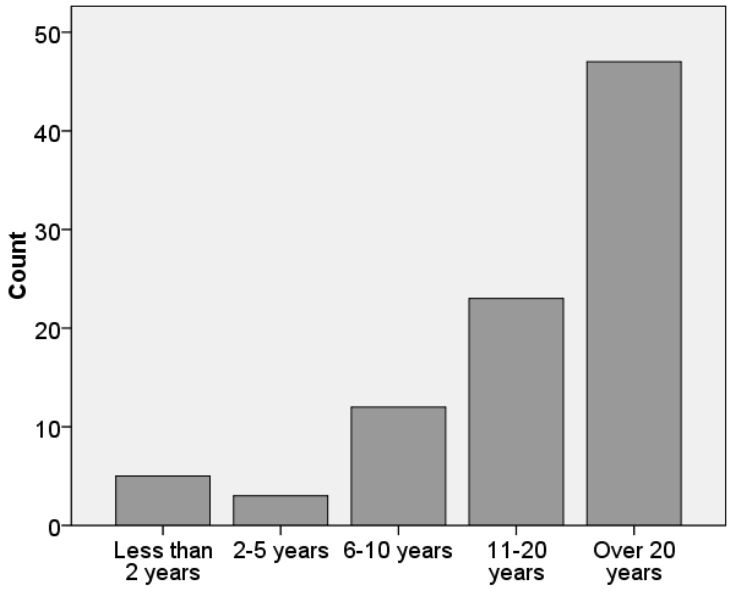

Figure 11 Length of residency in the area

Occupation splits showed that 44.4% of respondents were retired, 33.3% were in full-time employment, while and 11.1% were long term sick (the entire last group lived in Lower Irwell). There were significantly more respondents in full time employment in Alder Forest. Figure 12 presents the differences in employment between the two case-study areas.

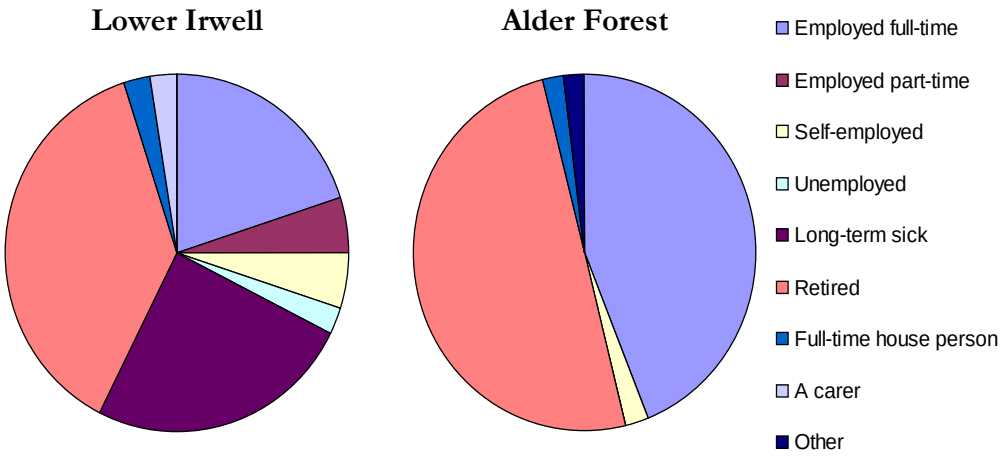

Figure 12 Employment status of respondents in Lower Irwell and Alder Forest.

5.3.2 Climate change: knowledge and opinions

Over half of the respondents agreed or strongly agreed that they were concerned by how climate change affected them and their properties. The respondents also expressed a strong feeling of personal responsibility for climate change; i.e. 68% of the respondents agreed or strongly agreed that the fossil fuels used to produce energy for their house contribute to climate change. Also, 76% of the respondents agreed or strongly agreed that lowering their energy consumption can make a difference to climate change. Figures 13, 14 and 15 show the full distribution of the answers to these questions.

The survey showed the properties of 23% of the respondents had been previously affected by flooding. This percentage is much higher for Lower Irwell residents (42%) compared to Alder Forest (less than 9%). Similarly, a much higher percentage of respondents were aware that their properties were located within flood risk zone in Lower Irwell (93%) than in Alder Forest (28%), giving an overall sample total of 56% of respondents aware that their homes were located within flood risk zone. However, there were no significant differences between the areas in the perception of risk that the respondents' property will be flooded (Figure 16).

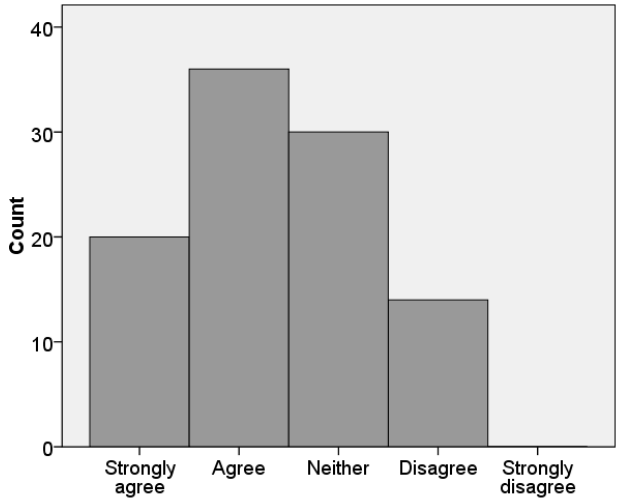

Figure 13 Level of concern about climate change impact on respondents' lives and properties.

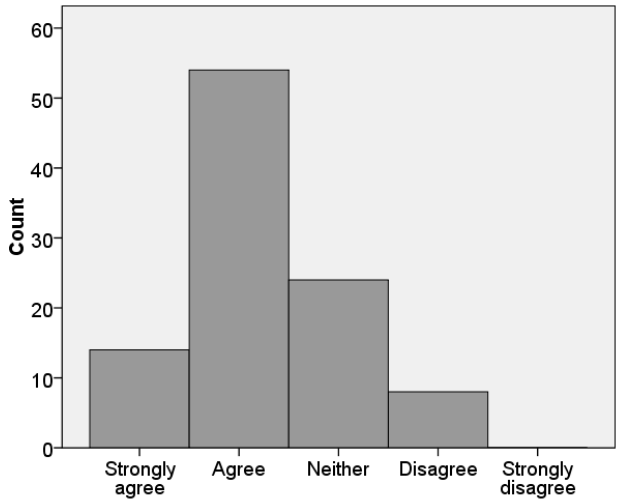

Figure 14 Level of agreement with the statement "using fossil fuels to produce energy for my home is changing the Earths climate".

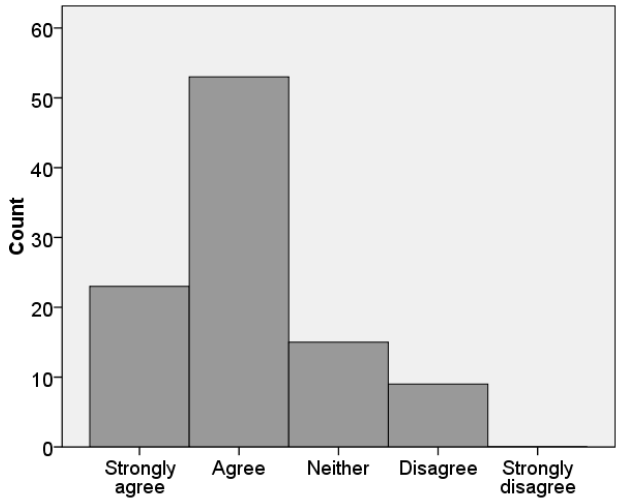

Figure 15 level of agreement with the statement "using less energy in my home will make a difference to climate change".

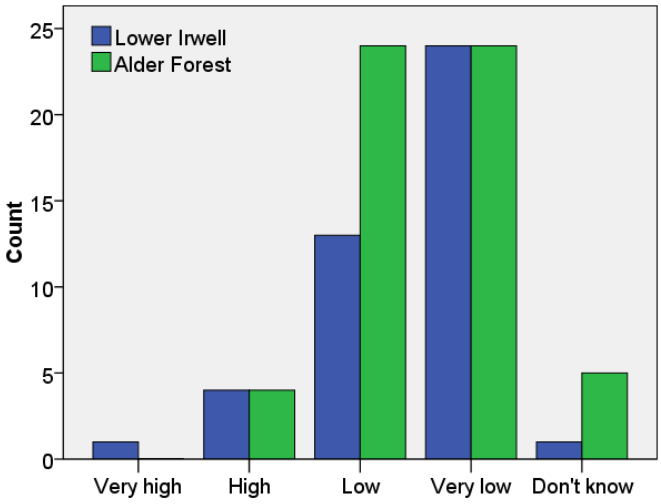

Figure 16 Perceived likelihood of the property being flooded.

The perception of the risk of flooding as very low could be explained by little history of flooding from Worsley Brook in Alder Forest (one of the comments on the questionnaire read "never had a problem with the brook - unlikely in my life time to flood!"); and by the extensive flood mitigation works, including the Littleton Road floodwater storage basin, that had been completed in Lower Irwell (See Section 5.2.3).

The Environment Agency's Floodline Warnings Direct was operating in Lower Irwell at the time of the survey. Nearly 49% of respondents in the Lower Irwell area were subscribers to the scheme and only 11% were not aware of the warning scheme. The remaining 40% chose not to subscribe, mainly because they did not see the risk of flood as significant. In Alder Forest, where the scheme has not yet been implemented, nearly 40% of the respondents said they would like to register for the Floodline Warnings Direct scheme; 34.5% definitely did not want to (because of the low perceived risk of flooding, like in the Lower Irwell area). The rest were unsure.

In Lower Irwell 62.2% of respondents were insured against flooding, while significantly more (82.2%) had this insurance in Alder Forest. The reasons for lack of insurance were quoted as lack of need (4 people), high cost (4 people) and being refused the cover (1). There was no significant difference in terms of rates of subscriptions to the Environment Agency Floodline Warnings Direct and take up of flood insurance between people who had been flooded and those who had not.

Just under two-thirds of the respondents agreed or strongly agreed that the responsibility for flood protection of the property rested with house owners (Figure 17). However, similar percentage of respondents agreed or strongly agreed that it is the Government's responsibility to protect people's houses from flooding (Figure 18).

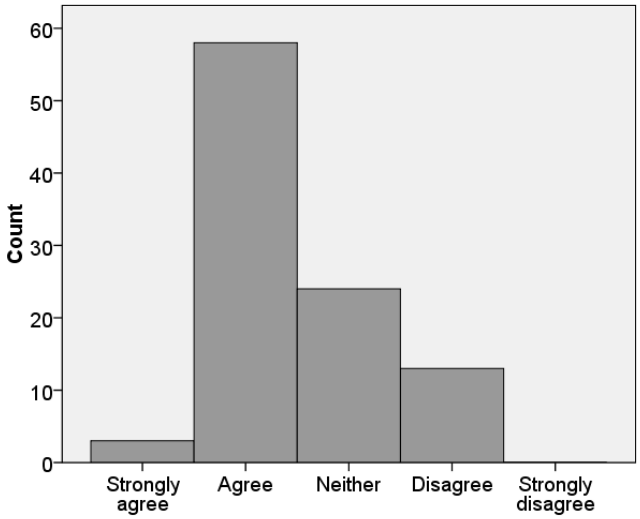

Figure 17 Are house owners responsible for flood protection of their properties?

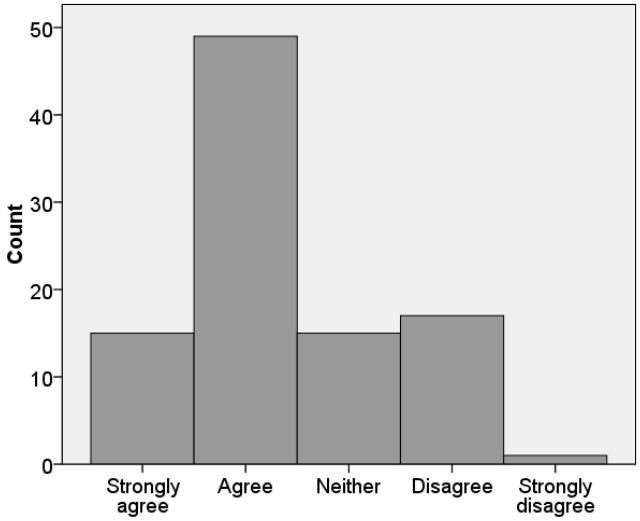

Figure 18 Is the Government responsible for protection of houses against flooding?

5.3.3 Awareness of flood protection measures and willingness to apply them

The awareness of property-level flood protection measures was in general low. Sandbags were the most frequently named measure (45 respondents). Three respondents were aware of air brick covers, and five knew of the possibility of raising the thresholds. Six people said door barriers would be an effective measure, while sealing the doors and windows was mentioned by three people. Two more said raising plugs and sockets above the likely flood level. Thirteen respondents also noted that one method of protecting their belongings from damage is to move them upstairs. There was a high level of awareness of the flood resistance and resilience measures in the Lower Irwell area than in Alder Forest; either because of the previous experiences

of floods, or because of their subscription to the Environment Agency's Floodline Warnings Direct scheme, which gave them this information.

Most popular flood protection measure considered by the respondents was raising the electric fixtures (Figure 19), and six respondents already had it done in their houses. There were some concerns about the upheaval associated with moving electrics and how this would look after the work was done. The second most popular solution was air brick covers (three respondents in Lower Irwell already had them installed). Concerns associated with this solution included poor ventilation and, consequently, problems with condensation and dampness. This was alleviated when it was explained that air brick covers are only applied when flooding is imminent. Door guards were less popular, and it was observed that they can cause difficulties for elderly and disabled people. The least popular solutions were the concrete staircases (one person in Lower Irwell had this) and replacing timber or carpet flooring with ceramic tiles (however, two people living in Lower Irwell had tiles). Many respondents were concerned that this type of flooring would be cold, and that the replacement of flooring/staircase would cause a serious disturbance to their lives.

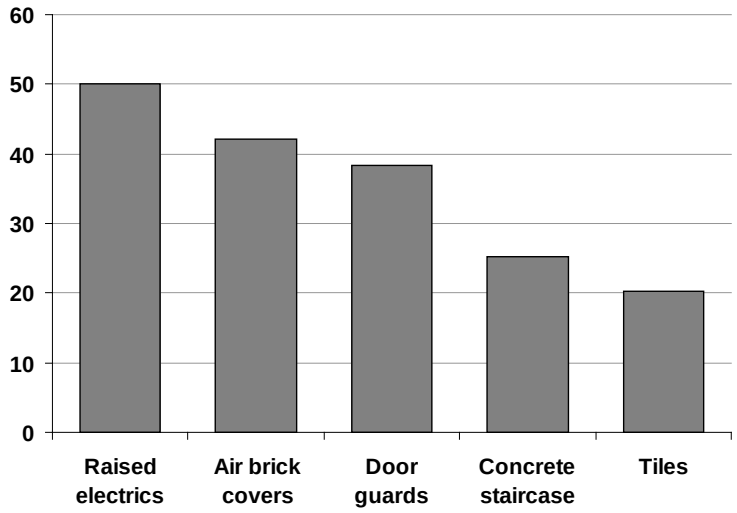

Figure 19 Percentage of respondents who would consider given flood resistance and resilience measures

5.3.4 Awareness of energy-efficiency improvements and willingness to install them

The best-known energy efficiency measure was the installation of energy-saving light bulbs (46 respondents). There were 33 respondents who mentioned loft insulation and 27 said wall insulation. Double glazing was listed by 20 respondents, while six people included energy-efficient boiler on the list and five respondents mentioned energy-efficient appliances. In addition, 33 people highlighted the importance of turning lights and appliances off. There were eight people who said turning the heating down or using timers and two people mentioned re-setting the washing

machine to operate at cooler temperatures and boiling less water in a kettle. In addition, eight people mentioned energy generation with solar panels or wind turbines.

Nearly 47% of the respondents had already had loft insulation and 40.2% had double glazing (Figure 20). Replacing appliances with A-rated alternatives was the most popular among the respondents (46.2% of positive answers), followed by replacing the boiler with a more energy-efficient one, and loft and wall insulation. Table 7 presents the differences between the two case study areas in terms of the considered energy-saving measures. In the case of wall insulation, "A"-rated appliances and double glazing, there were significantly more respondents from Alder Forest who either already had these or would consider making these improvements. On the other hand, higher percentage of respondents having loft insulation in Lower Irwell may be a result of more people being eligible for the Warm Front grants. Also, several respondents from Lower Irwell were aware that their houses do not have cavity walls and therefore cannot be insulated in this way.

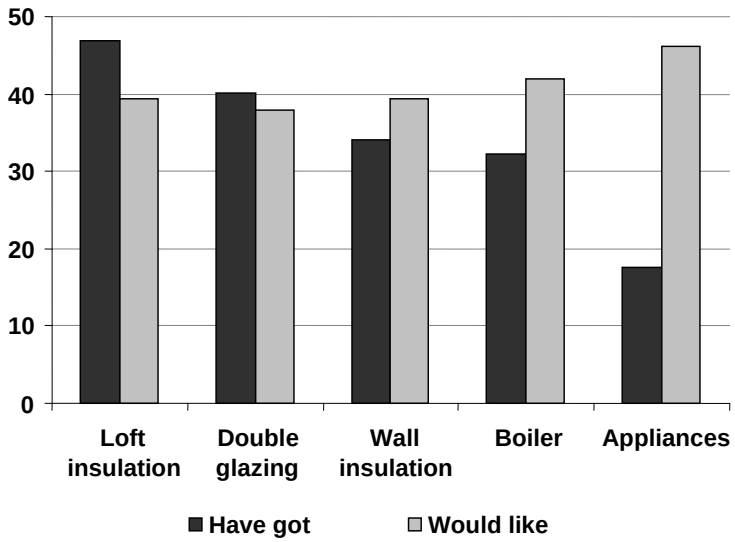

Figure 20 Energy-saving improvements already in place and considered.

Table 7 Differences between Lower Irwell and Alder Forest in terms of willingness to apply energy-saving measures.

Improvement	Have got (%)		Would consider (%)	
	Lower Irwell	Alder Forest	Lower Irwell	Alder Forest
Loft insulation	51.2	43.1	27.9	49.0
Wall insulation	25.6	41.1	34.9	43.1
New boiler	28.6	35.3	38.1	45.1
Appliances	11.9	22.4	33.3	57.1
Double glazing	31.0	48.0	33.3	42.0

5.3.5 Preparedness to pay for house improvements and to accept non-cash incentives

Nearly half of the respondents were not willing to spend any money on either flood-proofing their house or making it more energy-efficient (Table 8). The median value in both cases was under £100. There were no significant differences in the declared amount of money that could be spent between the respondents from Alder Forest and Lower Irwell, or between people of different employment status. This might be partially explained by the current economic situation: one of the respondents observed that while they would be interested in making some of the flood-proofing or energy-saving improvements, in the current "credit crunch" situation they would not be willing to spend any money.

Table 8 Sum of money the respondents were willing to spend on flood-protection and energy-efficiency improvements

Sum of money	Flood protection	Energy efficiency
Nothing at all	47.8	46.1
Under £100	14.4	15.7
£100-£500	14.4	15.7
£500-£1000	13.3	11.2
£1000-£3000	8.9	6.7
More than £3000	1.1	4.5

Financial gain was the most frequently offered motivation people needed to make changes to their homes to make them better prepared for floods or use less energy. Nearly two-thirds of the respondents said they would be motivated by the prospect of receiving non-cash rewards. The least favoured motivator was doing the same thing as other people in community.

The most popular non-cash reward for investing in flood protection or energy-saving were vouchers for fruit and vegetables (51.7% of positive answers), followed by free meals at restaurants (44.2%). Just over one-third of respondents would accept entertainment tickets and 27.4% would consider vouchers for leisure and health centres in return for making improvements to their property. The least popular reward was free bus travel (15%). Given that the majority of respondents in both areas already had access to free bus travel because of their age this was an expected result. There were no significant differences between the two case-study areas in terms of the preferred type of non-cash reward.

Other incentives volunteered by the respondents were shopping vouchers including DIY stores and supermarkets (15 respondents). This was followed by holidays "in warm places" or air travel (9 respondents), petrol vouchers (7 people), help with paying bills or mortgage (7) and vouchers for the actual flood-proofing or energy-saving improvements (7). Help with paying flood insurance was requested by three people. Other ideas included building something "for the kids", free treatments at hairdresser's, cleaning service and cash towards energy-efficient services and

equipment. Three people would just like their money back, illustrated by this comment: "Why give rewards, why not just spend the money on the homes that need work". Another respondent said: "As these are for my benefit and my home's I don't think rewards should come into it. If necessary, maybe help paying."

