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WP 4: Stakeholder interviews
National report United Kingdom
University of Surrey and Centre for Sustainable Energy
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by

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I. INTRODUCTION

BarEnergy is an EU funded research project addressing the barriers to reduced energy consumption in six different countries. The countries have been chosen to represent the variety in political, economic and cultural systems within which domestic energy choices are made. The aim of the project is to understand the comparative influence of structural, political, financial, psychological, social/cultural and knowledge barriers to pro-environmental energy choices and how these can be overcome.

This report details the findings from interviews with government, business and civic stakeholders. The interviews addressed the recognized barriers and potential solutions for a range of behavioural areas. This report focuses on home energy use behaviors, although it includes limited findings about energy efficient appliances and transport choices.

ii. The UK energy policy framework

The overall policy arena of the UK sits within the influence of legislation from Brussels, but has also been subject to its own internal reorganization and gradual devolution of decision-making structures throughout the previous two decades. Therefore, barriers and opportunities explored in this report, and the particular policies that have been developed, should be viewed as accurate only in relation to the situation in England. It could be argued that devolution in the UK has been symptomatic of the search to ground political legitimacy in the UK within more responsive, democratic institutions which more accurately reflect the views of the electorate.

The decision-making framework through which energy policy has taken place in the UK has moved through two distinct regimes; the latter of which largely influences the current agenda:

- A first phase nationalized, 'command and control' framework characterized the period from 1945 to approximately 1979. This era was primarily politically-led with political leaders being centrally involved in decision-making regarding the institutional and operational dynamics of UK energy policy;
- The second period spanned the period approximately from 1979 – 1998. Here there was a shift in emphasis to faith in the principles of the market as the guiding framework for energy regulation as opposed to the primacy of state intervention.

The liberalization of energy markets in the UK has meant that political leaders are restricted in their ability to directly intervene – in the way in which they would have more able to do under state controlled energy supply – to address the growing importance of climate change and energy security. Instead, the last two decades has seen the growth of a number of specialized departments, whose role it is to work with trade and industry in finding policy solutions *within* an overall market framework.

There are several of these key government departments responsible for the policy areas covered by this report, including the Department for Transport, Department for the Environment, Food and Rural Affairs, and the Department for Energy and Climate Change. National policy is delivered by a second tier of government with local policy making powers: Local Governments. Additionally, London has a city-wide government – the GLA – led by a mayor. The Mayor of London is responsible for London transport policy, including public transport and the congestion charge. Delivery bodies such as the Energy Savings Trust and the Carbon Trust are funded by the UK Government to devise and implement consumer and business facing behaviour change initiatives.

iii. Methodology

The University of Surrey and the Centre for Sustainable Energy conducted 13 interviews with stakeholders in the UK for WP 5. In accord with the BarEnergy theoretical 'triangle', eight interviewees came under the political category; four came from the business sector; and three were drawn from NGO/civil society organizations.

Martyn Webb, Market Transformation Programme, Department for Environment, Food and Rural Affairs, Defra;

Derek Lickorish, former EDF Energy;

John Slaughter, Homebuilder's Federation

Philip Stamp, Behaviour Change Unit, Department of Environment, Food and Rural Affairs

Trewin Restorick, Managing Director, Global Action Plan

Peter Lipman, Policy Director Sustrans

William Baker, Principal Policy Advocate, Consumer Focus

Matthew Wright, Customer Insight Director, Energy Saving Trust

Michael Harrison, Head of Energy Services Directorate Team, Department of Energy and Climate Change

Patrick Caiger-Smith, Green Energy Options CEO

Tara Garnett, Food Climate Research Network

Michael Meacher, former Secretary of State for the Environment

John Aston, Philips Lighting

The central focus of the interviews has been the home energy use behavioural domain which was covered by nine of the participants. Additionally, three interviews covered the use and purchase of appliances, and two of the interviews explored the area of mobility.

The interviews were conducted face to face, using the agreed interview schedule or a slightly modified version of this schedule. The schedule covered the interviewee's perceptions of the main barriers to behaviour change, the success of previous interventions and recommendations for future initiative. In addition, interviewees were asked to rate specific barriers to sustainable energy use that were identified in work package 3. Responses to these barriers have been highlighted throughout the report graphically. For ease of analysis, the weighting of interviewees towards the first section has been presented in mean form while the latter sections highlight individual ratings. All interviews were recorded digitally and transcribed. The interviews were analyzed utilizing an agreed template.

This report identifies the main findings from the interviews and tries to set them within the particular context of the UK. It is apparent that some of the more interesting data cannot be divorced from the political economy of UK energy policy and of the institutions and political structures which provide the context for both individual behaviour and policy activity. A separate cross national, comparative report will examine national differences in more depth.

1. Area of Domestic Energy Use

Domestic energy use in the UK covers a fairly broad range of stakeholder involvement and incorporates a range of practices, behaviours and technologies ranging from home dwellers and more individual actions, to the need for more structural transitions, such as those associated with the design and planning of buildings themselves. As Jones *et al* (2000:201) point out, 'residential energy use accounts for approximately 28% of total primary energy use in the UK, with consumption in this sector forecast to increase due partly to expanding numbers of households'. It is thought that approximately 30-40 per cent of the UK's CO₂ emissions emanate from this sector. This poses a dilemma for the UK Government as it strives to meet rising housing demand with increasingly stringent environmental targets and 'peak oil' concerns. Within an increasingly liberalized energy infrastructure in the UK, government policy since the early 1990s has been broadly based on the assumption that a market for household energy efficiency investments, i.e. products such as loft insulation, cavity wall insulation and double glazing and renewable energy take-up, could be integrated with changes in practice and behaviour – notably in changing social norms around things such as temperature regulation in buildings and households. It was felt by political leaders that a combination of these actions held the potential to be effective in address both environmental and energy security issues *if* the barriers to take-up demand could be identified and addressed more effectively by policy makers. Working on the basis that a potential market may not have appeared due to asymmetric or unclear price signals – a clear problem in valuing carbon – many of the policies have been based around providing more information to both producers *and* consumers regarding the costs and benefits of energy saving measures. Thus it was hoped that producers would respond to information on demand and 'rational' consumers buy according to a range of choices. *The Home Energy Efficiency Scheme, The Home Energy Conservation Act* and the *Warm Fronts Grant* have all been examples of the kinds of policy which the UK Government hoped would provide an effective regulatory framework through which to address this domain of energy use.

1.1 Installation of photovoltaic panels (Purchase)

Photovoltaic energy use in the UK is noticeably underdeveloped. In 2006, UK Government proposals to subsidize up to £50 million for the installation of micro-generated power have yet to create a substantial market in PV generated energy in homes and buildings. It has been pointed out by that this level of investment has been insufficient anyway as a way by which to realistically scale up this technology to compete with current energy use; not least because it has been estimated that even £50 million of grants and subsidies would only convert approximately 15,000 houses, or 1 per cent of the UK's housing stock. Goodall (2007) has compared the scale of this ambition with that of Germany, where the level of political support for PV technology means that it now has solar installations on well over 100,000 homes.

1.1.1. Barriers

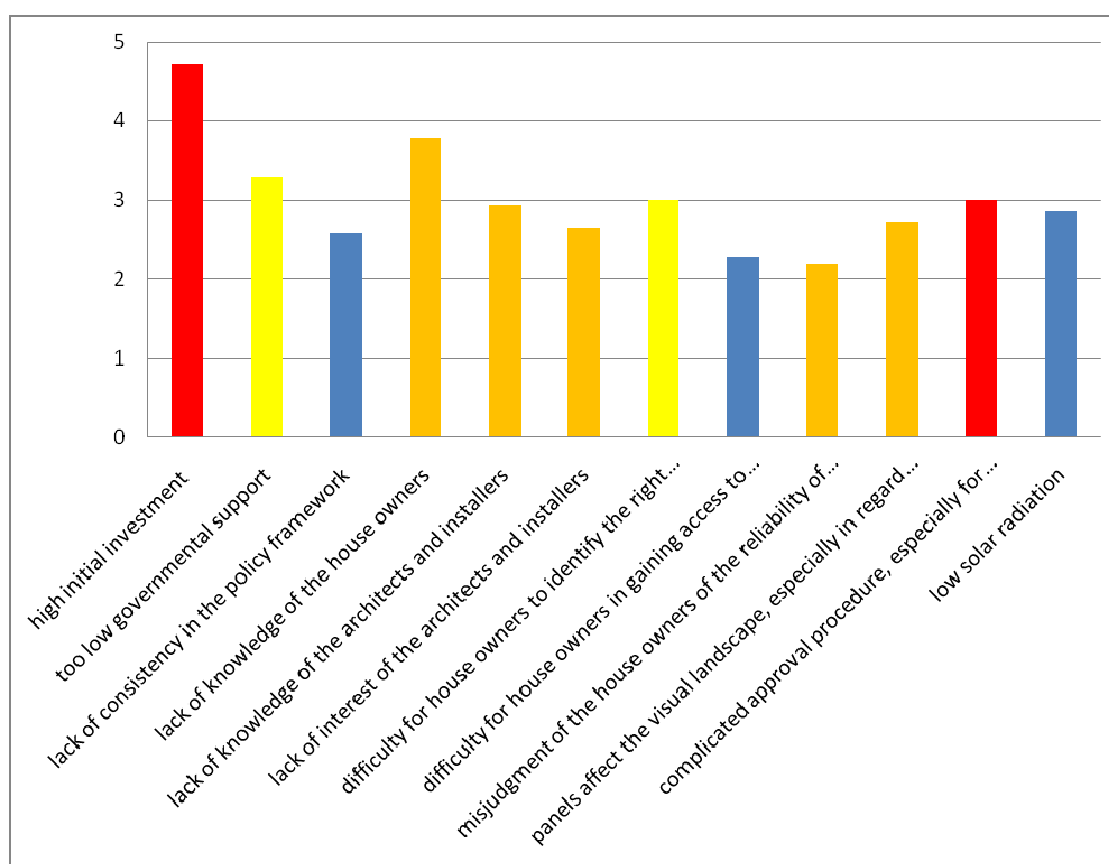
The stakeholders interviewed for this section were:

William Baker from **Consumer Focus** (Civil Society);
 Michael Harrison from the **Department for Energy and Climate Change** (Political);
 Derek Lickorish, former **EDF Energy** (Business);
 Patrick Caiger-Smith, **Green Energy Options** (Business);
 Michael Meacher MP, former **Cabinet Minister for the Environment** (Political);
 Matthew Wright from the **Energy Saving Trust** (political);
 Trewin Restorick from **Global Action Plan** (Civil Society).

The above interviewees identified the following main barriers to substantial uptake of PV in the UK. Only 'high investment cost' stood out and many of the subsequent barriers that were identified could be linked to a number of other related barriers and issues:

1. Photovoltaic panels have high upfront capital costs and their payback is long due to relatively low power output and cost of fuel displaced
2. Historically there has been a lack of grants or incentives for photovoltaics in the UK with a feed in tariff being the most notable omission
3. There is a lack of high quality information on the best options for householders. There is often 'information overload' and confusion amongst consumers
4. There are physical and visual barriers to the installation of photovoltaic panels i.e. adequate space, correct orientation and changes to the visual appearance of the property

1.1.2. Graphical ranking of barriers: Mean scores for all respondents



1.1.3. Basic overview of each barrier

- The upfront cost and long payback were identified by the majority of stakeholders as the key **economic barrier** to the installation of PV in the UK. The long payback associated with PV is partly a function of the high capital cost but also reflects the **technological barrier** of low power output, the **economic barrier** of low cost of fuel displaced and the **political barrier** of low price obtained for power generated.
- Several respondents highlighted the low power output of PV compared to conventional energy technologies as a **technological barrier** to its installation. This means that PV as a technology is not yet taken seriously by consumers and industry as a means of supplying a household's energy needs.

- A lack of financial incentives was identified as an important **economic and psychological barrier** by the majority of stakeholders, with Michael Meacher highlighting this as the key barrier to the uptake of PV and other renewables in the UK. Stakeholders felt the Government's historic resistance to the introduction of a feed in tariffs for renewables was a **political barrier** to the deployment of PV i.e. resulting in a low price obtained for power generated. It was felt that this reflected an inconsistent level of commitment to its climate change targets.
- The Energy Saving Trust and Trewin Restorick identified a lack of high quality information as a **knowledge barrier** to the uptake of PV. Consumers are often faced with 'information overload' on the energy options available to them and as a result become confused e.g. UK consumers are often unable to distinguish between solar water heating and PV.
- Derek Lickorish and Michael Harrison felt that there were physical and visual barriers to the installation of photovoltaic panels. The physical barriers of available roof space and orientation represent technological barriers. Whilst changes to the visual appearance of the property represent **societal and political barriers**. In particular the UK planning system has historically discriminated against renewables in conservation areas or on listed buildings
- Several stakeholders felt that consumers expected the Government to be supporting PV and other renewable technologies. Many feel that government should take the lead in the changes necessary to address current energy issues and that they are not the responsibility of individuals
- The Energy Saving Trust and Trewin Restorick felt that a policy designed to support a roll out of PV would result in a high financial burden on the UK economy. The financial responsibility for this policy was felt to be a **political and social barrier** i.e. if the UK Government placed an obligation on energy suppliers or generators to pay for the policy, then an increase in householders fuel bills may be a socially regressive.
- Derek Lickorish felt that the generation profile of PV was a **technological barrier** to its installation. PV generates power in the daytime when householders require the least power, if a system marginal cost were paid for power generated then PV would receive a lower price i.e. exporters are paid a sum that reflects the wholesale market costs

1.1.4. Stakeholders

The Government was unilaterally identified as the key stakeholder with respect to the installation of PV. Stakeholders felt the Government had a role to play in encouraging both businesses and consumers to 'think outside the box' regarding conventional energy use in the UK. Others such as Michael Meacher felt that the government had a more central role to play in developing a market in PV through encouraging greater incentives for both customers and businesses to invest. In particular the provision of a feed in tariff was seen as a key component of transforming the market for PV and achieving economies of scale i.e. overcoming the economic barriers highlighted above.

Several stakeholders felt Ofgem had an important role to play in ensuring that energy suppliers paid consumers a fair price for the power generated. Ofgem is the public regulator for the now privatized gas and electricity markets in the UK. It was set up in order to provide a measure of political intervention to protect consumers and also to prevent market monopolization and price fixing. The current market for generation tariffs is unregulated and a future roll out of feed in tariffs would require further intervention from the regulator.

Energy suppliers were also identified as an important stakeholder i.e. providing support for technologies and ensuring consumers receive a fair price for the energy they generate. It was felt that the lack of a feed in tariff in the UK was a particular disincentive to the expansion of smaller-scale and decentralized energy initiatives – particularly the possibilities for domestic and commercial microgeneration. However, respondents felt that they were keen to promote their ‘corporate image’, i.e. providing lower prices to consumers, rather than support PV or other sustainable energy measures.

Consumers are an important stakeholder in the take up of PV and other measures. However, consumers often rationalise their decisions based on a concern that they may be paying for something which the government themselves should be taking more responsibility for. Trewin Restorick certainly thought this to be the case and suggested that this fed into feelings of distrust among consumers in government and also in the business sector – particularly the privatised energy utilities where there has been a lack of clarity on advice to households and privatised energy companies do not always represent green issues ahead of profit.

This is an interesting finding as this suggests that it is not enough to supply customers with knowledge in order to change or modify behaviour; knowledge is inextricably linked into wider, structural power relations. One of the main points offered by Trewin Restorick in particular, is that the privatized structure of the energy utilities in the UK has consolidated power amongst the energy companies and a profit driven agenda. Compounding this problem, it was felt that the UK Government is currently averse to applying too much regulation and intervention as a method of tackling the cultural elements of unsustainable behaviour in the UK. A greater emphasis on the ‘citizen as consumer’ over the last three decades, alongside the short-term electoral cycle, has meant that the UK government is often unwilling to jeopardize the ‘populist vote’.

NGOs and pressure groups were also felt to be an important stakeholder with a responsibility to lobby the Government to implement new policies to support PV and other renewables. Stakeholders felt the Government needed NGOs to help create the political space needed to overcome the societal and political barriers identified.

