



'Stock Take':

Delivering improvements in existing housing

Foreword

The Sustainable Development Commission is pleased to launch our report “Stock Take” on the potential for improving and making more efficient use of the existing stock of 21 million homes.

We think existing housing is important to sustainable development because it can contribute to major gains in energy efficiency and waste reduction; it can help neighbourhood renewal; it can reduce demand on outer building by revaluing existing communities.

This report will be of interest to:

- central government policy makers involved in sustainable development, resource efficiency, housing and sustainable communities etc
- local government in preparation of planning documents and local housing policy
- housing associations and housing owners in preparing maintenance strategies, tackling environmental impacts and affordability
- NGOs concerned with neighbourhood renewal, communities and the environment.

We hope this report paves the way for a new government policy focus on existing housing stock.

Anne Power
SDC Commissioner

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Executive Summary

The Sustainable Development Commission was commissioned by the Office of the Deputy Prime Minister to examine the potential for significantly improved resource efficiency in the existing housing stock. Over the past year the SDC has worked with stakeholders to analyse the technical improvements that could be made in existing homes to minimise resource use. This report outlines those technical findings. This study also aims to inform policy makers of ways in which policy decisions could help accelerate the installation of those technical measures. It also presents our advice on how the Sustainable and Secure Buildings Act 2004 might be used to deliver these improvements.

Homes already built account for 99% of our total housing stock. Estimates vary of the proportion these will represent in 2020 and 2050, but even the most pessimistic estimate is that 75% of the current stock will still be in use in 2050 (depending on the rate of demolition of existing homes). The SDC strongly favours programmes for improving the resource efficiency of existing homes, rather than seeing widespread new build as the more appropriate option. Building new homes is carbon intensive and carries many wider environmental impacts. If the existing stock can be made more efficient at a more reasonable cost we can realise many environmental and social gains.

There are 21 million homes in the UK with widely varying standards of resource efficiency largely depending on the age of the home, house construction and the awareness of the occupants of the level of their energy and water consumption and waste management, and of the measures they can install to improve these. The occupants of these homes are responsible for 27% of our total CO₂ emissions through their energy use, half of public water use, and they generate 8% of total UK waste.

We have made an assessment of the level of savings that can be achieved by implementing the full range of technical options in existing homes. We recognise that the timeframes within which such savings could be made are

highly dependent on the range of policies that government puts in place to encourage industry, the supply chain, and householders. Our study shows that significant improvements are possible with technologies that are readily available, and we show that they are cost effective, and cheaper than many alternatives.

There is potential to deliver an extra 9-19 MtC savings per year by 2020 from the existing housing stock. Such savings in household energy use and carbon emissions are absolutely necessary if we are to be on track to meet our commitment to deliver a 60% cut in carbon emissions by 2050, with significant progress by 2020. Putting the right policies in place for meeting our 2010 CO₂ target (20% reduction over 1990 emissions) will be an essential precursor to achieving this and the existing stock can contribute significantly to short term targets.

As parts of the UK become increasingly water stressed, particularly as global climate change is likely to affect rainfall levels in southern England, and further demand for water from housing growth is expected, we estimate that water savings of 30% may be achieved in each home, through minimisation of demand and retrofitting efficient appliances and fittings.

In addition, construction waste contributes 33% of the total UK waste stream and we estimate that total savings of 50% can be achieved on construction sites over the next decade if our proposals are put in place. We also believe that improving the resource efficiency of materials use is an essential part of the waste minimisation effort, and will significantly reduce environmental pollution.

Reducing the generation of household waste to landfill depends heavily on the ease with which waste can be recycled by households. This is particularly true in relation to the recycling services that are provided by local authorities, as rates of recycling by householders increases dramatically when doorstep collections are introduced. Space for collecting recycling in the

home, and encouragement and communication from local authorities are also vital. The UK has a challenging recycling target to meet each year and local authority action to meet these targets is essential to influence consumer behaviour. Adopting the measures promoted in this study could cut household waste to landfill by over 50% and reduce total household waste arisings by 20%.

Buildings themselves require ongoing repair and reinvestment to improve their resource efficiency, and reduce carbon emissions. But there appears to be an uneven “playing field” between refurbishment projects, and new-build projects. This is regrettable and, we believe, needs to be tackled.

This study uses the behaviour change policy approach introduced in the UK Sustainable Development Strategy Securing the Future (HMG 2005a) to develop integrated policy recommendations. Individual policies would work better in a supportive policy framework. By proactive encouragement, enabling, exemplification and engagement, positive behaviour change can occur, as has been demonstrated in some other policy areas, which are identified in this study. Householders, builders, local authorities and product supply chains are the main implementers of policies relating to improvement in home resource efficiency, and therefore we need to use policy levers focussed at each sector to influence decisions and in behaviour.

In addition, policy proposals need to be projected over the medium term to give industry some certainty that their investment will be worthwhile. Industry capacity-building investments may take both time and money, so industry must feel confident that the products they produce and install will meet policy needs. Evidence shows that policies that encourage innovation and good practice by industry, based on outcomes rather than prescriptive requirements, are more readily welcomed by industry.

In summary the Sustainable Development Commission, through the broad range of its work, has found that:

- Consumers need clear and consistent signals about policy directions and priorities in order to change behaviour, and policies should

not only inform them about technological improvements that can be installed in their homes, but should also strongly encourage and incentivise people to do so. Assessing the effectiveness of policy interventions requires a clear understanding of consumer motivations across all income groups so that the most appropriate approaches are developed.

- Setting statutory standards, through regulation with proper enforcement, is necessary to ensure that a minimum standard is being met by all actors in a market. Much of the construction sector aims to deliver projects at lowest short term capital cost. To persuade them to adopt an acceptable minimum standard, will require reasonable and cost effective regulations. We therefore cannot rely on voluntary standards to deliver the great improvements in resource efficiency that are necessary.
- Regulations should set minimum standards that are achievable by all, proportional, and clearly deliver on policy objectives. Far from being a consistent burden on business, regulation can minimise the administrative burden on market players and the cost of compliance, as it provides a “level playing field” for those sectors. As industry capacity develops and the social and environmental context changes, regulations can be revised and, where necessary, tightened over time.

This report outlines a range of technical measures that can achieve improved resource efficiency. The measures are outlined under each of the resource efficiency sections 2-5 below, and are specific to the key resource issues of energy, water, waste and materials.

1. For improving resource efficiency in the existing housing stock an, overarching framework for change would include action in several areas:
 - 1.1 Develop a Code for Sustainable Buildings (Existing Housing) setting a framework for the carbon emissions, water consumption and household waste reduction provisions for existing housing. Where major

refurbishments are undertaken, this would also set standards for materials use and construction waste management. This Code for Sustainable Buildings (Existing Housing) could be integrated into existing and forthcoming policies such as:

- The Home Condition Report, to widen the householder advice to broader resource efficiency issues.
 - The Decent Homes Standard, to improve the environmental impacts of this government/local authority funded programme.
 - The Green Landlords Scheme, to raise awareness among tenants and encourage landlords to utilise the current incentives.
 - The Housing Market Renewal and other publicly funded refurbishments, to ensure high standards.
- 1.2 Offset any increase in CO₂ emissions or water consumption in the new Growth Areas by matching this with a commensurate reduction in carbon emissions or water consumption in existing homes in the same region.
 - 1.3 Equalise VAT on refurbishment and new build to overcome the current distortion that encourages developers and home owners to demolish and replace homes instead of refurbishing existing buildings to high environmental standards. Our assessment is that 11-12% VAT on both repair and new build would be revenue neutral.
 - 1.4 Use the enabling powers of the Sustainable and Secure Buildings Act 2004 to make sustainable development the driving force behind revised Building Regulations. This means Government will need to amend Regulation 8 to allow sustainability to be delivered across the Building Regulations approved guidance documents.
 - 1.5 Raise awareness on all resource efficiency issues, which should be delivered alongside any regulatory changes; for example advice to householders on energy, water, construction materials and waste, and household waste should be coordinated with other awareness raising efforts (such as the Energy Saving Trust campaigns and the new activities under the Climate

Change Communications Campaign) to maximise efficiency and effectiveness in delivery.

2. A broad range of technical measures for improving energy efficiency in homes are already well understood to be cost-effective and readily available on the market. These are: insulation (loft, walls, floors, tank and pipes), draught proofing (around windows, doors, skirting boards), secondary and double glazing, improved heating systems (complying with the new Building Regulations standards of 86% efficiency) wider use of heating controls, and efficient lighting and appliances. Installing micro-generation also reduces demand for centrally supplied energy, such as with solar hot water systems, ground source heat pumps, and photovoltaics. Micro CHP boilers allow householders to generate electricity whilst consuming gas for heating, and community wide CHP schemes provide probably the most cost effective option for reducing demand for energy in certain housing densities.

To encourage more sustained and widespread adoption of energy efficiency measures, the following steps could be taken:
- 2.1 Much improved consumer information through measures such as installing smart meters into homes; improved information on fuel bills; linking home energy efficiency to the Government's climate change objectives; and a voluntary agreement with global electronics producers on electronic goods standby power.
- 2.2 Improved incentives and requirements such as:
 - amending the Building Regulations Part L to implement the proposal to require consequential energy efficiency works when carrying out building work. This will enable LAs to require further energy efficiency measures as part of the general approval process for house extensions and major refurbishments
 - in the short term setting the Energy Efficiency Commitment 3 target at least three times the level of Energy

Efficiency Commitment 1, with a programme of supporting policies to engage owner occupiers (and this level to be announced in 2006, as some suppliers are achieving their targets early)

- introducing a Microgeneration Commitment, parallel to the Energy Efficiency Commitment to require a proportion of microgeneration to be installed by energy suppliers in homes, and financed using an energy services model
- over the medium term Government to support pilot projects in developing a system of carbon trading at household level, so individuals receive personal carbon credits that they can then buy or sell in a trading system.

3. Wider metering of water use is a key step to improve water resource efficiency in homes. This would raise consumer awareness of their water use, and thereby stimulate demand for water efficient toilets, taps and appliances (dishwashers etc) as well as water saving appliances such as water butts. However water industry issues also need addressing such as water leakage.

We have also identified supply chain barriers for householders who would wish to install water efficient taps/toilets etc. Such products are not readily available at all retail outlets, and therefore householder awareness of them is low. As bathrooms and kitchen are refurbished on average every 7-15 years there are regular opportunities for upgrading the resource efficiency of the appliances installed.

To improve water efficiency, we recommend:

- 3.1 Improved consumer information such as:
- providing systematic advice to consumers including standardised water audits
 - improving the availability and labelling of water efficient fittings and appliances.
- 3.2 Improved incentives or requirements such as:
- introducing water efficiency

regulations to improve the water efficiency of fittings and appliances, in all new and existing homes.

- requiring water supply companies to increase water metering installations, and install smart meters
- amending legislation to allow mandatory metering to enable meters to be installed in all homes as a central demand management measure
- reviewing with Ofwat and water companies the potential for variable tariffs in areas of water stress
- reviewing the potential for a Water Efficiency Commitment to explore whether this measure is needed to stimulate demand for water efficiency appliances and practices.

4. To improve the sustainable use of materials and construction products and to reduce construction and demolition waste, we propose:

- 4.1 Promoting the use of life cycle analysis of materials and products to inform specifiers of the environmental performance of each product relative to others on the market. This would drive a continuous improvement in the environmental impact of materials sourcing and manufacture.

In view of the potential costs of undertaking a life cycle analysis to small to medium enterprises (SMEs) we recommend that Government and trade bodies provide support to relieve the costs of product certification

- 4.2 We also recommend developing a new Building Regulations Approved Document on Materials and Waste to include standards for:

- pre-demolition audit and consideration of the potential for demolition materials use in new building
- design for deconstruction
- materials inventory
- materials environmental impact
- construction waste management.

- 4.3 Promoting waste management measures including:

- builders' merchants to introduce materials take-back schemes
- increasing training to SME builders on

- good practice in site waste management
 - local incentive schemes for minimising, reusing and recycling construction waste.
- 5. Success in increasing the level of householder recycling appears to depend heavily on the quality of collection service provided by the local authority. Areas where doorstep collection is established see significant improvements in recycling rates.

Dramatically reducing household waste to landfill, towards levels experienced in some other EU countries would require:

 - 5.1 Setting higher targets for household recycling and composting for 2010-2020 to stimulate local authority action plans.
 - 5.2 Researching trends in householders recycling practice, and researching best practice in spatial layout of homes and communities to promote recycling, and applying lessons learnt to future Building Regulations standards for new build and major refurbishments.
 - 5.3 Increasing public awareness through:
 - Consistently colour coded recycling bins for each waste stream available in public places
 - Clearer, more consistent information at supermarkets, schools etc to raise general understanding of the need for more recycling.
 - 5.4 Encouraging recycling through:
 - Local incentive schemes, where necessary (if doorstep collection has limited impact)
 - Allowing local authorities to implement variable waste charging.