Around a quarter of the respondents would not be persuaded to make any flood-proofing and energy-efficiency changes to their houses no matter what the value of rewards offered. The majority of the respondents indicated that the value of the rewards that would be acceptable to them was either equal to the value of the improvements made to the house or up to double the amount they spent (Table 9). The differences in the value of rewards to be accepted were not significant between respondents from Lower Irwell and Alder Forest.

Table 9 Value of the rewards acceptable in return for making the improvements to the house

Value of rewards in relation to costs of improvements:	Flood protection	Energy efficiency
50%	12.5	13.6
100%	37.5	38.6
Up to 200%	22.7	23.9
No amount would persuade	27.3	23.9

Over 57% of respondents were aware that some people qualify for grants for energy-saving improvements. Warm Front was the most often quoted scheme. However, in Alder Forest there was some bitterness about the criteria of eligibility for grants. One respondent said: "I believe they are for those who are on benefits not those who endeavour to work for their money".

When asked if they would be willing to take part in an actual reward scheme, 46 respondents said they were interested. This included 22 people from Lower Irwell and 24 from Alder Forest. This was nearly half of the respondents who were interviewed. This, coupled with the high awareness of climate change issues indicates that the possibility of engaging communities into property-level flood protection and energy-saving schemes (even in low income areas) is significant. On the other hand, the low disposable income of many households may mean that willingness may not be converted into interest.

5.4 National telephone survey

Key results

- Many of the results of the national survey were very similar to the ones in Salford, confirming Salford's suitability as case-study area for pilot scheme in Phase 2 of the project;
- However, the significant differences were as follows:
  - The implementation of energy-saving measures was much higher in England and Wales than it was in Salford;
  - Less people than in Salford would be willing to accept non-cash rewards in return for investment in climate change mitigation and adaptation;
  - Majority of those in England and Wales who would accept the rewards wanted only up to 100% of the reward value;
- People from higher social grades were more aware about their contribution to climate change and possibility to make a difference and respondents from lower socio-economic grades were more concerned about the effects of climate change, including flooding;
- Personal experience of flooding results in higher concern about climate change, better implementation of precautionary measures (subscription to Floodline Warning Direct, flood insurance) and more interest in installing flood resistance and resilience measures. However, the respondents who have been previously flooded think the responsibility for protection lies with the Government;
- The poorest respondents were the least likely to have a complete set of energy-saving improvements installed in their houses;
- The willingness to pay for mitigation and adaptation improvements was not associated with the social grade of respondents. Also, majority of respondents from all social groups would be motivated by non-cash rewards;
- The more aware of climate change the respondents were, the more money they would spend on the improvements in their houses.

5.4.1 Information about the respondents

There were 1,043 telephone interviews carried out with owner-occupiers living in flood risk areas as part of the survey of England and Wales. Nearly half of the respondents were over 60 years old (Figure 21). Over 40% of them were retired, a third were in full-time employment and 11% were employed part-time (Figure 22).

The sample was split into social grades, which were originally developed by the National Readership Survey in order to classify readers but are now widely used by other organisations and, in their congregated form (AB, C1, C2 and DE), have become a standard for market research. The four main social grades were nearly

equally represented, with slightly lower percentage of respondents from the lower socio-economic groups (Table 10).

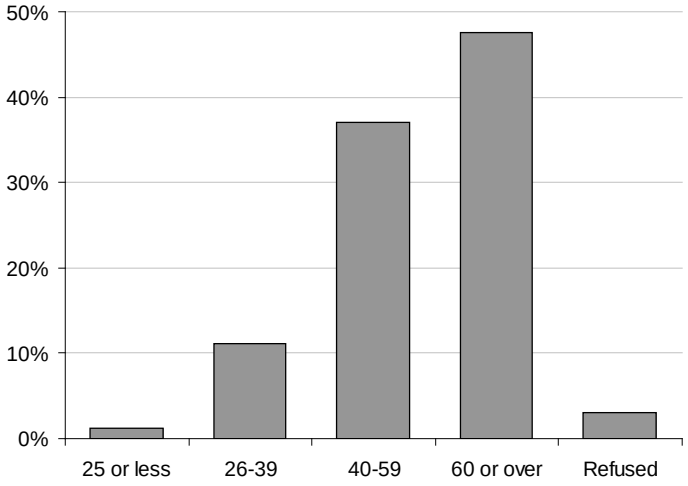

Figure 21 Age of the respondents

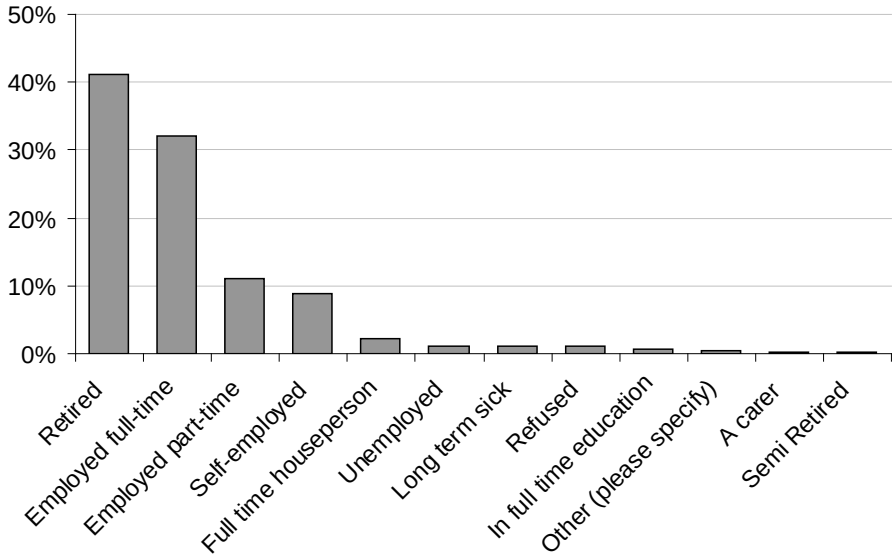

Figure 22 Employment status of the respondents

Table 10 Socio-economic status of respondents (Wilmhurst and MacKay, 1999)

Social grade	Social class	Chief income earner's occupation	% sample
A	Upper-middle	Higher managerial, administrative or professional.	25.6
B	Middle	Intermediate managerial, administrative or professional	
C1	Lower middle	Supervisory or clerical and junior managerial, administrative or professional	27.4
C2	Skilled working	Skilled manual workers	19.0
D	Working	Semi and unskilled manual workers	20.1
E	"Underclass"	Casual or lowest grade workers, pensioners and others who depend on the welfare state for their income	
Refused			7.9

In the sample, 73% of houses were occupied only by adults. Single occupants accounted for 30.5% of the houses and 50.2% of houses were occupied by two adults. The majority of respondents lived in three-bedroom houses (Figure 23). There higher the social grade was, the larger the houses were. Over 60% of the respondents had lived in their house for 11 years or longer, and under 5% of people had lived in their house for less than 2 years (Figure 24). Respondents from groups C2 and DE tended to be more sedentary than other groups and exactly half of them have lived in the area for over 20 years.

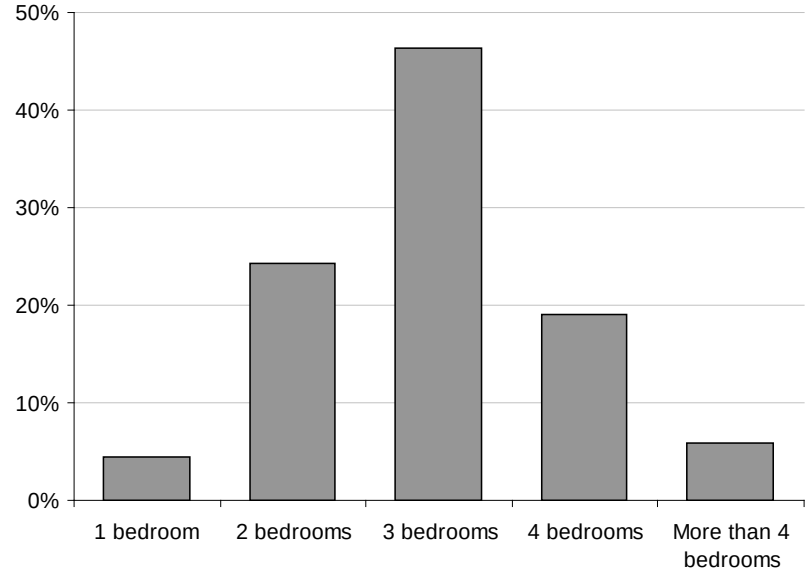

Figure 23 Size of respondents' houses

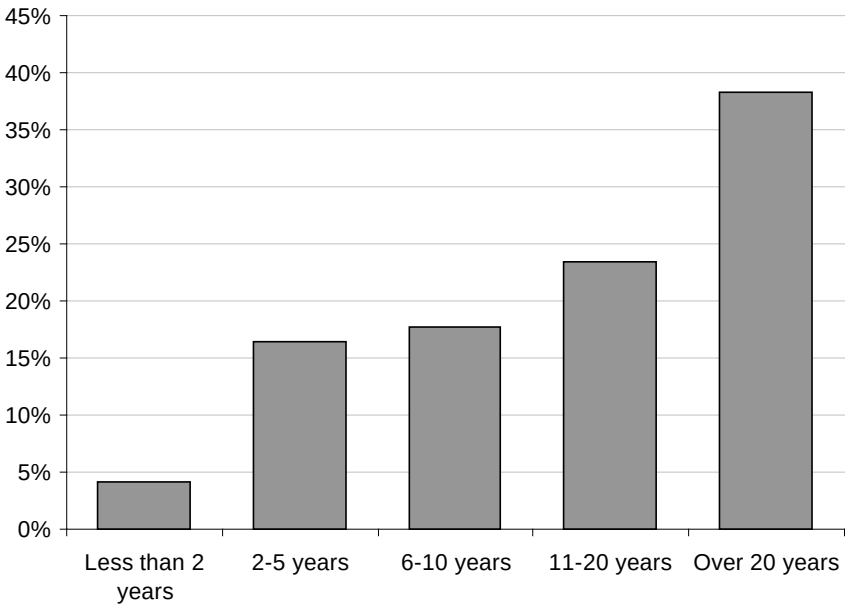

Figure 24 Length of residence in the house

5.4.2 Climate change: knowledge and opinions

Over 61% of the respondents agreed or strongly agreed that they were concerned about the climate change's impact on their property and 73.8% of the respondents agreed or strongly agreed that using fossil fuels to produce energy for their home is changing the Earth's climate. In addition, 78.2% of the respondents agreed or strongly agreed that using less energy in their homes would make a difference to climate change. The full distribution of answers to these three questions is presented in Figures 25, 26 and 27.

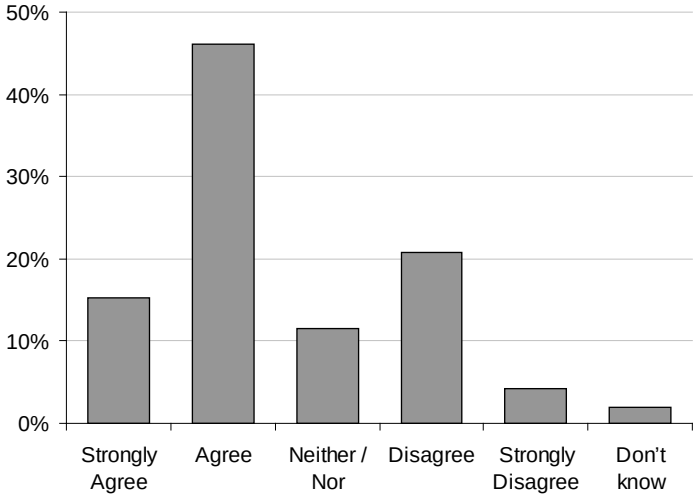

Figure 25 Levels of agreement with the statement "I am concerned about how climate change might affect me and my property".

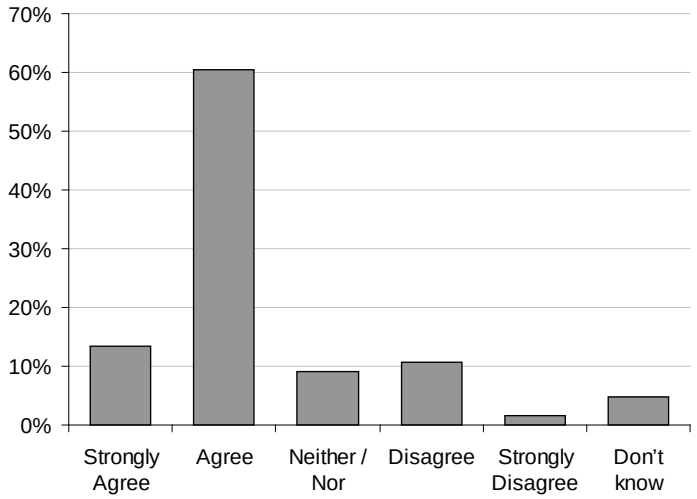

Figure 26 levels of agreement with the statement "Using coal, oil and gas to produce energy for my home is changing the Earth's climate".

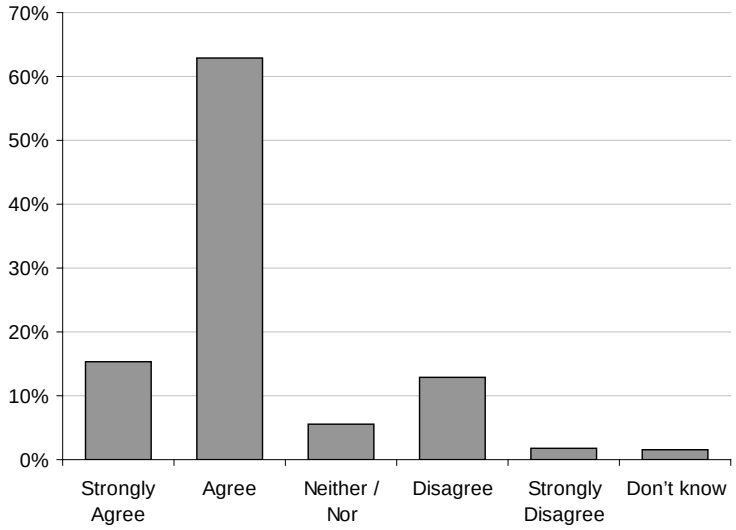

Figure 27 Levels of agreement with the statement "using less energy in my home will make a difference to climate change".

There were significant differences between the groups of respondents classified to different social grades in terms of their levels of concern of climate change effects. The highest concern about climate change was expressed by respondents from group C2 (69.2% strongly agreed or agreed). Significantly fewer respondents from group AB agreed that they were concerned about climate change effects (57.7%).

The higher the social grade was, the higher the levels of agreement with the statement that using fossil fuels in respondent's home contributes to climate change were (with the exception of group DE). Also, there were significant differences between socio-economic groups with regards to the statement "using less energy in my home would make difference to climate change", where the highest percentage of respondents from group AB agreed or strongly agreed (82.4%). Figure 28 presents the percentages of respondents from all groups who agreed or strongly agreed with these statements.

Only 17.5% of the respondents' houses had previously been affected by flooding and 82.1% of the respondents were aware that their house was located in flood risk zone. However, 78% of the respondents thought that the likelihood of their house getting flooded in the future was very low or low (Figure 29). People from group DE considered the chances of getting flooded to be higher compared to respondents from other groups. But still, 73% of the respondent group DE thought the chances were low or very low (compared to around 80% in other groups).

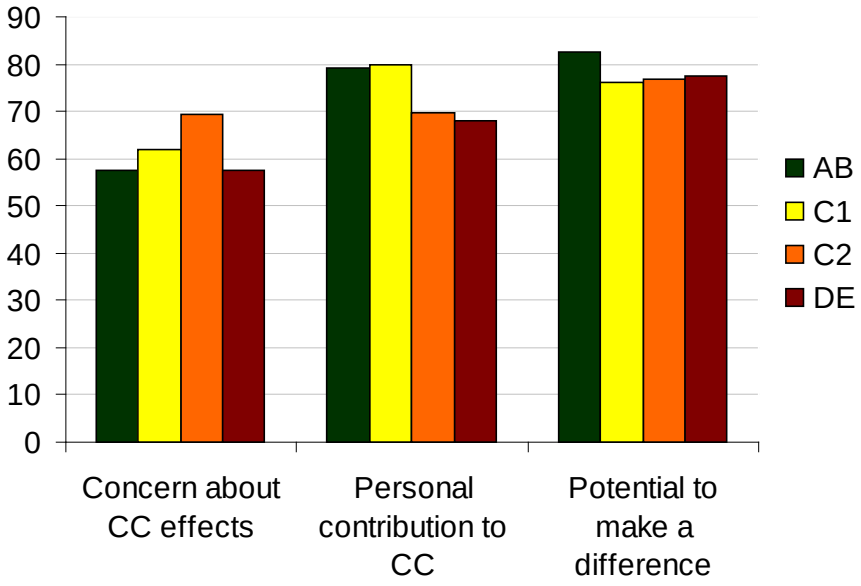

Figure 28 Percentage of respondents who strongly agreed or agreed with the statements that they are concerned about climate change effects on them and their property; that using fossil fuels to produce energy in their homes contributes to climate change; and that by using less energy they can make a difference to climate change

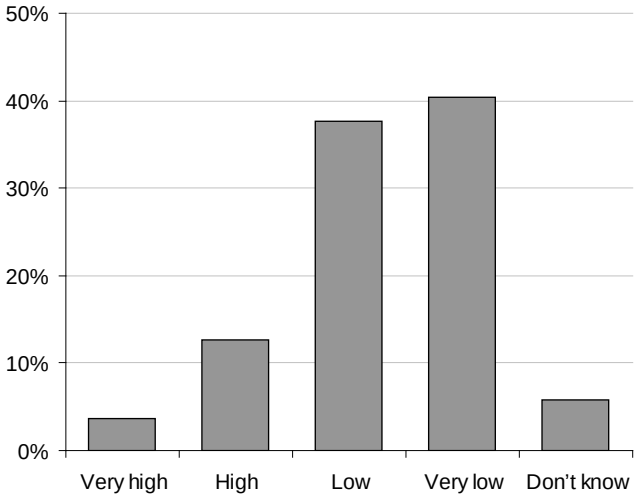

Figure 29 Perceived likelihood of house getting flooded in the future

In the sample, 42% of the respondents were registered with the Environment Agency Floodline Warnings Direct, and 37% knew about the initiative but were not interested in subscribing. Remaining 21% did not know about the Environment Agency scheme. This might be because the Floodline Warnings Direct is not yet operating in all areas threatened by flood in the country. There were slightly lower percentages of people subscribing to Floodline Warnings Direct among respondents classified to groups C2 and DE (38.3% and 41.1% compared to 44.6% in AB and 43.7% in C1). Out of the 392 respondents who did not want to register with Floodline Warnings Direct, 35.2% perceived the risk of flooding as too low to proceed with the subscription.

Nearly 73% of the respondents had insured their houses against flooding, 14% were not sure whether flood cover was included in their house insurance and remaining 13% were uninsured. There was a lower uptake of the flood insurance among the respondents from the lowest socio-economic group DE (64.7%) in comparison to other groups (76% in AB, 73% in C1, 76% in C2).

Those who had been flooded previously were more concerned about the impacts of climate change (71.0% agreed or strongly agreed) in comparison to those who had not been flooded (59.3% agreed or strongly agreed). They also assessed the chances that they would get flooded in the future as significantly higher than those who have not been flooded (Figure 30). In addition, those who had previously been flooded had higher rates of subscription to Floodline Warnings Direct than those never affected by flooding (62.3% compared to 37.6%) and were more likely to have flood insurance (83.1% compared to 70.6% of remaining respondents).

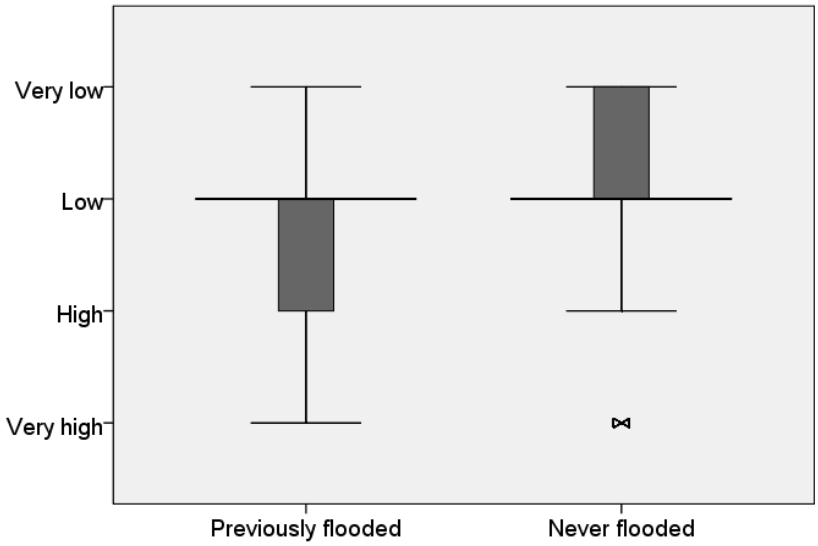

Figure 30 Perceived likelihood of the property getting flooded in the future between respondents who have and have not been flooded in the past.