1.1.5. Attempts to overcome the Barriers

The Low Carbon Building Programme (LCBP) is the UK Government’s principal support mechanism for domestic scale PV and other renewables. The LCBP offers capital grants towards the cost of installing technologies. Stakeholders felt that the programme had limited success to date and lack any real ambition to transform the market for PV and other technologies. Michael Meacher argued that felt the LCBP needed better financing and held the potential to address the **economic barriers** identified. Demand remains low so political action remains ambivalent at present.

In England, changes were introduced in April 2008 to provide a further push to PV use in UK homes. Obtaining planning permission for PV installations had been a particular difficulty within the UK’s legal framework, prompting the Government to ease some of the requirements on planning permission for PV installations. It has also been hoped that perceived public scepticism in PV as a robust technology which can be effectively incorporated into mainstream energy use, can be allayed through more stringent validation criteria for installers with the Energy Saving Trust’s *Solar PV Certification Scheme* replaced by the new Department for Energy and Climate Change backed *Microgeneration Certification Scheme*.

1.1.6. Attempts for the future

The general consensus from the interviewees in this section was that PV is still a long way from becoming a mainstream source of energy generation in the UK. As argued, the main

problem remains the upfront price to consumers, with a typical installation costing upwards of £10,000 (reduced to 5,000 with the help of a government grant) for a unit which can often generate no more than 2kW in bright sunshine.

Feed in tariffs have been observably underdeveloped in the UK, particularly in relation to developments in places such as Germany. A mandatory requirement on energy suppliers to offer feed in tariffs was seen as a key component in the creation of consumer demand for PV. Interviewees were fairly unanimous in suggesting that the government must take the lead in guiding both businesses and consumers towards a more sustainable pathway. It is important to note that planning – relating to government led, long-term energy strategy - remains a key political barrier to the deployment of renewables in the UK.

Stakeholders felt that the UK Government needed to decide on policy priorities in relation to climate change and carbon emissions, rather than the currently perceived 'conflicting objectives' of economic growth and security of energy supply. This would enable improved communication with stakeholders and encourage further consumer support for technologies such as PV.

The UK government could also provide more support for PV technology research and design i.e. reducing costs and improving efficiencies.

1.2. Buying Green Power (Purchase)

The Renewables Obligation (RO) is the UK Government's primary support mechanism for the deployment of renewables. The RO was introduced as part of the Utilities Act 2000 and it places a requirement on licensed electricity suppliers to provide a specified proportion of electricity from renewable sources. The proportion increases each year and the RO has been designed to achieve an overall generation of electricity from renewable sources of 15.4% by 2015/16. Suppliers can only meet their obligation through the production of Renewables Obligation Certificates (ROCs) and / or by paying a buy-out fee.

Renewable Obligation Certificates can be sold in conjunction with any type of electricity, and electricity generated to meet the RO can currently be sold as green electricity. The issue of additionality occurs as consumers may be paying for electricity which needed to be produced to comply with a supplier's obligation. The purchasing of green electricity in this instance results in no additional supply being added to the system. The consumer market for green electricity has become a subset of the obligatory market¹ rather than using that consumer demand to create additional generation.

1.2.1. Barriers

The stakeholders interviewed for this section were:

William Baker from **Consumer Focus** (Civil Society);

Michael Harrison from the **Department for Energy and Climate Change** (Political);

Derek Lickorish, former **EDF Energy** (Business);

Michael Meacher MP, former **Cabinet Minister for the Environment** (Political);

Matthew Wright from the **Energy Saving Trust** (political);

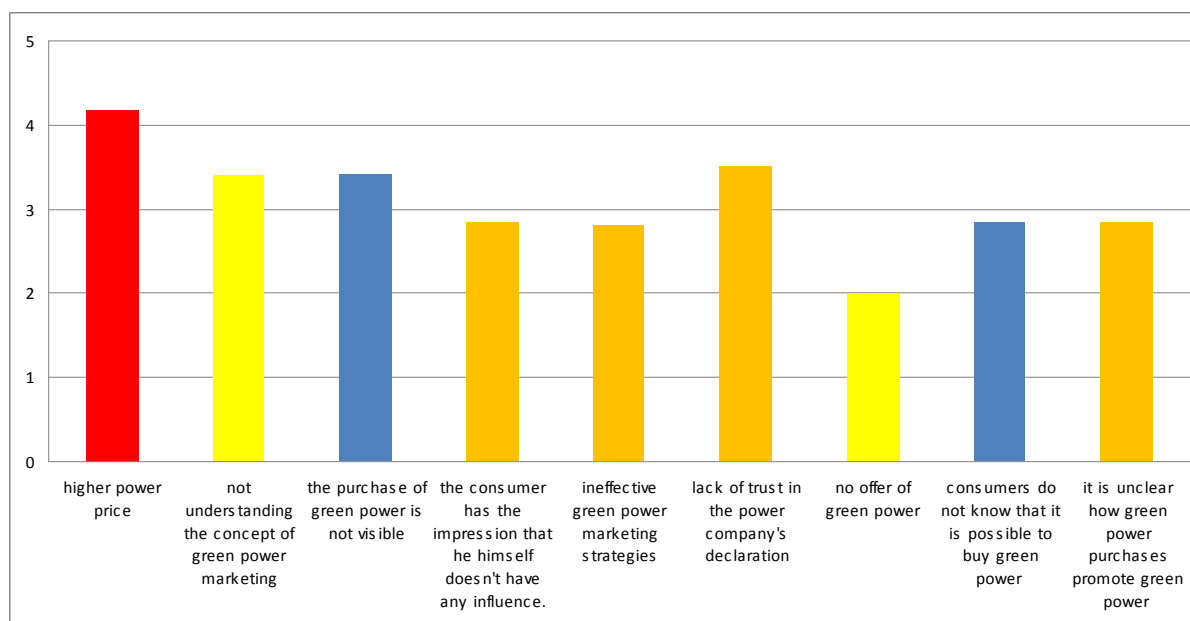
Trewin Restorick from **Global Action Plan** (Civil Society).

Stakeholders identified the following main barriers and the order below reflects the overall distribution of hierarchies:

1. Consumers pay a premium for green electricity and the justification for this is unclear to consumers
2. The purchase of green electricity does not necessarily result in the creation of any new capacity for generation i.e. additionality
3. There is lack of demand for green electricity in the domestic market which reflects a low overall level of knowledge
4. Green electricity still represents a relatively small proportion of UK generation and this shortage increases its cost and reduces its visibility to consumers

1.2.2. Graphical ranking of barriers: Mean scores for all respondents

¹ Friends of the Earth Guide to Green Electricity Tariffs 2004



1.2.3. Basic overview of each barrier

- All of the stakeholders asked with the exception of Michael Meacher highlighted cost as a significant **economic barrier** to the purchasing of green electricity. Green electricity is a premium product and consumers pay an additional cost compared to standard tariffs. Furthermore several respondents felt that the justification for this additional cost was unclear to consumers which therefore represent an additional knowledge **barrier**.
- William Baker, Trewin Restorick and Michael Harrison identified a consumer mistrust of the integrity of green electricity as a key **psychological and structural barrier**. The purchase of green electricity in the UK does not necessarily lead to the creation of any additional capacity i.e. ROCs. It was therefore felt that green electricity is a premium product that enables consumers to make a statement about their green credentials rather than an action that results in a quantifiable benefit.
- Michael Meacher and Derek Lickorish both strongly felt that a shortage of generating capacity was the key **structural barrier** to consumers purchasing green electricity i.e. green electricity costs more and is not visible. Planning was identified as the key obstacle to the increased deployment of renewables and it was felt the Government could do more to enforce national policy at a local level.
- The majority of stakeholders identified a lack of knowledge and motivation to purchase green electricity as a key **societal barrier**. If consumers were more aware of green tariffs and also more aligned with the climate change agenda then they would be more likely to purchase them.
- Several stakeholders also felt there was a degree of confusion between supply technologies i.e. what qualifies for inclusion under a green tariff. This represents a **psychological barrier** to the uptake of green electricity and may also reflect a wider distrust of energy suppliers.

1.2.4. Stakeholders

The UK Government was felt to be the key stakeholder in stimulating the provision of more renewable generating capacity and higher quality green tariffs. The local enforcement of na-

tional planning legislation and the introduction of an accreditation scheme for green electricity were highlighted as the two key mechanisms for this.

Several stakeholders felt Ofgem had an important role to play in ensuring consumers received transparent information on tariffs from all suppliers that offer them. Ofgem's role would become more significant in the event of the Government introducing an accreditation scheme i.e. enforcing the scheme designed to overcome the **structural and psychological barriers** identified. One of the ways in which this could be done would be to clarify on customers bills exactly what they are paying for and from where.

- Energy companies have a role to play in publicising their green tariff offerings more widely and clarifying the price structuring they apply to them
- Consumers have a role in purchasing green electricity
- NGOs, the media and environmental lobby groups have a role to play in supporting renewable energy and green electricity as a mechanism to combating climate change
- NGOs such as the RSPB and National Trust have deals with energy companies selling green power
- NGOs and charities that are designed to protect the countryside often object to installations unilaterally, rather than judging each development on its own merits

1.2.5. Attempts to overcome the Barriers

Past and current attempts to overcome UK barriers to a more significant integration of green energy into the UK energy infrastructure have included a mixture of behavioural approaches and market-led institutional changes, notably:

- Government led informational campaigns to consumers and energy users
- Green energy company campaigns
- The Fossil Fuel Levy
- The Non-Fossil Fuel Obligation
- The Renewables Obligation
- The Climate Change Levy

The 2007 UK Energy White Paper (EWP) points out that, 'renewable energy is an integral part of the Government's strategy for reducing carbon emissions as renewable energy resources produce very little carbon or other greenhouse gases' (EWP, 2007:143). With the opening of the Braes of Doune wind farm in 2007, the EWP points out that the UK has now become 'one of only eight countries in the world to achieve more than 2GW of wind generation' (EWP, 2007:310). They point out that this is also true of things such as geographical location and capacity issues (wind) and infrastructural issues – particularly in regard to connecting renewable energy sources to electricity generation. Renewable energy currently remains an expensive option and market driven conditions mean that they are currently heavily subsidized by the UK Government in order to avoid them going off of the radar altogether. Thus while landfill gas, biomass co-firing, and offshore wind have made progress in contributing to post-RO electricity generation, other renewable energies such as biomass, wave, or solar, remain cost inefficient and often incompatible with the practicalities and economics of the existing industry infrastructure.

1.2.6. Attempts for the future

The introduction of an accreditation scheme that ensures purchasing green electricity provides additional capacity was identified by the majority of stakeholders as a key measure to overcome the **structural barrier** of additionality, which means that green energy would hold the potential to supply growth in demand as well as supplement existing supply. William Baker and Michael Harrison felt that there was a strong need to ensure that accredited green

electricity provided consumers with detailed information about the mix of generation and the retirement of any ROCs generated.

- Educational and environmental awareness campaigns (e.g. Act on CO₂)
- Ensuring people are provided with information on green electricity before they switch tariffs
- Ramp up green taxation and incentives in order to encourage people to buy green rather than conventional electricity
- More effective labeling schemes for green energy which publish the generation mix i.e. the proportion from wind, hydro, landfill gas etc.
- Planning procedures that are more in alignment with renewable energy infrastructures such as wind or tidal energy mechanisms and infrastructures
- Using green taxation measures as economic incentives to encourage people to purchase green electricity

1.3. Construction of low Energy Houses

Housing currently accounts for 30 per cent of the UK's total energy use. While the above sections consider some of the behavioural aspects of energy use in the home by inhabitants, there is an acknowledgement that these changes can only go so far in reducing the percentage of energy use that arises from this sector. Environment and energy efficiency considerations have not historically been an integral part of the design, planning and construction of commercial and residential buildings in the UK.

The construction of low energy housing in Europe tends to be associated with the PassivHaus. The Building Research Establishment (BRE) is registered with the PassivHaus Institut Darmstadt to issue PassivHaus Certificates for domestic dwellings, offices, schools and industrial buildings. The PassivHaus UK² website states that there are presently no completed PassivHaus dwellings in the UK; however, the site contains a database of some 4,000 documented examples of PassivHaus design in Europe. The UK has several exemplar low energy or zero carbon homes. However, the construction industry has yet to embrace the changes in building practice and design required to achieve wide scale deployment.

The team asked six stakeholders from the political, business and third sector to comment on the barriers to the construction of low energy housing in the UK. Only John Slaughter of the Homebuilders Federation, Derek Lickorish and Patrick Geiger Smith responded with the remaining indicating a lack of overall knowledge in this policy area, which in part reflects the low penetration of low energy construction in the UK. Stakeholders identified a wide variety of barriers to the construction of low energy housing, to provide consistency with the other behavioural areas the four most popular have been included here:

1.3.1. Barriers

The stakeholders interviewed for this section were:

John Slaughter, **Homebuilders Federation**

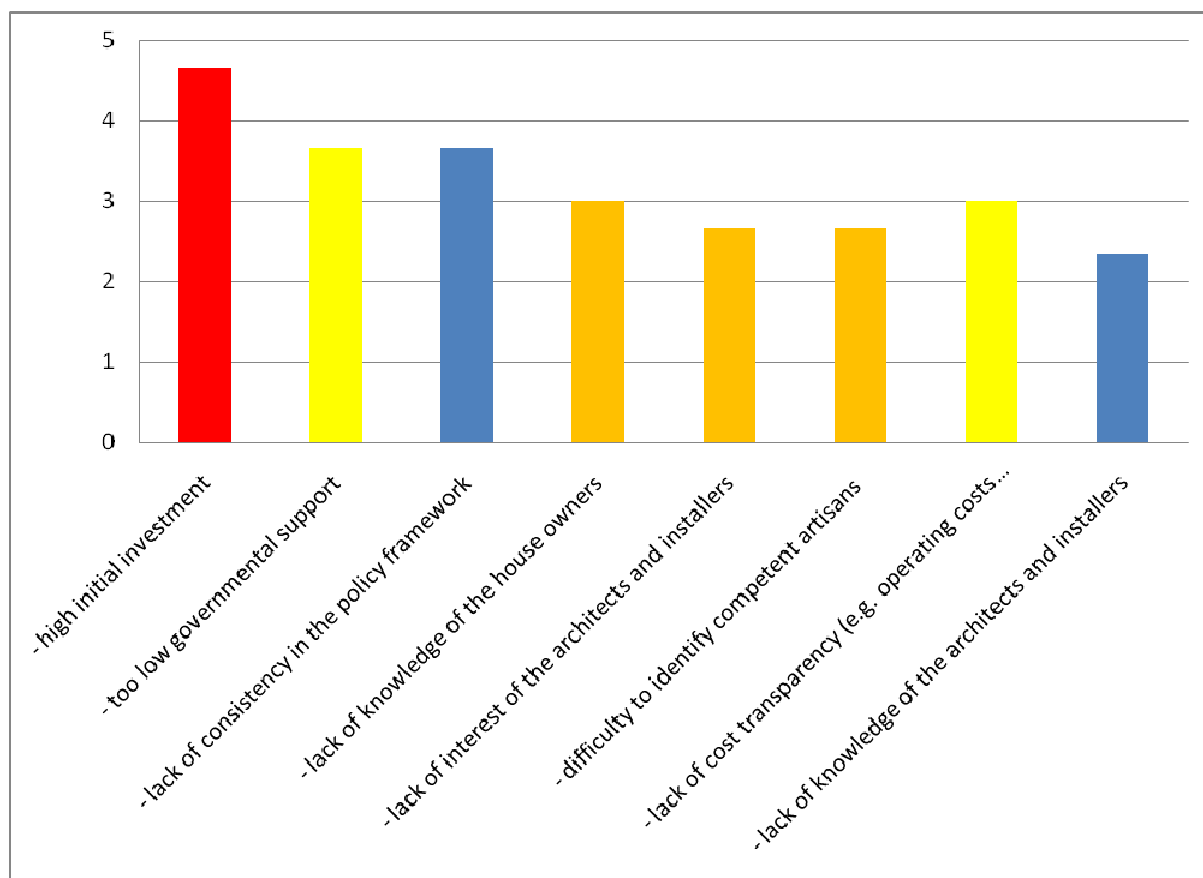
Derek Lickorish, former **EDF Energy** (Business);

Patrick Caiger-Smith, **Green Energy Options** (Business);

1. The building sector lacks sufficient skills and building discipline to achieve higher energy standards in new housing
2. There is a lack of comprehensible building regulations and standards and they aren't routinely enforced
3. There are technological limits to the delivery of zero carbon standards with allowance for offsite energy generation
4. There is still a lack of information on low energy housing which is reflected by an absence of consumer pull for them

² www.passivhaus.org.uk

1.3.2. Graphical ranking of barriers: Mean scores for all respondents



1.3.3. Basic overview of each barrier

- All the stakeholders interviewed felt that the building sector lacked the skills and knowledge required to build low energy houses in large volumes. This **societal barrier** reflects a historic lack of building discipline and construction companies and architects need to develop the skills needed to address this.
- Local planning authorities currently lack the skills, knowledge and capacity to enforce current building standards. All three stakeholders felt this was an important **political and regulatory barrier** to the construction of low energy homes, which was likely to deteriorate further in the future as standards improve. John slaughter highlighted the need for the construction industry to work more closely in conjunction with other sectors – particularly in working with planners and its supply chains.
- John Slaughter felt that there were technological limits to the delivery of zero carbon homes. The current emphasis on the structurally based technological and engineering design of houses in UK was seen to be a key **regulatory barrier**. The UK Government has set an aspiration for all new homes to be zero carbon by 2016; however, there are limitations to achieving this given the additional construction cost, supply chain issues for individual technologies and the conflicting demand for skills and materials. He argued that all homes must now be built with regard for the surrounding area and an awareness of possibilities such as localized energy generation, cellular water heating and renewable energy to make the efficiency gains which are now needed.