Tackling resource efficiency in existing homes requires a comprehensive package of measures to deliver a step change. But the rewards from implementing these changes will be great. We believe that our proposals to improve the efficiency and reduce the negative environmental impact of existing buildings would help set us on the right path to meet the UK Government's targets for carbon dioxide emissions reductions, reducing waste to landfill, and preventing further water stress in parts of the UK.

Improving our performance in resource efficiency is an essential element of sustainable development in the UK.

Acknowledgements

The Sustainable Development Commission is grateful to the Office of the Deputy Prime Minister for supporting this study.

We would also like to thank a number of other organisations for their contribution to this study:

Energy Watch
English Heritage
Green Alliance
The Building Regulations Advisory Committee
The Building Research Establishment
The Construction Industry Research and Information Associations
The Department of Environment, Food and Rural affairs,
The Department of Trade and Industry
The Energy Saving Trust
The Environment Agency
The Environmental Change Institute
The Housing Corporation
The Institute of Public Policy Research
The London School of Economics – Centre for Analysis of Social Exclusion
The Royal Commission for Environmental Pollution
The Waste and Resources Action Programme
WWF-UK

Disclaimer

This document has been produced with the financial support of the Office of the Deputy Prime Minister (ODPM). The report is the work of the Sustainable Development Commission and does not necessarily reflect the views of the ODPM, or other organisations listed above that contributed to the project. The Sustainable Development Commission accepts full responsibility for any errors or omissions.

Note

This report was completed and submitted to Government in January 2006. Progress has been achieved in some areas since then and this is noted in footnotes throughout the report. The responsibility for many of the policy areas covered in this report has been transferred from the Office of the Deputy Prime Minister (ODPM) to the newly created Department for Communities and Local Government since January 2006. Where the ODPM is referenced in this report, those references remain unchanged.

1. The sustainable buildings work programme: the existing housing stock

In Spring 2004, the Office of the Deputy Prime Minister (ODPM) asked the Sustainable Development Commission (SDC) to provide advice on improving the environmental impact of existing homes, following discussions about housing market renewal and demolition plans, as well as the SDC's work on the Thames Gateway and the growth areas. (Ref) This report is the outcome of this advisory work.

The core argument is twofold:

- a) Existing homes will comprise the vast majority of homes far into the future and the majority of these are not of a high environmental or energy efficiency standard but could and should be brought up to that standard.
- b) That existing homes are almost all located within existing communities which, without constant regeneration are liable to decay into run-down areas that can predominate in many of our cities.

This study follows the report of the Sustainable Buildings Task Force (2004) which proposed the Code for Sustainable Buildings as well as a number of recommendations for resource efficiency in new homes. Our study builds on that report in recognising the importance of the existing stock.

The introduction of the Sustainable and Secure Buildings Act in 2004 as an amendment to the Building Act enables the ODPM to create Building Regulations that further sustainable development, and to apply some standards to the existing building stock. This will open up the opportunity for a new focus on existing housing. The Government has recently launched a cross-departmental review into improving the resource efficiency of the existing building stock. We hope that this report will help with the Government's review.

There is a significant volume of work ongoing in the area of low energy and sustainable refurbishment of housing currently. A list of known projects and actors is presented in Annex E: Refurbishment Projects.

This study has covered the areas of energy,

water, materials and construction waste, and household waste. Many of the technical measures necessary for the most immediate energy and resource gains are already known and understood. The real issue is to set these out clearly and to discover which tools are necessary, both at policy level and at a more practical level, to implement the necessary measures.

This study does not include costings of the overall investment required in public and private sectors to deliver the improvements we identify. We consider it is necessary for the next stage of analysis to cover this, together with analysis of the expected payback in terms of reduced running costs.

An interim report (SDC 2005c) was released in June 2005 which reviewed the technical measures for delivering improved standards in the existing stock. The SDC held a workshop at the London School of Economics in April 2005 and a further series of workshops with key stakeholders (see Annex D: SDC Stakeholder Workshops for details) in Autumn 2005. This final report builds on the interim report, and develops the SDC's advice to Government on how to implement the technical measures through policy.

This report has been developed in the context of ODPM's housing policy and with consideration of the fact that existing homes are within existing communities. Making these communities sustainable is an important part of attracting investment to the existing stock. We see existing housing as an integral part of existing communities and its improvement central to neighbourhood renewal.

The aim of this report is to increase recognition of the potential of the existing housing stock in delivering environmental targets, and to support ODPM in improving its contribution to carbon reduction. By upgrading the existing stock we can improve the supply of affordable homes, extend the life of homes that already exist and enhance community stability and integration as well as reducing environmental damage.

2. Context for existing housing

The existing stock makes up 99% of all homes at any given time. Even with high projections of house building and demolition rates, an estimated 70% of the stock that will be inhabited in 2050 already exists. There is no option but to make the best use of these existing homes, to make them cost effective, healthy and comfortable to live in, and minimise their damage to the environment. We can significantly reduce the carbon impact of the 21 million existing homes – currently 27% of all emissions.

It is relatively low-cost to refurbish existing homes to high environmental standards, between a tenth and a quarter of the cost of

new build (Cambridge Architectural Research 2003). Homes need constant reinvestment and modernisation plus major refurbishment every 20-30 years, years; requiring about 1% of capital value at current market levels each year to be spent. As noted by the Empty Homes Agency, 'bringing empty homes back into use can be difficult, but it's rarely as expensive as building a new house and never as costly as doing nothing' (Guardian 2005).

Additionally, the environmental impact of new build includes increased carbon emissions, land take, materials consumption and construction waste (see Box1).

Box 1 – Environmental impacts of proposed new house building (ODPM 2005d)

- Additional 0.1 Mt of Carbon in 2016 above baseline missions of around 39MtC (0.3% increase).
- Additional 0.2 million tonnes of household waste in 2016 above baseline of 28.8 million tonnes. (0.7% increase).
- Additional 12 million litres of potable per day in 2016 above baseline of 12,728 mega litres/day. (0.1% increase).
- Additional 162 million tonnes of aggregates required for the house building planned up to 2016.

Refurbishing properties back into use has fewer environmental impacts than building new homes and such properties will also be located near to existing facilities and infrastructure (HM Treasury, ODPM 2005). New homes are often built outside existing communities which can lead to people in work moving out of town, and leaving behind poor communities.

Homes cannot be seen in isolation from their communities. In order to regenerate existing communities, there must be constant modernisation, not just of the homes but also of the neighbourhoods more widely. Street furniture, tree planting, open spaces, curtilages, and reuse of empty and underused buildings are all vital. In addition, within all communities there are many small abandoned or unused sites capable of beneficial use.

As households become smaller so communities have become more 'thinned out' and fragmented. As a result, in many areas, shops, buses, schools and other services are declining or disappearing altogether leading to greater car use and more traffic, and less socially and environmentally friendly neighbourhoods. But it is possible to reverse the process. Renovating and upgrading existing homes revalues older neighbourhoods and makes investment in general neighbourhood environments worthwhile. By the same token, improvements to neighbourhood environments generates enthusiasm for upgrading homes and attracts younger incoming residents looking for affordable homes. It is particularly important for families to know that the environment is cared for, and therefore upgrading the existing

stock needs to be linked to other agendas such as neighbourhood management and green spaces.

In order to deliver sustainable communities, new homes should be located on the most accessible sites, near town centres or close to major transport interchanges, and within neighbourhoods of sufficient density to support local services. Many new housing units can be integrated into existing communities, using existing infrastructure and boosting existing businesses whilst bringing a new vitality to existing neighbourhoods. The role of small infill development is very significant. Between 35-50% of all new homes are delivered this way. They can strengthen communities and improve viability. Refurbishment and infill building are the quickest and most environmentally friendly ways to introduce a better range of housing, expand supply and establish mixed communities.

At the moment there is an uneven playing field between new build and refurbishment. The whole system for at least 20 years has been geared in favour of new build: renovation grants have all but disappeared and incentives to renovate are minimal and extremely restrictive. There is a high VAT tax of 17.5% imposed on all repair and modernisation unless it is a conversion from another type of building into housing. Planning for major upgrades is complex and many planners tend to be conservative over such issues as altered facades, overlooking and extensions.

It is messy and complicated to work within existing buildings, particularly if they are occupied. Working in existing buildings is considered more risky by developers as the quality of existing structure and services may not be predictable. Small building firms are better suited for this type of work than large builders, but the major financial drivers work with the bigger developers. They favour larger-scale, new build housing schemes. However, within high demand areas, in-fill development is becoming much more popular and acceptable. This has the effect of upgrading

neighbourhoods and, in the long run, has an impact on the value of existing homes, giving incentives for their up-rating.

Plans to provide additional housing should consider the roles of renovation and conversion of housing to deliver enough of the right type of homes where people need to live. Refurbished property does not count as an additional unit because strictly it already existed. On the other hand, it is an extremely important housing target since it prevents property from falling down the value ladder and eventually being abandoned. Many homes are made empty simply through this problem and many housing associations across the northern Pathfinder areas are abandoning existing homes because of the Government's targets for new build housing, from which they stand to benefit.

There are currently 689,000 empty homes (3.2% of the housing stock) in England. About half of these are in southern and eastern England, where housing need is at its highest. The number of private sector homes standing empty for more than 6 months is around 300,000 and this should be one focus for policy effort.

Another barrier to renovation is that the lack of incentives for repair actually causes low demand by setting in train a spiral of decline. This is particularly relevant to rented property. In areas where older property is decaying, or "low-value", owners often leave and rent out their property, creating more instability in declining communities. As many owner occupiers of existing properties are low-income elderly people, they simply cannot afford the scale of reinvestment and upgrading needed.

In this paper we focus on increasing the resource efficiency of the existing stock. However it is extremely important to see this work within the much wider context of the overall maintenance and upgrading of the existing stock. The public at large values this huge asset, but the argument to prioritise housing investment in increasing its viability and resource efficiency is yet to be won.

3. Cross cutting policy measures to deliver sustainable homes

3.1 SDC approach to using policy measures

The Building Regulations, governed by the Building Act (amended 2004), are the main regulatory standards applying to new and existing homes.

On their own, information and voluntary standards are insufficient to encourage the vast majority of builders, developers and homeowners to improve standards; they help the committed and the enthusiastic. In contrast, the conclusions of the Energy Efficiency Innovation Review suggest that Building Regulations are among the most cost-effective policies. Although there are concerns regarding enforcement of Building Regulations, they are delivering 95% of the expected carbon savings (HM Treasury, Defra, Energy Saving Trust, Carbon Trust 2005).

However, regulation is not always appropriate, and in a market economy other policy measures may be used to complement regulatory minimum standards, including:

- Voluntary standards
- Market Instruments
- Behavioural instruments which often include information and incentives.

Voluntary standards, such as the Code for Sustainable Homes, may be used to deliver a number of outcomes, for example:

- to provide recognition to those who are willing to achieve a standard above regulation
- to signal future direction of regulation and timescale of introducing higher standards, and
- to start a market transformation process potentially using public procurement as a lever.

The combination of regulatory standards and voluntary standards, plus measures to inform and encourage change will be a powerful framework for driving change.

3.2 Policies to deliver sustainable homes

The Sustainable Buildings Task Group (2004) recommended that Government develop

a single national standard for sustainable buildings. A draft Code for Sustainable Homes has recently been released for consultation that will apply to the design and construction of new housing. The Government has committed to build all new homes in receipt of public funds to the Code standard (ODPM 2005b). The government will also promote the use of the Code standard to privately-funded new homes. It is hoped that implementing this higher resource efficiency standard across a significant proportion of the housing market will improve some of the 'default standards' used in the construction industry.

A version of the Code should also be developed to apply to existing housing to set a common standards framework for sustainable existing homes. This should set challenging new carbon, water and waste standards to measure performance of existing stock and set standards for improvements. The flexible structure of the Code means that it should also be developed to cover a wider range of sustainability issues. This should be used to establish standards in owner occupied and social and private rented homes, and should be linked to financial incentives.

A version of the Code for existing homes should cover:

- reducing the carbon emissions from homes by setting standards for thermal efficiency of the building envelope (wall, loft, floor and glazing insulation values) and the heating system and controls in line with standards for new homes
- bathroom and kitchen improvements incorporate good practice for water conservation
- materials used in repair and refurbishment works have low environmental and health impacts, whilst ensuring responsible sourcing
- waste generated during the repair and refurbishment works is minimised and waste materials reused or recycled where possible
- best practice is applied in the provision of space for separation and storage of household waste.