In answer to the statements "it is the home owners' responsibility to protect their house from flooding" or "it is the Government's responsibility to protect my house from flooding" respondents offered almost identical answers (Figure 31). There was no correlation between the SES segmentation and the level of agreement with the statement that it is the owners' or the Government's responsibility to protect individual houses from flooding. However, those who had been previously affected by flooding were more likely to see the Government as responsible for flood protection (25.1% strongly agreed) in comparison to the respondents who had not been flooded (13.9% strongly agreed).

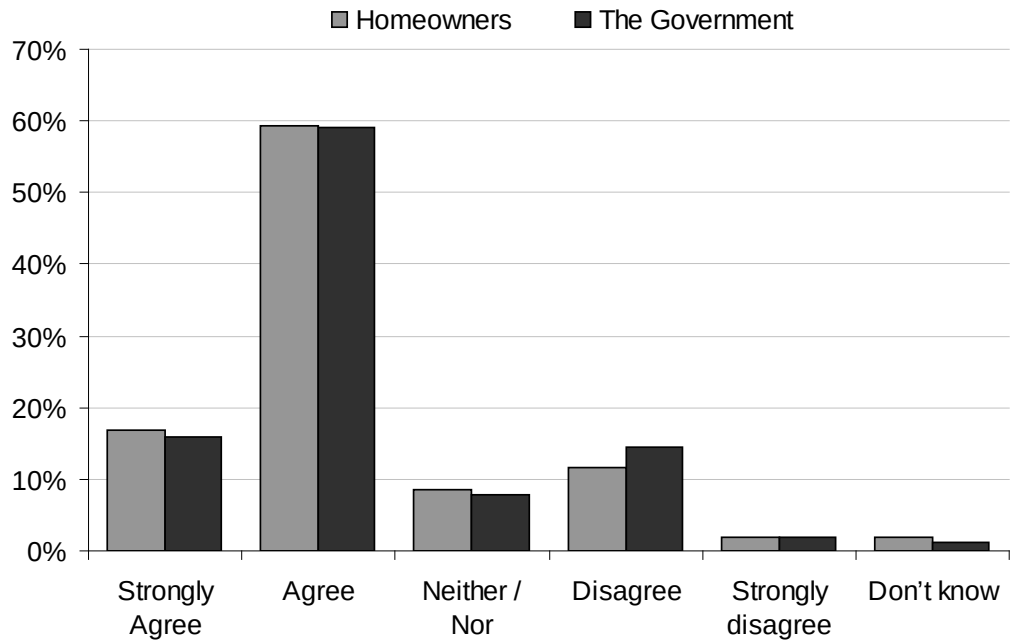

Figure 31 It is homeowners'/the Government's responsibility to protect individual houses from flooding

There was a positive correlation between the level of concern about climate change effects and the agreement that the Government is responsible for flood protection of individual properties, i.e. those who are most concerned about climate change impact feel the strongest that the Government should protect their homes. On the other hand, those who agreed that using less energy in their homes could make a difference to climate change also tended to agree that it was the owners' responsibility to protect their properties against flooding.

5.4.3 Willingness to apply flood protection measures

The highest number of people asked to state measures that would protect their house against flooding (29%) said that nothing could be done. Sandbags were the second most frequent answer, which was given by 18.6% of the respondents. Very low numbers of respondents aware of flood resilience and resistance improvements suggest little awareness of the existing flood protection solutions.

The most popular potential flood protection measure that the respondents would consider was raised electric sockets (56% of positive answers), while the replacement of wooden staircase with a concrete one would be considered by only a third of respondents and was seen as the least favourable (Figure 32). Raised thresholds were present in 74 respondents' houses, and 23 had raised plugs and sockets. Air brick covers were present in 22 properties and 20 respondents had concrete floor in their houses. There were eight households where the staircase was already made of concrete.

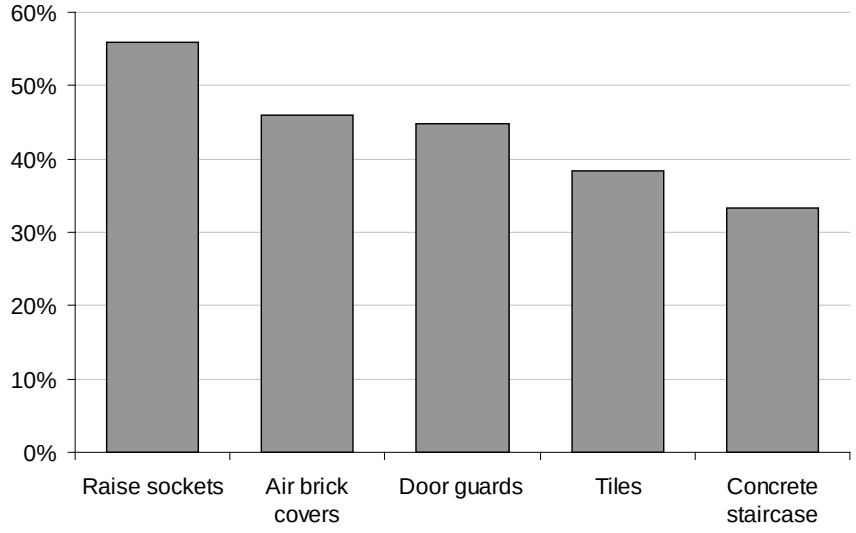

Figure 32 Preferred flood resilience and resistance measures

Those who had been flooded previously were keener to install most of the flood resistance and resilience improvements (excluding the concrete staircase, where there was no significant difference) (Table 11). The existing levels of installation were not significantly different between those who had and had not been flooded previously.

Table 11 Percentage of respondents who already have/would like flood protection improvements

	Door guards	Air brick covers	Raised electrics	Tiles
Flooded	7.1 / 55.2	1.6 / 56.3	12.6 / 65.0	8.2 / 44.8
Not flooded	7.1 / 42.5	2.2 / 43.8	7.2 / 54.1	6.0 / 36.9
Significance (p)	0.006	0.017	<0.001	0.075

5.4.4 Willingness to install energy-efficiency improvements

All energy-saving measures listed in the questionnaires were present in over 50% of the respondents' houses (Figure 33). Over 85% of respondents had double glazing and over three-quarters had insulated their lofts. Nearly two-thirds had wall insulation. The most commonly considered future energy-saving improvement was boiler replacement (nearly 30%) and replacing the appliances with energy-efficient equivalents (27.9%).

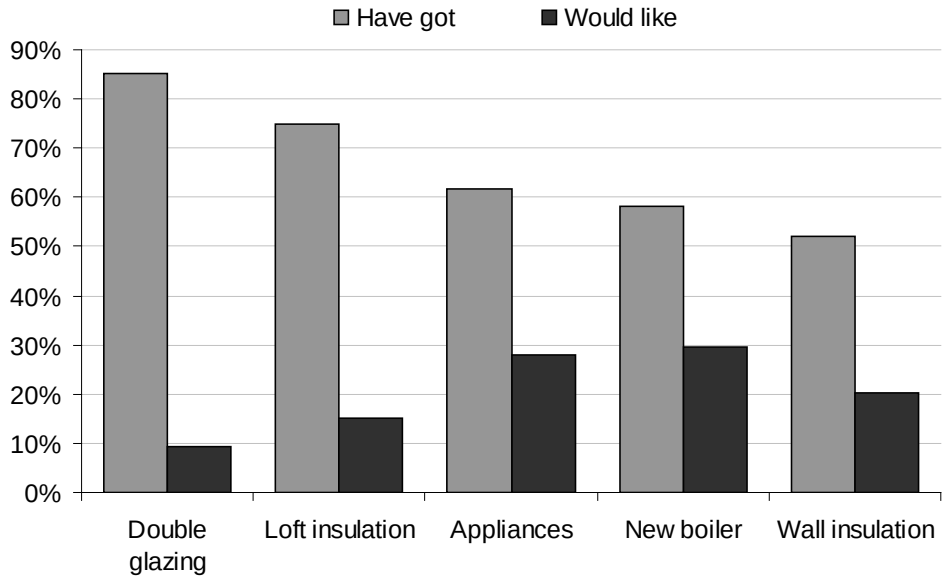

Figure 33 Energy saving improvements: installed and considered

There were no significant differences between respondents from different social grades in terms of already installed energy-saving measures (Table 12). However, respondents from the lower social grades had higher levels of installation of loft and wall insulation and lower levels of efficient boilers and A-rated appliances. This can be a result of the existing funding programmes such as Warm Front, where grants for loft and wall insulation are available to pensioners and recipients of benefits. On the other hand, boilers and appliances need to be bought from the occupiers' funds; hence their presence is likely to be associated wit the amount of disposable income.

Table 12 Percentage of respondents from different socio-economic groups who have the energy-saving measures installed

	AB	C1	C2	DE
Loft insulation	75.3	74.1	76.8	76.2
Wall insulation	49.8	53.5	51.5	54.3
Efficient boiler	61.4	60.5	59.1	50.5
"A"-rated appliances	66.3	61.2	60.6	58.6
Double glazing	84.3	86.0	88.9	84.8

The "big four" energy-saving measures (loft insulation, wall insulation, energy-efficient boiler and double glazing) were installed in 29.8% properties. There was an association between the percentages of houses in different socio-economic groups with the 'Big four' installed and the socio-economic group: the lower the group was, the lower the percentage (31.1% on the case of group AB; 26.2% in DE). All of the measures were installed in 23.2% of properties, and while in the groups AB, C1 and C2 the percentage was between 23.1% and 25.1%, in the group DE only 19.5% of respondents had all these improvements installed.

5.4.5 Preparedness to pay for house improvements and to accept non-cash incentives

Over a third of the respondents would not be willing to pay anything for flood protection and energy-saving improvements to their houses and around one-fifth were not sure how much money they would be prepared to invest. The median value that the respondents were willing to pay was between £100 and £500 for both flood protection and energy-saving improvements. However, considerable proportion of the respondents would pay over a £1000 to make their houses better prepared for floods or more energy-efficient (Table 13).

Table 13 Sum of money the respondents would spend on energy-saving or flood-protection measures.

	Flood-protection	Energy-saving
Nothing at all	38.10%	35.00%
Under £100	5.70%	5.40%
£101 - £500	13.60%	13.60%
£501 - £1000	11.10%	11.20%
£1001 - £3000	7.10%	8.50%
More than £3000	4.50%	5.20%
Not sure	19.90%	21.10%

The largest proportion of people from group DE (51%) did not want to spend any money on energy efficiency (compared to 40% from group AB) and the lowest percentage of people from group DE would be willing to spend over £100 on energy efficiency (Figure 34). However, there was no significant association between the social grade and the amount of money respondents would spend on energy efficiency. The distribution of answers is similar in the case of willingness to spend money on flood protection measures (Figure 35). There was no significant difference between the people who had been flooded and had not been flooded considering the sum of money they would be prepared to pay for flood protection measures.

The sum of money the respondents were willing to spend on either flood protection or energy-saving measures was positively associated with the levels of concern about climate change effects on respondent's property, levels of agreement with feeling personally responsible for climate change and levels of agreement with the statement that limiting energy use in one's home can make a difference; therefore, the higher the levels of awareness of climate change, the greater the commitment to spending money on adaptation and mitigation measures among the respondents.

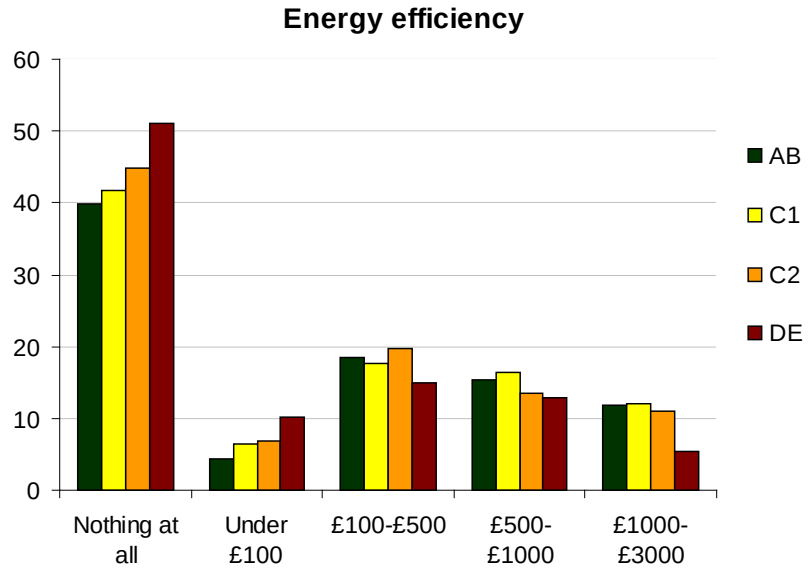

Figure 34 Sum of money the respondents were willing to spend for energy-efficiency

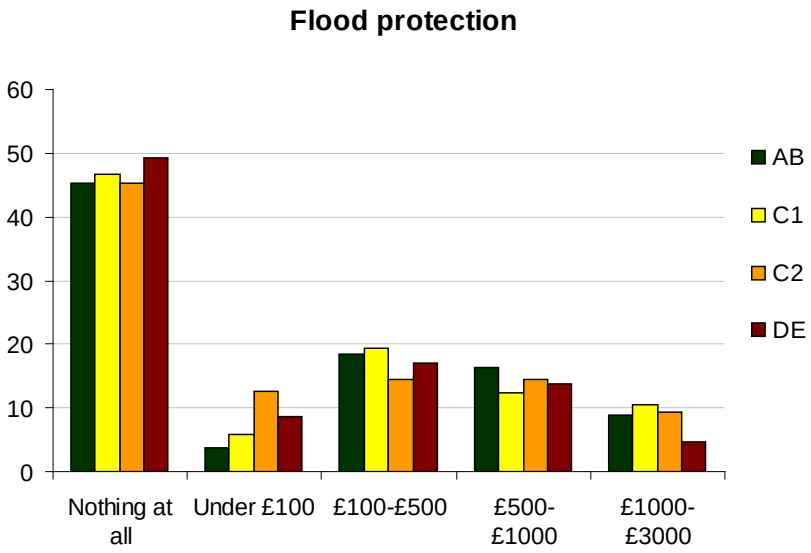

Figure 35 Sum of money the respondents were willing to spend on flood protection measures

Financial gain was the main motivation for the respondents to invest into flood-protection measures. Nearly 70% strongly agreed or agreed they would take advantage of cash rewards or grants. The respondents also said they would take advantage of cheaper prices when the whole street decided to have the work done together (56.9%). Savings on costs of repairs and replacements was another strong motivator (55.9%). The least popular motivation was to keep up with other members of the community (22% of respondents agreed/strongly agreed). More respondents from the higher social grades (61.8% in AB) were motivated by the possibility of getting a better price when the flood protection works are done for a group of neighbours than lower groups (51% in DE), but less motivated by "keeping up with what other people are doing" and "having a peace of mind".

Investing into energy-saving measures was mainly motivated by possibility of saving on electricity bills (79.6% of respondents agreed or strongly agreed). Over 72% of respondents would be motivated by cash rewards or grants (72.2%). However, a nearly equally strong motivator was the feeling that they have done something about climate change (70.8%). Again, keeping up with other people from the community was the weakest impulse for action (28.1%) and more respondent from lower socio-economic groups would like to install energy-saving measures to keep up with other people (32.4% in DE; 25.1% in AB).

Over 53% of people would be motivated to invest into property-level flood protection measures by non-cash rewards like free goods and services and nearly 60% of respondents would be motivated by non-cash incentives to invest into energy-saving improvements. There were no significant differences between SESs in relation to being motivated by non cash rewards both in the case of energy-saving improvements and flood protection measures.

The preferred types of non-cash rewards were vouchers for fruit and vegetables and free meals at restaurants. The least popular award was free bus travel (Table 14). Types of rewards volunteered by the respondents included vouchers for high street stores (13 respondents), holidays (7 people), grants for improvements (6 people), reduced council tax, and reduced bills (6 respondents each).

Table 14 Types of non-cash rewards that would be accepted by respondents

Reward	Yes	No	Don't know
Free bus travel	22.7	73.0	4.3
Entertainment tickets	34.2	62.1	3.6
Leisure and health centres	33.3	64.0	2.7
Vouchers for fruit and vegetables	56.0	40.9	3.1
Free meals at restaurants	53.2	43.8	3.0

There were no significance differences among different socio-economic groups in terms of their willingness the rewards in return for investment in flood protection or energy-saving measures. The lowest interest in bus travel was among people from groups AB and DE, where, respectively, high car ownership and senior bus passes can be expected. People from group C2 had the most interest in free bus travel, entertainment ticket, vouchers for leisure centres and free fruit and vegetables. Free meals at restaurants were the most popular among respondents from group C1 (Table 15).

Table 15 Rewards preferred by respondents from different socio-economic grades (%)

	Bus travel	Entertainment tickets	Vouchers for leisure centres	Vouchers for fruit and vegetables	Free meals at restaurants
AB	21.0	35.2	31.8	55.8	53.6
C1	21.7	31.5	33.2	58.4	55.6
C2	24.7	40.9	39.9	59.1	54.0

DE	21.4	32.4	31.4	56.2	51.9

Over 40% of the respondents would not be persuaded by any amount of non-cash rewards to spend money on flood protection, and 31.4% would not be persuaded to receive rewards in return for energy-saving improvements. Most of the remaining respondents would be happy to receive rewards up to the value of investment they made (Table 16).

Table 16 Value of non-cash rewards that would be accepted in return for making improvements

Value of rewards	Percentage of respondents	
	Flood protection	Energy saving
50% of the cost of the improvements	25.0	31.1
100% of the cost of the improvements	23.6	26.0
Up to 200% of the cost of the improvements	11.3	11.6
No amount of rewards would get me to spend money	40.1	31.4

The differences between socio-economic groups in terms of the value of rewards they would accept in return for investment into their house were more significant in the case of energy-saving measures (Figure 36) than flood protection improvements (Figure 37). In group C2 the highest percentage of people would be satisfied with rewards worth only 50% of the money they spend.

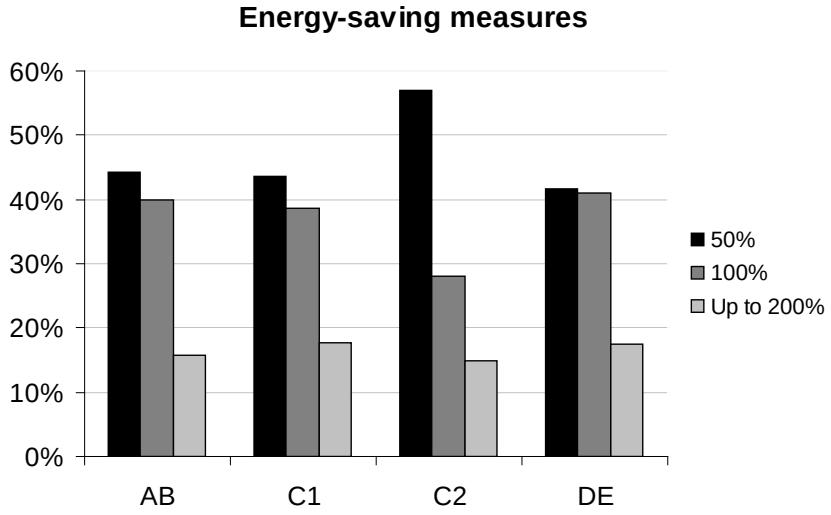

Figure 36 Value of rewards respondents from different socio-economic groups would accept in return for investment in energy-saving improvements

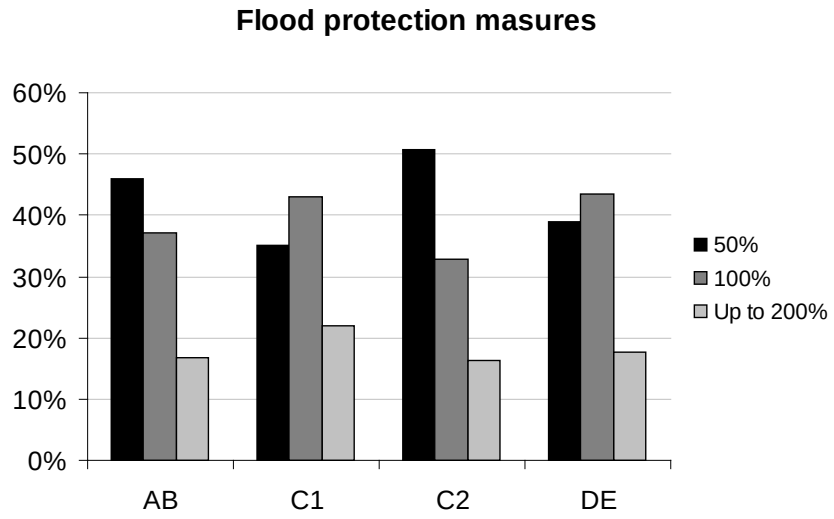

Figure 37 Value of rewards respondents from different socio-economic groups would accept in return for investment in flood protection measures

5.5 Comparison between the England and Wales and Salford surveys

The characteristics of respondents (age and employment structure) in Salford survey make them the most similar to the social grade DE respondents in telephone survey in England and Wales. The results of group DE nationally (210 people) and respondents from Salford (101) are compared below.