- The Government's future policies for low carbon homes and retrofitting existing homes are likely to create a conflicting demand for technologies. John Slaughter felt this to be an important **political and societal barrier** to the construction of low energy homes i.e. there are limited numbers of installers fitting solar water heating and as such there will be a short term gap to 2016 whilst supply expands to meet demand
- All three stakeholders felt there was a lack of knowledge amongst consumers regarding low energy housing. This lack of knowledge on future running costs and benefits represents a key **psychological and economic barrier** which is reflected by an absence of consumer demand for low energy or zero carbon homes.
- Low energy houses that are air tight need to be adequately ventilated or they could pose issues to health such as asthma and breathing problems. John Slaughter felt this could be an issue given the low levels of skills and knowledge in the building sector.
- The credit crunch and collapse of the UK housing market was also identified as a temporary economic barrier to the construction of low energy housing by all three respondents i.e. to protect its profit margin the construction industry is now building lower volumes of housing at least cost.

1.3.4. Stakeholders

The stakeholders identified a range of stakeholders with an important role to play in addressing the previously identified barriers. The UK Government has a key role to play in establishing the national planning framework for other stakeholders. However, John Slaughter and Derek Lickorish felt that further clarity on the definition of zero carbon and its role in a long term carbon reduction strategy was needed.

Local planning authorities and building control teams have a key role to play in ensuring new developments comply with current and future building standards. This would require an enhanced level of post construction follow up work to ensure the product matches the design specification. Evidence presented to the House of Commons Select Committee on Environmental Audit suggested that of the approximately 140,000 new homes built in 2006³ more than one third did not comply with Government energy efficiency standards. The Buildings Research Establishment (BRE) has uncovered many cases where new homes, supposedly compliant with building regulations, in practice failed basic tests such as poorly fitted insulation, cheap hot water tank jackets and out-of-date boilers. The Local Government Association, BRE and central Government have a role to play in developing the knowledge and skills base of local planning authorities.

The construction industry itself is a key stakeholder in the delivery of low energy homes. Stakeholders felt that best practice and regulatory bodies such as the BRE and Construction Products Association could play an important role in engaging construction companies, architects and engineering and design consultants. The emphasis on support agencies rather than the delivery agents is an interesting finding as this suggests that stakeholders don't feel that the construction companies are able to change their behaviour without the influence of their peers.

The financial sector also has a key role to play in providing finance to build low energy developments and introducing financial products that support low energy housing, such as green mortgages with lower interest rates.

³ Environment Agency 2006 see <http://www.publications.parliament.uk/pa/cm200708/cmselect/cmenvaud/566/56607.htm#a6>

Consumers have a key role to play in creating demand for low energy housing and thus encouraging the construction industry to address the current skills gap. However, stakeholders felt the Energy Saving Trust and the Government needed to do more to highlighting the benefits of low energy housing to consumers.

1.3.5. Attempts to overcome the Barriers

The UK Government has set the national planning framework for low energy and zero carbon homes through *Building a Greener Future: Policy Statement* and *the Green Homes for the Future Standards* (2007). Building a Greener Future outlines the government intent to ensure that all new homes will be zero-carbon by 2016, to be achieved through a progressive tightening of energy efficiency building regulations that are currently in place.

The UK Government introduced the Code for Sustainable Homes in 2008 as a method of enforcing these incremental improvements in energy standards. The Code measures the sustainability of a new home against categories of sustainable design, rating the 'whole home' as a complete package. Incremental targets between now and 2016 have been set at a 25 per cent in structurally based energy efficiency in homes by 2010; 44 per cent by 2013; and finally zero carbon by 2016.

1.3.6. Attempts for the future

Stakeholders felt the Government needed to clarify what impacts the increased capital costs of low and zero carbon homes will make to their running costs and how costs will be paid for. In particular, they recommended that the Government introduces feed-in tariffs as a way of making zero carbon homes more financially attractive to developers and homebuyers.

The definition of zero carbon homes is currently under consultation⁴. The consultation proposes a definition of zero carbon new homes, based on high energy efficiency, on- or near-site carbon reduction, and allowable solutions for dealing with the remaining emissions. The paper also sets out current Government thinking on zero carbon new non-domestic buildings. Stakeholders felt the construction industry and the planning sector needed a clear definition with a supporting evidence base for compliance.

Respondents thought that increased levels of the sustainability in new housing should be accompanied by a higher level of monitoring and enforcement of design and construction standards. Local planning authorities have a duty to ensure that national planning policy is delivered locally but this will require further resources from national Government.

Several stakeholders thought that moving home and getting married provided an opportunity to promote low energy homes to consumers. If you purchase a low energy home and start a family there, then you are more likely to desire one in the future.

⁴ <http://www.communities.gov.uk/publications/planningandbuilding/zerocarbondefinition>

1.3.7. Energy efficient Refurbishment

Despite a 30% reduction in domestic heat loss and a 30% improvement in the efficiency of domestic heating systems, energy delivered to UK dwellings has increase by 30% over the last 30 years⁵. This is because the demand for heat, light and other electricity in dwellings has doubled over the same time period. Whereas the average temperature maintained in dwellings 30 years ago is thought to have been 13°C it is now 18°C and could easily rise to 21°C over the next decade⁶. It is important to note that this increase in energy demand relates to the heating behaviours section, but it has been included here as the overall improvement in efficiency sets the context for this change.

Since the *Home Energy Conservation Act* in 1995 the UK has accelerated its transformation of the energy efficiency of its housing stock, with the average Standard Assessment Procedure (SAP⁷) rating in England rising from 42.1 in 1996 to 49.8 in 2007⁸. Despite the range of stakeholders consulted (political, commercial and third sector) there was a universal desire for the Government to stimulate a further step change in the efficiency of the housing stock through investment and market regulation. The need for the government to set out guidelines for industry through higher standards of efficiency has become an even more pressing concern with increased housing demand in the UK and more pressing environmental targets.

1.3.8. Barriers

The stakeholders interviewed for this section were:

William Baker from **Consumer Focus** (Civil Society);
 Michael Harrison from the **Department for Energy and Climate Change** (Political);
 Derek Lickorish, former **EDF Energy** (Business);
 Patrick Caiger-Smith, **Green Energy Options** (Business);
 Michael Meacher MP, former **Cabinet Minister for the Environment** (Political);

Stakeholders identified the following main barriers and the order below reflects the overall distribution of hierarchies:

1. Refurbishing properties is not a priority due to other time pressures
2. High costs coupled with insufficient financial incentives i.e. grants
3. There is a lack of high quality information
4. Energy is still relatively inexpensive and thus undermines the economics for refurbishment and the driver for consumer demand

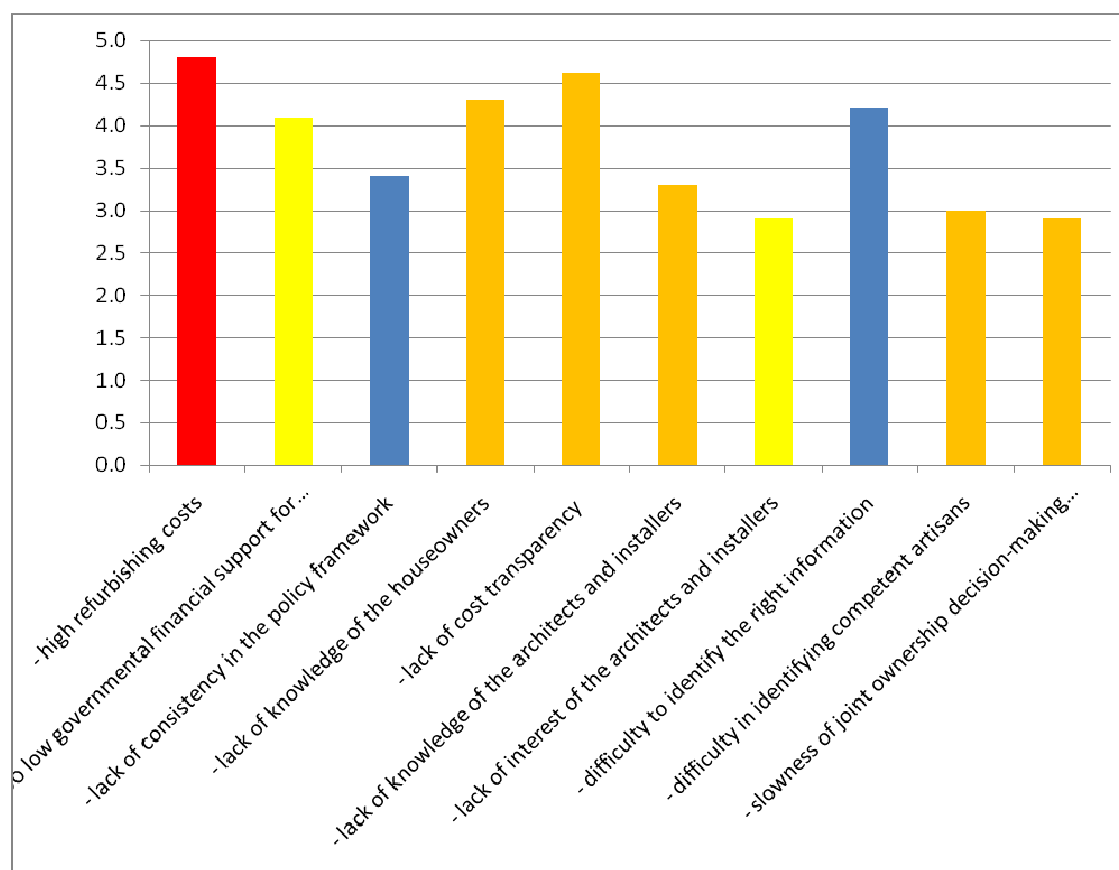
⁵ BRE, Domestic energy fact file 2003, Shorrock and Utley 2003

⁶ Select Committee on Science and Technology Minutes of Evidence, UCL 2008

⁷ <http://projects.bre.co.uk/sap2005/>

⁸ English House Condition Survey Headline Report, CLG 2007

1.4.3. Graphical ranking of barriers: Mean scores for all respondents.



1.3.9. Basic overview of each barrier

Michael Meacher, Derick Lickorish identified the primary **cultural barrier** to consumers refurbishing their homes as a lack of time due to other conflicting priorities. In the UK society does not economically or socially value energy saving measures.

Derick Lickorish and William Baker also identified the UK housing markets historically high turnover rate compared to mainland Europe as a **psychological barrier** to people prioritizing refurbishment activities i.e. people move people moving more frequently than the payback of many measures.

- The high cost of measures such as solid wall insulation was seen as a key **economic barrier** to the installation of measures. However, stakeholders felt the cost of measures could be addressed by an overarching set of political and regulatory reforms. The UK Government needs to increase investment in higher cost measures to help overcome the identified **economic and physiological barriers**, whilst regulatory reforms could encourage energy suppliers to provide energy services rather than finite units of energy.
- The price of energy was highlighted as an important **economic barrier** which underpins the low priority placed on home energy efficiency refurbishment. If energy prices remained high for a significant length of time the payback for measures would decrease, and consumers would begin priorities the improved efficiency of their homes to achieve a satisfactory degree of thermal comfort. However, respondents unani-

mously highlighted the implications of high fuel prices for fuel poverty i.e. vulnerable households can't afford to heat or power their homes.

- Michael Meacher and Patrick Caiger-Smith both felt there was insufficient level of high quality information. The current light touch provision of generic advice is both a **structural and social barrier**. Moreover, advice provision that was face to face and specific to the property was felt to be needed if the UK is to address the **psychological barrier** of a perceived lack of time. For example, generic advice states that double glazing is one of the least cost effective measures, when in some cases where windows are poorly fitting and low efficiency it may be cost effective.
- The provision of free low payback measures through Government and energy supplier funded schemes was as seen a **social and economic barrier**. It was felt that insulation, for instance, has often been devalued as consumers have been reluctant to pay for measures that are given to others for free. Under the UK Government's Warm Fronts Grant for instance, certain sectors of society – such as the elderly, disabled and unemployed, have been eligible for energy insulation measures in order to help address fuel poverty in the UK. The obligation on suppliers to install energy efficiency measures has also created a structural barrier, with energy suppliers now perceived to control the insulation sectors profit margins and growth prospects.

1.3.10. Stakeholders

The Government was universally identified as the key stakeholder with respect to home refurbishment. Stakeholders felt the Government could play a key role in establishing a coherent political objective for the reduction of carbon emissions; provide the economic support required to stimulate the market for measures through appropriate subsidies; and regulate the energy market to reduce emissions and constrain consumption i.e. overcoming political, regulatory, economic and in turn social barriers. It was suggested that the Home Energy Conservation Act, the Energy Efficiency Commitment and CERT had only made limited progress so far. The Energy Suppliers were identified as important stakeholders with a responsibility for carbon emissions from the housing stock. The Carbon Emission Reduction Targets (CERT) is third phase of a three year energy supplier obligation in the UK (DEFRA, 2009). CERT puts an obligation on energy suppliers to reduce carbon emissions from UK homes where part of this is to advice and cooperate on insulation measures in energy inefficient households. Suppliers must focus 40 % of their activities on low income accommodation, much of which is though to be the least energy efficient in the UK. Interviewees were unsure how successful this would be longer-term where stake holders felt that the current business-centred model did not lend itself to the finite reduction of energy use and emissions.

The third sector (NGOs, voluntary organisations and charities) were seen to have a significant role in national and local behavioural change campaigns and the local delivery of energy supplier funded CERT schemes. Independently led campaigns were seen to play a key role in overcoming political barriers i.e. creating the political space needed to develop further reaching policies such as the Climate Change Act 2008

Ofgem were identified as a potentially influential stakeholder; however, this is dependent upon the Government regulating the energy market to reduce demand across its customer base. Ofgem's is the regulatory body for the monopoly companies which run the gas and electricity networks.

Installers and artisans were seen to have a more passive role than the previous three stakeholders. The refurbishment of properties will require installers to embrace new technologies and working practices; however, they will respond to the stimulus created by others rather than seek to promote them themselves.

1.3.11. Attempts to overcome the Barriers

Warm Front programme (that provides grants for heating and controls in low income households) and the energy supplier funded CERT (previously Energy Efficiency Commitment) schemes represent the primary attempts to overcome the **economic and physiological barriers** to refurbishment. Whilst stakeholders were keen to highlight their role in improving efficiency and reducing emissions, it was felt that their success to date had been relatively modest. These schemes have historically supported low cost measures such as loft and cavity wall insulation and they have not helped develop the supply chain or market for solid wall insulation.

CERT, Warm Front and the proposed Community Energy Saving Programme are passive policies from a consumer's point of view i.e. rather than engaging them and promoting a long term dialogue they parachute in with measures. Stakeholders felt they needed restructuring to help form part of a wider carbon reduction strategy to get to 2020.