The Code for Sustainable Buildings (existing housing) may be developed using the BRE's Ecohomes XB (existing buildings) as a foundation.¹ This standard is currently being trialled by the Housing Corporation.

3.2.1 The home condition report

The forthcoming Home Condition Report, which will be delivered as part of the Home Information Pack will include an energy rating. When homes are sold or rented, this information must be made available by the seller or landlord to buyers or tenants. Making this information available to home buyers will influence purchasing choices, and in turn is likely to influence property values. Over eighty percent of home buyers want to know if their home is environmentally friendly.²

We propose that this home label is extended to include all resource efficiency using the Code for Sustainable Buildings (existing housing). Homes should be labelled according to their Code rating. Information on the likely consumption of (and therefore expenditure on) energy and water, and provision of recycling/composting facilities is useful to consumers.

Recommendation: The proposed Code for Sustainable Buildings (existing housing) is integrated into the Home Condition report to advise home movers on actual resource efficiency, potential for improvements and advice on grant availability.

3.2.2 New sustainable social housing standard

The Government currently uses the 'Decent Homes' standard for housing, which establishes standards for fitness, reasonable state of repair,

modern facilities and services and degree of thermal comfort.³ The Government is committed to making all social housing decent by 2010.

The Decent Homes standard has so far missed the opportunity to reduce carbon emissions from the existing social housing stock, and is estimated to contribute just 0.05MtC by 2010 (Defra 2004a) to the Government's Climate Change Programme. Establishing a standard for the decency of social housing is one of Government's signals to the construction and property industry for the expected standards of housing.

The Code for Sustainable Buildings (existing housing) should be used to establish the standard for social housing from 2010. The Code framework sets standards in a continuous spectrum of achievement which can be tightened up over time, creating a longer term policy framework within which to work. Where major refurbishment work is to be carried out to meet the standard, it should follow the good practice standards in the Code for materials and site waste management.

Recommendation: The Government's standard for social housing includes a wider range of resource efficiency objectives, based on the proposed Code for Sustainable Buildings (existing housing).

3.2.3 Private landlord incentives

The 'split incentive' where landlords invest, but tenants benefit, is a barrier to improving resource efficiency in the private rented sector. This sector of housing (10% of total) has the poorest energy rating as a result. The majority of landlords see their rental income as a sideline interest because they own only one or two properties, and therefore will not be interested in investing heavily in improving properties without significant incentives. Government has

1 Ecohomes XB is part of the Building Research Establishment's BREEAM (BRE Environmental Assessment Method) suite of tools to assess the environmental impact of buildings.

2 http://www.wwf.org.uk/news/n_0000001276.asp

3 Thermal standards are as follows:

For dwellings with gas/oil programmable heating, cavity wall insulation (if there are cavity walls that can be insulated effectively) or at least 50mm loft insulation (if there is loft space) is an effective package of insulation, and For dwellings heated by electric storage heaters/LPG/programmable solid fuel central heating a higher specification of insulation is required: at least 200mm of loft insulation (if there is a loft) and cavity wall insulation (if there are cavity walls that can be insulated effectively). (ODPM 2004b)

proposed the introduction of a 'green landlord scheme' to incentivise landlords to invest in whole house energy efficiency.

The Treasury published a consultation document⁴ during 2005 suggesting that a green landlord scheme might be linked to the existing Wear and Tear Allowance (W&TA), which allows landlords to offset a fixed rate of 10% of rental revenue tax against costs incurred for wear and tear. We welcome the announcement in the Pre-Budget report that the green landlords scheme may make landlords' W&TA conditional on the energy efficiency level of the property, but we encourage HM Treasury to go further.

The W&TA is only allowed for furnished properties, whereas a green landlord scheme should be established to apply to all properties. Only 25% of private rented properties are furnished. The proposal relates only to energy efficiency whereas we propose that it should relate to all resource efficiency as considered in this report (energy, water, household waste).

We propose that the scheme could use the Code for Sustainable Buildings as a framework for resource efficiency standards. This standard may be raised over time as property standards improve. A certificate of performance by an approved Code assessor would need to be presented to the HM Revenue and Customs as proof of compliance with the standard. In the shorter term, this standard could be established for just whole house energy performance, with a minimum standard to be established using the SAP rating.

A minimum standard should be established which will encourage landlords with poor performing properties to invest in energy efficiency, and reward landlords with better performing properties.

Any new green landlord scheme ought to be well publicised through appropriate networks to maximise landlords' awareness of the scheme. Further research should be carried out in the near future to establish what level of incentive should be set to trigger action in improving resource efficiency by landlords.

Recommendation: The Green Landlord Scheme uses a whole-house approach to establish a set minimum resource efficiency standard for private rented properties, with a flat rate tax incentive applied on an ongoing basis to all homes that reach this standard. The Green Landlord Scheme is based on the proposed Code for Sustainable Buildings (existing housing).

3.2.4 Housing growth areas

The Government's proposals for housing growth in the South and South East will inevitably bring marked increases in resource use and environmental impacts unless the impacts are comprehensively mitigated.

The SDC suggests that the Sustainable Communities Plan growth areas in the Thames Gateway, London Stansted Cambridge Peterborough, and Milton Keynes and South Midlands, as well as any additional allocation of housing resulting from the Government's response to the Barker Review, should be developed on the basis of achieving no net increase in carbon emissions or water consumption of the development. This means that additional resource use of new homes should be compensated for by increased efficiency of the existing stock.

Recommendation: Government commits to deliver zero net increase in resource consumption by 2015 in the housing growth areas.⁵

A commitment of this kind would ensure that all new dwellings are developed to maximise carbon and water efficiency (for example committing to a high standard in the Code for Sustainable Homes), and existing dwellings are upgraded at the same time. Our proposal is for an achievable short term target, which has a strong message that the Government's housing policy focus is to make all housing high quality, affordable to run and environmentally friendly – not just new housing. This proposal goes

4 <http://www.hm-treasury.gov.uk./media/726/37/greenlandlord010805.pdf>

5 We are aware that the Government has recently announced a feasibility study into implementing this recommendation.

hand in hand with the calls to use investment in growth to strengthen existing urban areas (London School of Economics 2004). Overall, it will help to mitigate the negative impact of new development.

For example, within the Thames Gateway growth area there is an existing population of around 1.6 million people, living in around 700,000 homes. The Sustainable Communities Plan growth proposals suggest that 120,000 new dwellings will be delivered in this area – a ratio of over 5 existing dwellings to each new dwelling.

Net zero carbon growth requires that the increase in carbon emissions from the occupation of new homes is offset by efficiency savings in the existing stock. This could be delivered through partnerships between developers, energy suppliers (who have Energy Efficiency Commitment (EEC) targets), the energy efficiency industry, local authorities, and community groups in the regions. Such a collaborative arrangement would help suppliers deliver their EEC targets more rapidly and would improve comfort standards and affordability for households. Taking an area-based approach means that developers will be encouraged to consider technologies which may be more effective at a bigger scale, such as district combined heat and power, which can be retrofitted to existing homes.

If existing homes are currently responsible for a typical 1.6tC/year, and a new home built to Building Regulations 2006 standard is responsible for around 0.75tC/year, then the emissions from each existing home would need to be reduced by around 10%. In this study we show that domestic carbon emissions can be reduced by at least 60% by 2050. This would be a clear step in the right direction, and achievable in the near future.

We believe it is also possible and appropriate to deliver a net zero increase in water consumption in the growth areas through matching increases in demand from new homes with efficiencies in existing homes. This could be delivered through a similar model as above, although the organisational and regulatory structures are less well developed. A typical existing unmeasured home currently uses 154 litres per capita per

day, while a new home built to modern water efficiency standards could use 125 litres per capita per day (if required through regulation or the Code for Sustainable Buildings). The water consumption of each existing home would need to be reduced by 16% to deliver net zero growth in water consumption.

Installation of water meters is expected to reduce water consumption in existing homes by 10% on average by increasing user awareness of water wasted. To ensure that water meters can be installed in all existing homes on a mandatory basis, it would be necessary to establish the growth areas as having water scarcity status.⁶ A programme of promoting water efficient retrofit and replacement appliances in those regions would encourage a further shift to lower water consumption by households, to deliver the total 16% saving.

A net zero increase in water consumption in the growth areas would ensure that there should be no need to develop new water resources such as reservoirs or desalination plants to meet increased supply, with associated environmental impacts.

3.2.5 Housing market renewal

The Government's proposals for dealing with the issues of low demand and failing housing markets (through the Housing Market Renewal (HMR) programme) include refurbishment, demolition of existing housing and significant new build housing and will also lead to increases in resource consumption and generation of waste.

There are around 900,000 homes in the Pathfinder areas. The ODPM proposals for up to March 2006 include refurbishment of 20,000 properties, 3,000 new build homes and 10,000 demolitions. There are no published standards for the refurbishment of homes in the Housing Market Renewal programme.

Recommendation: New homes in the HMR areas are delivered to the Code for Sustainable Homes standard, on brownfield sites within existing communities to aid regeneration.

6 Water companies must apply to the Secretary of State for water scarcity status. Legislation is currently structured to make this a last resort option.

Recommendation: Best practice guidance in the reuse and recycling of waste is followed for the demolition of homes planned in the HMR programme.

Recommendation: The HMR Pathfinder programme delivers increased resource efficiency using the proposed Code for Sustainable Buildings (existing housing) in all planned upgrading of existing homes.

Box 2 – VAT applied to renovation of existing housing in Langworthy, Salford

- Langworthy has huge swathes of currently derelict terraced and council homes. Working closely with Salford City Council and English Partnerships, developer Urban Splash has come up with proposals that reconfigure the terraced houses to create a modern solution to these run down streets. The proposals will create 349 homes of the highest quality, but homes that will also be affordable.
- The scheme was originally designed to utilise as much of the existing structure as possible. However, because of VAT rules for residential to residential conversions the scheme has been altered to ensure that it qualifies as a new build proposal and the zero VAT rating. Therefore, rather than retaining the existing party walls and first floor structure, the developers now plan to demolish these elements in order to avoid paying VAT. The VAT rules contradict the sustainability agenda.

3.2.5 Value added tax

The VAT on repair and renovation at 17.5% puts a very high tax on reinvestment by all owners in existing properties. This is particularly true for landlords and owner occupiers in low income neighbourhoods where disrepair and decay create adverse conditions for individual investment in repair and modernisation. But neighbourhood decline is partly the result of the cumulative impact of house by house decay. In contrast, new build homes go VAT free, effectively gaining a 17.5% subsidy compared to refurbishment projects. In practice most demolition receives the same subsidy.

If there is not an even playing field between new build homes in better newer neighbourhoods and older homes in existing neighbourhoods, then investment in repair, renovation and modernisation will be impeded further. Where cost of repair, refurbishment and

redesign is close to new build, VAT will make it uneconomic, in spite of environmental and carbon and community gains. There are many examples of the perverse effect of VAT on repair and renovation. The project in Langworthy, Salford offers a clear case (see Box 2).

However, we are aware of the positive steps taken in establishing reduced rate VAT levels that apply to regeneration areas, the rehabilitation of long term empty homes and conversions.

Recommendation: HM Treasury equalises VAT between new build, repair and renovation.

This could be set at a level that is revenue neutral, avoiding establishing further VAT exempt rates.⁷ We estimate that the Treasury would have to apply VAT at 11-12% on all repair and new build to maintain the current level of

⁷ European law currently allows Member States to apply a reduced rate of VAT to some refurbishment services. The Government has so far implemented the reduced rate for residential conversions (that change the number of homes in a building) and the conversion of non-residential buildings to residential ones and for empty homes (empty for at least three years).

revenue to the Treasury, although if the level of repair increased under better incentives, this VAT level could be lower and still revenue neutral.

Additionally, we propose the imposition of VAT on all demolition, to be paid by the organisation producing the replacement housing, for example, the private developer in the case of cleared council sites where a developer wants the land. Councils should no longer directly fund demolition at an overall cost of at least £17,000 per home, and demolition should not escape VAT.

3.2.6 Communication

Although there is a desire by householders to know more about the environmental impact of their homes⁸ and an interest in environmental and sustainable development issues, the general knowledge base is low. For instance, although public awareness of global climate change is increasing rapidly, few householders understand the direct contribution to climate change of inefficient energy use in their home. Further, there is poor understanding of the costs of implementing improvement measures.

Information on measures to improve energy and water efficiency, to improve recycling of household waste, and on good practice in efficient use of construction materials and management of construction waste, is not currently centralised. It is not easy for householders to access this information. Further information on grant funding and incentives is potentially even harder to find. Advice bodies are being established in most resource efficiency areas but the advice is fragmented. We propose a one-stop shop advice service for householders that requires all this advice to be coordinated and brought together.