In England and Wales, 73.6% from the group DE were over 60 years old, compared to 50.6% in Salford. In group DE, 72.9% were retired and only 7.1% were employed full-time, compared with 44.4% retired and 33.3% working full-time in Salford. There were no significant differences between respondents from Salford and England and Wales in terms of the length of residence in their houses. Respondents in Salford and people who answered the survey ain England and Wales lived predominantly in 3 bedroom houses. However, significantly more people from England and Wales lived in houses larger than 3 bedrooms in comparison to Salford.

Less respondents in the Salford survey than in the national survey disagreed or strongly disagreed with the statements that they were concerned about climate change, that their houses contributed to climate change and that they could do something about climate change by limiting the use of energy in their homes (Table 17).

Similar percentage of people nationally and in Salford had previously been affected by flooding. However, more people in the telephone survey said they knew they lived in flood risk area (77.4% compared to 56% in Salford). The perceived risk their house would get flooded were similar at the national and local level; the levels of subscription to Floodline Warnings Direct nationally and in Lower Irwell (Floodline Warnings Direct at the time of the survey was not in operation in Alder Forest) were also similar. More people in Salford had flood insurance (73.1%) than in England and Wales (62.5%).

Table 17 Awareness of climate change among respondents to England and Wales survey in comparison to Salford survey

Levels of agreement	DE in England and Wales		Salford	
	Agree/ strongly agree	Disagree/ strongly disagree	Agree/ strongly agree	Disagree/ strongly disagree
Concern about climate change effects	55.4%	25.6%	56.0%	14.0%
Personal contribution to climate change	67.3%	21.4%	68%	8%
Possibility to make a difference	78.0	11.9%	76.0%	9%

More respondents out of people interviewed in England and Wales agreed and strongly agreed that it was the owners' responsibility to protect their properties against flooding (76.8% compared to 62.2% in Salford). Similar percentage of respondents nationally and in Salford would consider installing door guards, air brick covers, raised electric fixtures and concrete bottom of staircase. Nationally, many more respondents would consider changing flooring to tiles (32.7% compared to only 20.2% in Salford). The percentage of respondents who already had energy-saving measures installed was much higher in the case of national survey than in Salford (Table 18). This includes the levels of implementation of "Big four", i.e. loft and wall insulation, efficient boiler and double glazing, which were present only in 14% of houses in Salford and a quarter of properties in group DE at the national level.

Table 18 Existing energy-saving measures among respondents in group DE in England and Wales survey in comparison to Salford.

	DE in England and Wales (%)	Salford (%)
Double glazing	84.8	40.2
Loft insulation	76.2	46.8
"A"-rated appliances	58.6	17.6
Wall insulation	54.3	34.0
Efficient boiler	50.5	32.3
"Big four"	26.2	14.1

There was no significant difference between people in group DE in England and Wales and respondents from Salford regarding the sum of money they would like to spend on flood protection and energy-saving measures.

Higher percentage of Salford respondents, in comparison to the people who answered the survey in England and Wales, agreed or strongly agreed that they would be motivated by different factors to install energy-saving and flood-protection measures. Comparable answers were given on the motivation "to keep up with what other people are doing" to install flood protection measures (Table 19), "to do something about climate change" and "to take advantage of cheaper price when the whole street or group of neighbours decided to install the same measures" in the case of energy efficiency (Table 20). The only motivating factor that respondents from Salford

indicated less often than the respondents in England and Wales was "to keep up with other people" in terms of installing energy-efficiency measures.

Table 19 Percentage of respondents who agreed or strongly agreed on the reasons to motivate them to invest into protecting their house from flooding

	England and Wales	Salford
To get peace of mind	59.0	66.3
To save on flood insurance	54.8	67.4
To save on repairs/replacements	58.1	70.0
To increase the house value	46.2	60.4
To keep up with other people	27.1	27.4
To use cheaper price when collective action	51.0	56.6
To take advantage of grants	64.8	74.4
To receive non-cash rewards	50.0	62.9

Table 20 Percentage of respondents who agreed or strongly agreed on the reasons to motivate them to invest into energy-saving measures

	England and Wales	Salford
To do something about climate change	72.4	71.4
To save on electricity bills	77.6	84.6
To increase the house value	60.0	68.1
To keep up with what other people	32.4	24.2
To use cheaper price when collective action	56.7	55.6
To take advantage of grants	67.1	74.2
To receive non-cash rewards	55.5	65.2

There were no significant differences in the percentage of respondents in England and Wales and in Salford who preferred a given type of non-cash reward. But, significantly less people from Salford than from the DE group nationally said they would not accept any rewards for flood protection or energy saving improvements (Table 21).

Table 21 Percentage of respondents who would not accept any value of non-cash rewards in return for investment in flood protection and energy-saving measures

	England and Wales	Salford
Flood protection	44.5	27.3
Energy saving	34.6	23.9

Out of those who would accept rewards, twice as many respondents in Salford as in England and Wales would like to receive rewards up to a double value of the investment they made to house. On the contrary, higher percentage of the respondents surveyed in England and Wales would be satisfied with rewards worth 50% of the investment made (Table 22).

Table 22 Comparison of acceptable value of rewards between Salford and England and Wales surveys (percentage of respondents who would be prepared to accept the rewards).

	Flood protection		Energy saving	
	England and Wales	Salford	England and Wales	Salford
50%	37%	17%	41%	18%
100%	48%	52%	43%	50%
Up to 200%	15%	31%	16%	32%

5.6 Recommendations

The survey carried out with owner-occupiers in Salford and in England and Wales leads to the following recommendations:

- The high level of awareness of climate change among owner-occupiers suggests that more efforts could be exerted to promoting action rather than raising awareness. However, there were differences in the perceived personal responsibility for climate among different social grades; therefore more persuasion may be needed in areas of lower income;
- The possibility of increased risk of flooding in the areas included in Phase 2 should be promoted more fully before participants from this area are motivated to protect their homes;
- There was a low awareness of flood protection measures that could be implemented by house owners; therefore, more information about them should be provided to householders in flood risk areas;
- There are almost no flood-proofing improvements in place in housing in England and Wales where flood risks have been identified. The take up of energy-saving solutions among owner occupiers is much higher at the national scale; however, in Salford case-study areas it does not exceed 50%. It suggests that there is scope for different approach to motivate homeowners;
- It could be speculated, that people from higher social grades would be more interested in mitigation measures, and adaptation measures would be of more interest to those from lower social grades;
- There is widespread misunderstanding of the flood-proofing measures (for example that the air brick covers and door guards are not permanent) and more work needs to be done to educate householders in this area;
- As the current level of implementation of energy-saving measures varies from house to house and the risk of flooding is likely to differ within the threatened areas due t local topography, the scheme needs to offer a surveying service assessing the need for energy-saving and flood-protection measures;
- A wider array of adaptation and mitigation improvements might have to be considered to meet the expectations and preferences of participants and to match the results of house surveys;
- The more aware of climate change the respondents were, the more money they would spend on the improvements in their houses. Therefore, awareness-

raising and education action is likely to increase the interest in property-level flood protection measures and energy-saving improvements;

- A wider range of incentives are needed as some of the respondents rejected the reward scheme idea in its entirety. Some people are likely to reject the idea for other reasons;
- Disruption during installation of the improvements was considered to be a problem for some owner-occupiers and coordination between flood protection and energy-saving improvements is required to minimise this;
- The telephone survey in England and Wales indicated that people who had previously been flooded were more willing to invest in flood resistance and resilience measures than other respondents. Therefore, the pilot study should include areas with recent history of flooding;
- The high levels of deprivation could have had an impact on the high value of rewards preferred by the respondents in Lower Irwell. On the other hand, much value of rewards that would be acceptable to the respondents (50%-100% of the investment value) of the telephone survey n England and Wales. If people can be persuaded by rewards worth up to 100% of the investment value, the financial feasibility of the scheme is significantly improved;
- The low disposable income among owner-occupiers in the more deprived areas highlighted the need to extend the eligibility for energy-saving grants beyond the pensioners and people on benefits. Among the respondents who said they could not spend money on energy saving there were people in full-time employment;
- Similarly, grants for flood protection would be a welcome initiative as many people cannot afford those improvements to their homes. This is particularly important because of the high percentage of elderly people living in flood risk areas;
- Due to mixed tenure in the study areas, private and social landlords should be invited to participate in Phase 2. Results of investigations into the landlords' attitudes to climate change adaptation and mitigation measures are presented in Annex 2.

6 Reward-Based Schemes for the Private Rented Sector and Social Housing

Key Points

- Tenanted properties form a significant proportion of housing stock in flood risk areas;
- There is support from both private landlords and Registered Social Landlord managers to improve the housing they manage to cope with dangerous climate change;
- Many landlords are attracted to rewards that would accelerate their actions;
- RSLs are hampered by constraints on budgets, and limited performance criteria that do not explicitly include energy saving measures or flood protection.

6.1 Landlords and Climate Change

The Lower Irwell Valley's housing stock is dominated (more than 70%) by tenanted properties. While reward-based incentives are more likely to attract those that own and live in their houses, there is potential scope to amend the terms of a reward scheme to attract landlords (both private and Registered Social Landlords-RSLs) to address the effects of climate change on the properties they own and manage.

The need to involve managers of former Council stock is even more pressing when the type of stock managed by RSLs is considered. This stock often includes houses of poor thermal qualities that are difficult to insulate (tower blocks, non-cavity wall houses, mass-build experiments etc.), as well as old housing stock that has suffered from under-resourced maintenance programmes.

Furthermore, the Government lacks the effective levers to compel landlords (particularly in the private sector) to invest in protection against dangerous climate change. At the moment there is no information about private and social landlords' opinions on feasibility of installing property-level flood-proofing measures and energy-saving improvements. Registered Social Landlords are guided in the improvements they carry out by the Decent Homes Programme (CLG, 2006a), which has a weak link to energy-saving and none to flood resilience and resistance measures. There are no regulations in place for private landlords that would compel them to act on flood-proofing their properties or implementing energy-saving measures. The Code for Sustainable Homes (CLG, 2006b) provides regulations for new houses, yet there is no such code in place for the existing buildings.

Private landlords can apply for the Landlords Energy Saving Allowance - a tax allowance which allows landlords to claim back income or corporation tax for

expenditure on buying and installing certain energy saving measures. Tax relief is for a maximum of £1,500 per property. The Energy Saving Trust has details for landlords on www.energysavingtrust.org.uk/Home-improvements/Private-landlords). In Salford, the private landlords who have been accredited by the City Council are eligible for a free energy package worth £800, including contribution to loft and cavity wall insulation, hot water jackets for boilers and energy-saving light bulbs.

Some business and public sector bodies in the UK have benefited from the Climate Change Levy. Imposed in 2001, the scheme adds about 15% to gas and electricity bills. However, there is up to an 80% rebate on this charge in return for meeting energy or carbon savings targets. The result is a net saving when cheaper energy bills are included in the calculation.

6.2 Aims and objectives of the landlord surveys

The research aim was to test the willingness of private and social landlords to carry out works on their properties that would make them more flood-resilient and more efficient and to investigate the willingness of social housing tenants to accept these improvements. This willingness, or lack of interest, was further tested by asking if attitudes changed when incentives, based on non-cash rewards, were offered. In order to achieve this aim, the following objectives were set:

- To investigate the awareness of climate change and the perceived responsibility to take action among social and private landlords, and social housing tenants in case-study area;
- To explore the willingness of private and social landlords to make flood protection and energy saving improvements to their properties; and to assess tenants' willingness to accept such changes to their dwellings;
- To look into the preparedness of landlords to accept a selection of non-cash incentives and rewards in return for making changes to housing.

6.3 Methods Used to Obtain Views of Those in the Rented Sector

Given the time constraints of the study, and the understanding that the project was primarily directed towards owner-occupiers, the research plan was to gain an insight of landlord and tenant attitudes about the key issues surrounding the Resilient Homes study through limited interview and survey work rather than attempt a significant sample of the whole rented sector. Three lines of inquiry were followed within the Lower Irwell study area in East Salford:

- A mail-administered questionnaire was issued in April 2009 to 100 private landlords operating in the low-income case study area. The questionnaire was sent on behalf of the University of Salford by the Salford City Council

Landlord Licensing Department in order to avoid disclosure of private landlords' data.

- Semi-structured interviews carried out in March 2009 with the representatives of the management team of Salix Homes (which is the Arms Length Management Organisation (ALMO) managing the public housing stock in Salford). The questions related to the existing and planned implementation of flood protection and energy-efficiency measures to Salix Homes' housing stock, and on the possible incentives that would enable Salix Homes to increase the scope of implementation of these improvements.

- Two focus groups with Salix Homes' tenants organised in March 2009 in order to gauge the awareness of tenants of the climate change issues, assess their willingness to accept flood-protection and energy-saving changes to their homes and explore whether incentives for tenants were needed to accept the changes to their homes.

6.4 Summary of Views from the Rented Sector in East Salford

There is a detailed account of the interviews, questionnaires and focus groups carried out for this part of the study in Annex 2. Broadly, social housing tenants' awareness of climate change was similar to the owner-occupiers surveyed in the other parts of the project. There was no objection to the proposal that landlords should undertake work to their homes to improve energy conservation levels, or resist future floods. This was true even for those that had recently undergone disturbance in relation to improvements associated with the Decent Homes Programme.

Most of the private landlords, and all of the social housing managers (Salix Homes) were in favour of additional works to houses to prepare them for climate change impacts although most were concerned about the cost of work. Many were interested in the possibility for rewards in exchange for undertaking this work.

6.5 Recommendations

- A project that addresses the effects of climate change on housing should involve social landlords. If the Environment Agency wishes to continue to work in deprived areas, then social housing can not be excluded as this tenure is dominant in these areas;
- Social landlords are willing to undertake the necessary renovation to existing stock to make it compliant to reducing the impact of dangerous climate change, but have neither the funding, nor the performance incentive to do this work at present. Government through the Housing and Communities Agency will need

to earmark additional ring-fenced finding to the reduce the consumption of greenhouse gases of social housing stock, and link this to performance criteria in conjunction with the Department of Energy and Climate Change and DEFRA;

- The Decent Homes Programme is ineffective to motivate RSLs to make flood-protection improvements and it does not include specific energy-saving measures. Therefore, either the Decent Homes criteria need to be tightened, or a new performance measure needs to be established to cover the issues of property-level energy efficiency and flood protection;
- RSLs should be required to identify all stock under their management that is in a flood risk area. Further, the nature of remedial work for each unit should be assessed using a qualified surveyor;
- In order to identify the housing stock within flood risk areas, improvements in the flow of information about flooding between City Councils and their RSLs are necessary in order for housing managers to identify properties at risk and take necessary actions;
- Rewards and incentives may reduce the cost of this initiative. Free building materials and expertise in finding innovative solutions to flood-proofing and energy saving were the preferred non-cash incentives for both social and private landlords and this should be explored further if landlords are to be included in the Phase 2 pilot;
- The high level of understanding about climate change among the social tenants suggests that education and awareness campaigns by social landlords will be less effective than making behaviour change options clear and easy to adopt;
- There is a high level of support for flood-proofing and energy-saving initiatives among the tenants and they were not perturbed by additional work to their houses, even when they had recently been disturbed by renovations under the Decent Homes programme and this should not be used to delay this work should the mechanism of implementation be agreed;
- Solutions that apply to all social landlords may be more efficiently applied at a city-region (Greater Manchester) or regional level;
- It is important that RSLs are enabled to make long-term investments in order to plan for dangerous climate change;
- Better information should be provided to private landlords about existing energy-saving grant schemes, as the awareness of these schemes was low;
- Grant schemes for private landlords exist for energy saving measures, and this should be extended to flood-protection measures.

7 Implementing a Rewards-Based Behaviour Change Scheme

Key Points

- There are two types of reward; void/gap and policy supported. The former is easily supplied providing there supply continues to outstrip demand. The latter needs to be complemented with a policy that the State wishes to fund, regardless of the reward initiative;
- The most popular reward offered in the Resilient Homes survey was fruit and vegetables. This can be associated with the drive to get the population to increase its consumption of these foods;
- There are many organisations that are willing to donate rewards to a climate change initiative;
- More cross-Departmental work needs to take place in order to co-ordinate a multi-agency, multi-sector initiative like the one proposed in this study;
- A 200 household pilot will confirm many of the attitudes and commitments uncovered in Phase 1 of this study.

7.1 How the Study Supports the General Principles of Reward Schemes

The literature review and surveys carried out for this project, and described in earlier parts of this report, show that the necessary conditions that would support a successful reward-based scheme to help householders protect their property against dangerous climate change exist in England and Wales. These include:

- High levels of concern by householders about climate change impacts and a feeling of personal responsibility for climate change;
- Significant numbers of house owners who are interested in adopting flood protection and energy-saving measures in their homes;
- A large percentage of house owners who are prepared to pay something towards these improvements;
- A majority of householders who would be motivated by non-cash rewards to install the improvements to their homes;
- Sections of the social psychology community that suggest that a cash-equivalent scheme can change people's behaviour to purchase one-off improvements to their houses, and may be led to adopt more long-term changes as a result of this.
- The ability of reward-based schemes to further government initiatives in other policy areas such as offender rehabilitation programmes or health improvement programmes, or the take-up of public transport.

In order to assess the final condition affecting the feasibility of the project, i.e. the availability of non-cash rewards for the scheme, extensive interviews were carried out with executives from private companies, public bodies and non-governmental organisations.

7.2 The Potential Rewards that Might be Considered for a Behaviour Change Scheme

7.2.1 Types of Reward

The researchers considered a number of criteria for the rewards that would test respondent's interest in participating in a future scheme. It was concluded that the rewards would ideally be:

- Attractive to prospective participants
- Easily valued by obtaining retailers' prices on the open market through tender requests or inquiry
- Offered without the need for any additional payment by the participant
- Provided at considerably less than market cost, or funded through other schemes
- Have intrinsic value that encourages sustainable living regardless of the behaviour they help to change
- Support the local economy

The Salford survey and the telephone questionnaire in England and Wales conducted for this study offered respondents a list of rewards based on precedents found elsewhere in the world, and ideas born out of conversations with local businesses and organisations. These included:

- Vouchers for free fruit and vegetables,
- Entertainment tickets,
- Free meals at restaurants,
- Vouchers for health centres,
- Free bus travel.

The public transport and fruit and vegetables were inspired by the Curitiba experiment (see Chapter 4). The other ideas were offered as examples where voids or gaps in public or private provision might be offered at low or no cost in order to promote business opportunities to potential customers who may not have considered patronising the business without the inducement.

As stated in Chapter 5, the most popular reward on the list was the free fruit and vegetables. Restaurant meals were the next most popular on the list. However, since

the list was compiled, three other ideas came to light. Train travel was suggested by Greater Manchester Passenger Transport Executive (GMPTE) during an early discussion about free bus travel. Free landscaping to gardens and drives was an idea that arose after Groundwork Trust became involved in another part of the Resilient Homes programme. Finally, Greater Manchester Chamber of Commerce suggested free places at the local further education college.

When the implication of supplying all of the rewards were considered by the research team, two clear types of reward emerged. There were:

- Void or provision gap rewards,
- Policy-supported provision.

7.2.2 Void or Gap Rewards

These rewards included places where an entry fee or the take-up of a seat (and the enjoyment of the meal/entertainment/journey/course) is sold. The providers of these rewards would say that the provision of spare capacity does have a small cost in terms of the duty of care they would need to show scheme participants who would and should be treated the same as someone who directly purchased entry to the service. However, these providers would also be interested in attracting more people to their venues and services providing numbers do not overwhelm logistics. Indeed, many businesses employ promotions that include free entry, often as a buy-one-get-one-free arrangement.