Housing Health and Safety Rating System (HHSRS) legislation allows local authorities to take action against landlords and home owners where a house fails on cold criteria (nominally SAP35 and below). Research by Impetus for the Energy Efficiency Partnership for Homes found that local authorities are failing to enforce this legislation due to a lack of the resources and knowledge.

1.3.12. Attempts for the future

Moving house has been identified as a key opportunity by the majority of stakeholders. The Energy Performance Certificate offers some hope where it is now mandatory on all new homes and on buying and selling transactions. It was suggested that if the Energy Performance Certificate (EPC) in the Home Improvement Pack were linked to taxation i.e. Stamp Duty at point of sale then this could have an impact. For example, if you receive a low rating then you would be subject to a carbon tax on top of Stamp Duty. This would give insulation a value and create a demand for it.

Retirement and downsizing: Children have left home and you are thinking about moving to a smaller property. At this point you may think about refurbishing your home as you will consider your long-term savings against your outgoings. However, for some a dual fuel direct debit customers an energy bill of £1,500 is still too cheap, if this were to be £5,000 then you would be focussed upon it.

The Government should link a more ambitiously funded grant schemes and refurbishment loans to a mandatory SAP target for the homes improved. This is the model used in Germany for the low interest loans programme which enables consumers to borrow capital at a cheap rate to improve the property to modern standards.

1.4. Energy efficient Heating Behavior (Use)

The energy efficient refurbishment section outlines the overall increase in household's internal temperature since the 1970s. It is now recognised that the theoretical energy savings predicted very rarely materialise as a result of improved comfort and other changes in occupant behaviour⁹. This is often called the "comfort factor" or "take back effect". Energy economists refer to the phenomenon, first recognised by Jevons in the late 19th Century, as the Brookes-Khazzoom effect¹⁰. In addition to householders are increasingly using air conditioning to cool their homes in the summer and this trend is expected to increase as a result of climate change.

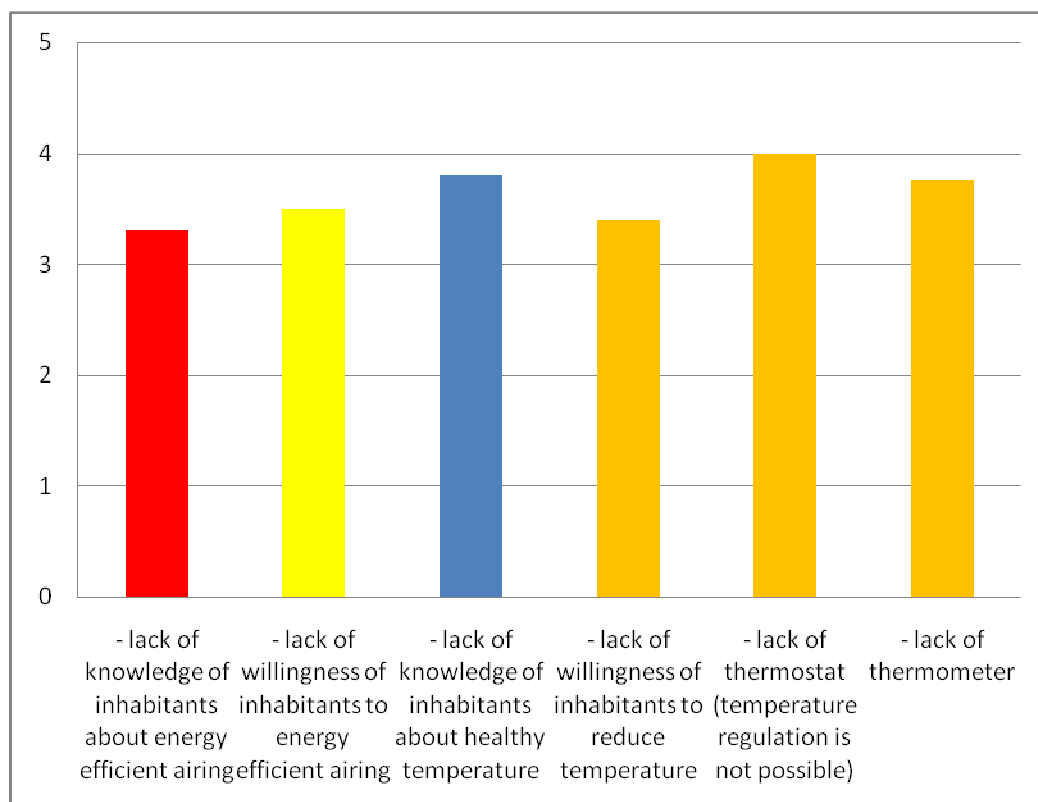
The relative impact of the take-back effect and householder behaviors has not been quantified accurately. The 1996 English Housing Condition Survey (EHCS) was the last survey to record internal and external temperatures. However, researchers have estimated that the take-back for improvements to thermal insulation and heating systems could be in the region of 50%.

1.4.1. Barriers

Stakeholders identified the following main barriers and the order below reflects the overall distribution of hierarchies:

1. Householders don't know how to operate their heating system efficiently
2. Heating systems do not provide accessible information about energy use
3. The design of heating system controls is overly complex
4. Energy is still relatively inexpensive

1.4.2. Graphical ranking of barriers: Mean scores for all respondents.



⁹ Select Committee on Science and Technology Minutes of Evidence, UCL 2008

¹⁰ Saunders, Harry, 1992, The Khazzoom-Brookes Postulate and Neoclassical Growth, Energy Journal, Vol 13, No 4, pp 131-148

1.4.3. Basic overview of each barrier

- The stakeholders interviewed unanimously identified a lack of knowledge and information as the key **psychological barrier** to improved heating behaviours. Respondents felt that consumers didn't know what constitutes a healthy internal temperature and also didn't understand how to programme their heating controls.
- Patrick Caiger-Smith, Derek Lickorish and Michael Harrison also highlighted a lack of information on heating energy usage as a further **psychological and structural barrier** to improved heating behaviours i.e. systems do not have the necessary tools to supply up to data to householders in an accessible format.
- The current provision of generic energy efficiency advice was felt to be a **structural barrier** to the previously identified **physiological barriers** around knowledge. Patrick Caiger-Smith, Michael Meacher and William Baker all felt that in-depth face to face advice needed to be delivered in far higher volumes to stimulate improved heating behaviours.
- The design of heating controls was acknowledged as a **structural barrier** to improved heating behaviours. Several stakeholders thought that controls were often overly complex and weren't designed with the user in-mind e.g. vulnerable and elderly householders won't be able regulate their system due to a lack of knowledge.
- The price of energy was highlighted as a key **economic and psychological barrier** which underpins the low priority placed on improved home heating behaviours. Several stakeholders thought consumers would ration use once the cost of energy becomes prohibitive. However, this was still a contentious issue as many highlighted the increasing levels of fuel poverty and the need to protect vulnerable consumers (Consumer Focus, Patrick Caiger-Smith, Michael Meacher and Derek Lickorish).
- Stakeholders again felt that consumers either do not have time to identify correct home heating behaviours or they perceive this to be the case. This represents a **cultural/societal barrier** that reflects our currently current social narrative on climate change and energy use i.e. over heating your home is not considered to be socially unacceptable.

1.4.4. Stakeholders

Stakeholders identified a wide range of stakeholders with respect to home heating behaviours. The Government was again identified as the stakeholder with the most significant role in influencing behavioural change. The key areas of influence for Government were identified as:

- Ensuring that every home has a smart meters by 2020 and thus overcoming the **psychological barrier** of knowledge and information
- Supporting the delivery of a wide scale programme of face to face advice provision. Although several stakeholders felt that simply engaging consumers further wasn't enough to stimulate imbedded behavioural change.
- Defining basic standards to help improve the design of controls
- Ensuring that energy efficiency and climate change are covered by the curriculum and taught too children routinely throughout their education

- Ensuring that carbon emissions are central to all policy decisions and thus given a higher profile within society i.e. helping to overcome the **societal, physiological and economic barriers** identified.

Energy suppliers were seen to have a key role in the provision of higher quality information and tools through improved feedback on billing and the role out of smart meters i.e. overcoming the **physiological and structural barriers**. Several respondents felt that energy suppliers were resistant to the role out of smart meters with real time displays i.e. the inclusion of real time displays would increase cost and reduce profit. However, Derek Lickorish, Patrick Caiger-Smith and William Baker all thought that real time displays would be needed to stimulate significant behavioural change as a result of the smart meters role out. The reluctance of energy suppliers to decrease their profit margins represents both a **structural and economic barrier**.

It was felt that the European Union had a role to play in ensure that there is a consistent and stable market for carbon across Europe. If a reasonable price for carbon could be maintained over a consistent time frame then Derek Lickorish felt this would stimulate energy suppliers and the business sector to engage consumers further.

The Energy Saving Trust (EST) is a not for profit organization, partly funded by the UK Government, that has been set up to provide advice on using energy more sustainably. The EST offers advice to consumers, trade and businesses, and technical expertise to the building industry and local governments, among others. The EST was seen to be an important stakeholder with responsibility for the delivery of more effective energy efficiency advice. The delivery of face to face advice and more specific advice guides have been approved by a recognized body were seen to be key components in addressing the **psychological barriers** of knowledge and information.

Consumers themselves were identified as a key stakeholders. Interviewees felt their role was dependent on their existing level of engagement and fuel poverty status. Fuel poverty continues to be a big issue in the UK with energy price hikes during the last two decades often pushing a large percentage of vulnerable groups into problems. Increasing fuel costs could be driving some fuel poor households to under heat their homes, where as there are a large proportion of consumers that aren't aligned to environmental messaging and need to be engaged.

In additional to these major stakeholders, the following were also identified:

- The media have more responsibility to inform people about climate change and pro-environmental behaviours
- Mavens and community leaders have a role in supporting local community groups
- Installers of central heating systems and controls could play a big role in supporting consumers in the choice of products and their operation
- Social Landlords have an ongoing responsibility to ensure their tenants know how to use their heating systems
- Control manufactures could produce simpler more engaging controls

1.4.5. Attempts to overcome the Barriers

The Energy Saving Trust has a network of Energy Saving Trust Advice Centres (ESTacs) which provide advice to consumers. The service has had moderate success to date reached 10% of the population; however, most of these contacts are one off and until recently they

have not been routinely followed up. Michael Meacher and William Baker felt that advice provision should be localized with a more imbedded network of provision.

The Warm Front programme provides grants for heating and controls in low income households. Although the programme provides the tools for home heating behavioural change i.e. controls, installers do not spend an adequate period of time explaining their use and are not qualified to do so.

1.4.6. Attempts for the future

Smart meters with real time displays were seen as a fundamental component in the provision of better information on consumption and bills i.e. addressing the social and psychological barriers identified. Smart Meters provide an opportunity to change people's relationship with energy i.e. heightens people's awareness by making it real and three dimensional.

EST Advice Centre's should provide more in-depth face to face advice to householders which provides information on property specific solutions, installers and sources of funding. The consumer should also be re-contacted in the future to help ensure they overcome any barriers encountered e.g. they are unable to obtain quotes for measures.

Energy use and carbon emissions could be written into the curriculum of schools. Several stakeholders felt that the education of tomorrow's consumers was fundamental to addressing the wider **societal and physiological and barriers**. For instance, In the same way that children may come home and asked their parents why they were smoking, they could be the generation that is asking 'why have left the lights been left on?'

1.5. Summary of Area of Domestic Energy Use

- Many respondents felt that the UK Government needed to value and consider carbon fully in all its policy decisions if we are to create a future low carbon economy. The prioritisation of carbon would then help address many of the issues and barriers identified i.e. transforming the energy market, increasing investment in advice delivery / energy efficiency schemes
- Whilst almost all respondents felt the Government needed to fund / encourage a higher and more enhanced level (face to face) of advice provision, at least half indicated that simply engaging consumers further wasn't enough to stimulate behavioural change and / or uptake of measures
- The majority of respondents felt the provision of accurate and up to date information in an engaging format was a fundamental component of consumer behavioural change i.e. smart meters with real time displays that enable people to count energy and thus help re-frame their relationship with energy
- Lack of time to identify measures and take actions was seen as a key barrier (particularly for home heating behaviours and insulation), respondents felt that other more immediate priorities would always take precedence over these actions. However, a number of respondents thought that a higher level of political and media support for pro-environmental behaviours would help normalise these behaviours i.e. providing a higher priority for these behaviours amongst social groups.
- The price of energy was seen as a barrier in many of the sections (PV, heating behaviours, and insulation) i.e. energy is too cheap for many and making it more expensive would reduce the payback associated with measures and increase the priority of actions. However, this was a contentious issue as many highlighted the increasing levels of fuel poverty and the need to protect vulnerable consumers (Consumer Focus, GEO, Michael Meacher and Derek Lickorish)
- The majority of respondents felt that the energy market needed to be transformed so that our relationship with energy suppliers is reconstructed, whilst a number of different approaches were discussed, there was an overall consensus that the policy framework needs to be changed to reduce the demand for energy from fossil fuels in a manner that is profitable to either companies or consumers (the latter is a key point as some felt suppliers should be able to profit from the delivery of energy services, whilst others felt consumers should benefit directly from renewables and energy efficiency measures funded through taxation)
- The transformation of the energy market was seen as a key component of addressing the barriers of several sections i.e. once the market has been changed this overcome many of the barriers identified for (heating behaviours, insulation, PV and green energy)
- The current regulatory framework (Renewables Obligation) means the supply of green energy doesn't deliver meaningful additionality i.e. growth in supply. It is therefore a premium product that enables consumers to make a statement about their green credentials,

a number of respondents felt the introduction of a certification scheme and a mandate to publish the supply mix on bills would help protect consumers

- Planning was identified as a key barrier to the growth in supply of green electricity use and supply in the UK.

2. Area of Household Appliances

2.1. Energy Efficient Appliances (Purchase)

As argued above, reducing carbon emissions from housing and building infrastructures is a policy priority for the UK Government. It is thought that appropriate changes in purchasing decisions and household energy use could reduce annual CO₂ emissions in UK homes by up to two tonnes. Domestic energy use in the home rose by 1.7 per cent between 1995 and 2002 and much of this has been attributed to the proliferation of consumer electronics in the UK: a trend which will constitute the biggest single sector of domestic electricity consumption by 2010 (Owen, 2006:34).

This section considers the use and purchase issues involved in three areas of 'energy efficiency appliances' in the UK: The first concerns the use and purchase of fridges; the second looks at lighting issues in UK households and buildings; and the last part considers cooking and baking. 'Cooking and baking' does not draw on interview material, but considers this issue within the context of the first two sections and frames the debate within the wider context of UK policy on energy efficient appliances.