Communicating co-ordinated messages on simple and practical steps that all householders can take to improve all aspects of resource efficiency of their homes would be a significant step forward. Government should match all regulation and incentive schemes with full consumer engagement programmes to maximise impact and acceptability.

Means of communication should be considered in order to maximise understanding, trust and demographic engagement.

Recommendation: Communication and provision of advice is brought together into a 'one-stop-shop' to raise householder awareness on resource efficiency issues and solutions.

3.2.7 Skills

There is a known shortage of construction industry skills, difficulties in recruiting staff and gaps in the skills of the workforce (CITB 2003). These shortages relate particularly to traditional skills such as plasterers, joiners and plumbers. Additionally, a range of new skills have been identified that are necessary for the delivery of sustainable communities (ODPM 2004a). The recommendations made in this report for policies to improve the resource efficiency of the existing housing stock will rely on the construction industry to deliver. Delivering improved standards in energy, water, waste and materials will require a focus from construction industry training bodies, including industry accreditation schemes.

Recommendation: Construction training promotes the skills needed for resource efficient refurbishment of existing housing.

3.2.8 Delivery

There is no 'one stop shop' for home owners interested in upgrading the resource efficiency of their home. Individuals are likely to find the plethora of bodies and organisations offering advice confusing. We propose that one body is charged with delivering advice on home audits, good practice for improvements and grants.

Recommendation: A single body is charged with delivering advice on energy, water, materials and waste efficiency to avoid fragmentation.

8 http://www.wwf.org.uk/news/n_0000001276.asp

4. The Sustainable and Secure Buildings Act and Building Regulations

The Office of the Deputy Prime Minister asked the Sustainable Development Commission (SDC) to provide advice on how the SSBA should be implemented in Building Regulations, and this report forms part of the outcome of this work. This complements the SDC's focus on existing housing and climate change, providing new powers to improve the existing stock.

The Sustainable and Secure Buildings Act (2004) (SSBA) amended the Building Act to extend the existing powers for making Building Regulations. Previously, the Building Act stated that Building Regulations may be made for:

- a) securing the health, safety, welfare and convenience of persons in or about buildings and of others who may be affected by buildings or matters connected with buildings
- b) furthering the conservation of fuel and power
- c) preventing waste, undue consumption, misuse or contamination of water.

The SSBA added:

- d) furthering the protection or enhancement of the environment;
- e) facilitating sustainable development,
- f) furthering the prevention or detection of crime.

The SSBA restates the general principle that Building Regulations do not apply to buildings erected before the date on which regulations are made, but lists a number of new circumstances which are an exception to this general principle:

- where regulations concern the demolition of buildings
- where regulations concern the use of materials or components that have been produced from or incorporate recycled items
- where regulations concern the reuse of materials or components
- on a change of occupancy but only for conserving fuel and power or prevention

- or reduction of greenhouse gases
- where any regulated building work is to be carried out, but only for conserving fuel and power or prevention or reduction of greenhouse gas emissions.

As part of this work, the SDC has been contributing to the work of the Building Regulations Advisory Committee (BRAC) Working Party on Sustainability, established to advise on the implementation of the sustainability aspects of the SSBA.⁹

4.1 The approved documents

There are currently fourteen Approved Documents for the Building Regulations, which provide practical guidance on ways to comply with the functional requirements in the Building Regulations Parts A-P. The current Approved Documents of the Building Regulations are listed in Table 1.

The Approved Documents (AD) give guidance on achieving the standards for performance outcomes of the building in operation. Building Regulations do not currently set standards for the process of design, construction or demolition.

The Building Regulations are used by building designers and constructors and enforced by Local Authority Building Control or their private sector equivalent Approved Inspectors.

The SDC has carried out a review of the Approved Documents (ADs) in order to identify where the ADs currently address sustainability, and where there may be scope for ADs to further address sustainability, or where a new AD may need to be developed to address aspects of sustainability. The review process included meeting with the leaders of each Approved Document in ODPM. The findings were submitted to ODPM and the Building Regulations Advisory Committee and are summarised in Annex A: The Approved Documents of the Building Regulations. Our recommendations on energy,

⁹ A separate BRAC Working Party has been established to advise on the implementation of the Security aspects of the SSBA. The BRE are currently carrying out a scoping study of cost effective security measures for dwellings for this WP.

water, materials and waste are incorporated throughout this report.

An early finding was that the scope of each Approved Document is currently limited. Regulation 8 within the Building Regulations Statutory Instrument¹⁰ currently limits the purposes of the existing ADs as follows:

“Limitation on requirements: Regulation 8. Parts A to D, F to K and N and P (except for paragraphs H2 and J6) of Schedule 1 shall not require anything to be done except for the purpose of securing reasonable standards of health and safety for persons in or about buildings (and any others who may be affected by buildings, or matters connected with buildings).”

In view of Regulation 8, a key consideration is whether ‘sustainability’ is added into the remit

of each of the ADs (requiring an amendment to Regulation 8), or whether another AD is created specifically for ‘sustainability’. We consider that it is desirable to embed sustainable development principles across all policy and regulation, rather than making a separate provision. The best way to achieve the most sustainable outcomes in terms of the built environment, will be to integrate sustainable development across the Approved Documents. This would avoid ‘sustainable development’ becoming the niche task of just one discipline.

Recommendation: Government amends Regulation 8 of the Building Regulations so sustainability can be integrated throughout the Building Regulations where appropriate.

Table 1 – The Approved Documents of the Building Regulations

Approved Document	Issues Covered
AD Part A: Structure	Loading Ground Movement Disproportionate Collapse
AD Part B: Fire Safety (2002)	Means of warning and escape Internal Fire Spread (linings) Internal fire spread (structure) External fire spread Access and facilities for the fire service
AD Part C: Site Preparation and Resistance to Moisture (2004)	Preparation of site and resistance to contaminants Resistance to moisture
AD Part D: Toxic Substances (1992)	Cavity Insulation
AD Part E: Resistance to the Passage of Sound (2004)	Protection against sound from other parts of the building and adjoining buildings Protection against sound within a dwelling-house etc. Reverberation in the common internal parts of buildings containing flats or rooms for residential purposes Acoustic conditions in schools
AD Part F: Ventilation (2005 Interim)	Means of ventilation

¹⁰ <http://www.hmso.gov.uk/si/si2004/20043210.htm>

Approved Document	Issues Covered
AD Part G: Hygiene (1992)	Sanitary conveniences and washing facilities Bathrooms Hot water storage
AD Part H: Drainage and Waste Disposal (2002)	Foul water drainage Wastewater treatment systems and cesspools Rainwater drainage Building over sewers Separate systems of drainage Solid waste storage
AD Part J: Combustion Appliances and Fuel Storage Systems (2002)	Air supply Discharge of products of combustion Protection of building Provision of information Protection of liquid fuel storage systems Protection against pollution
AD Part K: Protection from falling, collision and impact (1998)	Stairs, ladders and ramps Protection from falling Vehicle barriers and loading bays Protection from collision with open windows etc. Protection against impact from and trapping by doors
AD Part L: Conservation of Fuel and Power (2005 Interim version)	Work in new dwellings Work in existing dwellings New buildings other than dwellings Work in existing buildings that are not dwellings
AD Part M: Access to and Use of Buildings (2004)	Access and use Access to extensions to buildings other than dwellings Sanitary conveniences in extensions to buildings other than dwellings Sanitary conveniences in dwellings
AD Part N: Glazing – Safety in relation to Impact, Opening and Cleaning (2000)	Protection against impact Manifestation of glazing Safe opening and closing of windows etc
AD Part P: Electrical Safety (2005)	Design, installation, inspection and testing Provision of information

4.2 Integrating sustainable development

In order to integrate sustainable development across the Building Regulations as we recommend, by amending Regulation 8, it is necessary to establish the principles of sustainable development centrally in the Building Regulations. The UK Government in March 2005 (Securing the Future) agreed the five principles of sustainable development (HMG 2005a). The principles should be used holistically, and selected principles should not be 'cherry picked' for a particular purpose. Their application to building performance may be considered as follows:

Living within environmental limits

Consider the environmental impacts and use of natural resources of buildings in construction and operation, and develop regulations that will limit these impacts to within the carrying capacity of natural systems. This relates to consumption of natural resources such as energy, water, materials, and their contribution to waste generation in construction and operation. Pollution impacts from construction and operation, and demolition of buildings, should also be considered.

Ensuring a strong, healthy, just society

Building Regulations should protect and enhance the health and safety of people in and around buildings, setting minimum standards that promote health and reduce inequalities. Building Regulations currently protect people in and around buildings from 'accidental danger' but do not focus on enhancing public health and wellbeing. 'Health' links strongly to sustainability, incorporating public health, pollution, and opportunities for healthy lifestyles.

Achieving a sustainable economy

Building regulations should be developed with consideration of economic impacts, ensuring that they are integrated with other financial incentives supporting sustainable development. Building Regulations may be developed with consideration of skills and employment and diversity of opportunities, including consideration of small building firms

and the local economy. This can be done with consideration of whole life costs, reducing the inefficient use of resources and decoupling economic growth from environmental degradation.

Promoting good governance

Effective systems of policy making such as development of Building Regulations should engage individuals and industry in an open and transparent system, with defined goals. Local governance is vital in promoting sustainable development through the activities in housing, local environments and regeneration.

Using Sound Science Responsibly

Building Regulations should be developed and implemented on the basis of strong and reliable evidence for related issues including climate change, health effects, environmental benefits and costs. The accumulated evidence on building impacts, improvement technologies and benefits is vital. This should be achieved through clear impact analysis. Where there is insufficient evidence, the precautionary principle should be used to avoid severe risks.

4.3 Sustainable development at the heart of Building Regulations

We propose that the ODPM should place sustainable development at the heart of the Building Regulations system. This will require full adoption of the principles of sustainable development by the ODPM Buildings Division and the Building Regulations Advisory Committee (BRAC). This is likely to require strong leadership as well as some capacity building at ODPM's organisational level, with which the SDC would be willing to assist.

To use the Building Regulations to further sustainable development, all new proposals would be evaluated against the five principles outlined above. The remit for BRAC members would need to include sustainable development.

4.4 Building Regulations and small building firms

For refurbishment, small building firms are required to follow the Building Regulations, and this is the main means by which Government can ensure minimum standards within this sector of the construction industry. We understand these standards to be the main driver for small builder performance standards. However, rates of compliance by small building firms on refurbishments have not been tested.

The Building Regulations and their Approved

Documents are complex, which may be a barrier for small builder compliance. Much enforcement of refurbishment work is delivered through industry self-certification schemes.

We propose that the ODPM should consider the steps taken by the Scottish Building Standards Agency in developing 'technical handbooks', and whether this could be used to summarise all relevant requirements to domestic refurbishment work.

Better links between local authority planning departments and Building Control departments may also deliver enhanced compliance.

5. Energy and carbon

Housing has a key role to play in meeting the UK's challenging carbon targets for 2010 and 2050. Buildings contribute around half of the UK's carbon dioxide (CO₂) emissions. The UK's homes contribute about 27% of UK carbon dioxide emissions (HMG 2004) and energy consumption is rising. These emissions of carbon dioxide are attributed to the consumption of fossil fuels for the generation of heat and power, with around 80% for space heating and hot water.

Total UK CO₂ emissions in 2004 were 158MtC (Defra 2005a). This represents a 4% reduction on 1990 levels. Of total emissions, (when electricity use is allocated to end users) 28% are from transport, 27% from industry and 27% from homes and 16% from other end users including business and service sectors.

Currently committed policies for reducing household CO₂ emissions will lead to a fall in this emission level by around 16% from 1990 levels (by 2010,) (HMG 2004). Nevertheless, further savings of around 14MtC are needed across all sectors if we are to reach our 2010 target of a 20% cut in emissions. There is technical and cost effective potential to deliver 9-19MtC savings per year by 2015 from the existing housing stock (Energy Efficiency Innovation Review 2005).

Energy efficiency has been identified in the Government's Energy White Paper (DTI

2003) as the cheapest, cleanest, safest way of reducing carbon emissions. Existing housing may be refurbished to a high standard of energy efficiency and this has clear benefits to occupants through improved comfort and reduced running costs.

Energy efficiency, conservation and carbon displacement support the concept of sustainable development. Measures will result in a reduction in the damaging release of CO₂ into the atmosphere, and of other pollution released as a result of fuel combustion. Improved energy efficiency will contribute to reducing fuel poverty, and to delivering healthy homes. There is a significant evidence base suggesting many carbon reduction measures are cost effective currently, delivering economic benefits to householders. Household carbon savings are vital to delivering the Government's climate change targets.

Household energy efficiency policy contributions to reducing carbon emissions are listed in Table 2. Existing policies relating to energy efficiency and carbon reduction are listed in Annex B: The Policy Context. This shows that the Energy Efficiency Commitment (EEC) has been very effective in delivering carbon savings, and in contrast the Decent Homes programme has delivered small carbon savings.