There are variations to conditions associated with this type of reward. Capacity for some providers can be time dependant. Public transport companies would find it difficult to accommodate large numbers of additional passengers during rush hour. Some businesses in a sector are more popular than others. Entry to some Premier League Football Clubs may not be viable, whereas other sports may not be as popular, save for a key derby or cup match. This does also have a bearing on the desirability of the reward.

In the case of places at Colleges, there would have to be a minimum financially viable number of paying attendees to cover overheads before additional rewarded participants could take up their places.

On this last point, it may be that in order to overcome some financial shortfalls, the State will have to recognises the value of the reward scheme both in minimising the impact of climate change, and encouraging the take-up of further and continuing education. If this is the case then a subsidy may be offered to cover the overhead. Providing the college is making a surplus elsewhere in its business plan, this may be an acceptable solution.

7.2.3 Policy-Supported Rewards

Where a gap or void exists as a potential sale, the true cost of provision as a reward can be reduced to a low value. However, where the rewards are goods, or contain goods that the reward donor has purchased, then selling at a heavy discount will be unattractive and an alternative scenario will need to be applied. It may be acceptable to offer goods for free for the short duration of a promotion, but this is not a viable option for a reward programme that seeks to attract large numbers of people over a medium time frame.

An alternative is to identify a policy programme that requires the State to invest in a desired outcome. This may be anything from the generation of jobs and skills, training, healthy outcomes and habitat protection. The key to the success of this type of reward is to extract two outcomes, literally for the price of one. In this way, behaviour is changed through the acceptance of a reward that the State would have paid for anyway. There are two policy-supported examples that have been explored in this project. One offers labour for gardening through a social enterprise that rehabilitates ex-offenders. The other offers a vehicle for subsidised fruit and vegetables via a major supermarket.

7.2.4 The Cost of Rewards

The cost of the reward scheme is fundamental to its success. There would be understandable scepticism about mounting a reward scheme that incurred a higher cost (including the administrative resources) compared to cost the State could pay to do the work in a more direct manner. The participant that expects a reward for his or her outlay will need to believe that the value of the reward is worth at least as much as the money that they spend. This is fairly easy to achieve where void or gap rewards are offered as the market value to the participant is obvious, while the true cost is negligible.

For policy-supported rewards this is more difficult to justify simply on grounds of cost without including the social and environmental return on investment. There is still a double benefit to the State for helping ex-offenders or increasing the consumption of produce while lowering greenhouse gas emissions and protecting property from flooding. However, there are a number of other indirect benefits that could be generated by a reward scheme. Taken together the combined benefits can be summarised as:

- The direct societal savings from avoiding dealing with the consequences of dangerous climate change;
- The indirect benefits that are provided by the reward (more public transport take-up leading to lower private car emissions and congestion for example);

- The personal and community well-being associated with enjoying the reward and the pride (albeit induced) from taking personal responsibility and contributing to the solution of a common problem.

The following section of this report describes the extent of negotiations with potential reward donors at the time this report was submitted. While some rewards are available to be offered virtually immediately, others will need more time to ensure donors are comfortable with their role in the scheme. Some rewards are likely to remain as potential ideas until either funding or more effective methods to attract donors into the scheme are devised.

7.3 Explored Rewards

7.3.1 Free Bus Travel

As described in Section 4, the city of Curitiba in Brazil has used free travel on the bus services to change behaviour towards the environment. The Curitibans were interested in rewarding higher recycling rates, but this same reward could be offered to those that invested in protecting their homes against dangerous climate change.

Discussions were held with Greater Manchester Passenger Transport Executive (GMPTE) about the possibility of encouraging bus and train companies serving Salford to offer a limited number of free passes for a Phase 2 pilot scheme. GMPTE is the trading name of the body whose role is to carry out the policies of its Integrated Transport Authority. The Authority is responsible for providing the transport services and facilities which the market does not provide in large conurbations. The Executive serves the ten District Councils of Greater Manchester including Bolton, Bury, Manchester, Oldham, Rochdale, Salford, Stockport, Tameside, Trafford and Wigan.

Representatives of GMPTE were positive about the reward scheme proposal and told researchers that *'it was supportive of new and innovative ways of promoting public transport. The proposed scheme certainly appears to have potential. Its novelty in Britain suggests that a trial is the correct way to proceed'*. The representative went on to say:

> *'The desired outcome for GMPTE would be to increase off-peak patronage without damaging revenue by encouraging modal shift from car and additional journeys made by existing passengers. Most public transport in Greater Manchester is currently full at peak times, so unless and until additional capacity is made available it would not be wise to encourage more peak travel as this could drive away existing passengers'.*

However, a reward scheme that offered free public transport was, on balance, viewed as a positive innovation and GMPTE said that it could practically support a reward

system for good sustainable behaviour by negotiating and liaising with operators to provide ticketing. When asked what effect a wider scheme would have (for example, encompassing the whole of Salford, or the whole of Greater Manchester) the PTE thought there would be a number of issues to work through including:

- Making the case to bus, rail and Metrolink (the city-regional tram system) operators for ticketing;
- Potential loss of revenue from passengers;
- Potential capacity issues on public transport;
- Staffing and administrative issues within GMTPE.

However, the GMPTE view was that these would be problems of success rather than failure, and it would be helpful to establish whether the scheme would work and it was appropriate for Greater Manchester to be the first to try it out. The representative said that 'if clear benefits can be articulated for all parties, we anticipate that any problems could be overcome'.

While details of the reward scheme will need to be worked out prior to the pilot, GMPTE considers that the offer most likely to be taken up by participants would be weekly single operator passes. An example of this would be the bus company First Group which offers a FirstWeek pass for £15.50. Other possibilities would be a Wayfarer ticket that would allow participants to travel on buses, trains and trams in Greater Manchester for £9.20 per day

Therefore, if a householder spent a total of £300 on door guards or loft insulation, it would entitle them to free bus travel for 6 months if the reward was geared at 150% of expenditure. GMPTE said that it would be prepared to offer an initial budget of £5,000 towards free bus travel to the Phase 2 pilot.

7.3.2 Free Train Travel

At the time of writing, two train companies serving Greater Manchester accepted that offering travel on trains was a feasible contribution to the scheme. Northern Rail operates networks across the north of England, serving a population of nearly 15m. The company's trains call at over 500 stations which is approximately 20% of all UK railway stations. First TransPennine Express (FTPE) runs inter-city train services on three main routes across the North of England. The company links Liverpool and Manchester with Leeds, York and the North East, with Sheffield and Doncaster, and with the Lake District and beyond. The most recent route linked Manchester with Glasgow and Edinburgh.

While untested by the attitudinal surveys, a reward scheme offering free rail travel would operate in a similar way to free bus travel and may be more attractive to those who would value trips away from the city.

7.3.3 Free Tickets to Rugby League Matches

The local Rugby League team, Salford City Reds, had its first season in 1896 and plays in a stadium (known as The Willows) that is less than 3 km from the study areas. The team has had plans accepted to build a new stadium in Barton, but work on this is on hold because of the current economic conditions. Tickets on a game-by-game basis are £17 to stand and £22 for a seat. Season tickets are £150 to stand and £180 to sit. The club also sells packages including a meal and seats for the game for £50.

The Club would have concerns about offering free tickets to reward scheme participants if those that accepted the tickets were already intending to pay to see the matches. However, the Chief Executive thought that this was worth investigating as it might equally be the case that new fan who would not have considered coming to the games would become regulars because they were introduced to the game by the scheme.

The Club would be able to track the people who accepted the free tickets because they have a data base of fans, and each ticket is issued to a named individual. The Willows would be able to accommodate the scheme members as the current capacity is about 11,000, but average gates are around the 5,000 mark.

The Club agreed to offer as many tickets as the scheme members required for the 200 household pilot, and would review the take-up of tickets at the end of this period.

7.3.4 Free Admission to Further Education Courses

Salford College is the new institution comprising the merger a number of further education colleges. The College offers a range of courses from 'leisure learning' through to vocational courses (see box below).

The Principle of the College was interviewed to determine whether the College was able to offer free places for certain courses as part of the rewards scheme. He said that places at the College may not appeal to some householders as many will already have free access to courses. This includes the under 19s, and anyone on benefits.

The College said that it had an interest to attract more people to increase their skills and the reward scheme had the potential to do this. An initial budget of £20,000 of course provision has been set aside for those taking up places through the reward scheme in the Phase 2 pilot. In the longer term, the College considered that if the Council or a sponsoring government department bought course spaces at 60% of

their market value (representing coverage of salaries, and the rules were relaxed barring entry for anyone other than first time attendees, then the College could offer places to many more people.

Leisure Learning Club	Vocational courses
• Art • Costume Jewellery • Ceramics • Cookery • Beginners Garment Making • Intermediate French & Culture • Costume Jewellery Making Healthy Delights Cookery • Soft Furnishings • Spanish Language & Culture • Yoga • Metal Jewellery • Photoshop	• Construction & Building Services • Creative Industries • Teaching and Supporting Learning • Health, Care & Counselling • Financial Services • Hairdressing & Beauty Therapies • Information Technology • Speaking Modern Languages • Functional & Basic Skills in English & Maths • Learning for leisure & personal development

Administration could be made simple if the College produced vouchers that the Council could distribute on proof of purchase of flood protection or energy conservation goods and services.

7.3.5 Free Fruit and Vegetables

This reward also has a precedent in Curitiba, but there are also examples of free fruit and vegetables in the UK. Families on certain benefits can be eligible for vouchers through the 'Healthy Start' programme. There have also been a number school-based fruit and vegetable initiatives such as the School Fruit and Vegetable Scheme launched in 2004.

The prospect of receiving free produce as part of the climate change reward scheme proved very popular in the attitudinal surveys carried out in Salford and England and Wales. While the pilot is not obliged to offer this reward, it would be an advantage to secure this, and possibly other foods, in order to attract more participants. The challenge for retailers is to offer the food without undermining profitability. In order to test the viability of asking retailers to offer fruit and vegetables, researchers approached two major businesses.

Discussions with the supermarket ASDA (a Wal-Mart company) resulted in an interest by the company to be the delivery system through which the Government's commitment to increase the consumption of fruit and vegetables can be achieved. Statistics show that the average consumption of produce in the UK is approximately 2.5 portions a day. In deprived areas this average decreases to 2.1. These figures have

not improved markedly despite some intense government-backed campaigns to change behaviour.

There are few weapons left in the State's arsenal on this issue. One is to increase the cost of unhealthy foods. Making the unsustainable unaffordable is a familiar ploy and is applied (by the addition of taxes) to 'harmful' goods such as cigarettes and vehicle fuel. However, pricing out bad behaviour is also inequitable and penalises the poor leaving higher income consumers largely unaffected. It is attractive to the State because, unless the higher price results in a significant change of behaviour, it results in a revenue neutral position, and may bring in additional taxes.

The other main financial lever is to subsidise sustainable goods and services. This can be done by the removal of taxes, or the subsidisation of the uncompetitive margin to give it a comparable price point. This was achieved by the European Union to give high efficiency appliances (A and B rated) price parity with less efficient units. This is less attractive to the State as it has significant costs, but it is equitable and draws consumers into a positively directed choice. If the criteria of 'no additional expenditure' was applied to the Resilient Homes rewards scheme then the State would need to pay wholesalers or the retailers the entire price of the goods as it does already for low income families. While this may seem an unlikely decision by Department of Health Ministers, when measured by social return on investment, the resulting decrease in National Health costs (because the population becomes healthier) may seem like a smart investment.

From the retailers' point of view, this may appear to be a good scheme to support because of beneficial media coverage and the approval returns from customers. This is likely to compensate for the administrative requirement to receive and verify as genuine the fruit and vegetable vouchers that are 'spent' by reward scheme participants.

7.3.6 Free Landscaping

The offer of landscaping is useful in that it is something that many people would like but rarely buy, particularly in inner-city areas where garden are small or, housing that has paved yards at the rear, and doors that open to the street.

However, it is the potential for landscaping to offer to change the permeability of the hard surfaces that offers an added value to the climate change project. A high volume of rain falling in a short time period is increasingly responsible for flash flooding and the overwhelming of surface water drainage systems. Greater permeability of the ground in inner urban areas would reduce the potential for flooding. If landscaping services could include the conversion of drives and car ports from impermeable to permeable hard standings, then the reward could also represent an adaptation measure.

Groundwork Manchester, Salford, Stockport, Tameside & Trafford was interviewed about the possibility of offering a service it is starting in the area to the reward scheme. Groundwork has decided to take up the franchise for a social enterprise called Blue Skies. The business model uses newly released offenders as the primary workforce for a landscaping business. Blue Skies is based on statistics that show that 70,000 of the 90,000 released offenders return to prison within two years. However, this figure reduces to 45,000 if former offenders are offered a job. The Blue Skies model helps 60% of those that enter the programme to find better jobs when they leave.

The Blue Skies business run by Groundwork in Manchester has already secured work with Councils and the Forestry Commission. It needs to find 70% funding from contracts to be viable. Groundwork thinks that it could create a number of garden templates for those that want to receive landscaping as a reward. The commercial fee for a garden or yard make-over is £2,000 to £3,000. Details are still being considered, but with subsidies and labour overheads, the Blue Skies business could complete this type of work for around £1,000. This means that this reward will need a funder for it to be able to be offered to participants on the pilot. However, as a high value reward with climate change adaptation advantages, it could attract subsidies from other programmes.

7.3.7 Other Rewards Proposals

There were a number of potential rewards that could not be investigated within the Phase 1 timeframe. Among these were free cinema tickets, free theatre and other entertainment tickets, tickets to other sporting venues, free meals at restaurants, and shopping vouchers.

The main difficulty with these rewards is that, like fruit and vegetables and landscaping, they will require a level of subsidy. Attracting donor businesses often requires time and effort to cultivate individual store managers and help them to see the commercial advantages of join the scheme.

If the Phase 2 pilot received sufficient publicity, and gets support from the Manchester business community, there may be a chance to add to the reward list as businesses voluntarily come forward and offer some of their goods and services for scheme. This is what happened with the NU-Spaarpas scheme in Rotterdam (described earlier in this report) when, after a slow start, over 100 businesses were participating in the scheme by the end of the experiment.

7.4 Administration of a Reward-Based Behaviour Change Scheme: East Salford Case Study

Based on the findings from the attitudinal surveys conducted in this study, successful reward schemes would incorporate the following elements:

- A combined (flood and energy) surveyor service that will respond to initial visit requests and follow-up visits (post purchase and installation) in a timely manner
- A range of climate change modifications that will appeal to variations in both income and house type.
- The facilities to expand the list of modifications as new products become available. This might include solid wall insulation, more efficient insulating glass, different types of water-proof furnishings or decoration etc.
- A flexible, attractive combination of rewards that will at least match the amount that the householder has spent on the modifications.
- A simple administration system that recruits participants, manages both the participants and the reward organisations, confirms eligibility for the rewards, and verifies that the householder has fulfilled the requirements of the scheme (proof of purchase, installation etc.).

It is anticipated that those that wish to join the reward scheme will need to have their house surveyed for both remedial work to protect against flooding, and for the potential to save energy. A combined visit would be preferable to avoid multiple visits and disturbance to residents. Details of how this would be supplied (public or private sector delivery) this may need to be agreed each time a scheme is set up in a new area. Alternatively a National contractor list might be set up that would encourage contractors to form alliances to allow a one-stop arrangement to be offered to scheme co-ordinators. The survey report will help to identify those works that are needed, and those that would be desirable providing the house holder was interested in investing more to reap more rewards.

The report would be held by the local rewards office and compared with the second survey report produced after the follow up (post-purchase) survey that would confirm that the work/appliance has been installed correctly. If the reward offices are to be set up in each local area that operates a reward scheme, then the production of a national tool-kit may aid confidence and lead more efficient implementation across the country.

There should be no upper limit to the amount spent by each household. This may be tempered by the quantity and quality of the rewards that are chosen by the participants, but there is also scope to continue to add to the reward list as the scheme continues. A lower limit will probably be set by the attractiveness of the reward return.

In areas of high deprivation and unemployment, the amount of disposable income may be insufficient to take advantage of the reward scheme, even where occupants are interested in protecting their homes. An extension of the grant criteria that currently relates to energy conservation should be extended to flood protection measures in these circumstances. The delivery agent for this could be the same reward office, but could equally be offered to energy saving agencies like the Energy Saving Trust which has recently extended its remit to include water and waste.

One possible unintended outcome of offering grants and rewards to householders living on the same street is the possible misunderstanding that more affluent people (with disposable incomes) will receive both climate change modifications and rewards, whereas those on benefits will just receive the modifications. Clearly those that receive the rewards will have spent their own money to receive them, but a clear communication of the scheme and how it works to all parts of he community would help to overcome any misunderstanding.

Finally, concern that the scheme would need to recruit whole terraced streets to ensure that flood protection measures are effective was raised during the draft reporting stage. The concern here is that space under the whole row of houses could be inundated if one householder fails to block air brick or gaps under the front step(s). This is a genuine concern and concerted persuasion may need to be brought to bear in some cases. However, the need to ensure full participation should not hinder implementation. The visual and verbal cues of those that have accepted rewards in return for flood protection measures will be picked up by those not qualifying for the grant, and will, in many cases, encourage them to make inquiries and enter the reward scheme in time.

7.5 Regional and national roll-out potential for a reward scheme

Similarities between the Salford and England and Wales surveys imply that a reward scheme would be accepted anywhere in the country. The Resilient Homes initiative has a target of helping 200 households to take action in response to dangerous climate change. It is proposed that additional householders should be recruited from one of the areas containing large numbers of housing in high flood risk identified by the Environment Agency. This would offer continuity with the Phase 1 work, but would also provide a comparison population as a further test of the transferability of the initiative.

7.5.1 Potential number of households to be involved

An extended scheme would also progressively target the most vulnerable householders living in areas of significant flood risk (i.e. where probability of flooding is at least 1 in 75 years). Approximately 500,000 properties are located in significant flood risk zones in England and Wales, and 1,200,000 are in areas of significant or

moderate risk (EA, 2009). Out of this, circa 75% may be assumed to be residential properties. Furthermore, the tenure structure for England (CLG, 2008) suggests that 70% of houses are owner-occupied. This leaves around 260,000 owner-occupied houses located in significant flood risk zones (630,000 in significant and moderate flood risk zones).

The reward scheme would aim to attract those households that have sufficient disposable income to make a short-term investment in energy-saving and flood-protection measures. Household disposable income per head comprises income derived directly from economic activity in the form of wages and salaries and self-employment income, as well as transfers such as social security benefits. It is then subject to a number of deductions such as income tax, council tax, and contributions towards pensions and national insurance. Table 23 presents the distribution of weekly household disposable income.

Table 23 Weekly household disposable income 2005/06 (ONS, 2008)

Disposable income (£)	Percentage of households
Up to 100	3.0
101 - 200	12.9
201 - 300	23.4
301 - 400	19.5
401 - 500	14.5
501 - 600	9.7
601 - 700	5.8
701 - 800	3.7
801 - 900	2.1
901 – 1000*	5.4

** There were also an additional 2.5 million individuals with disposable income above £1,000 per week that have not been included in the calculations.*

The reward scheme might hope to attract households where the disposable weekly income is between £200 (£217 per week is 60% of median income, which is a threshold for 'risk of poverty') and £500 (£443 per week is the mean income); over 57% of households qualify. This gives a distribution of around 150,000 households in significant flood risk zones and 360,000 in significant and moderate flood risk zones. If £700 is considered as the upper threshold (80% of the population has less than £700 weekly disposable income), the number rises to 72.9% of households and 190,000 in significant flood risk zone or 460,000 in significant and moderate flood risk zones. These calculations result in four scenarios for different numbers of houses (Table 24).

A constant refrain when considering flood risk figures is that the households in Table 24 are located in flood risk areas associated with rivers and the sea. If the houses at risk of surface flooding are considered, then twice as many houses would be eligible to participate in the scheme. This assumption is based on the EA (2009) figures that 2.4 million properties are located within river and coastal flood risk areas and further 2.8 million properties are at risk of surface flooding.

Table 24 Approximate estimated number of houses qualifying for the reward scheme

Weekly disposable income	Flood risk from rivers and the sea*	
	Significant	Significant and moderate
£200-£500	150,000 (scenario 1)	360,000 (scenario 2)
£200-£700	190,000 (scenario 3)	460,000 (scenario 4)
£200-£1,000	220,000	530,000

* Numbers at risk double when risk from surface flooding is included.

Table 25 presents the numbers of households that would be included in the project based on the findings of the telephone survey according to these scenarios. This table shows the numbers of households where given flood protection measures and energy-saving measures were absent.