2.1.1. Barriers

The stakeholders interviewed for this section were:

Martyn Webb of the **Defra Market Transformation Programme** (Political Domain);

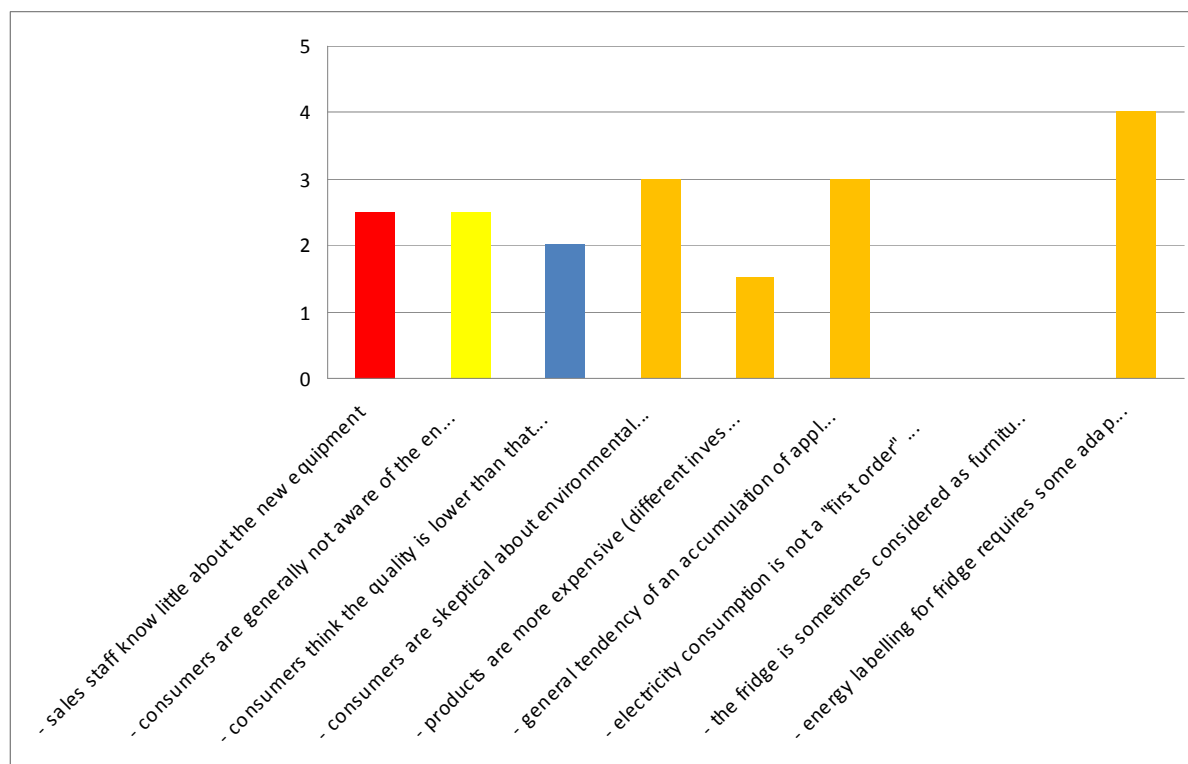
Tara Garnett of the **Food Climate Research Network** (Civil society). The main barriers to the purchase of energy efficient appliances in the UK were identified as:

1/ The UK have traditionally lagged behind other EU countries in relation to both provision and information regarding the integration of appliances such as fridges and freezers;

2/ A lack of consumer awareness over the meaning of ratings;

3/ The UK has different cooking habits to the rest of Europe and consumers cook a lot of processed food and ready made meals. This requires more fridge/freezer space.

2.1.2. Graphical ranking of barriers: mean scores for respondents.



2.1.3. Basic overview of the barriers

- For the purchase of energy efficient fridges, a mixture of **political**, **economic** and **cultural** barriers can be seen to interact with knowledge barriers around inadequate labeling.
- According the Martyn Webb of the Market Transformation Programme, Defra, the UK has traditionally lagged behind other countries in the development of the markets for energy efficient fridges and freezers, particularly from a **political leadership** aspect. The Market Transformation Programme is a part of DEFRA and provides support for the product and service aspects of the UK Government's Framework for Sustainable Production and Consumption. It is hoped the MTP, by working with stakeholders on services and product design, can help shift production and consumption towards lower energy and environmental impact. Energy labels and minimum standards have now created a considerable improvement in the uptake of energy efficient appliances, however concern about energy efficient appliances is not high in the UK. Tara Garnett argued that, in the UK take up of A+ rated fridges is lower than in other countries because of the fact that brands haven't yet entered the market and there isn't yet a sufficient level of consumer awareness and **knowledge** of the meaning of those ratings.
- At an **economic barrier** level, whilst other countries, such as the Netherlands have used price incentives to reduce the price differential between the most energy efficient appliances and the average, the UK has tended to focus the financial stimuli on insulation and light bulbs, rather than other energy efficient products. This is partly because the deregulated energy market has meant that privatized energy suppliers can choose how to spend energy efficiency incentive payments. At the same time the

inadequacy of the energy labeling scheme means there is a high level of difference between the energy efficiency of A rated fridges – reflected in the price differential between these fridges.

- At a **cultural level**, the UK has a tendency to buy frost-free cold appliances and ‘built in’ appliances. These are more energy demanding than free standing and non-frost free appliances. However, since energy efficiency labels are rated by class of product, an A-rated frost-free fridge would be more energy intensive than an A-rated fridge which is not frost-free. Whilst there is a high degree of consumer awareness of the Energy Efficiency label, there is less awareness of the meanings of the different classes of fridge creating a **knowledge barrier** around the final energy demand of different categories of appliances.
- Recent **cultural trends** in the UK include a shift towards bigger, ‘American’ style cold appliances. Whilst suggesting there is little evidence for the driving forces behind this change, Martyn Webb believes it could be caused by high levels of disposable income and US influence on UK lifestyles. Additionally, the UK is more dependent upon ready meals and frozen food than its EU counterparts, requiring more fridge and freezer space, and encouraging a trend towards multiple fridge ownership.
- More positively, the introduction of the Energy Efficiency labeling and the removal of the D and E rated fridges has meant that products are getting more energy efficient year on year. Manufacturers want to have high quality goods and see the energy label as signaling that to the consumer. Promotion of the Energy Efficiency label by the Energy Saving Trust helped with this. However, despite the increased purchase of energy efficient goods, the energy demand from cold appliances is still increasing because of the other trend factors listed above.
- Tara Garnett suggests that the turnover rate on fridges in the UK is something like 12 to 15 years and not the suggested optimum changeover time of 7 years. She points out that in this time fridges are likely to be at their worst in terms of being energy efficient.

2.1.4. Stakeholders

- Product designers: they need to be persuaded of the value of the design of more efficient products.
- Retailers are the key stakeholder. They need to be persuaded of the value of selling primarily energy efficient products. This can be done through green branding, which has specific criteria. Also they do not know what they should be looking for in products so it is essential to provide them with information about what their buyers should be looking to stock in their range.
- The Energy Saving Trust needs to get information to consumers more effectively.
- The Carbon Trust, an independent government funded body which advises business on ways to reduce carbon, needs to get information to businesses in a more effective way than at present.
- Trade Associations need to intervene between the different requirements of manufacturers and retailers.

- International cooperation requires those working for more efficient products in the UK to talk to manufacturers in China etc.

2.1.5. Past attempts to overcome the barriers

- The main tool to increase the purchase of energy efficient goods has been to label goods and to set minimum standards.
- Energy Saving Trust does provide information for consumers. However, fridges and freezers are usually 'distress purchases'; that is they are bought because the old fridge has broken and needs immediate replacement. This means the information is more essential at point of purchase. The window of opportunity for other goods is Christmas time, so consumer information should be focused on this time of the year.
- In terms of providing consumers with an understanding of the energy efficiency labels, the Energy Saving Trust has worked with retailers to train their staff about energy efficiency. However, this has had mixed results because of the high turnover of sales staff.
- Additionally, Energy Savings Trust has worked to promote the energy efficiency label amongst consumers and has a website providing consumer advice.
- Awareness raising advertising from the Energy Saving Trust and government has been used to address consumer behaviour around the inefficient use of products. However, Martyn Webb suggests that whilst there is evidence to suggest it *can* change behaviour in the short term, people do return to their former behaviour.
- The Market Transformation Programme has worked with stakeholder across the supply chain to raise awareness of the importance of energy efficient appliances. This includes convincing trade associations to talk to their members about the value of energy efficient goods, and working directly with retailers, manufacturers and product designers. This helps to facilitate 'choice editing' (removing the less efficient goods from the market), which is seen by Martyn Webb as an effective method of addressing the purchase of inefficient goods.
- Whilst the market may be UK based, some of the solutions have been to encourage product designers and manufacturers in China and other countries to adopt an energy efficiency standard. This cross national working with the supply chain can have effective results for addressing some of the barriers to more efficient appliance.
- The Market Transformation Programme (MTP) is encouraging certain retailers to adopt greener standards, selling high quality, efficient goods. This can be done through 'green branding', using policy endorsed criteria. One of the initiatives currently being undertaken is to train retailers' buyers about energy efficient goods. Since buyers are not always sure what they should be looking for, MTP have worked with retailers to provide advice about what criteria their buyers should use to select the most energy efficient goods. Getting the timing of the advice right is key: the windows of opportunity to get more efficient product lines include talking to retailer's buyers in March when they about to set out for their buying trips for the Christmas product lines.

2.1.6. Attempts for the future

- The inadequacies of the energy labeling for fridges (explained above) is currently subject to EU discussions. This is an issue likely to be resolved without reference to the consumer. With rolling systems of minimum product standards, it is likely that more stringently energy efficient products will be on the market soon.
- The Market Transformation Programme suggest price that differentials can be addressed through government procurement policies. They provide the example of the price of energy efficient IT equipment was driven down by the US declaring it to be a procurement standard. The economies of scale made it cheaper for ordinary consumers. So the government is being to look at how procurement policies can help reduce the price differentials of energy efficient products.
- Whilst it is clear that cultural trends towards multiple ownership and larger fridges are overwhelming energy efficiency initiatives, there appears to be a **political barrier** to intervening in the free market and cultural trends in consumption. Instead, the main policy response to multiple ownership is to quantify the energy demand trend and to factor it in to the overall energy use model. This model looks at the impact of all the policies more meeting carbon reduction targets and savings will be made at a more appropriate point in the product lifecycle. It is likely that other stakeholders would be more interested in addressing these cultural barriers, in particular environmental campaigning organizations.

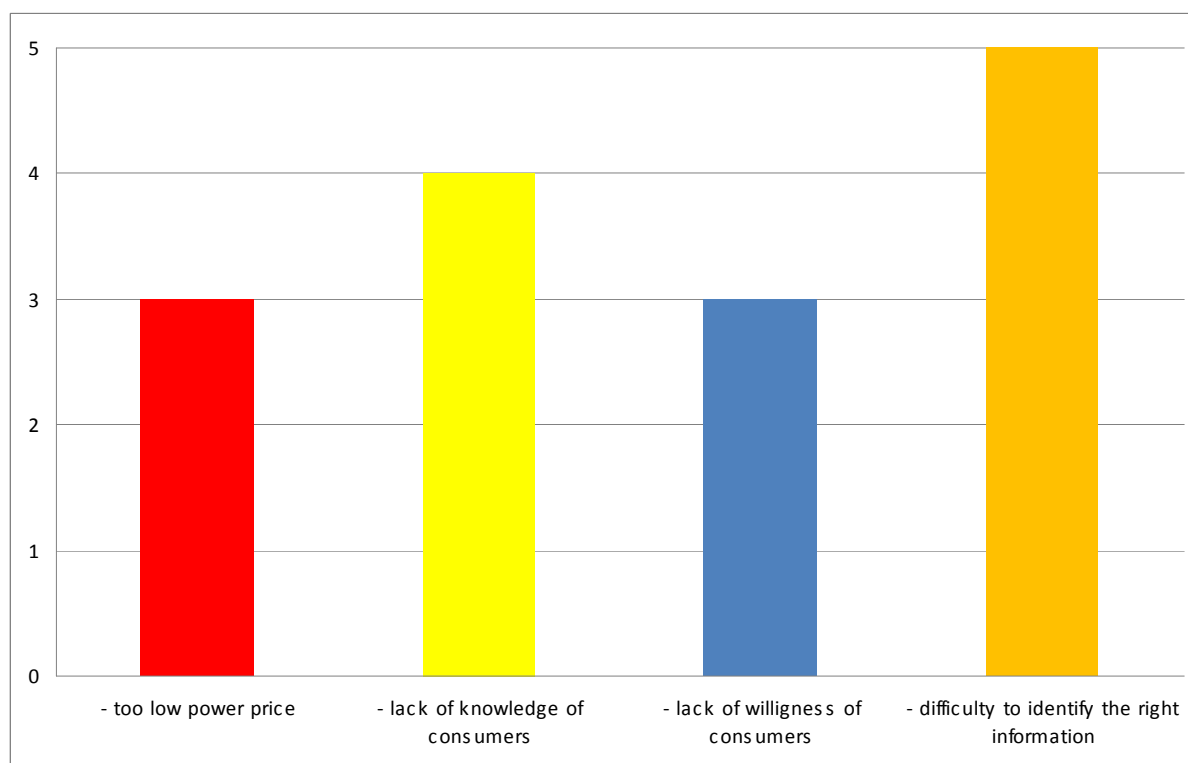
2.2. Energy Efficient Appliances (Use/purchase)

The stakeholder interviewed for this section was:

John Aston, the **Environmental Marketing Director of Phillips Lighting** (Business domain). The main barriers to both the use and purchase of energy efficient appliances in the UK were identified as:

- 1/ The limitations of technology and its relationship to behaviour;
- 2/ The aesthetics and practicalities of changes in lighting hardware to the consumer;
- 3/ Providing and disseminating relevant and up-to-date information to the consumer

2.2.1. Graphical ranking of barriers



2.2.2. Basic overview of the barriers

- John Aston argued that the biggest barrier to more widespread use of energy efficient lighting could be located in the limitations in current technology to be able to address inefficient lighting behaviour. This could be deemed to be a combination of **structural** and **cultural** issues and the complex ways in which these can play out. The interviewee suggested that this situation was further exacerbated by apparent **political barriers** regarding the fact that the UK Government does not really understand lighting technology and how to best disseminate this information to stakeholders.
- In relation to the above, John Aston argued that the public don't currently know as much about lighting as they should. For instance, many people do not really have a true appreciation in regard to how much lighting contributed to their electricity bills. Seeing this as both a **knowledge-based** and an **economic barrier**, the interviewee pointed out that consumers do not currently have enough knowledge in regard to technology choices in

lighting, what they can do, and what the cost-benefits can be in terms of monetary gains through pay-back for instance. There are also **cultural issues** related to use of lighting and its relationship to spatial context and habitual practice.

- John Aston argued that the UK Government must take the lead in providing a conduit between business and consumers in providing information to consumers. He pointed out that the government may have more success in selling more energy efficient lighting on the basis of cost and energy efficiency rather than on environmental concerns where there remain **psychological** issues regarding mistrust of both agendas and priorities.

2.2.3. Stakeholders

- The government must take the lead on lighting in the UK but there is currently a danger that they will promote the wrong technology at the wrong moment.
- Business has a large role to play in incorporating more sustainable lighting and infrastructures into the UK but this must to be framed by effective policy initiatives.
- Research and design and also educational institutions in developing the next generation of engineers.
- Retailers have a role to play in ensuring the UK Government's voluntary phase out of incandescent bulbs is supported and they stock a range of low energy bulbs i.e. bulbs to fit different fittings and lighting needs.
- Consumers.

2.2.4. Past attempts to overcome the Barriers

- John Aston suggests that the UK was far more proactive than it is now in attempting to diversify on conventional energy use – and encouraging more sustainable lighting – back in the 1980s, subsequent to the Iranian oil crisis when security of supply became a widespread concern.
- The Energy Performance in Buildings Directive has been hit-or-miss so far in the UK and the National Energy Efficiency Plan have been hit-and-miss so far in shifting the UK to more sustainable lighting practices on a larger scale.
- The Enhanced Capital Allowances Scheme has failed to incentivise investment in energy saving equipment primarily due to insufficient understanding of existing fixtures and fittings of buildings and cultural practices in lighting in the UK.

2.2.5. Attempts for the future

- John Aston pointed out that the UK Government needs to take the lead in coordinating stakeholders but must do this with a much better understanding on both the possibilities and limitations of technology in lighting. LED technology is an example of this where it has been lauded as a 'technological fix', but it is not fully developed or appropriate for all lighting practices.
- The interviewee pointed out that Phillips is trying to get away from the idea that people in research and design are coming up with ideas that are always marketable. He sug-

gested that it is really about actually making sure that the insights into what you really need actually deliver into the commercial and domestic marketplace.

- John Aston also pointed out that the design and planning of buildings must become more integrated with *available* technology and policy aims. He reasoned that more thought must go, not just into the design of energy efficient buildings, but also into the *cultural* aspects of the practices through which they are actually run.
- Such a cultural shift in current individual and institutional ideas regarding lighting and its use in everyday life has to be led by the UK Government he reasons. One way in which to do this would be to train the next generation of engineers to have a clear understanding of the design and construction of buildings. In this way, it would be hoped that the future design of buildings will be able to facilitate more direct behaviour change.
- The debate on climate change needs to be widened to incorporate to make people aware of current energy security issues.