Table 2 – Projected carbon savings from households (Defra 2004a)

Policy	Projected carbon savings (MtC) by 2010
Energy Efficiency Commitment 2002-2005	0.4
Building Regulations 2002	1.0 (partly relates to existing homes)
Energy Efficiency Commitment 2005-2008	0.7
Decent Homes	0.05
Building Regulations 2005 (draft)	0.08 (new homes) 0.5 (boiler standards)

5.1 Whole house carbon reduction

Proportions of carbon emissions from various activities in housing are shown in Figure 1, which illustrates that the major portion of energy consumption is in space heating and hot water. However, Figure 2 shows that the proportion of carbon emissions from those uses is less due to the lower carbon content of gas than electricity.

Carbon emissions from housing may initially be reduced through improving the thermal

efficiency of the building fabric and improving the efficiency and controls of boilers and heating. Further savings may be made through installing efficient appliances, improving control of energy use, and reducing the carbon content of energy sources by installing microgeneration technologies. A programme to improve carbon efficiency should follow a hierarchy (see Box 3) to enable greatest cost effectiveness. Appropriate carbon reduction measures are listed in Box 4.

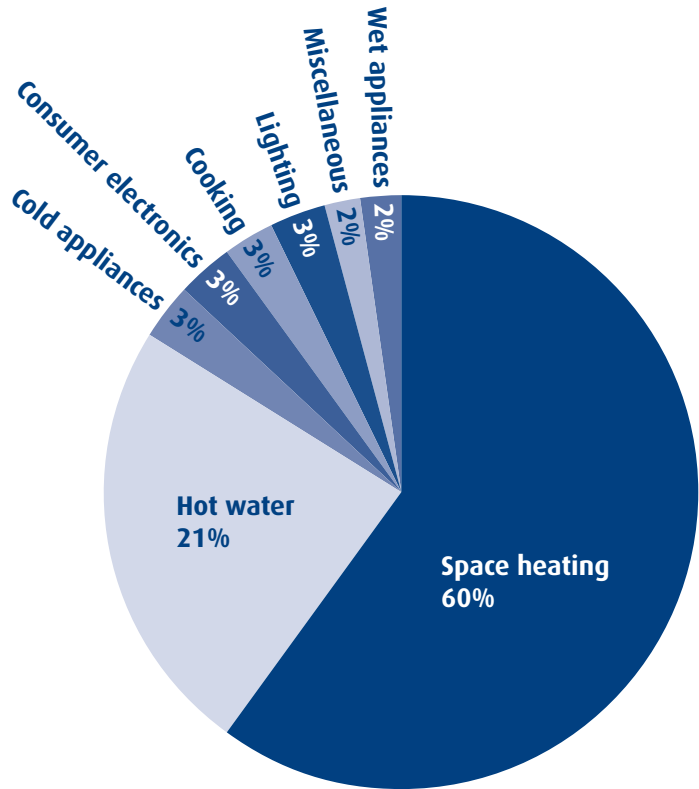


Figure 1
Household energy consumption by end use (DTI Energy Consumption Tables 2004)

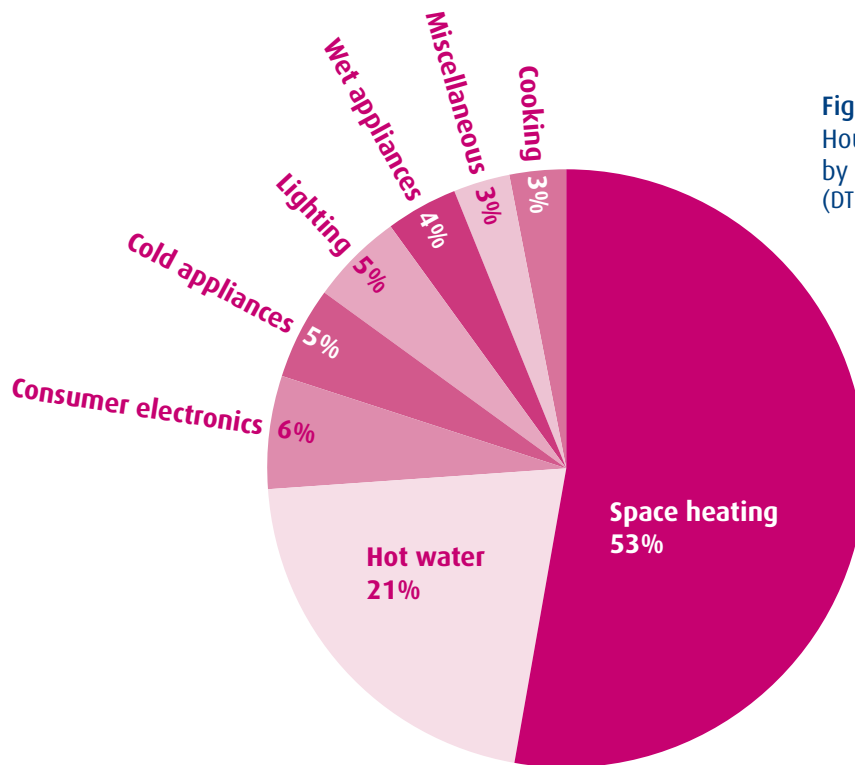


Figure 2
Household carbon emissions
by end use
(DTI Energy Consumption Tables 2004)

Box 3 – Energy Efficiency Hierarchy

1. Energy Efficiency

Maximise energy efficiency to minimise the kWh of energy needed to provide a reasonable level of service in the home (heat, light, appliance functions). It is not reasonably possible that energy will be reduced to zero, but it may be significantly reduced from current levels. Energy efficiency is entirely determined by the building fabric and services, which should aim towards ‘passive’ heating and cooling.¹¹ Occupant behaviour patterns vary and therefore the residual energy consumption will always vary between households, despite measures to influence behaviour.

2. Carbon reduction

Carbon emissions result from energy use in the home as many sources of energy derive from fossil fuels. However, it is possible to reduce household carbon emissions to zero through ‘hard’ measures. This may be achieved by the replacement of fossil fuel energy sources with carbon neutral sources either at the home or within the supply network. In order to ensure all homes are made carbon neutral, a benchmark level of residual energy consumption, in kWh/m² for heat and power, should be established, which may then be supplied from carbon neutral sources.

(An intermediate step would be to apply carbon efficient but not carbon neutral generation measures such as heat pumps or combined heat and power, which may then be fuelled by a carbon neutral resource.)

¹¹ ‘Passive’ heating means providing these services without ‘active’ energy using systems such as boiler systems – effectively using heat gains from the sun and occupancy, alongside high insulation to provide sufficient warmth. Passive cooling similarly is achieved without air conditioning, instead using shading, thermal mass and ventilation to provide comfort.

Box 4 – Key Carbon Efficiency Measures Summary

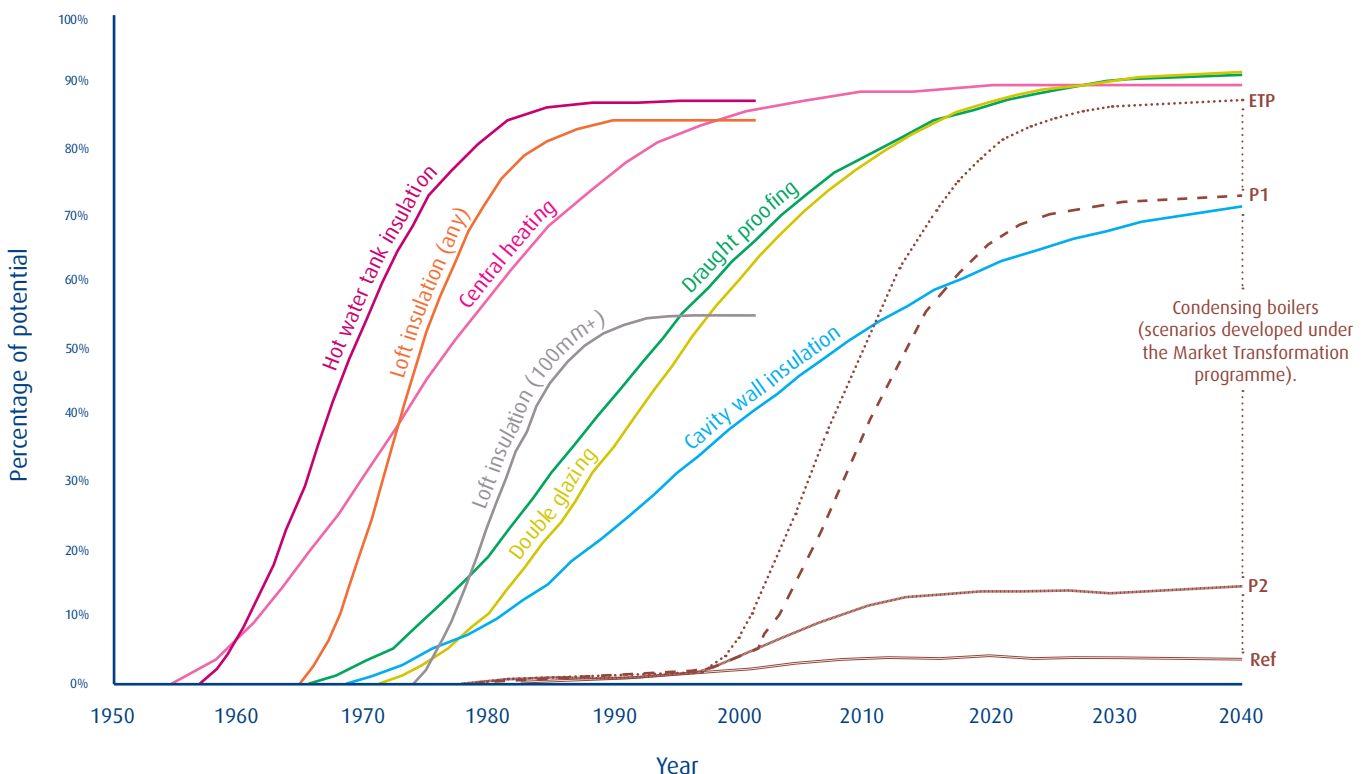
- Insulation (walls, ground floor, loft/roof, glazing)
- Draught proofing and ventilation
- Energy efficient equipment – boilers, lighting
- Energy efficient appliances – washing machines, dishwashers, fridges and freezers, electronic goods
- Simple and effective heating and lighting controls
- Controlled solar heat gain – avoiding need for cooling in summer with thermal mass and shading
- Carbon efficient microgeneration technologies

Figure 3 shows the market penetration of key energy efficiency measures in the context of their potential application. This shows that although some measures such as hot water tank insulation are currently nearing maximum penetration, there is still significant potential to apply cavity wall insulation and ‘top up’ loft insulation.

Several studies (See Box 5) have modelled the existing and projected housing stock to 2050 and demonstrated that it is technically possible to deliver the 60% carbon cut by

2050 using currently available technology: a combination of energy efficiency and renewable technologies. The studies show that the average efficiency of homes (expressed as the SAP rating) must be increased by around 30 SAP rating points. However there has been little evaluation of the costs of delivering the 60% cut in homes, and much further modelling work is urgently needed to make a fair assessment of costs over the 44 year timeframe (and paybacks), considering technology and policy developments. The current study broadly takes

Figure 3 – Market penetration of home energy efficiency measures (BRE 2003b)



Box 5 – Key measures needed to achieve a 60% cut in domestic CO2 emissions

Various studies have been carried out to project the range of technical measures that need to be applied to homes to reduce the carbon emissions of the whole housing stock in 2050 by 60% (against 1990 levels).

These studies have included consideration of projected increases in housing numbers and an allowance for all homes to have more warmth, hot water and access to appliances.

Main conclusions that are relevant to this study include:

- Over 2/3 of 2050's dwellings already exist today, even allowing for much increased demolition rates of the least efficient stock – their standards must be improved.
- The following measures must be installed in existing homes: 100% cavity wall fill; major programme of solid wall insulation; 100% loft insulation at 300mm; 100% high performance windows; air tightness; mechanical ventilation.
- Building Regulations improvements every 5 years.
- The average SAP rating brought up to SAP 80, compared to average of SAP 51 today.
- Majority of homes will have microgeneration installed.

Standards for zero heating in homes should be established in Building Regulations by 2020.

(Study references: Environmental Change Institute 2005, Johnston 2004, ESD 2004)

on board the conclusions of these studies and moves forward to recommend the policies that are needed to ensure that they are delivered.

Energy efficiency and carbon emissions of homes is assessed using the Government's Standard Assessment Procedure (SAP) which has been recently updated (SAP2005)¹² to score homes from 1-100 (100 is most energy efficient). The SAP rating is based on the energy performance associated with space heating, water heating, ventilation and lighting, less cost savings from energy generation technologies.