Table 25 Approximate number of households where flood protection and energy-saving improvements were not present. (Accuracy of 1,000)

Mitigation and adaptation measures	% households without the measures	Approximate number of households that could be involved in the project Scenarios			
		1	2	3	4
Individual measures					
Door guards and raised thresholds	92.9	139,000	334,000	177,000	427,000
Air brick covers	97.9	147,000	352,000	186,000	450,000
Tiles	93.7	141,000	337,000	178,000	431,000
Raised electrics	91.9	138,000	331,000	175,000	423,000
Concrete staircase	96.5	145,000	347,000	183,000	444,000
Loft insulation	25.0	38,000	90,000	47,000	115,000
Wall insulation	47.9	72,000	172,000	91,000	220,000
Boiler	41.8	63,000	151,000	79,000	192,000
Appliances	38.4	58,000	138,000	73,000	177,000
Double glazing	14.8	22,000	53,000	28,000	68,000
Combinations of measures					
Boiler and appliances	23.0	34,000	83,000	44,000	106,000
Boiler and double-glazing	9.0	13,000	32,000	17,000	41,000
Double-glazing and loft insulation	7.1	11,000	26,000	13,000	33,000
Door guards and air-brick covers	92.0	138,000	331,000	175,000	423,000
Door guards and tiles	88.1	132,000	317,000	167,000	405,000
Raised electrics and air brick covers	90.1	135,000	324,000	171,000	415,000
Appliances and air brick covers	37.7	57,000	136,000	72,000	173,000
Boiler and door-guards	39.0	59,000	140,000	74,000	179,000
Loft insulation and tiles	23.5	35,000	85,000	45,000	108,000
Raised electrics and A-rated appliances	35.9	54,000	129,000	68,000	165,000

Table 26 outlines the cost of providing flood protection and energy-saving measures for the number of houses that require them. In Table 27, cost for various combinations of measures is presented.

Table 26 Cost of individual measures for percentage of households, where implementation was considered

Measures	Cost per house (£)	Cost (£ million)			
		Scenario 1	Scenario 2	Scenario 3	Scenario 4
Door guards/raised thresholds	700***	97.55	234.11	123.56	299.14
Air brick covers	600***	88.11	211.46	111.61	270.20
Tiles	500*	70.28	168.66	89.02	215.51
Raised electrics	800*	110.28	264.67	139.69	338.19
Concrete staircase	6,000*	868.50	2,084.40	1,100.10	2,663.40
Total flood protection measures	**8,600**	**1,234.71**	**2,963.30**	**1,563.97**	**3,786.44**
Loft insulation	300**	11.25	27.00	14.25	34.50
Cavity wall insulation	500**	35.93	86.22	45.51	110.17
Boiler	1,000**	62.70	150.48	79.42	192.28
A-rated appliances	1,000**	57.60	138.24	72.96	176.64
Double-glazing	2,000***	44.40	106.56	56.24	136.16
Total energy saving measures	**4,800**	**211.88**	**508.50**	**268.38**	**649.75**

** Estimates by the Association of British Insurers for three-bedroom, semi-detached house*
*** Energy Saving Trust estimates*
****Other sources (internet search: double glazing based on minimum of £300 per window; air bricks: 6 airbricks £100 each; door guards 2x£350 (front and back door)*

Table 27 Cost of combinations of climate change adaptation and mitigation measures for percentage of households without the measures

Combinations of measures	Cost per house (£)	Cost (£ million)			
		Scenario 1	Scenario 2	Scenario 3	Scenario 4
Boiler and appliances	2,000	69.00	165.60	87.40	211.60
Boiler and double-glazing	3,000	40.50	97.20	51.30	124.20
Double-glazing and loft insulation	2,300	24.50	58.79	31.03	75.12
Door guards and air-brick covers	1,300	179.40	430.56	227.24	550.16
Door guards and tiles	1,200	158.58	380.59	200.87	486.31
Raised electrics and air brick covers	1,400	189.21	454.10	239.67	580.24
Appliances and air brick covers	1,600	90.48	217.15	114.61	277.47
Boiler and door-guards	1,700	99.45	238.68	125.97	304.98
Loft insulation and tiles	800	28.20	67.68	35.72	86.48
Raised electrics and A-rated appliances	1,800	96.93	232.63	122.78	297.25

7.5.2 Rewards for investment

While these additional roll-out ideas could potentially involve millions of house holders, a National reward scheme to motivate action for climate change in the home would not be an open-ended risk for the State. Table 28 presents the estimated value of rewards to recipients.

Table 28 Value of rewards (for 1 person)

Type of reward	Value to the recipient (£)	Cost to State
Provision gap rewards		
Buss pass for a day on public transport in Manchester	10	0*
Weekly bus pass	15	0*
Monthly buss pass	50	0*
Yearly buss pass	500	0*
One-off ticket to a rugby match	25	0*
Season ticket for a rugby club	150	0*
Monthly pass to local sports centre	25	0*
Yearly pass to local sports centre	250	0*
College courses (e.g. Health, beauty and makeup DIY – 10 weeks)	50	0*
College courses (e.g. Carpentry and joinery, 22 weeks)	500	0*
College courses (e.g. Accounting – 36 weeks)	700	0*
College courses (e.g. Construction or counselling – 2 years)	1,500	0*
Policy-supported (subsidised) rewards		
Fruit and veg. vouchers for a month**	60	60
Fruit and veg. vouchers for a year**	700	700
Landscaping (per household)***	2,000	1,400

** Some capacity investment may be required if high take-up ensues (see section 7.3)*
*** Subsidised under the five-a-day campaign*
**** Subsidies by the Blue Skies social enterprise*

Table 29 presents examples of combinations of rewards that could be chosen by the house owners in return for the investment made into flood protection and energy saving measures. Most of the rewards come at little cost to the provider and do not need to be subsidised. Therefore, the non-cash rewards used instead of cash grants can results in significant savings. The amount of money saved depends on the proportion of void and subsidised rewards chosen by the house owners in return for their investment.

Table 29 Investment into climate change adaptation/mitigation and rewards equal in value to the investment

	Combinations of improvements			
	Boiler and double-glazing	**Door guards and air-brick covers**	**Boiler and door-guards**	**Raised electrics and A-rated appliances**
Investment (£)	3,000	1,300	1,700	1,800
Combination of rewards	Landscaping (£2000); a college course (£500); two yearly passes to sport centre (£500)	Yearly bus pass (£500); Fruit and veg. vouchers for a year (£700); Tickets to a rugby match for four people (£100)	Fruit and veg. for a year for two people (£1400); 6 months bus pass (£250); Two tickets to a rugby match (£50)	Two season tickets for rugby (£300); College course (£1,500)
Value of rewards (£)	3,000	1,300	1,700	1,800
Cost of rewards to State (£)	1,400	700	1,400	0
Money saved (compared to cash grants)(£)	1,600	600	300	1,800

8 References

Abrahamse, W., Steg, L., Vlek, C., & Rothengatter, T. (2005) A review of intervention studies aimed at household energy conservation. *Journal of Environmental Psychology, 25,* 273-291.

Adams, J., & White, M. (2004) Why don't stage-based activity promotion interventions work? *Health Education Research, 20,* 244-258.

Aerts, J., Kolen, B., van de Most, H., Kok, M., van 't Klooster, S., Satijn, B. and Leusink, A. (2007) Waterveiligheid en klimaatbestendigheid in breder perspectief. Klimaat voor Ruimte, Leven met Water and Habiforum.

Aitken, C., McMahon, T., Wearing, A., & Finlayson, B (1994). Residential water use: Predicting and reducing consumption. *Journal of Applied Social Psychology, 24,* 136-158.

Ajzen, I., & Fishbein, M. (1980) *Understanding Attitudes and Predicting Social Behavio*r, Prentice Hall, New Jersey.

Ajzen, I., & Madden, J.T. (1986) Prediction of goal directed behavior. *Journal of Experimental Social Psychology*, *22*, 453-74.

Allen, J., Davis, D., & Soskin, M. (1993) Using coupon incentives in recycling aluminum: A market approach to energy conservation policy. *Journal of Consumer Affairs, 27,* 300-319.

Anderson, C. D., Colwill, N., & Kent, P. (1985) Evaluation of major financial incentives for in-home energy conservation. *Journal of Economic Psychology, 4,* 363-376.

APFM (2006) *Social Aspects and Stakeholder Involvement in Integrated Flood Management*, Flood Management Policy Series. Available at: http://www.apfm.info/publications.htm (19 February 2009)

Arnold, J. (2005) *Work Psychology*. Prentice Hall, London

Arnstein, S. R. (1969) A Ladder of Citizen Participation. *JAIP*, *35*, 216-224.

Association of British Insurers (No date) *Flood Resilient Homes. What homeowners can do to reduce flood damage*. Available at: http://www.abi.org.uk/Display/File/Child/553/Flood_Resilient_Homes.pdf (12 February 2009)

Bamberg, S. (2007) Is a stage model a useful approach to explain car drivers' willingness to use public transportation? *Journal of Applied Social Psychology, 37,* 1757-1783.

Bamberg, S., & Schmidt, P. (2005) Incentives, morality, or habit? Predicting students' car use for university routes with the models of Ajzen, Schwartz, & Triandis. *Environment and Behavior, 35,* 264-285.

BERR (2007) *EnergyMeasures Report: Overview*. Department for Business, Enterprise and Regulatory Reform. Available at: http://www.berr.gov.uk/energy/environment/measures/page41270.html (11 December 2007)

Bichard, E. & Cooper, C.L. (2008) *Positively Responsible: How Business Can Save the Planet*, Butterworth Heinemann, Oxford.

Blamey, R. (1998) The activation of environmental norms: Extending Schwartz's model. *Environment and Behavior, 30,* 676-708.

Boardman, B. (2007) *Home truths: a low-carbon strategy to reduce UK housing emissions by 80% by 2050*, Environmental Change Institute, Oxford.

Brook Lyndhurst (2004) *Bad Habits and Hard Choices*. Brook Lyndhurst, London.

Burger, J. M. (1999) The foot-in-the-door compliance procedure: A multiple-process analysis and review. *Personality and Social Psychology Review, 3*(4), 303-325.

Burger, J. M., & Caldwell, D. (2003) The effects of monetary incentives and labelling on the foot-in-the-door effect: Evidence for a self-perception process. *Basic and Applied Social Psychology, 25,* 235-241.

CABE (no date) River Irwell Flood Control Scheme. Available at: http://www.cabe.org.uk/case-studies/river-irwell/description (28 May 2009)

Cahn, E. (2000) *No More Throw Away People*. London, Harper Collins.

Cambridge Econometrics (2004) *UK Energy and Environment*, CE, Cambridge.

Cavity Insulation Guarantee Agency (2008) *The benefits of insulation*. Available at: http://www.ciga.co.uk/benefits.html. (31 March 2009)

Cialdini, R. B. (2007) *Influence: The Psychology of Persuasion*, Collins, New York.

Cialdini, R. B., & Trost, M. R. (1998) Social influence: Social norms, conformity, and compliance. In D. T. Gilbert, S. T. Fiske, and G. Lindzey (Eds.), *Handbook of social psychology,* 4th ed., Vol. 2, McGraw Hill, New York, pp. 151 – 193.

Cialdini, R. B., Reno, R. R., & Kallgren, C. A. (1990) A focus theory of normative conduct: Recycling the concept of norms to reduce littering in public places. *Journal of Personality and Social Psychology, 58,* 1015 – 1026.

CLG (2006a) *Planning Policy Statement 25: Development and flood risk*. Department for Communities and Local Government, HMSO, Norwich.

CLG (2006b) *Strong and Prosperous Communities – a Local Government White Paper*. Department for Communities and Local Government, HMSO, Norwich.

CLG (2008) *Housing statistics 2007,* Department for Communities and Local Government, HMSO, Norwich

CLG (2006a) *A Decent Home: Definition and guidance for implementation*. Department for Communities and Local Government, HMSO, Norwich.

CLG (2006b) *Code for Sustainable Homes. A step-change in sustainable home building practice*, Department for Communities and Local Government, HMSO, Norwich

Climate Change Act (2008) The Stationery Office.

Climate Change Committee (2008) Building a Low Carbon Economy. 1st December 2008.

Couzins, I. (2007) Collective minds. *Nature, 445*, 715.

Couzins, I., Krause, J., Franks, N. R., & Levin, S. A. (2005) Effective leadership and decision making in animal groups on the move. *Nature, 433,* 513-516.

Crompton, T. (2008). *Weathercocks and signposts*. World Wildlife Fund. United Kingdom. Available at www.wwf.org.uk/strategiesforchange (29 May 2009)

CSE (2007) *Mobilising individual behavioural change through community initiatives: Lessons for Climate Change*. Centre for Sustainable Energy and Community Development Exchange. HMSO, London.

de Groot, J. I. M., Steg, L. & Dicke, M. (2007) Morality and reducing car use: Testing the Norm Activation Model of Prosocial Behavior. In F. Columbus (Ed.), *Transportation Research Trends*, NOVA Publishers.

de Groot, J., & Steg, L. (2008). How to measure egoistic, altruistic, and biospheric value orientations. *Environment and Behavior, 40,* 330-354.

DECC, BRE and EST (2008) *Energy use in homes 2006. A series of reports on domestic energy use in England*. BRE Housing. Available at: http://www.bre.co.uk/filelibrary/rpts/energy_use/Energy_Efficiency_2006.pdf (20 May 2009)

DECC (2009) *Community Energy Saving Programme (CESP) consultation document*. Department of Energy and Climate Change, London. Available at: http://www.decc.gov.uk/en/content/cms/consultations/open/cesp/cesp.aspx (26 May 2009)

Deci, E., & Ryan, R. (1985). *Intrinsic motivation and self-determination in human behavior*. New York: Plenum.

DEFRA and BERR (2008) *The UK Fuel Poverty Strategy. 6th Annual progress report.* Department for Environment, Food and Rural Affairs. Available at: http://www.berr.gov.uk/files/file48036.pdf (21 May 2009)

DEFRA (2008a) *Developing the evidence base for flood resistance and resilience. R&D Technical Report FD2607/TR1*. Department for Environment, Food and Rural Affairs, London.

DEFRA (2008b) *Local authority CO_2 emissions estimates 2006*. Department for Environment, Food and Rural Affairs, London.

DEFRA (2008c) *Consultation on policy options for promoting property-level flood protection and resilience*. Department for Environment, Food and Rural Affairs, London: Available at: http://www.defra.gov.uk/corporate/consult/flood-protection (30 May 2009)

DoE (1996) *Circular 2/96 – The Home Energy Conservation Act*. Department of the Environment, HMSO, London.

Downing, P. and Ballantyne, J. (2007) *Tipping Point or Turing Point? Social Marketing & Climate Change*. Ipsos MORI.

Dresner, S. and Ekins, P (2006) Economic instruments to improve UK home energy efficiency without negative social impacts. *Fiscal Studies 27(1*), 47-74.

DTI (2007), *Meeting the Energy Challenge: a White Paper on Energy*. Department of Trade and Industry, The Stationary Office, Norwich.

EA (2002) *Parrett Catchment: Water Management Strategy Action Plan*. The Environment Agency, Bristol.

EA (2006) *Addressing environmental inequalities: flood risk. Science Report SC020061/SR1*. The Environment Agency, Bristol.

Energy Saving Trust (2005) *Changing climate, changing behaviour: delivering household energy savings through fiscal incentives*. EST

Energy Saving Trust (EST) (no date) Energy Saving Trust Website www.**energysavingtrust**.org.uk

Experian (2009) *Multimedia guide to Mosaic UK*. Available at: http://www.business-strategies.co.uk/sitecore/content/Products%20and%20services/Micromarketing%20data/Consumer%20segmentation/Mosaic.aspx (26 May 2009)

Express India (2008) *Flood lesson: disaster management authority to come up in districts* The Indian Express Limited. Available at: http://www.expressindia.com/latest-news/flood-lesson-disaster-management-authority-to-come-up-in-districts/360746/ (23 March 2009)

FEMA (2009) Federal Emergency Management Agency The National Flood Insurance Program. Available at: http://www.fema.gov/business/nfip/ (22 May 2009)

Flood Plan UK (2008) *Summary report – Dry Run workshop 1. Flood simulation exercise, Boroughbridge, Saturday 15th November 2008*. Available at: http://www.floodplanuk.org/userfiles/file/Summary%20report%20-%20Flood%20simulation%20Boroughbridge.pdf (21 May 2009)

Foresight (2004) *Future Flooding Report.* Foresight Directorate of the Department of Transport, Local Government and the Regions, London

Futerra (2005) *New Rules: New Game.* Available at: www.futerra.co.uk/downloads (29 May 2009)

Geller, E. S. (2002) The challenge of increasing proenvironmental behavior. In R. B. Bechtel & A. Churchman (Eds.), *Handbook of environmental psychology* (pp. 541-533). Wiley, New York.

Gloucester City Council (2009) *Gloucester Flood Protection Grant Scheme.* Available at: http://www.gloucester.gov.uk/CouncilServices/Flooding/GloucesterFloodProtectionGrantScheme.aspx (22 May 2009)

Groundwork (no date). *Green Behaviours*. Available at: http://www.groundwork-london.org.uk/upload/documents/webpage/Services/Green%20Behaviours.pdf (29 May 2009)

Guardian (2008), *Time for deeds not words,* 3rd July, 2008, viewed online (12 July 2009) at www.guardian.co.uk/environment/2008/jul/03/carbonemissions.climatechange

Harris, T. (2009) *DEFRA funding for household flood protection workshop.* Powerpoint presentation available at: http://www.defra.gov.uk/environ/fcd/adaptationandresilience/20090204workshop-pres3.pdf (29 May 2009)

Hassett, K., & Metcalf, G. (1995) Energy tax credits and residential conservation investment: Evidence from panel data. *Journal of Policy Economics, 57,* 201-217.

HM Government (2006) *Climate Change, The UK Programme 2006*. HMSO, Norwich.

Howlett, S. (2009) *Social housing faces 'a daunting challenge'*. The Guardian, Society Guardian, 25.03.2009, p.2

Intergovernmental Panel on Climate Change (2007) *Fourth assessment report: synthesis report.* Available at: http://www.ipcc.ch/ipccreports/ar4-syr.htm (29 May 2009)

Jackson, T. (2009) *Prosperity Without Growth?* Sustainable Development Comission, March 2009.

JBA Consulting and Salford City Council. 2005. *Strategic Flood Risk Assessment.* Available at: http://www.salford.gov.uk/living/planning/naturalenvironment/flood-risk/strategicfloodriskassessment.htm (29 May 2009)

Kalinowski, C., Lynne, G., & Johnson, B. (2006) Recycling as a reflection of balanced self-interest: A test of the metaeconomics approach. *Environment and Behavior, 38,* 333-355.

Karan P.P. and Gilbreath, D. (2005) *Japan in the 21st century: environment, economy and society*. University of Kentucky Press, Kentucky.

Kelly, M.J. (2008) *Britain's building stock – a carbon challenge*. Presentation …..

Keys, C. (2003) *Managing Floods in a Volunteer Agency: some Considerations Relating to Training, Planning and Response Activities in New South Wales, Australia*. International Disaster and Emergency Readiness (IDER) Conference, October 2003, London.

Killip, G. (2008) *Building a greener Britain. Transforming the UK's existing housing stock*. Federation of Master Builders, London.

Krasovskaia, I., Gottschalk, L., Saelthun, N.R. & Berg, H. (2001) Perception of the risk of flooding: the case of the 1995 flood in Norway. *Hydrological Sciences-Journal-des Sciences Hydrologiques. 46(6*), 855-868.

Lippke, S., Ziegelmann, J., Velicer, W., & Schwarzer, R. (2009) Validity of stage assessment in the adoption and maintenance of physical activity and fruit and vegetable consumption. *Health Psychology, 28,* 183-193.

Maurer, B. (2003) Uncanny exchange: the possibilities and failures of 'making change' with alternative money forms. *Environment and Planning D: Society and Space 21(3),* 317-340.

McCarthy, S., Penning-Rowsell E. & Tunstall E. (2008) *Public attitudes to 'community based' small-scale flood risk reduction measures in England.* IN Bosher, L. (Ed.) Hazards and the Built Environment: Attaining Built-in Resilience, Routledge, London, pp. 150-171.

new economics foundation (nef) (2008) *The new wealth of time: how time banking helps people build better services*. new economics foundation, London.

Noar, S. M., Benac, C., & Harris, M. (2007) Does tailoring matter? Meta-analytic review of tailored print health behavior change interventions. *Psychological Bulletin, 133,* 673-693.

ONS (2008) *Social trends No. 38. 2008 edition*. Office for National Statistics.

Peters, M. and Fudge, S. (2008) *Motivating individual carbon reduction through local government-led community initiatives in the UK*. IN: Ken, T.G, Tukker, A., Vezzoli, C. and Ceschin, F. (Eds.). Sustainable Consumption and Production: Framework for Action. Proceedings of the 2nd Conference of the Sustainable Consumption Research Exchange (SCORE!) Network, 10th-11th March 2008, Brussels, pp 193-212.