2.2.6. Summary of Area of Household Appliances

It was generally felt that the purchase of energy efficient appliances in the UK constitutes a complex relationship between a variety of barriers, both **structural** and more **individually** based. Martyn Webb for instance felt that the UK lagged behind other European countries on product labelling regarding fridges and freezers and that there was a **political** role for the UK Government to play in disseminating greater awareness of energy efficient products and practices to consumers, in line with the activities of Northern European countries. This was also felt to be true in the lighting sector where political faith in technology to find more energy efficient solutions in this sector remains out of step with some of the cultural and contextual issues in the UK.

These findings reflect many of the wider issues in the UK regarding the so-called 'rebound effect', where energy efficiency measures achieved through technological intervention continue to be offset, both by the proliferation and complex cultural practices regarding consumer goods. This trend reflects that identified for home refurbishment and heating behaviours i.e. the "take back effect".

Crosbie's (2008) research in the UK for instance, has explored the ways in which the design and marketing of electronic goods promote rather than dissuade things such as 'the practices of watching television in the UK, which have become more energy intensive without viewers changing their viewing behaviour'. She notes that electrical goods (such as DVD players and digital radios) are now designed to be left on standby rather than being switched off. While people may buy more energy efficient product, greater disposable income means that they spend this on *more* electrical goods. She also suggests that the advertising and marketing campaigns for products such as plasma TV sets are aesthetically pleasing rather than pointing to what is often unlabelled energy use. Developments such as the 'individualization of TV viewing', encourage energy inefficient viewing habits through the cultural embedding of more household TV sets to accommodate the new ways of viewing provided by the new technology. Crosbie has argued that it is not enough for government policies to focus on changing individual behaviour in these regards, but that this must happen in tandem with proactive, early changes to lifestyle products themselves: ones which are designed to encourage more energy efficient practices in households.

3. Area of Mobility

Although fuel efficiency improvements continue, increases in the number of cars in the UK and associated social and cultural practices related to private transport use, mean that petrol consumption in the UK continues to increase. While an increase in the actual *number* of private cars on the road in the UK has actually slowed down more recently (Goodall, 2007) and average mileage per vehicle itself has flattened out from a previous upward trajectory, nevertheless, private transport use contributes to a significant percentage of the UK's CO₂ emissions: a figure acknowledged as problematic as long ago as 1990 where the emergence of a UK White Paper on the environment *The Common Inheritance* argued that pollution from road transport accounted for as much as 20% of the UK's total carbon emissions (HM Government, 1990). This paved the way for a series of policies which were designed to try to address pollution from road transport and, perhaps more importantly, the dynamics of vehicle use. A series of policies aimed at this sector began during the Conservative reign and continued after the New Labour Government came to power in 1997.

The problems in regulating pollution from the transport sector have been illustrative of some of the difficulties that the UK Government has faced in attempting to modify the behavioural aspects of private transport use. One of the intentions behind the *Fuel Price Escalator*, which was introduced in 1993 for instance, was to begin to address the effects of road transport pollution on the environment. This was to be achieved through increasing taxation on road fuel as a way of discouraging unnecessary vehicle journeys. It was also seen as an indirect means of reducing the need for future new road building projects. During this period, there had been intense lobbying from environmental groups who had pointed to the contradictions that were apparent in, on the one hand promoting environmental goals as a fundamental policy objective, and then unveiling plans for extensive road building projects. The failure of the *Fuel Price Escalator* (it was scrapped after civil demonstrations regarding the high price of fuel to UK consumers) and the variable success of other initiatives such as pegging vehicle excise duty to environmental performance, would seem to highlight the **political** difficulties in changing the **social** and **cultural** norms that surround the characteristic elements of mobility in the UK and particularly the dominance of private car use.

3.1. Public Transport (Use)

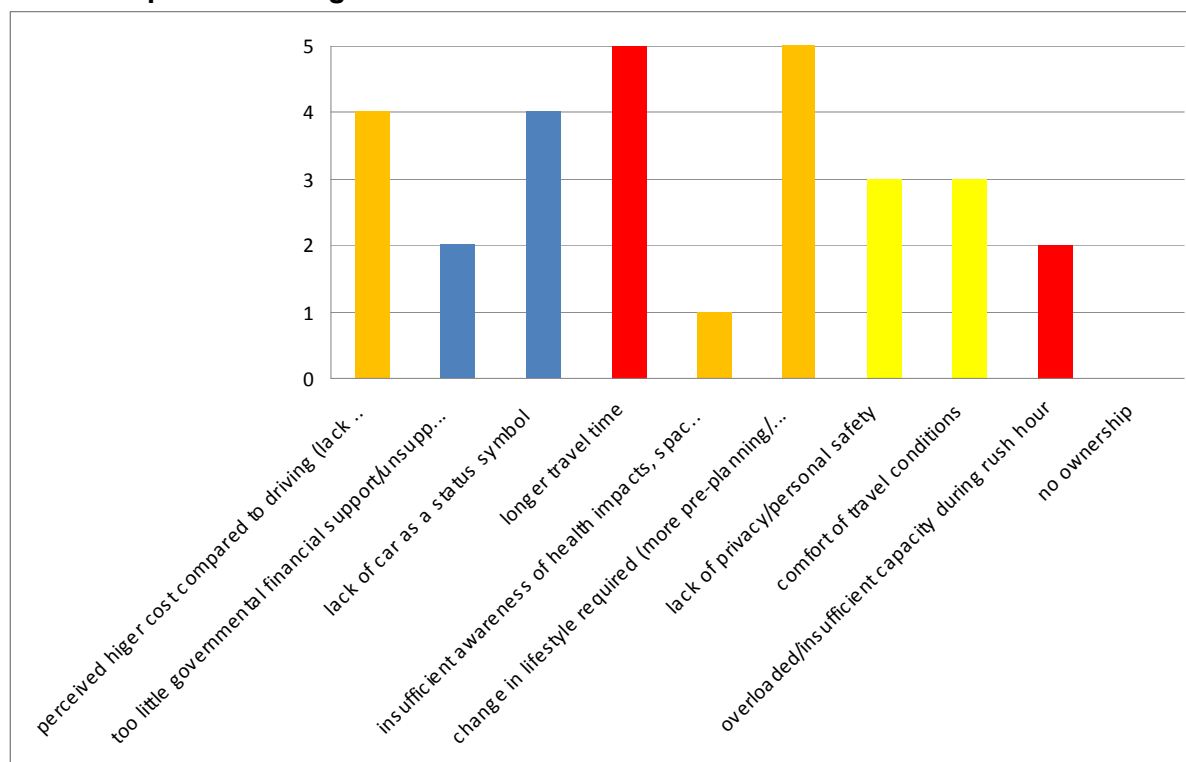
The stakeholders interviewed for this section were:
Phillip Stamp, **Behavioural Change Unit, Defra**;
Peter Lipman, **Policy Director Sustrans**

3.1.1. Barriers

Stakeholders identified the following main barriers in the area of public transport use in the UK:

- 1/ Inconvenience (longer travel time);
- 2/ Changes in lifestyle required (more pre-planning);
- 3/ Perceived higher cost compared to driving;

3.1.2. Graphical ranking of barriers: mean scores for interviewees



3.1.3. Basic overview of the barriers

The Environmental Behaviours Unit at Defra is responsible for coordinating the evidence base and policy response for pro-environmental behaviour change. It has worked with stakeholders from business, academia, policy, local government and NGOs to develop a 'Pro-environmental Behaviours framework for the UK'. This framework details 16 headline behaviours to be addressed by stakeholders. The team has developed a segmented approach to deliver targeted public behaviour change and commissions research to collate and expand the knowledge base on pro-environmental behaviour change. Philip Stamp from the Unit has knowledge about consumer barriers to public transport use. However, he stressed that as he is not the policy lead for public transport in the UK his knowledge of policies and initiatives to address structural, economic and political barriers is partial.

Sustrans is the UK's leading sustainable transport charity. They are involved in promoting initiatives and pushing for changes in mobility in the UK in regard to raising awareness of the environmental impacts of the ways in which people travel – particularly in relation to the predominance of private car use. The National Cycle Network has been a more recent initiative that Sustrans have been involved in and promoting the benefits of cycling.

Both of these viewpoints, therefore, were derived from a political and a civil society perspective on public transport use in the UK.

- Philip Stamp at Defra identified the primary **psychological barriers** to greater public transport use as time, cost and convenience. He argued that time, in particular, has been shown to be the greatest barrier to modal shift in the UK, with door to door travel timings being central to consumer decisions on public transport use.

- He qualifies this however, by stressing that these psychological barriers were viewed as the result of a larger set of **structural, political and economic barriers**. A long term lack of investment into the UK's transport infrastructure, coupled with a predict and provide transport planning model, which has meant that public transport does not have the level of provision necessary to now allow for a widespread shift away from car use. Moreover, in the UK we moved away from public transport towards car ownership earlier than other countries, so retrofitting it back into urban structures has been a big challenge. Peter Lipman also suggested that the privatization of public transport in the UK has itself created a barrier where he argued that it is now primarily delivered by private companies that seek to make profit rather than deliver a public service.
- In relation to the above, Phillip Stamp pointed out that at peak times, particularly in urban areas and across the South East, the overall transport system is at saturation levels. Because of this there is little opportunity to encourage greater use of public transport, without doing so in line with major infrastructure investments.
- Phillip Stamp suggested that **economic and social barriers** combine in complex ways to push people into longer journeys. The UK is one of the world's most density populated countries. Increasing populations and a shift in home ownership patterns, has not been matched by the appropriate level of housing provision. A concentration of business within key urban areas and high costs of housing, mean that people are often forced to live some distance from their work. This is underpinned by a **cultural desire** for home ownership, space and a garden. These factors increase demand for the transport system in general, and make convenience and time demands more dominant in the decision making process. Moreover, the de-regulated nature of the public transport system outside of London means that service provision has been irregular across the country.
- At the same time as there is over-demand for public transport in some areas and under-demand in others, the cost of car use has not been rising in proportion to public transport. Above inflation fare rises mean there is still some perception that public transport is expensive.
- Since the main costs attached to car use are attached to the purchase of the vehicle, annual taxation and parking permits when someone owns a car they see it as being sensible and practical to use it to maximize value for money. Moreover it is convenient to use the car when it is already there. Philip Stamp suggested the level of car ownership for the UK was about 70% households, so there is a particular need to find solutions which discourage unnecessary short journeys. Peter Lipman also agreed that the comparatively low price of private vehicles encourages private journeys.
- Some groups of travelers have concerns about using public transport. For example, single female passengers can perceive public transport in some areas and at certain times of the day as unsafe. For this set of travelers, safety will be the deciding factor. However, it is not the main factor for public transport decisions overall.
- Other people enjoy being in control of their personal space, listening to their music – even if it is in a traffic jam which looks like it should be a stressful experience. These sort of people might be hard to encourage out of their vehicles.
- A **cultural/social barrier** is that cars are still one of the main status symbols and public transport is not aspirational. However, Government is not yet ready to shift away from being a car society and it is not seen as being the remit of policy to change perceptions of status. This is more appropriately done by other sectors.

3.1.4. Stakeholders

- Central government need to lead in the negotiations with private transport companies to ensure passenger targets and fair prices continue to encourage uptake of current facilities and the extend provision to less profitable routes.
- Planners need to create traffic systems which favour public transport and local government need to think about new processes of consultation which might help to enable schemes such as the congestion charge.
- Private and public transport companies, as the lead actor in providing the facilities, should be responsible for promoting a more positive image to counter car culture and encourage further uptake of public transport.

3.1.5. Past attempts to address barriers

- The key to increasing public transport use really rests with improvements to the services. These have been improved, as have the quality of the stations and bus stops, and the facilities provided on some of the long distance services. Better ticketing and payment methods have increased convenience, particularly in London with the introduction of the Oyster Card payment scheme. Peter Lipman argued that the privatization of public transport has left the government with an incoherent sense of how to overcome many of the barriers that exist due to this structural shift.
- Philip Stamp suggests the most effective recent initiative to encourage public transport use was the London Congestion Charging Scheme. The scheme, which charges drivers to enter central London at peak times has dual benefits as it both changes the relative cost of public transport and provides the money for infrastructure improvements. The scheme has raised money to increase the efficiency of the bus service. More buses and a change to road designs to create priority bus lanes, has made the bus service quicker and more reliable.
- The success of the Congestion Charging Scheme highlights the complexity of the interaction of the different types of barriers. Whilst acknowledged to have improved both the capacity and desirability of modal shift, no other city has established a similar scheme. Public consultations in other cities, such as Edinburgh, resulted in potential schemes being rejected. Culturally and socially, these cities were not open to a scheme which would limit their freedom to use their car or add to their costs. Politically, the London scheme has only been pushed through due to the determination of an Independent mayor. In the absence of party politics, the potential unpopularity of the scheme was less essential to the decision making process. Moreover, the local media may take a view one way or the other, which can be instrumental in swaying public opinion.
- Convenience factors have been addressed for bus use in certain locations by the introduction of 'countdown' information boards. These provide the passenger with information about when the next bus will be arriving, meaning that they can make an informed decision about how long the journey will take.
- Concerns about safety have begun to be addressed by the introduction of CCTV on public transport and stations.
- Marketing public transport as a more positive option has been implemented in London, but it is hard to say how successful this is as an initiative on its own.

- For the Behaviours Unit, the focus has been on looking at ways to shift people out of the car for short journeys. They do not have a fixed target for a modal shift to public transport.

3.1.6. Attempts for the future

- From a policy perspective, the 'basket of policies' approach to public transport has to start from a sensible place – which is accepting how much of a modal shift is likely, affordable and desirable. It is only one of the package of transport behaviours being addressed to combat climate change. Where there is likely to be more to be gained from encouraging fuel efficient vehicles or other options, then these will be prioritized.
- The main public transport initiatives have to be around providing better services. Particularly in the key areas, such as urban areas. These could be achieved through negotiation with service providers and more thought about service regulation in the de-regulated areas. Better infrastructural provision will be required, with local government often the lead stakeholder in the process.
- New forms of consultation processes need to be introduced to understand if more deliberative forms of consultation allow more social acceptability of politically sensitive initiatives, such as Congestion Charging Schemes.
- On a similar line, Philip Stamp suggests more positive ways to encourage people out of their cars and onto public transport could be to talk to people about what they would like for their local area, and how they would like their local environment to look. So thinking through what car free zones would do for neighbourhoods, rather than just concern about personal convenience.
- Taxation changes to address the perceived price differential between public transport and car use.
- Private sector transport providers could do more to market the attractiveness of public transport and to change perceptions of the status of the behaviour.
- At an individual level, the obvious windows of opportunity are when young people are leaving home for the first time, for example trying to prevent students from developing car reliance as a habituated way of life. The other is when moving home. For both of these, initiatives providing free public transport use for the first month alongside clear information about the public transport possibilities could be effective.
- New technologies and changes in transport infrastructure offer a window of opportunity to help people revise their perceptions of public transport. This is where marketing can have a substantial impact.