5.2 Building fabric and heating system measures

Although it is vital to consider the carbon reductions from homes holistically, it is useful to understand the individual measures necessary. In some cases we propose policies to deliver individual measures which should be prioritised in the near future.

The external envelope of a dwelling – the external walls, ground floor, roof and glazing – are the routes through which heat is lost in cold weather. Insulation standards for thermal elements are expressed as heat loss per element area per degree temperature difference across the element (W/m^2K); a lower value means

lower unit heat loss. See Table 3 for comparison of new build and retrofit insulation standards.

Infiltration of air through the building envelope allows the dwelling to ventilate but allows warmed air to escape, increasing heat loss. Draught-proofing of the envelope, for example sealing joints around service pipes and at junctions, will reduce this infiltration. Controlled ventilation to extract air from kitchens and bathrooms, and supply fresh air to habitable spaces (with heat recovery) should be installed where infiltration is reduced significantly.

Measures to improve the thermal efficiency of the building envelope depend on the type of construction of the building. Insulation, heating and ventilation measures should be considered in a combined package in order to avoid risks of condensation. There is a range of data and guidance available for the building stock of England (ODPM 2003b) and on appropriate thermal improvement measures from the Energy Saving Trust Energy Efficiency Best Practice Programme.¹⁶ BRE guidance is available on appropriate design of insulation to avoid the build up of moisture and ineffective insulation solutions (BRE 2002a).

Cavity wall insulation is reasonably cheap and easy to install, and is supported by grant programmes. Seventy percent of homes have

¹² <http://projects.bre.co.uk/sap2005/>.

¹⁶ <http://www.est.org.uk/bestpractice/publications/all.jsp>

Table 3 – Good and advanced practice standards for retrofitting insulation in relation to new build standards.

Element	2005 (draft) Building Regulations ¹³ for new build (W/m ² K)	'Good Practice' insulation standard ¹⁴ (W/m ² K)	'Advanced' insulation standard ¹⁵ (W/m ² K)
Cavity wall	0.35	Cavity wall insulation	Cavity wall insulation plus internal/external 0.24
Solid Walls		0.45 external or 0.35 internal	0.2-0.45 external 0.16-0.35 internal
Roof	0.16	Loft insulation 0.16 Internal 0.16 External (not specified) Flat roof 0.25	Loft insulation 0.09 Internal 0.12 External 0.13 Flat roof 0.2
Ground floor	0.25	0.2-0.25	0.14-0.2
Windows and glazed doors	2.0	2.0	No standard specified, range 1.1-1.5
Solid doors	2.0	1.0	No standard specified
Draught proofing	10m ³ /m ² /hr (at 50Pa)	Apply draught stripping on windows and doors	Potential 4.5-14.4 ac/h

cavity walls, but only 36% of these are filled with insulation. This leaves around 9 million cavities to be filled (allowing for 1-2 million that will not be appropriate for cavity insulation as they are in exposed conditions where cavities must remain empty for the building's structural integrity), with 2.62MtC potential saving (Energy Efficiency Innovation Review 2005).

Loft insulation is a very cost effective and reasonably simple measure to install. The vast majority of dwellings have a loft space and almost all of these have some loft insulation. However, many lofts have less than 100mm of insulation, whereas the standard for new build requires around 300mm of insulation. New and 'top up' loft insulation is the focus of energy efficiency policy and can deliver 1.23MtC (Energy Efficiency Innovation Review 2005). From 2006, energy suppliers involved in the Energy Efficiency Commitment have agreed

to install loft and cavity wall insulation free of charge to households on Pension Credit.

Council tax rebates have proved effective as a means of incentivising consumers to install cavity wall and loft insulation. Such an incentive could persuade a significant number of owner-occupiers to install cavity wall insulation, saving an additional 0.3MtC per year in 2010 (Energy Saving Trust 2005b). This proposal relates to a one-off rebate to households that install a particular measure. In order for councils to be able to deliver this, we propose that it should be centrally funded. There is potential for a longer-term policy to re-band properties in accordance with their resource efficiency, which could see less efficient homes paying more council tax. The rebates would be designed to work in tandem with the EEC, providing the trigger to encourage owner occupiers to come forward for measures.

13 note these are Reference Values – the new standards are not prescriptive but based on total carbon emissions.

14 reference: EST GPG155 (EST 2003)

15 reference: EST CE97 (EST 2005d)

Recommendation: Government considers centrally funding council tax rebates to incentivise owner occupiers to install energy efficiency measures.¹⁷

There are seven million solid walled homes (without cavities) in the UK. There is the potential for 4.19MtC saving from solid wall insulation (Energy Efficiency Innovation Review 2005). Solid wall insulation is either applied as internal insulation, which marginally

reduces the size of rooms (by up to 200mm on each wall) and can be very disruptive to occupants, or is applied externally, which can be costly, may require multiple apartments to be treated simultaneously, and may be limited by planning constraints due to visual impacts. Delivering solid wall insulation is vital to extend the viability of a third of UK housing stock. New innovation for solid wall insulation currently appears unlikely, so the focus should be on the good practice application of existing insulation

Table 4 – Average costs and savings from typical energy efficiency improvements (EST)

Measure	Annual Saving (£/yr)	Installed Cost (£)	Installed Payback (years)	DIY Cost (£)	DIY Payback (Years)
Cavity Wall Insulation	£100 - £120	£135	1-2	-	-
Internal wall insulation (i)	£210 - £260	> £40/m ²	-	-	-
External wall insulation (ii)	£220 - £270	> £1800	> 7	-	-
Loft Insulation (0-270mm)	£140 - £170	£135	< 1	> £275	1-2
Loft Insulation top up (50-270mm)	£40 - £50	£200	4-5	> £200	4-5
Draught proofing	£10 - £20	> £75	4-7	> £50	3-5
Floor insulation (iii)	£30 - £40	-	-	> £100	>3
Filling gaps between floor and skirting board	£10	-	-	£20	2
Hot water tank jacket	£15	> £5	<1	> £10	<1
Primary pipe work insulation	£10	-	-	£5 - £10	1-2

Notes: Costs are approximate. **(i)** Assumes insulating to EST Best Practice standard 0.45 W/m²K. **(ii)** Assumes insulating to EST Best Practice standard 0.35 W/m²K. Installed costs assume that walls are being repaired anyway and relates to the additional cost of insulation and labour. **(iii)** Floor Insulation represents the cost of the insulation only.

¹⁷ We are aware that the Climate Change Programme 2006 included funding of £20m to strengthen consumer demand for energy efficiency, which may include council tax rebates.

measures. Further research into products that would appeal to householders should be stimulated. Solid wall insulation will also be necessary as secondary insulation to older cavity wall properties with a narrow cavity.

Glazing replacement is effective to improve insulation and draught proofing. This is an area of concern for heritage groups and planning bodies, as it affects the external appearance of buildings. Listed buildings may be 'opted out' of Building Regulations standards, but guidance on this is not clear. In heritage situations,

secondary glazing and draught proofing are likely to provide an acceptable solution but need further development. Further, many existing windows in listed buildings can be satisfactorily repaired and draught-proofed, improving energy performance. Secondary glazing or double-glazed timber sash windows should be aesthetically acceptable in 19th century housing in Conservation Areas (Camden Council 2005).

Heating system efficiency may be improved by installing efficient boilers and using heating

Figure 4 – Delivered energy saving per measure (ref Market Transformation Programme, undated a)

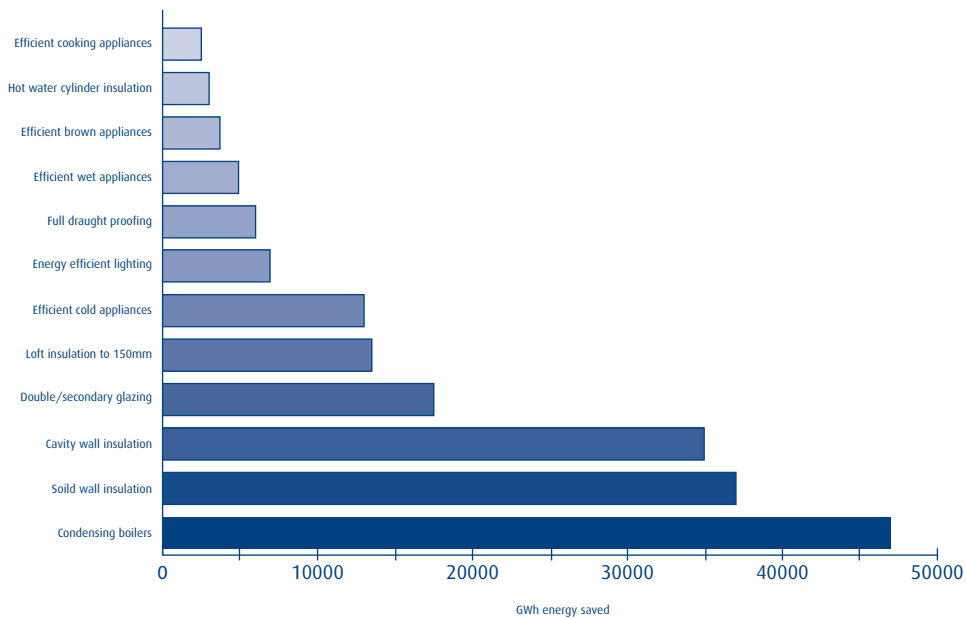
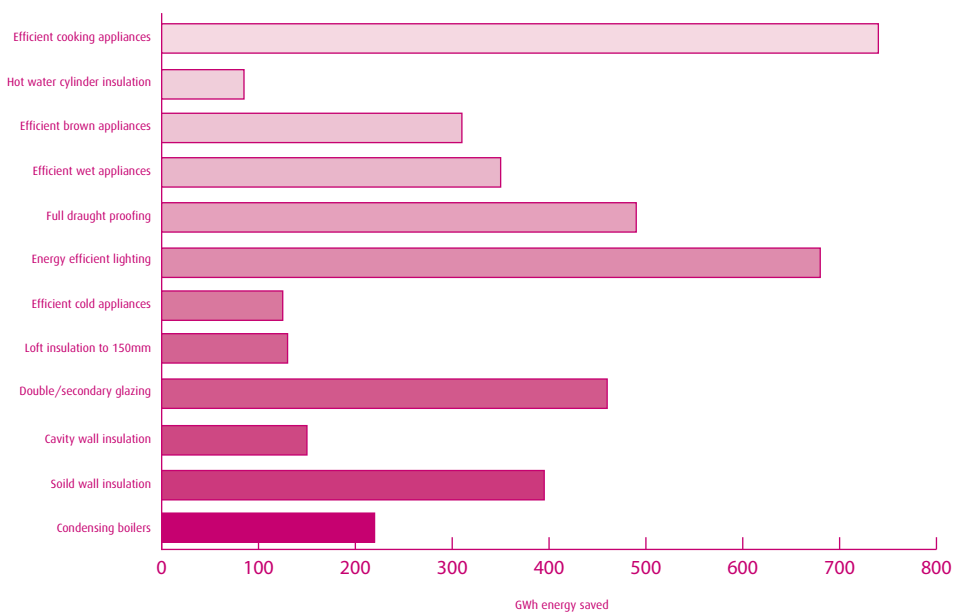


Figure 5 – Cost per carbon unit saved for range of measures (ref Market Transformation Programme, undated a)



system controls. This is already controlled under the Building Regulations, which require replacement boilers to be at least 86% efficient (effectively requiring condensing boilers) as of 1 April 2005, with effective controls. The introduction of this regulation has seen the market share of condensing boilers leap from around 30% to over 80% in six months since implementation, with significant carbon savings of 0.5% by 2010, and 2.98MtC by 2020 (Energy Efficiency Innovation Review 2005).

A wide range of data is available on costs, benefits and financial paybacks of efficiency measures (see Table 4). Investments in insulation pay back through savings in energy bills. Households move on average every 7-10 years; within this period it is possible to see a return on investment, whilst the house itself is in a better condition and has, potentially, a higher value.

Figure 4 suggests that an efficient replacement boiler and effective wall insulation give the greatest energy savings. Figure 5 shows that cavity wall insulation and efficient boilers are also among the most cost effective measures for delivering carbon savings. These should be the initial focus of policies to deliver energy and carbon savings across the whole stock. Future policy programmes will need to address the currently less cost-effective measures such as solid wall insulation.