Pitt, M. (2008) *Learning lessons from the 2007 floods, an independent review by Sir Michael Pitt*, Cabinet Office, London.

Pitts, R. E., & Wittenbach, J. L. (1981) Tax credits as a means of influencing consumer behavior, *Journal of Consumer Research,* 8, 335–338.

Prochaska, J. O., & DiClemente, C. C. (1983) Stages and processes of self-change of smoking: Toward an integrative model of change. *Journal of Consulting and Clinical Psychology, 51,* 390-395.

Prochaska, J. O., Velicer, W. F., Rossi, J. S., Goldstein, M. G., Marcus, B. H., Rakowski, W., et al. (1994) Stages of change and decisional balance for twelve problem behaviors. *Health Psychology, 13,* 39-46.

ProVention Consortium and Alnap (2008) *Flood disasters: Learning from previous relief and recovery operations*. The Active Learning Network for Accountability and Performance in Humanitarian Action, London. http://www.alnap.org/publications/pdfs/ALNAP-ProVention_flood_lessons.pdf (15 May 2009)

Rabe, B. and Borick, C. (2008) *Climate Change and American Public Opinion: The National and State Perspective*, Miller Centre of Public Affairs, University of Virginia, December 10, 2008

Rabinovitch, J. (1992) Curitiba: towards sustainable urban development. *Environment and Urbanization 4(2),* 62 - 73.

Retallack, S., Lawrence, T. & Lockwood, M. (2007) Positive Energy, IPPR

Samaranayake, M. (1996) *Significance of participatory approaches in empowering people for sustainable development*. In: Bastian, S. and Bastian, N. Assessing Participation. Konark Publishers private limited, Colombo, pp. 46-66.

Samuelson, C. D., & Biek, M. (1991) Attitudes toward energy conservation: A confirmatory factor analysis. *Journal of Applied Social Psychology, 21,* 549-568.

Schade, J. (2003) European research results on transport pricing acceptability. IN J. Schade & B. Schlag (Eds.), *Acceptability of transport pricing strategies* (pp. 109-123). Amsterdam: Elsevier Science.

Schultz, P. W. (1999) Changing behavior with normative feedback interventions: A field experiment in curbside recycling. *Basic and Applied Social Psychology, 21,* 25-36.

Schultz, P. W. (2002) Knowledge, education, and household recycling: Examining the knowledge-deficit model of behavior change. In T. Dietz & P. Stern (Eds.), *Education, information, and voluntary measures in environmental protection* National Academy of Sciences, Washington, DC, pp. 67-82

Schultz, P. W., & Tabanico, J. (2008) Community-based social marketing and behavior change. In Cabaniss, A. (Ed.), *Handbook on household hazardous waste*, Government Institutes Press, Lanham, MD, pp. 133-157.

Schultz, P. W., & Zelezny, L. (2003) Reframing environmental messages to be congruent with American values. *Human Ecology Review, 10,* 126-136.

Schultz, P. W., Gouveia, V., Cameron, L., Tankha, G., Schmuck, P., & Franek, M. (2005) Values and their relationship to environmental concern and conservation behavior. *Journal of Cross-Cultural Psychology, 36*, 457-475.

Schultz, P. W., Khazian, A., & Zaleski, A. (2008) Using normative social influence to promote conservation among hotel guests. *Social Influence, 3,* 4-23.

Schultz, P. W., Nolan, J., Cialdini, R., Goldstein, N., & Griskevicius, V. (2007) The constructive, destructive, and reconstructive power of social norms. *Psychological Science, 18,* 429-434.

Schwartz, S. H. (1977) Normative influences on altruism. In L. Berkowitz (Ed.) *Advances in experimental social psychology Vol. 10*, Academic Press, New York, pp 221-279.

Schwartz, S. H., & Howard, J. (1981) A normative decision-making model of altruism. In J. P. Rushton & R. M. Sorrentino (Eds.) *Altruism and helping behaviour,* Erlbaum, Hillsdale, NJ, pp. 189-211

Secord, P.F. and Backman, C.W. (1969) *Social Psychology*, McGraw Hill, New York, N.Y.

Smith, C. (2009) Speech given by Lord Chris Smith to the Flood and Coastal Risk Management Conference 2009, 30 June 2009.

Staats, H., Wit, A., & Midden, C. (1996) Communicating the greenhouse effect to the public: Evaluation of a mass media campaign from a social dilemma perspective, *Journal of Environmental Management, 45,* 189–203.

Steg, L., Dreijerink, L., & Abrahamse, W. (2005) Factors influencing the acceptability of energy policies: A test of VBN theory. *Journal of Environmental Psychology, 25,* 415-425.

Steg, L., Dreijerink, L., & Abrahamse, W. (2006) Why are energy policies acceptable and effective? *Environment and Behavior, 38,* 92-111.

Stern, N. (2006) The *Stern Review: the economics of climate change, executive summary,* HM Treasury, London. Available: http://www.hm-treasury.gov.uk/media/8AC/F7/Executive_Summary.pdf (29 May 2009)

Stern, P. C., & Dietz, T. (1994) The value basis of environmental concern. *Journal of Social Issues*, *50*, 65-84.

Stern, P., Dietz, T., Abel, T., Guagnano, G. A., & Kalof, L. (1999).A value-belief-norm theory of support for social movements: The case of environmentalism. *Human Ecology Review*, *6(2),* 81-97.

Stokkom, H. T. C. & A. J. M. Smits (2002). *Flood Defence in the Netherlands: A new era, a new approach*. Flood Defence, Science Press, New York.

Sustainable Consumption Roundtable (2006) *I will if you will: Towards Sustainable Consumption*, SDR. Available at: http://www.sd-commission.org.uk/publications/downloads/I_Will_If_You_Will.pdf (30 May 2009)

Syme, G., Nancarrow, B., & Seligman, C. (2000) The evaluation of information campaigns to promote voluntary household water conservation. *Evaluation Review, 24,*539-578.

Takeuchi, Y., Kameda, H., Shaw, R. & Ikeda, N. (2008) *Indigenous knowledge from Japan experience: prevention, damage reduction and erosion control by flood disaster*. Available at: http://drh.edm.bosai.go.jp/database/item/a36dcf409bf8d85cf0215eac49b25a948c3eb4e8 (13 May 2009)

Thøgersen, J. (1996) Recycling and morality: A critical review of the literature. *Environment and Behavior*, *28*, 536-558.

Thøgersen, J., & Olander, F. (2003) Spillover of environment-friendly consumer behaviour. *Journal of Environmental Psychology, 23,* 225-236.

Tippett, J., Searle, B., Pahl-Wostl C. & Rees, Y. (2005) Social learning in public participation in river basin management - early findings from HarmoniCOP European case studies. *Environmental Science & Policy, 8,* 287–299.

UKCIP. (2002) *Climate Change Scenarios for the United Kingdom. The UKCIP02 Scientific Report*. Available at: http://www.ukcip.org.uk/images/stories/Pub_pdfs/UKCIP02_tech.pdf (10 May 2009)

van Sambeek, P. & E. Kampers (2004) *NU-Spaarpas: The sustainable incentives card. Stiching Points.* Available at: http://www.nuspaarpas.nl/www_en/pdf_en/NUspaarpasENGCH6.pdf (29 May 2009)

Weinstein, N. D., Rothman, A. J., & Sutton, S. R. (1998) Stage theories of health behavior: Conceptual and methodological issues. *Health Psychology, 17,* 290-299.

Werritty, A., Houston D., Ball, T., Tavendale, A. & Black, A. (2007) *Exploring the social impacts of flood risk and flooding in Scotland*. The Scottish Government, Edinburgh.

Whitmarsh, L. (2008) Are flood victims more concerned about climate change than other people? The role of direct experience in risk perception and behavioural response. *Journal of Risk Research 11(3*), 351-374.
Wilmhurst, J. &McKay, A. (1999) The fundamentals of advertising, Butterworth-Heinemann, Oxford.
Zelizer, V. (1997) *The social meaning of money*. Princeton University Press, Princeton, New Jersey.

Annex 1: Resilient Homes questionnaire for householders

RESILIENT HOMES QUESTIONNAIRE
EXPRESSION OF INTEREST

Information filled in by the interviewer

Interviewer's initials:

Area Lower Kersal St. Aidan's Spike Island
CIRCLE ONE
Address: Street name: Number:

Introduction

Hello, my name is…… , I represent The Broughton Trust and I am carrying out a survey for the University of Salford as part of the "Resilient homes" project. A few days ago you should have received a letter describing this project – do you remember seeing it? Do you want me to remind you what this study is about? Could I take 15 minutes of your time and ask you a few questions about the climate change effects on your house, and what you can do to protect your house and belongings from these effects? By completing this questionnaire you will be entered into a prize draw of 10 high street shopping vouchers worth £20.
Before we start, I want to make sure you understand that no names or addresses will be used in this work, and your answers will be combined with everyone else's and never linked to you personally.

House ownership

1. Can I confirm that you are either the owner of this house, or you are living with the owner of this house?

Yes ☐[1] No ☐[2]

If the answer is NO, then ask if you can speak to the owner. If the house is rented then terminate the interview.

2. Are you involved in deciding how money is spent in your house?

Yes ☐[1] No ☐[2]

If the answer is no, then ask if there is someone in the house that can answer the survey questions. If not then the interview should be terminated.

Climate change and what it means for you and your home

I am going to ask you a few questions about climate change and how it might affect you and your house.
Please choose a response for each of the following statements:

3. I am concerned about how climate change might affect me and my property. TICK (✓) ONE BOX

Strongly agree	Agree	Neither	Disagree	Strongly disagree
☐[1]	☐[2]	☐[3]	☐[4]	☐[5]

4. Using coal, oil and gas to produce energy for my home is changing the Earth's climate. TICK (✓) ONE BOX

Strongly agree	Agree	Neither	Disagree	Strongly disagree
☐[1]	☐[2]	☐[3]	☐[4]	☐[5]

5. Using less energy in my home will make a difference to climate change. TICK (✓) ONE BOX

Strongly agree	Agree	Neither	Disagree	Strongly disagree
☐[1]	☐[2]	☐[3]	☐[4]	☐[5]

6. One of the possible effects of climate change is more frequent and more severe flooding. To your knowledge, has your house ever been affected by flooding? TICK (✓) ONE BOX

Yes ☐[1] No ☐[2]

7. Are you aware that your house is in a flood risk area? TICK (✓) ONE BOX

Yes ☐[1] No ☐[2]

8. What do you think the chances are that you will be flooded? TICK (✓) ONE BOX

Very High	High	Low	Very Low	Don't know
☐[1]	☐[2]	☐[3]	☐[4]	☐[5]

9. Are you aware of the Environment Agency Floodline Warnings Direct? TICK (✓) ONE BOX

Yes, I am registered	☐[1]	Yes, but I am not registered	☐[2]	I know nothing about it	☐[3]

If the answer is box 2, ask why they have not registered

……

10. Is your house insured against flooding?

Yes ☐[1] No ☐[2] *Why not?*.....

Choose a response for each of the following statements:

11. Homeowners have a responsibility to protect their homes from flooding TICK (✓) ONE BOX

Strongly agree	Agree	Neither	Disagree	Strongly disagree
☐[1]	☐[2]	☐[3]	☐[4]	☐[5]

12. It is the Government's responsibility to protect my home from flooding TICK (✓) ONE BOX

Strongly agree	Agree	Neither	Disagree	Strongly disagree
☐[1]	☐[2]	☐[3]	☐[4]	☐[5]

Making changes to your house

I would now like to ask you a few questions about the changes you might make to your house to use less energy and to make it less vulnerable to flood damage.

13. Can you think about things you could do to stop flood water entering your house or to limit the damage water can cause to your house and belongings?

(a)……
(b)……
(c)……
(d)……

14. Can you think about ways to improve your house that would reduce the amount of energy you use in the house?

(a)……
(b)……
(c)……
(d)……

15. I am going to read out a list of improvements that can protect a house from flood damage. Ignoring how much this would cost for the time being, tell me if you would consider having any of them done to your house. TICK (✓) ONE BOX IN EACH ROW *If the answer is NO, then why not?*

Door guards with raised thresholds	Yes ☐[1]	No ☐[2]	*Why not?* ……	No knowledge ☐[3]
Air brick covers	Yes ☐[1]	No ☐[2]	*Why not?* ……	No knowledge ☐[3]
Carpets and floorboards replaced with tiles over concrete	Yes ☐[1]	No ☐[2]	*Why not?* ……	No knowledge ☐[3]
Electric, TV and phone sockets, and the fuse box and meter raised above the ground level	Yes ☐[1]	No ☐[2]	*Why not?* ……	No knowledge ☐[3]
Replace bottom of wooden staircase with concrete	Yes ☐[1]	No ☐[2]	*Why not?* ……	No knowledge ☐[3]

16. I am going to read out a list of improvements that can save energy in your house. Ignoring how much this would cost for the time being, tell me if you would consider having any of them done in your house. TICK (✓) ONE BOX IN EACH ROW *If the answer is NO, then why not?*

Insulate/put more insulation in your loft	Yes ☐[1]	No ☐[2]	*Why not?* ……	No knowledge ☐[3]
Insulate your walls	Yes ☐[1]	No ☐[2]	*Why not?* ……..	No knowledge ☐[3]
Replace your boiler with a better one	Yes ☐[1]	No ☐[2]	*Why not?* ……	No knowledge ☐[3]
Replace equipment (kettle, fridge, washing machine, etc.) with energy efficient ones	Yes ☐[1]	No ☐[2]	*Why not?* ……	No knowledge ☐[3]
Fit energy-saving double glazing	Yes ☐[1]	No ☐[2]	*Why not?* ……	No knowledge ☐[3]

17. How much money would you be prepared to spend to make the improvements that I just mentioned to your house? TICK (✓) ONE BOX FOR EACH COLUMN

To protect your house from flooding:

Nothing at all	☐[1]
Under £100	☐[2]
£100 - £500	☐[3]
£500 - £1,000	☐[4]
£1,000 - £3,000	☐[5]
More than £3,000	☐[6]

To make your house more energy efficient:

Nothing at all	☐[1]
Under £100	☐[2]
£100 - £500	☐[3]
£500 - £1,000	☐[4]
£1,000 - £3,000	☐[5]
More than £3,000	☐[6]

Motivations and rewards

I would now like to ask you a few questions about what might help you to change your mind to make some, or more changes to your house in order to save energy or prevent flood damage.

18. How would you respond to the following statements; I would consider making changes to my house to prevent flood damage in order to… TICK (✓) ONE BOX IN EACH ROW

Give me peace of mind	Strongly agree ☐[1]	Agree ☐[2]	Neither ☐[3]	Disagree ☐[4]	Strongly disagree ☐[5]
Save on my insurance bill	Strongly agree ☐[1]	Agree ☐[2]	Neither ☐[3]	Disagree ☐[4]	Strongly disagree ☐[5]
Save on the cost of repairs/replacements	Strongly agree ☐[1]	Agree ☐[2]	Neither ☐[3]	Disagree ☐[4]	Strongly disagree ☐[5]
Increase the value of my house	Strongly agree ☐[1]	Agree ☐[2]	Neither ☐[3]	Disagree ☐[4]	Strongly disagree ☐[5]
Keep up with what other people in my community are doing	Strongly agree ☐[1]	Agree ☐[2]	Neither ☐[3]	Disagree ☐[4]	Strongly disagree ☐[5]

Take advantage of a cheaper price when the whole street or a group of my neighbours decided to have the work done together	Strongly agree ☐1	Agree ☐2	Neither ☐3	Disagree ☐4	Strongly disagree ☐5
Take advantage of cash rewards or grants	Strongly agree ☐1	Agree ☐2	Neither ☐3	Disagree ☐4	Strongly disagree ☐5
Take advantage of non-cash rewards like free goods or services	Strongly agree ☐1	Agree ☐2	Neither ☐3	Disagree ☐4	Strongly disagree ☐5

19. I would consider making changes to my house to save energy in order to…

Feel like I am doing something about climate change	Strongly agree ☐1	Agree ☐2	Neither ☐3	Disagree ☐4	Strongly disagree ☐5
Save on electricity bills	Strongly agree ☐1	Agree ☐2	Neither ☐3	Disagree ☐4	Strongly disagree ☐5
Increase the value of my house	Strongly agree ☐1	Agree ☐2	Neither ☐3	Disagree ☐4	Strongly disagree ☐5
Keep up with what other people in my community are doing	Strongly agree ☐1	Agree ☐2	Neither ☐3	Disagree ☐4	Strongly disagree ☐5
Take advantage of a cheaper price when the whole street or a group of my neighbours decided to have the work done together	Strongly agree ☐1	Agree ☐2	Neither ☐3	Disagree ☐4	Strongly disagree ☐5
Take advantage of cash rewards or grants	Strongly agree ☐1	Agree ☐2	Neither ☐3	Disagree ☐4	Strongly disagree ☐5
Take advantage of non-cash rewards like free goods or services	Strongly agree ☐1	Agree ☐2	Neither ☐3	Disagree ☐4	Strongly disagree ☐5

20. How many of the following rewards would you accept in exchange for flood-proofing your home or making your home more energy-efficient? TICK (✓) ONE BOX IN EACH ROW

Free bus travel	Yes ☐1	No ☐2	I don't know ☐3
Entertainment tickets (cinema, sports, events, the theatre etc.)	Yes ☐1	No ☐2	I don't know ☐3
Vouchers for leisure and health centres	Yes ☐1	No ☐2	I don't know ☐3
Vouchers for fruit and vegetables	Yes ☐1	No ☐2	I don't know ☐3
Free meals at restaurants	Yes ☐1	No ☐2	I don't know ☐3

21. Are there any other rewards other than cash that you would accept in return for making the flood protection or energy saving improvements in your home?……

22. Thinking now about the value of the rewards that you would accept, which of the following would help you to spend money on flood protection TICK (✓) ONE BOX

Rewards worth 50% of the cost of the flood protection work	☐[1]
Rewards worth the same amount as I spend on flood protection	☐[2]
Rewards worth up to double the cost of the flood protection work	☐[3]
No amount of rewards would get me to spend money on flood protection	☐[4]

23. What value of reward would you accept in exchange for spending on energy-saving improvements? TICK (✓) ONE BOX

Rewards worth 50% of the cost of the energy saving improvements	☐[1]
Rewards worth the same amount as I spend on energy saving	☐[2]
Rewards worth up to double the cost of the energy saving improvements	☐[3]
No amount of rewards would get me to spend money on energy saving	☐[4]

24. Are you aware that some people qualify for grants for energy saving improvements to their homes? TICK (✓) ONE BOX

Yes ☐[1] No ☐[2]

If yes, which grants are you aware of? WRITE HERE……

About you and your home

I would like to finish by asking you some questions about your own situation so that in the future the right rewards can be matched to the right people in the next phase of the project.

25. How large is your house? TICK (✓) ONE BOX

1 bedroom	☐[1]
2 bedrooms	☐[2]
3 bedrooms	☐[3]
4 bedrooms	☐[4]
More than 4 bedrooms	☐[5]

26. How many people are living in your household? FILL IN

Adults (over 18): ……. Children (under 18): ……..

27. How long have you lived in this house TICK (✓) ONE BOX

Less than 2 years	☐[1]
2-5 years	☐[2]
6-10 years	☐[3]
11-20 years	☐[4]
Over 20 years	☐[5]

28. How old are you? TICK (✓) ONE BOX

25 or less	☐[1]
26-39	☐[2]
40-59	☐[3]
60 or over	☐[4]

29. How would you describe yourself? TICK (✓) ONE BOX

Employed full-time	☐[1]
Employed part-time	☐[2]
Self-employed	☐[3]
In full time education	☐[4]
Unemployed	☐[5]
Long term sick	☐[6]
Retired	☐[7]
Full time houseperson	☐[8]
A carer	☐[9]
Other *(write)*	☐[10]

……..

Finishing the interview

Thank you for your time. By completing this questionnaire you have been entered into a prize draw of 10 high street shopping vouchers worth £20 each. As you were informed in the letter, this project has two stages: In this first stage the University of Salford are trying to find out if people in your community are willing to make improvements in their homes that would protect them from flood damage and help them save energy. The University of Salford are also trying to learn, what sort of rewards people in your community would be willing to accept for making these changes to their homes. In phase two of the project, which is likely to start in summer this year, rewards will be actually offered to people who agree to make flood-proofing or energy-saving changes to their homes. So, people who make their houses more energy-efficient or safer from flood will not only enjoy their peace of mind or lower electricity bills or but also get rewards, such as free public transport, for doing so. On behalf of the University of Salford we are looking for participants in this second part of the project.