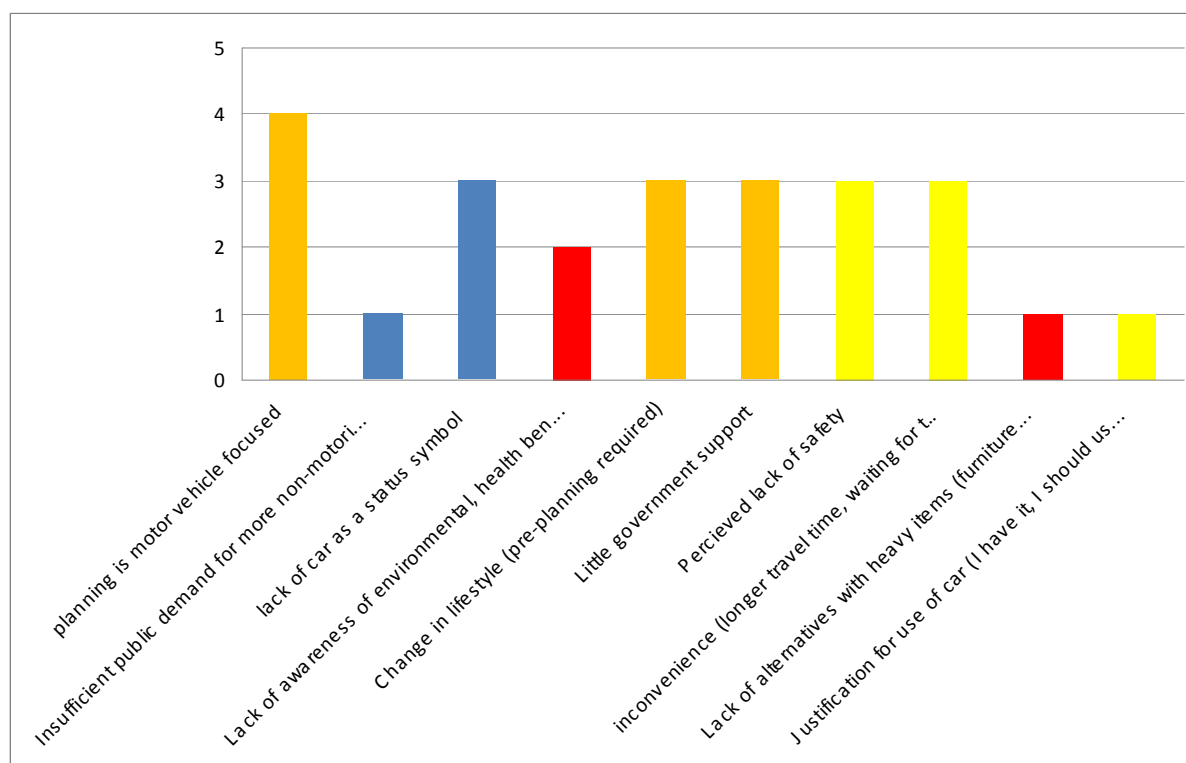
3.2. Short Distance Mobility – decreased use of cars for short-distance trips (3km)

The stakeholder interviewed for this section was:
Peter Lipman, **Policy Director Sustrans** (Civil society).

Peter Lipman identified the following main barriers in the area of public transport use in the UK:

- 1/ Inconvenience (longer travel time);
- 2/ Planning is motor vehicle focused;
- 3/ Perceived lack of safety
- 4/ Perceived higher cost compared to driving;

3.2.1. Graphical ranking of barriers



3.2.2. Basic overview of each barrier

Many of the issues identified by Peter Lipman in this section cross-cut with many of themes discussed in the first mobility section.

- Peter Lipman argued that the main barrier to decrease/change of habits in regard to short term car journeys in the UK could be considered in terms of constituting a **cultural barrier**. He suggests that this characterizes society in the UK in general, where there is an assumption that we should enable people to travel as far and as fast as they want to. He points out that this has tended to mean that this has tended to influence all journeys – not just short distance trips – whereby infrastructures and associated travel habits in the UK now tend to permeate and influence *all* journeys.
- Planning for journeys – whatever the distance – remains motor vehicle focused with a dominant **psychological** and **cultural** attachment to the private car as the most convenient form of transport. This is particularly well illustrated in ‘the school run’ and getting to

and from work – the most common journeys undertaken in the UK and the journeys to have gained most attention from policy-makers trying to influence change in vehicle use.

- Related to the above in some ways, there is a complex **cultural/psychological barrier** among many private transport users that public transport is inconvenient, unsafe and that car journeys – whatever the distance – remain the best option. Peter Lipman pointed out that short distance trips of less than 3 km are roughly 30 per cent of all car trips across Europe – a distance that with the right set up should be fairly easy to walk, cycle or use public transport. He reasons that in theory this should be easy to change, but if it is relatively easy to park your car, if it feels unsafe to walk or to cycle, or it is perceived that taking the bus is a low status option, then people will tend to use the car instead of more sustainable options.
- Peter Lipman also reiterates some the comments made in the first section in pointing to the relative cheapness of private car use compared to current costs of public transport. **Economic barriers** therefore relate to the low cost of fuel in relation to public transport – particularly train journeys in the UK. He believes that this situation has been further exacerbated by the privatization of public transport where the profit maxim has driven up the cost of using public transport for consumers.

3.2.3. Stakeholders

- Local authority, all relevant elements – transport, planners, highway engineers.
- Employers. There needs to be a much larger role for employers and employing institutions to encourage and to help employees not to drive where necessary and to encourage things such as cycling to work.
- Furthermore, institutions – hospitals, schools, private sector – need to put more provisions in place which discourage driving.
- Regional and central government policies have a large impact e.g. price of petrol, level of taxation, hidden rules of treasury – in UK have assessment for proposed schemes called NATA (New Approach to Assessment). The transport part of that is up for review because under current rules if the highway authority proposes a scheme to increase levels of public transport use and decrease levels of driving then that is penalized because of loss of levy on sales of petrol and diesel. One of the fundamentals of transport is to ‘predict and provide’ – if you provide more space for cars then you will generate additional traffic, and vice versa (“disappearing traffic”). Need to have combination of physical interventions – reallocation of road space – together with other interventions – hard and soft measures.
- Citizens in the travel choices that they make.

3.2.4. Attempts to overcome barriers

Peter Lipman pointed out that there have been attempts to address the above barriers at national level but none of them have been particularly effective so far where there is a visible reluctance to intervene directly in cultural norms which have developed around consumer rights. While park and ride schemes, information campaigns, and green parking permits have had variable success, it is thought that initiatives can be more effective if implemented at a more local level of delivery. For instance, emission based charging for parking permits schemes have shown how local authorities can modify their existing services and regulatory framework in order to promote attitudinal and behavioural change among community resi-

dents on both distance and necessity of journeys. Such a scheme was introduced by Islington Borough Council April 2007 as a modification to existing permit charges operating in the borough's controlled parking zones and has met with some success.

3.2.5. Attempts for the future

Peter Lipman argued that to make any really meaningful changes in society then *all* stakeholders will have an important role to play. He suggests that the UK Government will act radically only when there is pressure on them to do so. However, he also points out that the government have a key role to play themselves in leading this change. He believes that if the UK had the political commitment and also put the appropriate resources forward, then we could have for example the Dutch example of cycling as a percentage of travel – currently 30 per cent as opposed to the UK's 2 per cent. As has been argued in a few of these sections so far, there is a reluctance to intervene too directly into cultural habits in the UK – particularly when they might reflect shifts in voting behaviour.

3.3. Car-sharing (Use)

3.3.1. Barriers

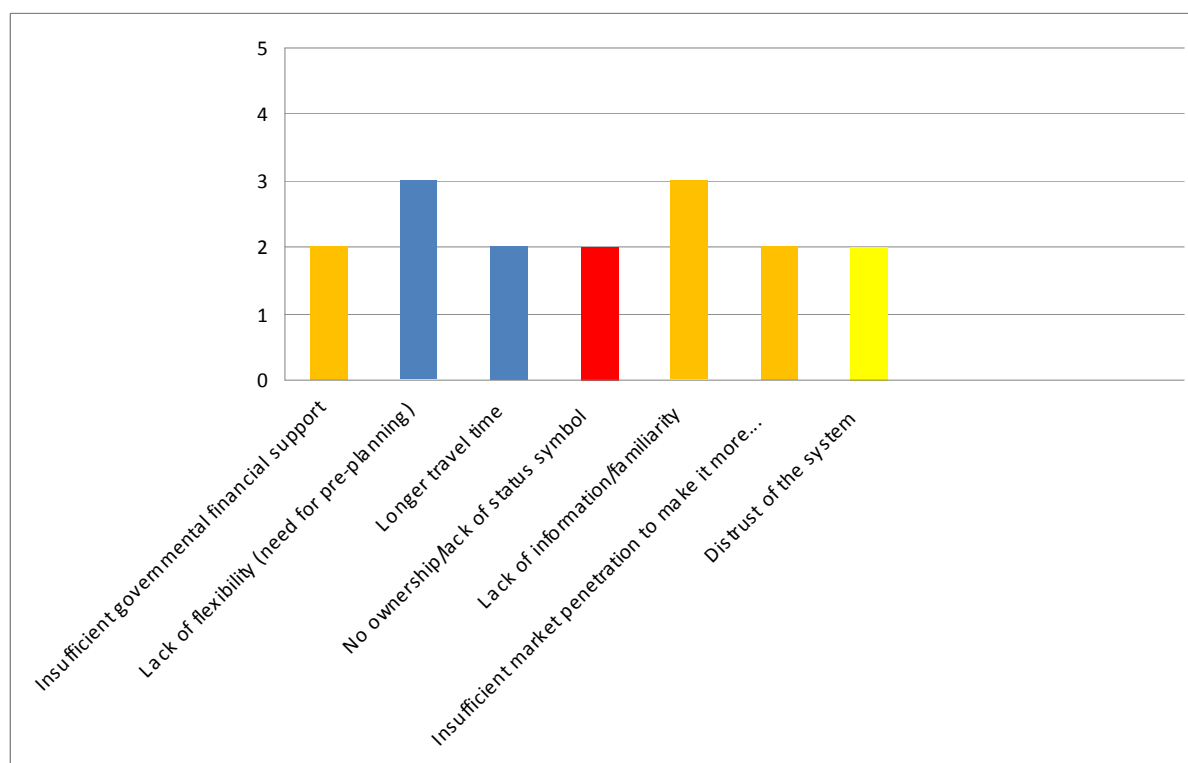
The stakeholder interviewed for this section was:

Peter Lipman, **Policy Director Sustrans**

The stakeholder identified the following main barriers to decreased car use through car sharing in the UK:

- 1/ Inconvenience and lack of flexibility;
- 2/ Lack of information/familiarity;

3.3.2. Graphical ranking of barriers



3.3.3. Basic overview of each barrier

Again, many of the issues identified by Peter Lipman in this section cross-cut with a lot of the themes discussed in the earlier mobility sections.

- Peter Lipman argued that the predominant barrier to more widespread car sharing in the UK is related to convenience and a perceived lack of flexibility attached to the practice. It is suggested that this again is linked to issues such as the way in which the car has been integrated into many of the **cultural** norms and practices which have developed around the private vehicle as a symbol of the ordering of time and space in the UK. Relatedly, it is also linked to **psychological** values concerning a tendency to what has become a 'culture of individualism' in the UK, whereby issues such as trust and reciprocity have declined to a certain extent.
- The interviewee argued that there is also a lack of coherent information and guidance currently available to *guide* behaviour towards car sharing where this could be practica-

ble. While there are plenty of schemes organized through different institutions, he argued that this **information deficit** is the responsibility of a variety of stakeholders where workplaces, schools, local authorities, and central government all have role to play in promoting the role of car sharing in developing more sustainable transport in the UK.

3.3.4. Stakeholders

Peter Lipman argued that the initiative 'liftshare' has done well and has gained in popularity but car sharing is still regarded as a minority option in the UK. He suggested that there needs to be more thought on how to provide greater impetus to the idea. In this way, he argued that the dominant stakeholders would be:

- Large employers and institutions;
- National policy initiatives and greater government interventions;
- Highways agency;
- Local authorities;
- Car users themselves

In the government report: *Making Travel Plans Work* (2002) it is suggested that, in companies that are running or promoting car share schemes, an average of 14 per cent of the workers are making use of them. Relevant stakeholders need to take the lead in encouraging car sharing where they will be in the best place for providing incentives to do so.

3.3.5. Attempts to overcome the barriers

Marks and Spencer Financial Services and Computer Associates are two major employers in the UK who have encouraged around a third of their staff taking to take part in car-sharing. Part of this encouragement has been to offer financial incentives in the way of reduced parking fees for participants.

'Liftshare' is a website that has been set up to offer car-sharing opportunities to people who may not work in the same area but may be traveling to a similar location. To use 'Liftshare', the prospective user posts the details of the journey they intend to make onto the website and whether they are seeking or offering a vehicle to share. The website itself then searches the details that have been entered in order to match up participants for shared journeys. The site also informs participants on how much a journey will cost and how much CO₂ they will be saving by sharing a vehicle for a journey. Liftshare currently has 104,000 members and it is claimed that 41 million kilometers of journey are shared every year.

3.3.6. Attempts for the future

Peter Lipman argued that these schemes need to be higher profile current information campaigns if they are to capture greater interest. If perceptions on car-sharing were to change, this would create the political space for the government to do more. This applies to government at all levels alongside people demanding and understanding that we really need change. Information could then be integrated with appropriate fiscal incentives such as taxing car use and journeys more heavily than at present. He also pointed out that in the United States hitch-hikers are given identity cards and designated places for hiking – encouraging the trust element in this practice. He also cited the situation in Cuba where it is illegal to go past hitchers if you have space in your car!

3.4. Hybrids/Fuel efficiency in vehicles (Purchase)

The use of biofuels in addressing environment and energy efficiency objectives in road transport sector remains limited in the UK. Biofuels as a percentage of road transport fuel in the UK constituted 1 per cent in 2007 and low carbon cars represented less than 0.1 per cent of UK car sales in the same year (Lane and Potter, 2007). It is hoped that this figure will rise to around 5 per cent in 2010/11 from the impacts of 2008's *Renewables Transport Fuel Obligation* and graduated tax incentives on both biodiesel and bioethanol.

This echoes the development of a hybrid vehicle market in the UK which remains underdeveloped as a way through which to reduce the impact of private vehicle use. The UK Government has developed a series of policy initiatives which have been designed to integrate the behavioural aspects of private vehicle use with technological developments in fuel efficiency and vehicle design.

While fuel efficiency in vehicles has been encouraged by various EU directives and innovation within the automobile industry itself, the UK Government introduced measures such as changes to the vehicle licencing laws in order to encourage smaller, more fuel efficient engines and vehicles. UK Government reforms to Vehicle Excise Duty (VED) in 2001 were aimed at all cars that were first registered and licenced on or after 1st March 2001, and introduced a new system of road taxation based upon payment bands depending on the level of CO₂ emissions measured for when the model was tested prior to going on sale. The baseline for banding begins at 'no taxation charge' on cars with the very lowest emission levels.

Research by the Society for Motor Manufacturers and Traders (2007) has found that during the previous decade, average emissions from cars bought in the UK have dropped by 10%. Some critics however have suggested that this has been largely due to efficiency gains in vehicle energy use which are themselves on course to be overtaken by a predicted growth in traffic volume and distances being covered – a '**cultural rebound effect**'. One of the criticisms of the effectiveness of the Vehicle Excise Duty changes has been that the tax banding system only applied to drivers who had low emissions on these vehicles that had been assessed as of 1st March 2001. Critics argued that this has served to penalize owners of older vehicles who had more energy efficient cars or who had already spent money converting to greener sources of fuel. It was argued that owners of these vehicles should be made part of the new changes where their behaviour could be taxed according to new rules brought in as part of this policy. It has also been pointed out that it has displayed limitations as an incentive to behavioural change regarding car use. Research by Friends of the Earth (2003) has shown that there has been an explosion in the number of most polluting cars with the sale of 4x4s rising by 18% while the sale of the most efficient cars actually decreased.

3.5. Summary of Area of Mobility

More recently, plans to widen policies such as the *London Congestion Charge* (LCC), and incentives to foster behaviour changes in private car use have accompanied changes to vehicle licensing structures in the UK. The LCC is a fee that is levied on the majority of motorists entering the central London area and has proved to be successful in decreasing private transport use in Central London. Since 2001, UK Government reforms to *Vehicle Excise Duty* (VED) – aimed at all cars that were first registered and licenced on or after 1st March 2001 – introduced a new system of road taxation based upon payment bands depending on the level of CO₂ emissions measured for when the model was tested prior to going on sale. The baseline for banding starts at ‘no taxation charge’ with an incremental rise in excise payment depending upon engine capacity and fuel choice.

Environmental groups and organizations continue to be unhappy about the scrapping of the FPE alongside what has been seen as a ‘dumbing down’ of other associated tax levies on fuel consumption. Groups such as Friends of the Earth argue that higher taxes are essential policy mechanisms in addressing climate change, particularly in beginning to change the behavioural and cultural norms that characterize vehicle use. Critics have argued that policies such as the FTE were not given time to mature as *long-term* strategies in directing people to cut down on unnecessary journeys, to use smaller, more fuel efficient vehicles, to make greater use of public transport, or to inform decision-making on future road construction.

4. Some conclusions: situating more sustainable energy behaviours within the UK policy context

The last section of this report considers the barriers identified in WP-4 and highlights some of the particular issues that frame the context of the way in which policy-makers are searching for ways in which to promote more sustainable energy behaviours in the UK. The section highlights each of these barriers in turn and draws upon the main findings of the research itself. The report concludes by summarizing the main overall barriers to sustainable energy use in the UK and recommends some potential ways forward.