5.3 Energy efficient lights and appliances

Energy efficiency savings through improved thermal performance of building fabric could be outweighed by rapid increases in energy consumption from electrical appliance demands. Electrical appliances make up 17% of energy consumption but over 25% of carbon emissions from homes. The carbon intensity per unit of energy of electricity is almost 2½ times that of gas therefore carbon emissions could increase rapidly if the efficiency, switching and proliferation of these appliances is not managed. The energy use of lights and appliances is increasing by 2% annually (Environmental Change Institute 2005). For the carbon emissions from lights and appliances to be reduced efficient appliances should be encouraged, and residual emissions may be displaced using renewable energy.

Further, reducing the 'standby' energy consumption of a range of electrical goods would reduce internal heat generation from appliances and wasted electricity consumption. The Government estimates that goods on standby currently contribute 1.2MtC per year (House of Lords 2005). Goods such as TVs, VCRs and digital set top boxes, have standby functions with much higher energy consumption than necessary (from 5-30W) where around 0.1W is technically achievable. Achieving a 1W standby on all appliances would save 1-1.2MtC per year. Standby power consumption may be reduced by industry agreements or regulation. However policies should consider whether 1W appliances would replace or be additional to existing appliance, and should perhaps consider appliance amnesties or trade-in schemes to enhance turnover.

Without labelling, consumer awareness of the variation in standby power will not be improved, and this should be addressed as a priority. So far there has been little action to make a real difference in this area, although in 2005 G8 leaders gave their backing to promote a 1Watt standby initiative, and a forthcoming EU Directive (Directive 2005/32/EC) establishes a framework for setting ecodesign standards for energy-using products and will include implementing directives on standby of appliances.

Recommendation: Government establishes a voluntary agreement for labelling standby power in entertainment goods in advance of achieving an EU or global standard for 1W standby on all appliances.

There is currently great scope to improve the efficiency of lighting and home appliances. The range of low energy household appliances is increasing, encouraged through the Energy Efficiency Commitment (EEC), and the Market Transformation Programme, which sets minimum standards and voluntary agreements. Purchasing decisions for these goods are dominated by initial cost, therefore the EEC has managed to transform markets for fridges and freezers by offering significant discounts on 'A' rated appliances, but there remains plenty of scope to increase the market share of cold appliances and tumble dryers with A, A+, A++ ratings.

The EEC could be used to increase efficiency of a wider range of essential household appliances.

Measures to promote low energy lighting include promotion of compact fluorescent lights (CFL) in the EEC. However, a more radical approach would be to apply a product tax to incandescent bulbs in order to send a strong price signal. These are likely to be more effective than subsidies on CFLs (Energy Efficiency Innovation Review 2005). Innovation is needed to accelerate radical technological improvements such as LED lighting for widespread household use.

Recommendation: Government considers applying a product tax to incandescent light bulbs.¹⁸

There is no up-to-date established benchmark for energy consumption from lights and appliances for homes (in kWh/m²) which could be used to determine the level of micro generation needed to displace carbon emissions. In order for homes to be made 'carbon neutral', microgeneration systems need to be installed that will supply all the renewable power for lights and appliances, but there is currently little certainty about small power use.

Recommendation: Government benchmarks energy consumption from lights and appliances in homes based on current trends.

Domestic Cooling

Occupants in the UK have traditionally cooled their homes by opening windows in the summer. Rising external temperatures due to global climate change suggests that this will be insufficient. In homes, passive measures are predicted to be sufficient until the 2080s. Research suggests that a combination of external and internal solar shading and optimal ventilation will be sufficient to ensure that bedrooms and living rooms stay within the heat stress limit of 35°C (Hacker et al, 2005).

Using air conditioning to regulate internal

temperature could lead to a 20% increase in domestic carbon emissions by 2050. Cooling projections are not currently considered in detail in the Government's Climate Change Programme. Policies to consider domestic cooling should follow a hierarchy to prioritise passive cooling, followed by efficient active cooling systems for example using ground source heat pumps followed by 'A' rated packaged systems.

Recommendation: Government establishes best practice guidance for retrofitting passive cooling into homes.

5.4 Microgeneration

Further carbon savings may be achieved by installing microgeneration technologies (see Box 6). These systems may be installed in existing buildings and are applicable in all regions of the UK. Costs and benefits of microgeneration technologies are listed in Table 5.

High up-front costs deter households from investing in microgeneration technology. Therefore, microgeneration uptake in the UK is largely driven by grant programmes. The DTI recently announced proposals for a new grant funding scheme, the Low Carbon Buildings programme, which will give less funding per year than the two previous Government microgeneration funding programmes combined. The outline of the programme proposes that existing householders should bid competitively for funding, which is considered a barrier. The proposals do not include energy efficiency as an integrated part of the scheme. Consumer awareness of microgeneration is low, and there is an informational barrier in terms of access to impartial advice.

We propose that microgeneration may be best supported through an obligation on energy suppliers to deliver microgeneration to households through an energy services contract – see 5.9 *Delivering the savings: energy services* for further details.

¹⁸ We are aware that the Government recently announced moves to phase out the least efficient light bulbs in the Energy Review 2006.

Table 5 – Costs and benefits of microgeneration energy technologies (EST 2005c)¹⁹

Micro gen technology	Cost	Saving	Cost of savings (£/tonne CO ₂ saved)
CHP (district)	£600-1500/kWe £3000-8000 per dwelling		40-80
Micro CHP	£2500-3500 per home	£150/year	Approx. 600
Solar water heating	£2000-3000 for 4m ² Generates 1400-2500kWh heat/year Provides 40-50% of hot water	£35-62/year	130-600
PV	£2000-4000 5m ² Generates 500kWh electricity	£32	550-1100
Ground source heat pumps	£800-1000 per kW heat		£30-350

Box 6 – New and renewable energy technologies for existing housing.

Combined heat and power (CHP) systems can be up to 90% efficient, providing heat and electricity. They can be used to supply groups of dwellings, using a range of fuels including gas and biomass. The most cost effective use of district CHP is likely to be the replacement of other centralised heating systems. CHP systems have higher capital and maintenance costs than conventional centralised boilers, but save money and carbon in operation.

Micro CHP is usually gas fuelled, and can replace domestic boilers for space and water heating; they also generate electricity, without the need for significant alterations.

Solar water heating provides carbon-free domestic hot water. It is among the most cost effective renewable technologies and may be easily installed in existing properties. Homes with solar water heating need a large hot water storage cylinder.

Photovoltaics (PV) offer the opportunity to generate carbon free electricity. Excess electricity may be sold to the grid although potentially at a lower price than electricity purchased. PV may be installed in existing dwellings with minimal disruption to occupants. PV needs good solar access.

Ground source heat pumps (GSHP) work by transferring heat from the earth to the building, and can be used for space heating and hot water. GSHP can be very cost effective for homes off the gas grid, and will lower carbon emissions. Maintenance costs are lower than for conventional gas boilers.

When applying these technologies, it is important to apply energy efficiency measures first to maximise cost benefit of carbon reduction. (Source EST 2005c)

5.5 Energy consumption feedback – smart meters

The current package of policies to reduce carbon does not focus on householder behaviour,

not how to encourage behavioural change. Increasingly, household carbon emissions will be dominated by behaviour as the thermal efficiency of the building fabric is improved.

Feedback to householders on their home’s

¹⁹ Note: energy costs assumed gas 2p/kWh, electric 6.5p/kWh.

energy consumption is a positive way to reduce energy consumption through behaviour change. Direct and indirect measures including smart metering, informative billing and energy audits, can reduce energy consumption by 10% (Darby 2000). If widespread, smart electricity meters could deliver 2.3MtC annual savings by 2010 (DTI 2001). Savings are likely to be increased if coupled with efficiency advice and innovative energy tariffs, which can encourage more sustainable patterns of use.

Microgeneration is one driver for smart meters, as it requires the capability to measure properly the export of surplus power. Installing microgeneration technology together with its associated monitoring display systems raises awareness of energy consumption. Householders have been shown to alter their behaviour to reduce consumption as a result (SDC 2005b). Automated meter reading will improve billing services to consumers and reduce costs to suppliers of meter reading and dealing with queries on estimated bills. Smart metering could also be used to deliver reduction in peak demand for energy through time related tariffs which would improve security of supply.

Smart meters are utility meters which include some of the following functions:

- display and record real time information on energy consumption
- easy to understand prominent display unit showing costs, indicator of low/med/high use
- comparison with historic/average consumption
- function for remote reading
- and export metering for microgeneration.

Smart meters currently cost up to £50 more than conventional meters. In England, electricity meters are installed by the energy supplier, who risk having 'stranded assets' if a consumer switches supplier; this is a barrier to smart meter installation. In other countries the meters belong to the district network operator, who

would not be affected by supplier switching; this may be an appropriate model for the UK. Alternatively, stranded assets may be avoided by combining smart meters with longer term contracts such as energy service contracts, and this should be prioritised. If smart meters are recognised as an energy saving measure within the EEC²⁰, suppliers would be incentivised to install them.

Energywatch (the Gas and Electricity Consumer Council) believes that smart meters may provide the solution to consumer complaints about poor billing practices, by facilitating reading by suppliers, and improving service value to consumers (Energywatch 2005).

Ofgem is researching options for improving consumption information provided to consumers including a trial of improved billing with an energy supplier. It is also researching smart metering:

- an analysis of the key functionalities in both gas and electricity credit and prepayment meters
- an overview of international developments in smart metering
- analysis of the initial costs and benefits of smart metering
- identifying the existing regulatory and commercial barriers to smart metering
- monitoring and evaluation of a small-scale trial of smart meters, known as 'Warm Plan'. The trial involves the installation of smart meters in 200 homes and will last for two years from 2005 (Ofgem 2005).

Recommendation: Ofgem requires energy suppliers to provide informative bills to consumers.²¹

Recommendation: Ofgem agrees installation of smart meters as a measure for the Energy Efficiency Commitment.

Recommendation: Government establishes a major pilot trial of smart metering in the UK in 2007.²²

²⁰ The EEC currently only recognises energy efficiency measures (such as insulation) and not behavioural measures such as improved awareness through smart metering.

²¹ We are aware that the Government has announced, in the Energy Review 2006, that it will work with Ofgem to encourage more frequent, accurate billing and moves towards more informative billing.

²² We are aware that the Budget 2006 announced a programme of smart meter trials.

5.6 Overcoming barriers

A range of real or perceived barriers currently limit the implementation of energy efficiency in existing homes.

5.6.1 Consumer awareness

Householders are unlikely to seek ways to reduce their domestic carbon emissions, as popular understanding of the connection between global climate change and household energy consumption is low (Cragg Ross Dawson 2004). The Government's Climate Change Communications Campaign 'Tomorrow's Climate, Today's Challenge' should address local communication of these issues as a priority.

For 'able to pay' consumers, fuel bills are a small proportion of overall outgoings so energy efficiency is a low priority. Consumer apathy is a significant factor inhibiting installation of energy efficiency measures. The potential savings in fuel bills do not significantly influence consumer decisions (HM Treasury, Defra, Energy Saving Trust, Carbon Trust 2005). This will only be overcome by improving awareness and incentivising consumers to install measures.

Information is vital to enable consumers to make decisions about improving energy efficiency. Householders consider that some improvement measures such as cavity wall insulation will be more costly and less beneficial than they are in reality. Communication methods used do not always produce accessible and useful advice, particularly across a range of demographic groups (Centre for Sustainable Energy 2005). Innovative communication methods include using teaching at schools to impact on the whole household or identifying community champions.

Labelling schemes such as are used for white goods, and now to be extended to houses through the Home Information Pack Energy Performance Certificate. This could enable consumers to make better choices, understanding the benefits to them and to the wider environment of more efficient products. Householders are very interested in an energy audit of their home (Cragg Ross Dawson 2004). However it is possible that under current proposals energy information could get lost

among all of the other information in the Home Information Pack. Provision of information without verbal follow-up results in a 40% reduction in installation of energy efficiency measures (EST 2005a).

Special efforts should be made by estate agents and mortgage lenders to promote energy information, and explain to consumers what it means to them both when they are choosing a property and when they actually take ownership.

Recommendation: Government works with estate agencies, mortgage companies and surveyors to promote information in the Energy Performance Certificate to house buyers and tenants.

5.6.2 Consumer confidence

Consumers need to be convinced that energy suppliers are genuine in promoting energy efficiency (especially as they are not aware that EEC is a Government regulation on energy suppliers) (EST 2004b). There is a general mistrust of energy suppliers motives in offering energy saving products.

Recommendation: Government requires energy suppliers to explain to householders the energy efficiency obligation placed on them by Government when offering measures.

Many carbon reduction improvements require householders to employ a building contractor to carry out the works, where there may be issues of trust regarding what work is necessary and whether the work gives value for money. Homeowners should feel they can trust the builder to give sufficient and accurate advice.