Would you like to take part in the phase two of the project and participate in a scheme where you receive rewards for improvements to your house that make it more flood-proof and energy-efficient? TICK (✓) ONE BOX

Yes	☐[1]
No	☐[2]
I would like to think about it, contact me again please	☐[3]

If the answer was "yes" or "would like to think about it", is it possible to take your name and phone number so we can contact you again?

NAME:……

Phone number:……

Annex 2: Details of Interview Return for Tenants and Private and RSL Landlords in Salford (Lower Irwell Valley)

A2.1 The Social Landlords

Two members of Salix Homes business management team and two senior managers were interviewed on the issues of flood protection and energy-saving improvements that have been applied, or are planning to be made to the Salix Homes housing stock, and what incentives would Salix Homes be willing to accept to implement these changes.

A2.1.1 Flood risk and flood protection

In opinion of the interviewees, while the Strategic Flood Risk Assessment had been carried out by the Council, "information has not filtered down" and the results were not fully shared throughout the staff. The respondents were not able to assess what proportion of Salix Homes housing stock was threatened by flooding, or where these properties were located because it was not seen as a priority to carry out this work. However, it was observed by the senior managers that this sort of data can be relatively easily obtained from the Strategic Flood Risk Assessment, or from the Manchester-Salford Housing Market Renewal Pathfinder operating in the Lower Irwell flood risk area. It was considered unlikely that an assessment of flood risk would be commissioned until this was identified as output under the Decent Homes appraisal, or as a new performance indicator under a future appraisal scheme.

Despite the lack of knowledge about extent of the problem, flooding was unanimously considered to be a serious issue for Salix Homes. This is also due to the fact that Salix is an ALMO and is closely associated with Salford City Council. However, as yet Salix Homes has not produced a strategic document that would cover the actions to be carried out in order to protect housing against a flood. Flooding is mainly considered in relation to new and future development and not for the existing stock.

The respondents were aware of several of the resistance measures such as air brick sealing, waterproof doors, changing the drainage direction and effectiveness by landscaping gardens and resilience improvements (rewiring houses, raising electricity sockets and replacing plaster with waterproof materials). However, there was little knowledge about the costs and practicalities of implementation of these measures.

The respondents were aware of, and put some faith in, the flood mitigation measures that have been applied to surrounding infrastructure in areas like Spike Island and Lower Kersal. They knew about the raised river banks, improved drainage, changed road layout and use of presently vacant land as flood storage. Consequently, improvements to houses were seen as an additional or secondary measure.

The interviewees pointed out that considerable work had already been carried out to stock under the Decent Homes standard (especially in Lower Kersal, where the implementation is in the last phase), and to go back there and carry out another set of works would cause disruption to tenants and would not be feasible.

Because the Decent Homes funding was seen as "quite rigid", interviewees thought that Salix Homes would get no additional funds for flood-proofing measures. They thought that the funding criteria needed to be changed to reflect the local situation better (e.g. location of housing in flood risk zone). Alternatively, tapping into other funding resources would be necessary. While discrete funding pots could be used for investment and refurbishment outside the Decent Homes programme, the results would have an ad hoc or stop-start character.

Furthermore, implementation of the flood resilience and resistance issues would require an extensive consultation not only with Salix Homes' partners, but also with their customers. The senior managers observed that the tenants can have diametrically different perception of priority issues. For example, new kitchens and bathrooms, issues of security and the quality of immediate physical environment were suggested as more important than flood protection measures. This view was not supported by the tenants that participated in focus groups conducted by the University of Salford for this study (see Section 5.3.2).

The respondents concluded that there was an urgent need for support from either local or central Government on flood resistance and resilience, in terms of establishing or identifying funding streams alternative to Decent Homes Programme.

A2.1.2 Energy efficiency and energy saving improvements

The overall strategic goal of Salix Homes is to reduce fuel poverty of the tenants. In order to achieve this goal, the "Energy Efficiency and Affordable Warmth Strategy" was produced in October 2008. Salix Homes is also obliged to contribute to the Council's target of 40% CO_2 emission savings by 2012.

The respondents displayed good understanding of the energy issues facing housing. Improvements that have been carried out on Salix Homes stock included:

- Loft insulation, where 50% of the loft insulation costs is covered by the City Council;
- Wall insulation, which has been carried out for all properties with cavity walls;
- Changing boilers as part of the Decent Homes Programme;
- Installing central heating as part of the Decent Homes Programme.

The respondents were aware that the Decent Homes Standard does not set a high requirement for either energy efficiency or thermal comfort of the tenants.

Consequently, Salix Homes is aiming to incorporate energy-saving solutions in addition to the Decent Homes works. This included the additional measures that all new boilers installed have an 'A' energy-efficiency rating; all new windows are double-glazed; spray taps are installed in new kitchens and bathrooms in order to reduce the use of water and energy. The ambition is to complete all energy-saving improvements by 2014.

Salix Homes has offered tenants leaflets on energy consumption and energy and also has handed out energy-saving light bulbs and kettles, as well as power-down appliances for computers and TV sets. There are plans in place to monitor the change in people's behaviour and attitude, following these initiatives, but no details on this were available at the time of the interviews.

Other energy-saving initiatives included a pilot installation of movement detectors controlling lighting in communal areas in several tower blocks and photo-voltaic panels on top of tower blocks in Blackfriars area. There are also plans to expand both schemes to other tower blocks. Also, ground source heat pumps are being considered as an alternative source of energy for some properties.

A2.1.3 Incentives for implementation of flood-proofing and energy-saving measures

The interviewees thought that if additional funds were offered they would be spent on current priority issues, such as kitchens, bathrooms, security, and immediate surroundings improvements. Therefore, the respondents appreciated the concept of non-cash incentives offered for a specific set of improvements, such as flood protection measures.

There was a moderate interest in apprenticeships among the business management team. They were seen as being directly linked to the installation of the improvements rather than a way of freeing up resources. However, the senior managers found the idea interesting and said that Salix Homes is already involved in some social enterprise schemes, where people who do the work learn new skills and can be trained to get better jobs at the end of their time with the scheme.

Free building materials were seen as a welcome initiative, in particular those associated with implementation of flood-proofing solutions (air brick covers, door guards, waterproof doors etc) and those that could be used for external cladding of the difficult to insulate properties. There was also interest in advice and expertise that could be provided to Salix by external parties. This included surveying the extent of flood risk area, surveying the properties and providing expertise on flood-proofing solutions, and calculating their cost-benefit ratio. In the case of energy-efficiency improvements, expertise would be welcome to identify possible sources of funding and suitable innovative solutions.

A2.2 Social housing tenants

Two focus groups were carried out with the Salix Homes' tenants. The first one was for those living at Spike Island, while the other was for the tenants of Lower Kersal. The aim of the focus groups was to establish the level of awareness about climate change and its effects on participants' houses; the knowledge about energy-saving and flood resilience and resistance measures; their opinions about and their preparedness to accept these improvements.

The focus group at Spike Island was organised by the Riverside Island Tenants Association and included nine participants over the age of 50. There were seven females and two males in the group. All of them have lived in the area at least since 1982. Some of them have lived in the area for over 60 years.

The Lower Kersal group was smaller, with four participants taking part. All of them were female and included one woman in her early twenties, two in their thirties and one over 60. This was organised by a local community leader. The Lower Kersal area has not benefited from the same level of tenant organisation and the absence of a residents association made if difficult to attract substantial numbers to this group.

A2.2.1 Awareness of climate change

All participants in Spike Island were aware of the climate change. They compared the seasonality of the weather from their youth with the current patterns. They also recognised that climate change is a worldwide problem, and gave examples of extreme weather events associated with climate change, such as very intense snow fall in North America and bush fires in Australia.

The level of knowledge about climate change was significantly lower among the respondents in Lower Kersal. They had also observed changes in the weather and higher rainfall in particular. However, they had low awareness of the reasons of climate change. The reasons were described as "what is going in the air" and "ozone layer". Nevertheless, participants were aware of alternatives to fossil fuel sources of energy, such as wind turbines and solar panels, which have been seen on supermarket and house roofs.

All participants agreed that everyone should take individual action against climate change. However, two of the participants stated, based on the knowledge acquired from TV, that three countries in particular (USA, China and India) are mainly responsible for climate change, and that these countries should be taking more responsibility for doing something about it. One member of the group said "Whilst we do our share, they should be made too, and America won't listen". However, the fact that other countries do not take action was not considered to be sufficient reason not to take personal action, as the following exchange indicates:

> Facilitator: "Would that [other countries' inaction] stop you doing your bit?"
> Participant: "No, I would still do the same, but other countries should realise the situation as well – it is a worldwide thing."

One of the participants also had a particular interest in alternative sources of energy and what kind of future there would be after the oil runs out in twenty years. He asked the facilitator's opinion about wind turbines as a source of renewable energy. During the discussion participants raised the issue of solar panels as a source of renewable energy for homes, yet due to time constraints this discussion was curtailed.

A2.2.2 Flood protection

Some in the Spike Island group participants recalled the floods of 1947 and 1980. The 1980 flood was mainly caused by overflowing drains and it did not reach the houses. This flood was better remembered by the participants from Lower Kersal. One of the participants could recollect playing in the water ("the kids loved it") that was described as about 5 feet deep. It was also remembered that the water caused fires in some houses, and that residents of flats next to the river had to be evacuated and brought to the dry land.

The flood that had occurred in 1947 was recalled by three participants, who were children and teenagers at the time. Memories included the evacuation of St. Andrew's school next to the river by workmen on lorries, as well as a body in a coffin and beer barrels from a local pub floating on the flood water. The participants thought that flooding of housing areas in Salford was a political decision, because if the flood water reached Salford Docks (if locks were open) it would have resulted in very high financial implications for the local authorities in terms of paying out compensation to ship owners. It was recalled that the water was filthy, because of the river pollution that persisted until 10-15 years ago. The extent of the flood was described as reaching Tenerife Street (up the hill). In Lower Kersal, one participant remembered that the water was about waist-high and flooded the garden of her house ground.

The aftermath of the 1947 flood was described by one participant from Spike Island as "horrible", mainly because of the smell of the sludge left by the receding flood water. In particular, one participant remembered, people's cellars were badly affected with the dampness and "the smell was dreadful". It was also remembered that very little help was provided by the City Council to restore the properties of the poorest people.

A.2.2.3 Responsibility for flood protection

Most in the Spike Island group thought responsibility to prevent flooding laid with the Government, the "River Boards" or the Council. People were baffled and slightly annoyed by the fact that there was still new development and schools being built in

the floodplain. One participant said "We got so used to being let down by the Council we don't even care". It was also said that "they could have done better" in terms of flood mitigation measures. The participants thought that the Council run out of money for flood protection measures.

However, the floodwater storage basin in Lower Kersal and strengthened river banks were highly appreciated by the respondents in Spike Island and described as "amazing". Interestingly, the levels of appreciation for the same flood protection measures were much lower in Lower Kersal. The participants were aware of the works that have been carried out in the area, but did not believe in effectiveness of the scheme. One person said "you can't block all the river off". There was also a low understanding of how the scheme worked. One of the respondents thought that the flood mitigation was ineffective because the playing fields got flooded, which was the aim of the scheme.

While most participants wanted more action from the authority, one of the participants said that, while it is Government's responsibility to do everything they can to stop the river from flooding, "once it's flooded then we're all responsible for trying stopping it from coming to our houses". Some participants were aware of the EA Floodline Warnings Direct scheme among some participants, yet they were not very keen on the idea of subscribing to it.

When asked to name any flood protection measure some of the participants said sandbags and they remembered that they were used in the 1980 flood. Many thought that sandbags were not really practical or effective in stopping the water, and that they offered only a short-term solution. As one of the Lower Kersal participants stated "you can't fight with mother nature". One of the Spike Island participants was aware of door guards and "vent covers" (air brick covers). She knew about them from trips to Venice. But other participants did not know about any other way to stop water entering houses.

Photographs of air brick covers, door guards and changes in interior (ceramic tiles on the floor, raised electricity sockets) were shown to the participants. On seeing these images the participants in Spike Island did not express concern about the appearance or inconvenience caused by putting these measures in place. "It wouldn't bother us" it was said. However, in Lower Kersal, the opinions about flood resilience were strongly affected by the aesthetics of the ceramic tiling, which were seen as nice ("I'll have them all the way through"), although one of the participants said "it depends what the tiles are like".

One of the participants in Spike Island thought that moving the fuse box and electricity meter upstairs would be a good thing. Moving sockets higher up the wall was also considered to be "a good idea" by several participants, especially in light of the current rewiring works being carried out by Salix Homes. In Lower Kersal, the oldest participant thought that raising electricity sockets was a good idea as they were too low anyway. She also said that the electricity meter should be higher up the wall

and complained that her meter was located under the boiler, which she considered to be unsafe. Other participant's meters were located low on the outside of the house. Some of the participants agreed that in the event of a flood the door guards and air brick covers would make "a big difference" in making the house less vulnerable to damage.

A2.2.4 Energy consumption and climate change

The participants in Lower Kersal were aware of their high energy use. They said they "used loads" and had to top up the electricity card every few days. One of the participants said that her older children were using electricity playing computer games and watching TV, costing her as much as £30 a week.

The participants of both focus groups were aware of the physical changes to that could be made in order to make their houses more energy-efficient. Those included energy-saving light bulbs, wall insulation and placing foil behind radiators. Loft insulation was a also a recognised method, and it was stated that many of the houses had had it done. A few members of each group were aware of the possibility to insulate cavity walls, although Spike Island residents lived mainly in houses of prefabricated concrete walls, which did not have cavities.

Double glazing was also discussed. Many in the groups pointed out that there had been a scheme to replace old, rotten wooden windows with single glazing with plastic frames. Later a decision was made to replace all windows on the estate. While the remaining wood-framed windows were replaced with plastic double-glazed windows, the single-glazed plastic windows were not replaced.

Other method of physical energy-saving improvement mentioned by the Spike Island participants was "sealing" (draught-proofing) front and back doors. One of the participants also mentioned replacing timber doors.. Another solution that was considered important and desired by the participants in Spike Island was replacement of old boilers with the new "combi" models. Some of the participants still had 30 year old boilers. They were also aware that the new boilers installed by Salix were not the best ones in terms of their energy efficiency and there was a slight disappointment about that.

There were no real objections to the possibility of intrusive works for any of the energy efficiency measures that had been discussed. Many of the participants already had them installed in their houses. Also, they could see benefits from these improvements. Many said that they would be happy to accept energy efficiency measures as this would help them spend less money on the electricity. The only contentious issue mentioned in Spike island were energy saving light bulbs. They were considered ugly ("horrible"), too dim and taking too long to light up. Another problem was the incompatibility with some light fittings. Finally, the price of new generation energy saving light bulbs (which lit up fast and are brighter) was seen as an

obstacle. The price quoted by one of the participants was £24. She said "It is ok that they last longer but you need to have the money in the first place to buy them".

A2.2.5 Rewards in return for energy-saving and flood protection measures

The discussion about rewards was limited both in Lower Kersal and Spike Island, as incentives did not seem to be necessary to bring tenants to accept the improvements discussed. Therefore, the discussion was constrained to rewards offered for accepting energy-saving light bulbs in Spike Island, and exploring hypothetical problems with the improvements.

There was a moderate level of enthusiasm about free bus travel, as many of the participants in Spike Island already qualified for this. In Lower Kersal they were all car users. However, they agreed that "it would be OK for the people that don't have a car". One of the participants also said that she would use the free bus travel to go to town, as she does not like driving there.

There was a mixed response to the tickets to entertainment events. Some participants considered it a good reward, as these tickets are expensive, while others declared that they had no interest in going to cinema or theatre. In Lower Kersal, tickets were seen especially important for people who have children. It was observed than in cinema there is always "loads of free seats". However, it was remarked that people would still have to travel out of the area to use these tickets.

The free "use of leisure centres" incentive was more welcome than tickets in Spike Island, and equally appreciated in Lower Kersal. The fruit and vegetables reward was of interest to the participants, mainly for financial reasons. The offer of free meals at restaurants was welcomed in both groups.

Participants' own ideas for rewards included putting a bus back on the route around the estate and flexible taxi or bus that would take people shopping to different places and allow them time to go for something to eat at the destination.

A2.3 Private landlords

One hundred questionnaires were sent to the private landlords on the accredited landlord list in Lower Kersal area (no private landlords have been identified in Spike Island and Alder Forest). Only seven responses were returned, indicating a low level of interest in climate change adaptation and mitigation issues among the private landlords. The respondents altogether owned or managed at least 36 properties (one answer was missing). These included 28 two-bedroom houses and 8 three-bedroom houses.

The landlords that answered the survey indicated high levels of agreement with the statements that climate change could affect their properties and using fossil fuels in their properties has an impact on climate change. The agreed that using less energy in their properties could make a difference to climate change (for all questions the median answer was "agree").

Only one respondent said his/her property(ies) had been affected by flooding and four out of seven respondents were aware that their properties were located in flood risk zone, but only two of them notified their tenants of this fact. Five out of seven respondents judged the chances of their properties being flooded as very low, and the remaining two did not know. Only one property was insured against flooding.

Five landlords agreed or strongly agreed that it was their responsibility to protect their properties from flooding and two strongly disagreed. None of the landlords disagreed with the statement that it was Government's responsibility to protect houses from flooding, and four strongly agreed with the statement. Therefore, while the responsibility for protection of properties against flooding was shared, the Government was seen as the main responsible body.

The level of awareness of the improvements that could be made to houses to make them more energy-efficient was higher than awareness of the flood-proofing improvements. Only one landlords listed several flood resilience and resistance measures such as door guards, raised door thresholds, or being registered with the Environment Agency Floodline Warnings Direct.

Most of the landlords said they would consider implementation of the listed flood-proofing measures. Two landlords were concerned about the tiles being cold, one objected to airbrick covers due to the possibility of condensation, and one through concrete staircase would decrease comfort levels. Five landlords listed loft insulation as an energy-efficiency method, while four listed double glazing, and three mentioned efficient boiler. Two landlords thought of energy-saving light bulbs. One landlord mentioned cavity wall insulation, draught excluders (also in form of thick curtains and draught excluding skirting boards) and replacing appliances with energy A-rated equivalents.

Two landlords already had had loft insulation to current standards and one respondent had cavity wall insulation in his/her property(ies). One landlord was aware that walls of his/her house(s) could not be insulated in this way. Two landlords had replaced the boiler in at least some of their properties, and two had replaced the glazing in at least some of their properties. One landlord had replaced the appliances in her property, one declared lack of funds to do so and in one case the appliances were the responsibility of the tenants.

Three landlords would not spend more than £100 to protect their properties from flooding, while two other respondents declared they would be prepared to spend between £1,000 and £3,000. One respondent would not spend any money on making

the property more energy-efficient and three would spend between £100 and £500 on energy-saving measures.

The landlords generally agreed or strongly agreed that they would consider making flood-protection changes to their properties to give themselves - and their tenants - peace of mind, to save on the insurance and repairs costs, to increase value of the property and to take advantage of either cash grants or non-cash incentives. Lower levels of agreement were associated with the statement "to keep up with what other landlords are doing". Similarly in the case of motivation to implement energy-saving improvements the levels of agreement were high with the exception of "keeping up with other landlords" (median: neither agree nor disagree).

All landlords would accept free building materials for renovations as an incentive to carry out the works associated with flood-proofing the property or making it more energy-efficient. One respondent definitely was not interested in the options of apprenticeship schemes, landscaping or subsidy for a hybrid vehicle. However, overall there was interest in the various non-cash incentives listed in the questionnaire. Other possible incentives listed by the respondents included advice on "what to do and how to do it" and grants to install "renewable technology such as solar panels".

Both in the case of flood protection and energy-saving measures only one landlord would accept rewards worth half of the money invested into these improvements. Three landlords would accept rewards of equal value to the money invested, and three wanted to receive rewards to the value of up to double the amount they spent.

There was general low level of awareness of the grant schemes for energy-efficiency changes to properties available to private landlords. Two respondents declared a lack of awareness of any of the five schemes highlighted in the questionnaire, and one was not eligible for any if the schemes except Enhanced Capital Allowance, of which he/she expressed no knowledge. Another respondent only planned to apply for the local energy supplier's grant and was not aware of other possibilities of subsidising the energy-saving improvements. Only two landlords had knowledge about all the schemes and one had have applied for several different grants.

All seven respondents were interested in participating in Phase 2 of the project. While the response level was low, the landlords who returned their questionnaires showed high level of awareness of climate change issues, but had a better understanding of energy-saving improvements compared to flood-protection measures. Many preferred incentives that deliver free building materials of double the value of the money invested. There appears to be a need for more effective publicity for energy-saving grant schemes directed at private landlords.