4.1. Physical and structural barriers

The report began by introducing the idea that energy policy in the UK and associated regulatory mechanisms sit within a particular framework which is now informed by the past legacies of both state governed and then market-led regulatory regimes and now a more recent phase which can be characterized by the following four developments. Evidence that these constitute *structural barriers* would seem to be evidenced by the following issues which now frame energy policy regulation in the UK:

- The growing evidence of the impact of climate change and wider international recognition that there needs to be a concerted global effort to cut greenhouse gas emissions, especially carbon dioxide;
- Rising fossil fuel prices and slower than expected liberalization of EU energy markets at a time when the UK is increasingly relying on imported energy;
- Heightened awareness of the risks arising from the concentration of the world's remaining oil and gas reserves in fewer regions around the world, namely the Middle East and North Africa, and Russia and Central Asia;
- In the UK, companies will need to make substantial new investment in power stations, the electricity grid, and gas infrastructure (DTI, 2007:6).

As many of the interviewees who participated in this research have argued, it is important to understand that, while the UK Government maintains responsibility for environmental policy, many of the structures essential for its delivery are privatized. Energy use also often remains conditioned by infrastructures that were put in place under state ownership where private companies have simply 'sweated' these assets. Gas and electricity companies are private, but subject to regulation through Ofgem. However, many stakeholders felt Ofgem had done little to regulate the UK energy market or protect consumers. Public transport is privately owned in the UK, but leased subject to contract by the Department for Transport. In London the public transport system is regulated, but it is de-regulated in other towns and cities.

The privatized nature of the utilities means they are not fully under government control. Other structural barriers specific to the UK include:

- High population density, particularly in the South East, which means that at peak times all transport modes are congested;
- High accommodation costs, forcing people to commute long distances to their place of work;
- A large majority of the housing stock which is old, energy inefficient and in need of substantial, expensive retrofitting of insulation measures.

4.2. Economic barriers

Cost to consumers was felt to be an important aspect of changing behaviour in individuals. Some felt that this was linked to the increasing importance of the market in influencing individual choice and the 'consumer democracy' which has developed in the UK. An obvious

limitation here has been an inability or an unwillingness to factor in carbon pricing on conventional energy and fuel use. One of the principal difficulties for this agenda would seem to be in changing perceptions of public 'rights' concerning the availability and product pricing that have developed from two different eras of energy regulation: both underpinned by the idea that citizens of the UK had a *political right* to cheap, available energy. Energy regulation became increasingly important to the relationship between government and electorate during the post-war period and that it is still seen to be the government's duty to ensure that 'the lights stay on'. This relationship was illustrated in 2000 when the high price of fuel in the UK - informed to some degree by the environmental tax that was in place at the time - caused demonstrations across the UK and forced the government into a reversal of the Fuel Price Escalator.

Cost was also felt to be an issue in regard to using public transport in the UK where Peter Lipman from Sustrans for instance, suggested that the private ownership of much of the transport infrastructure in the UK kept these prices higher than the price of running a private vehicle and served to dissuade many from using it more often. A number of interviewees - in the photovoltaic and energy efficiency sections for instance - pointed out that the cheapness of fossil fuels continues to direct behaviour towards the least cost option.

Related to the above, several interviewees argued that real change in the way of reducing energy use in general in the UK is often offset by the 'rebound effect'. This has happened in the transport sector where technological innovations in fuel efficiency gains have been offset by increased road use and the relative cost of vehicle use. Thus in a similar way, lowered fuel bills fostered by greater monitoring of energy use can often be offset by consumer technology such as the increased popularity of digital set-top boxes that remain on standby and 'gadgetry'¹¹.

Much of the future success of energy efficiency as a policy goal will be closely linked to its effectiveness in communicating - to both producers and consumers - the urgency of behaviour change and consumption habits. Several interviewees suggested that current government policy on efficiency and the need for widespread changes in energy use has often been characterized by mixed messages, or even an unwillingness to tackle many of the cultural issues that are at the core of more effective sustainability policies and measures in the UK. The perceived urgency in addressing climate change has been interdispersed with announcements on road building projects and new airports - sectors that receive substantial financial support in relation to environmental goals. Government messages must also compete with powerful media images that are often fuelled by consumer messages taking a contrary position to the idea of sustainable consumption. It is often the case that the government will adopt a backseat position to market pressures whenever these kinds of issues come into collision in policy.

¹¹ Energy Saving Trust, *Rise of the Machines*, 2007

4.3. Political barriers

There was a general consensus amongst interviewees that political barriers were a particular problem for the UK Government in driving change towards a low carbon future. It was felt in particular that behaviour change and engaging citizens in more sustainable lifestyles is perhaps the biggest challenge to present UK government initiatives on climate change and maximizing energy security. The strikes of the mid-1970s showed that energy supply was intrinsic to electoral stability and the Heath administration fell, in part, because they could no longer ensure this. It was argued that the Conservative regime that came to power in 1979 learned from the way in which energy became 'politicized' in a much more high profile way. Therefore, energy efficiency and sustainable consumption have been areas that the UK Government have been trying to engage the public in more directly in order to increase their effectiveness. However, one of the problems for present policy aspirations would seem to be the way in which market sovereignty has served to 'individualize' society from more collective forms of political identity. Thus at the point at which the 'fuel price escalator' started to force behaviour change the response was political protest from those hardest hit – the hauliers. Their blockade of fuel depots had immediate impacts on the ability of the country to operate and discourage the Labour government from large scale interventions for the next few years.

So at a political level, central and local governments have been tentative about acting on climate change, and even more so when this would necessitate intervention into cultural trends or economic growth. Whilst the recent introduction of the Climate Change Act has embedded carbon reduction targets in law, the UK was still perceived to be 'running to catch up' across a host of behavioural areas. Moreover, the philosophy of addressing climate change is not central to the operations of government. Many of our interviewees mentioned that the biggest single barrier to addressing climate change was the failure to value carbon across all policy areas.

The challenges face by government when addressing energy consumption are considerable. These are often the result of previous policies around deregulation and privatization of the energy supply and 'public' transport. Interviewees suggested there was a need for a wholesale change in the way the UK energy markets operate, with a shift away from a profit driven system which rewarded greater energy use. Moreover, several interviewees identified a need for either higher fuel prices or limits to carbon use, such as personal carbon allowances, both of which were seen as being hugely contentious and difficult for governments to address.

A few Interviewees suggested that the government must be the primary stakeholder in driving change in the UK towards being a more sustainable energy economy. However, it was also pointed out that there is a general lack of trust in government, and also business, to deliver or intervene in the market. It was suggested by Trewin Restorick that this trend may be particularly strong because of the de-regulated utilities market in relation to weaker government.

4.4. Cultural-normative and social barriers

Interviewees from across the range of domains covered argued that the UK is seen as having a very specific cultural context within which the politics and economics of behavioural choice are situated. In general the UK is viewed as being an increasingly individualistic society. Therefore, a consumer based economy and a political model which classifies individuals as 'consumers' is key to understanding the apparent unwillingness of government to try to change cultural norms around consumption. In particular, the policy interviewees suggested Government was not yet willing to intervene to reduce multiple appliance ownership or move away from a car based society. Furthermore, a lack of trust in government and the motiva-

tions of the privatised utility owners has meant that collective action is seen as eliciting a ‘you first’ response from many individuals.

There is a growing body of community led initiatives in the UK which directly or indirectly seek to reduce carbon emissions and combat climate change. The capacity building and community empowerment, which result from engaging with ‘grassroots’ community projects, have been identified as strong mechanisms in sustaining behaviour change in the long-term i.e. ensuring that action does not stop with the installation of measures. These projects may also have an important role to play in creating the political space required to regulate the energy and transport sectors effectively.

Energy efficient appliance purchase was seen as being an area with large cultural barriers according to the interviewee from the Market Transformation Programme. This is not to suggest that people in the UK will *not* purchase A-rated fridges. Moreover, the efficiency of cold appliances has improved considerably over the last few years. However, energy demand from cold appliances is still rising in the UK. This is because of a cultural desire for frost-free appliances and built in fridges – both of which use more energy than conventional fridges, even if they are rated the same. A growth in demand for American style giant fridges and multiple ownership would seem to add to the problem. As a long hours working culture, the UK has become more dependent on ready made meals, hence the requirement for more cold appliances.

The other key area for cultural and social barriers was in mobility. Public transport use is not seen as being ‘aspirational’ according to Philip Stamp (Defra). Once again, the Government feels business and NGOs are better placed to address cultural and lifestyle issues. Instead policy is focused on information, structural and economic solutions to cultural and social barriers. It has implemented a range of schemes to shift perceptions of the desirability of different modal choices and efficiency of vehicles. Changes to Vehicle Excise Duty, congestion charging and improved transport provision have been policy led. However, in a privatised ‘public transport’ system the key stakeholders for improving social and cultural attitudes towards the status and normality of using transport are business and NGOs. With a lack of public acceptance of solutions such as congestion charging (outside London) and high fuel prices, the Government is still wary of the space to introduce tough policies to reduce car use. However, future schemes include allowing Local Government the ability to place a charge on business with parking spaces.

4.5. Knowledge barriers

Knowledge barriers and information for pro-environmental behaviours have been the subject of extensive discussion and critique in the UK for many years. Whilst it is now accepted that awareness raising alone will not change behaviour, there is still a heavy focus on information provision. This is focused on a range of different types of solutions from education and information campaigns, to more innovative methods of providing information about energy use such as SMART meters and better heating controls.

There was general agreement amongst the interviewees that a lack of knowledge was the key barrier for energy efficient heating behaviours and product use. However, awareness raising about behavioural impacts was not necessarily perceived to be the most effective solution to more efficient cooking behaviours according to the interviewee from the Market Transformation Programme where research has shown that running advertising campaigns about boiling too much water in a kettle created short term shifts in behaviour which were not sustained in the long term when the adverts ceased.

SMART meters were mentioned by many of the interviewees as a knowledge based solution to home energy behaviours. While these are currently being rolled out by the UK Govern-

ment, there remain concerns about the whether the meters will display costs and full range of home energy use. Interviewees from all sectors viewed SMART meters as being one of those tools that changes the consumer's awareness of energy use by making it visible (Derek Lickorice, energy consultant). Similarly, new heating control systems, which were simpler for the user and easier to understand were cited as one of the solutions now available to Government. As well as better billing and metering, several interviewees suggested advice about retrofitting homes and home heating needs to be tailored to the individual household, which requires more face to face advice and more pro-active advice centres.

Several of the interviewees mentioned a lack of knowledge about photovoltaics as a key barrier to their uptake. Moreover, they suggested the type of awareness people have about micro-gen is not the same as the sort which would embed it in meaning and practical knowledge. His department is working on more innovative everyday knowledge solutions, such as situating micro-gen in schools, as a community focal point, with children and parents engaged in learning about its practical use and potential.

Whilst consumers in the UK are aware of the energy label for appliances, they do not tend to know that different categories of fridges have the same rating, but will produce very different levels of emissions. As new purchase tend to be distress purchases due to the failure of the product, information needs to be at the point of sale knowledge. The Energy Saving Trust is seen as being the key stakeholder in the UK for this time of information and EST have tried to train sales staff in some stores. However, the turnover of staff is so fast it is difficult to maintain a steady level of knowledge.

The UK Government has opted for a system of 'choice editing' for the most environmentally damaging goods, by which we mean removing the least energy efficient products from the market. As well as the minimum standards agreed with the EU, MTP have targeted retailers as the key stakeholder to remove the worst products from their shelves. In particular they have been teaching retailer's buyers about what to look out for to ensure they purchase best practice products for their product lines. They give this training at appropriate times of the year to fit in with buyers' trips to China and India.

In summary, knowledge barriers continue to be identified by many practitioners as one of the main barriers to the uptake of pro-environmental behaviours. Across the interviews there appeared to be a focus on information rather than other social, normative or psychological barriers, suggesting that culture or value change remains outside the aims of policy and other actors.

4.6. Individual/Psychological barriers

Individual and psychological barriers were seen as being largest for home heating, retrofitting and transport choices. In particular, the types of individual barriers mentioned are those around the ease/difficulty of the behaviour. The scale of attention to individual barriers is dependent upon whether economic considerations are included within this. If so, then costs to the individual of public transport, micro-gen and the most energy efficient products suggest that individual and psychological barriers to be a substantial area which needs to be addressed.

Whilst many of the interviewees rated 'lack of willingness of inhabitants to reduce temperature' as one of the main factors around home heating behaviours, there was less explanation about why individuals were unwilling to do this. Whilst academic research has pointed to 'a socially accepted understanding of a comfortable temperature' created through a range of factors, including the standard temperature of the workplace (Shove, 1998), interviewees talked about the unwillingness as being about environmental attitudes or a general lack of sense that controlling energy use mattered. Thus approaches to overcoming this barrier sug-

gested education as the solution. A lack of time to refurbish homes and install insulation, and the difficulties attached to fitting PV, were listed as the other main individual/psychological barriers.

For public transport time cost and convenience were seen to be primarily psychological barriers. Behaviour based models have suggested to the UK Government that time is the greatest influence on modal decisions (Philip Stamp). However, these barriers are inevitably based on underlying factors around the lack of public transport infrastructure and the high cost of housing in the UK which forces people to live long distances from their work and extended families. The congestion charge has been one of the biggest drivers of change in London. This has provided the economic means to create new infrastructure, such as better ticketing and bus lanes and more frequent buses which increase the comparative journey times for public transport. However, other cities have offered residents a vote on introducing congestion charging and the public have always voted against their introduction. This illustrates the narrow margins within which a democratically elected government has to work and situates the individual and their values, attitudes and beliefs as a potential barrier to initiatives to reduce energy use. Thus addressing individual-psychological barriers becomes part of an iterative process in addressing structural and political barriers.

Overall conclusions and recommendations

We would argue that the main points to have emerged from this report can be summarized as follows:

- The UK has largely privatized its energy supply within a market-based framework, meaning that political leaders must largely operate within this context;
- The UK Government has been devising policies over the course of the last two decades which will address 'barriers' to reducing and also changing patterns of energy use – in line with the increased urgency of climate change and energy security issues – and there is already an established awareness of what these barriers are in policy circles;
- Citizens are largely engaged politically as *consumers* within this rationale and it is acknowledged that there are things that politicians can and can't do regarding deeper integration of externalities such as environmental pricing. The Fuel Price Escalator for instance touched a particular nerve with road users. Similarly, politicians are expected to 'keep the lights on' or get voted out;
- Encouraging behaviour change in the UK largely takes place therefore, through policies which engage with citizens on the premise that they are economically motivated, individualized, and marginally engaged. Correcting the economic and informational rationalities of the consumer citizen have had varying degrees of success at present because...
- The reality of the situation in the UK is more complex than this simple equation and barriers at the individual level or often interdispersed with higher level barriers (some of which politicians have limited leverage power over) alongside cultural practices and rights and obligations which have developed around a 'consuming society'.

From across the range of interviews that were carried out, we found similar conclusions regarding the systemic causes of barriers to sustainable energy use. The main overall conclusions are:

1. Carbon needs to be fully valued across all policy decisions;
2. The energy market needs to be transformed to facilitate a reduction in energy demand and an increase in renewable energy. This includes better feed-in tariffs, a

change in the way 'green energy' is packaged and sold to consumers, and better carbon pricing across all forms of energy consumption.

3. Consumers need to be provided with the tools needed to ensure they can measure and understand their energy consumption. This includes the use of SMART meters and heating controls, clearer labelling of the most energy efficient goods and tailored information about how they can increase the energy efficiency of their home.

Additionally, we have concluded that policy makers and government continue to be wary of addressing cultural and social influences on energy demand. Rather than aiming for cultural change away from a car dependent society or increased growth in energy demanding goods, solutions are being found up-stream, such as 'choice editing' or taxation. Whilst we recognise that there is talk of more innovative methods for changing cultural and social norms, for example by use of mavens, this was not central to the discussions in our interviews. There appears to be room to understand whether the UK has substantially different attitudes towards the environment, governance and willingness to change behaviour than other countries. This will be explored in attitudinal surveys and focus groups in the following parts of this project.

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