5.6.3 Costs

Sometimes there are high up-front costs to taking significant action to reduce carbon emissions. Some investments in carbon saving can be considered 'choice' decisions, where consumers are deciding between similar

necessary products i.e. an efficient fridge and an inefficient fridge. Other investments are 'discretionary', such as wall insulation, which is not a product most households consider necessary.

The cost in time and inconvenience of having works carried out in the home to install energy efficiency measures is a barrier to action. This may be tackled through an energy services contract with managed works packages (see 5.9 Delivering the savings: energy services).

For 'choice' decisions, householders do not generally calculate savings in energy consumption partly because this information is not readily available. Other issues such as the up-front cost are usually more important to them, so if the most efficient products are more expensive it will be difficult to persuade consumers to buy them. Recent experience shows that reducing comparable costs of energy efficient white goods (through EEC) was the key to transforming the market for these products.

Certain professionally-installed energy efficiency 'discretionary' products have a reduced level of VAT (5% rather than 17.5%)²³ however this is not applicable to all energy efficient products, and not to DIY installations. This 5% incentive will marginally improve the affordability of an item once a consumer has decided to invest but is not enough to drive change. HM Treasury predicts that reduced rate VAT on energy saving products will save 0.1MtC by 2010 (HM Treasury 2003).

VAT variation is restricted by EU agreements such that reduced rate VAT cannot be used to reduce the price of a product in order to make it more financially attractive in a choice between two models (i.e. fridges) and is only applied to energy efficiency goods directly. We welcome Government negotiations with European partners to extend the categories of permitted reduced VAT.

Recommendation: Government sets reduced rates of VAT on a wider range of energy

efficiency measures in homes including secondary glazing and DIY measures such as loft insulation and draught proofing.

5.6.4 Planning barrier

The Planning system may constrain energy efficiency improvements, particularly in conservation and other architecturally sensitive areas where external insulation of solid wall homes and the installation of micro renewable energy systems may not be permitted. The Government is currently reviewing the planning consents required for microgeneration.

Recommendation: Government reviews planning barriers to refurbishing homes to low carbon specification.

5.6.5 Split incentives

Landlords are reluctant to invest in energy saving in private rented accommodation. This 'split incentive' could be resolved using special measures. The Landlords Energy Saving Allowance (LESA) provides private landlords with up-front relief on capital expenditure for installations of loft, cavity wall and solid wall insulation for their rented property. The allowance does not cover heating upgrades and heating controls or draught proofing.

Recommendation: The definition of allowable expenditure for the LESA is extended to include wider energy efficiency measures. The LESA is widely publicised and promoted to enhance landlord awareness of the scheme.²⁴

The Treasury's 2004 Budget also included the proposal for a 'green landlord scheme'. Proposals for its implementation are outlined above (3.2.3 Private landlord incentives).

²³ Reduced rate VAT (5%) is currently available on controls for central heating and hot water systems; professionally installed draught stripping for windows, doors and lofts; professionally installed insulation for walls, floors, ceilings, lofts, pipes and plumbing; solar photovoltaics and related equipment; solar thermal and related equipment; wind turbines and related equipment; water turbines and related equipment; ground- and air-source heat pumps; and micro CHP.

²⁴ We are aware that the Government announced, in Budget 2006, the extension of the LESA scheme to draught proofing and insulation of hot water systems.

5.7 Delivering the savings: The energy efficiency commitment

The Energy Efficiency Commitment (EEC) is the Government's main instrument to deliver carbon savings, and has been operating successfully since April 2002. Energy suppliers delivered their EEC1 (2002-2005) target of energy savings of 62TWh. The EEC2 target for 2005-2008 is 130TWh, but no target has been set for the 2008-11 period.

The SDC believes that the success of EEC1, and the need to achieve additional carbon savings to achieve the 2010 target, are sufficient drivers for announcing an expanded EEC3 2008-11 to at least triple the energy efficiency installation activity levels of EEC1. Based on the achieved savings of EEC1 and estimates for EEC2, EEC3 at this level could achieve 1.1MtC/yr by 2011 (saving an additional 0.3MtC above current projections). This is considered feasible within the Energy Efficiency Innovation Review (HM Treasury, Defra, Energy Saving Trust, Carbon Trust 2005) and suppliers are delivering EEC2 targets ahead of time. Furthermore there is a need to create certainty for the insulation industry (the one most affected by EEC, and the measure most needed in homes) to give longer term security for expanding their manufacturing and labour. With 11M homes remaining with unfilled cavities, the potential is huge. Over the longer term these homes (and the 7m solid wall homes) may need to incorporate solid wall insulation onto the structure as well.

However, relying on the householder responses to energy supplier offers is risky as much of the 'low hanging fruit' – in targeting multiple social housing units, and promoting efficient white goods – has been achieved. Means of supporting energy suppliers for EEC2 include ways to encourage owner occupiers and private landlords to come forward demanding discounted energy efficiency measures. This will be achieved through the creation of policies that incentivise or require owner occupiers and landlords to install these measures. Specific initiatives being trialled are, for example, the

potential for council tax rebates to encourage energy efficiency improvements.

In setting higher targets for EEC3, it is possible that the structure of the scheme will need altering, to ease delivery. A more flexible EEC3 could be established to allow third parties to enter the market and trade in 'white certificates' which they would earn for installing accredited energy efficiency measures; the third parties would then be able to trade these white certificates and receive enhanced revenue for energy efficiency work. The Energy Saving Trust will be studying the options for how a trading mechanism might work in 2006. To develop the EEC3 to use white certificates, the UK should learn from implementation experience in Europe (particularly France and Italy). Defra has already identified white certificates as a research priority.²⁵

Recommendation: Government sets the target for EEC3 at least three times the level of EEC1, and sets EEC3 target early.

5.8 Delivering the savings: Building Regulations

Energy consumption in buildings is currently addressed in Building Regulations by Approved Document Part L: Conservation of Fuel and Power. This is currently being revised, with a draft revision released in September 2005, for implementation in 2006. The next revision of the Part L will be around 2010, following the requirement of the EU Energy Performance in Buildings Directive which states that energy regulations should be reviewed every 5 years.

AD Part L covers the thermal efficiency of the building envelope and efficiency and control of fixed items of plant (boilers, cooling, ventilation). The SSBA opens up the opportunity to apply these types of regulatory measures to existing buildings when carrying out building work or at a change of occupancy.

Part L standards already apply to all boilers and window replacements in both new and existing homes,²⁶ and since April 2005 all

²⁵ <http://www.defra.gov.uk/news/2004/041208c.htm>

²⁶ The 2002 revision of Approved Document Part L included an amendment of the Building Regulations to require replacement windows, rooflights, roof windows, doors (more than 50 per cent glazed), space heating or hot water service boilers and hot water cylinders, to be of the same standard as for new buildings.

replacement gas boilers are required to be 86% efficient (except where it is not possible to install condensing), with similar standards for oil and solid fuel. In effect this regulation means that most boilers installed (85% of the market currently) are now condensing, and projected carbon savings are a significant 0.5MtC/year. These standards for existing buildings have largely been enforced using industry self-certification schemes, which appear to have been successful (ODPM 2003c).

As noted in Table 2 above, the changes to Part L to be implemented in 2006, will deliver only 0.08MtC savings from new homes, and zero additional savings from existing homes. The draft regulation requires (unchanged from Part L 2002) cost effective improvements in insulation to be made when undertaking renovation works to thermal elements but there are concerns regarding enforcement of this. For example when replastering the inside of an external solid wall, that solid wall should be insulated. Building Control officers are unlikely to be alerted when repair and maintenance works to internal surfaces are taking place, therefore we see little chance of delivering the energy savings. Further, the regulations set weak standards for energy performance of mechanical cooling, and with little chance of enforcement.

5.8.1 A requirement for consequential works

The consultation document for the revised Part L 2005 proposed setting a requirement for improving the energy efficiency of the whole house when carrying out improvement works. This has been termed 'consequential works'. Works that would have been subject to this requirement include:

- an extension
- the provision, extension, alteration or renovation of a controlled element, service or fitting
- the material alteration of a building; and
- a material change of use.

The consultation document proposed that if building works (such as any in the list above) were being carried out on existing housing, and where the regulated building work cost would

exceed £8000, an additional 10% of the cost of the works should be invested in applying cost effective energy efficiency improvements to the whole dwelling. It is understood that this proposal would have delivered significant carbon savings, in the order of 0.5MtC by 2010. This proposal was not implemented in the revised Part L as published in September 05 – although it was popular in the consultation, but the consultation did not include individual householders, only professional bodies. The SDC is disappointed that the proposal was not taken forward.

We consider that the Building Regulations are an appropriate route to encourage householders to improve energy performance in existing homes. The requirements for wall and loft insulation are insufficient, and draught proofing is not required. These are low cost measures that deliver significant benefits in energy consumption and comfort. Using the Building Regulations to require these improvements would deliver a significant increase in uptake for these measures.

Householders who are investing in extending their homes, are likely to be 'able to pay' occupants, who are increasing the value of their home whilst increasing its carbon emissions. It is appropriate therefore that a requirement is established to improve the efficiency of the whole home as a step towards offsetting the increase in emissions.

We propose that the Government consider again setting a requirement for improving the energy performance of existing homes through the use of the Building Regulations. Extensions of habitable floor area would be approved subject to:

- a full energy audit being carried out,
- plus draught proofing to meet the 10m³/h/m² standard, with matched installation of efficient supply and extract ventilation,
- installation or upgrading of loft insulation to new build standards (around 300mm thickness) and
- filling of cavity walls (up to a maximum cost).

This would be triggered by any extension of the internal usable floor area (including a conservatory) of more than perhaps 2m². As part of the energy audit, householders should

be provided with information on available EEC offers for supporting the costs of any works which will help energy suppliers to deliver on their challenging commitments. It has been estimated that this proposal would deliver up to 0.5MtC per year by 2010²⁷.

A full public consultation including consumer groups should be carried out for our proposal for consequential works. This revision should be implemented as soon as possible, well before the 2010 review of Part L. Introduction of a 'consequential works' requirement could be counterbalanced with a revision of the VAT rate for all refurbishment to mitigate the potential disincentive to carrying out improvement works on homes.

Recommendation: Government sets a requirement in Building Regulations to improve the energy performance of existing homes when they are extended, saving around 0.5MtC/year.

The SSBA also enables the Regulations to be applied to existing buildings at change of occupancy, and this could effectively be linked to the introduction of the Energy Performance Certificate (part of the Home Information Pack). The Building Regulations could require cost effective improvements as identified on the energy performance certificate label to be implemented. Issues regarding whether this would unfairly penalise existing homes and encourage the purchase of new homes should be considered.

Recommendation: Government reviews progress with delivering the EEC targets in 2006/7 and if necessary, considers setting a regulatory standard for energy efficiency improvement of dwellings at change of occupancy.

5.9 Delivering the savings: energy services

Energy services provide an opportunity to realise the financial potential of energy savings.

Rather than simply selling electricity and gas, energy services focus on the outcome the customer wants – such as warm rooms and hot water – and offer the most cost-efficient way of achieving it. Under an energy services contract a supplier might, for example, install insulation or a more efficient boiler in a customer's home, and recoup the investment through the service bill over several years. Energy services may also allow supply companies to gain market share by adding value to their core product, whilst potentially reducing the volume of energy sold. HM Treasury has identified a market failure in the provision of energy services in the household, commercial and public sectors and will be holding a summit on Energy Services early in 2006 to consider how the energy services market may be developed.

The Energy Efficiency Commitment provides an incentive to energy suppliers to establish energy services contracts and there is also currently a two-year pilot trial of energy services being undertaken by Ofgem. However, so far this has not proved very interesting to energy suppliers. In effect, the 28 day rule²⁸ – as identified by the Energy Services Working Group (2003) – was probably not the only barrier to energy services.

Consumers are unwilling to enter into a longer contract for low value works such as cavity wall insulation, and the costs to the suppliers of recruiting customers to the scheme are high. Householders may be persuaded to enter into such a contract for more high value works, such as a major carbon reduction package as identified above (5.1 Whole house carbon reduction). Energy services offerings should tap into consumer interest in home audits, feedback and microgeneration.

We propose to stimulate energy services and microgeneration, recommending a Micro-generation Commitment (similar to the Energy Efficiency Commitment) requiring suppliers to install a certain capacity of microgeneration technologies through energy services contracts. Suppliers will be able to enhance the value of the contract by installing energy efficiency measures. We would expect the financial

²⁷ Source: personal communication with Energy Saving Trust and the Association for the Conservation of Energy

²⁸ Where consumers switch suppliers with a 28-day notice period; this was considered to block the development of a longer term relationship between suppliers and customers.

contracts to include a cost premium to consumers in order to cover the costs of the technology.

Recommendation: A Microgeneration Commitment is placed on energy suppliers to stimulate a mass market in microgeneration technologies, financed through energy services.

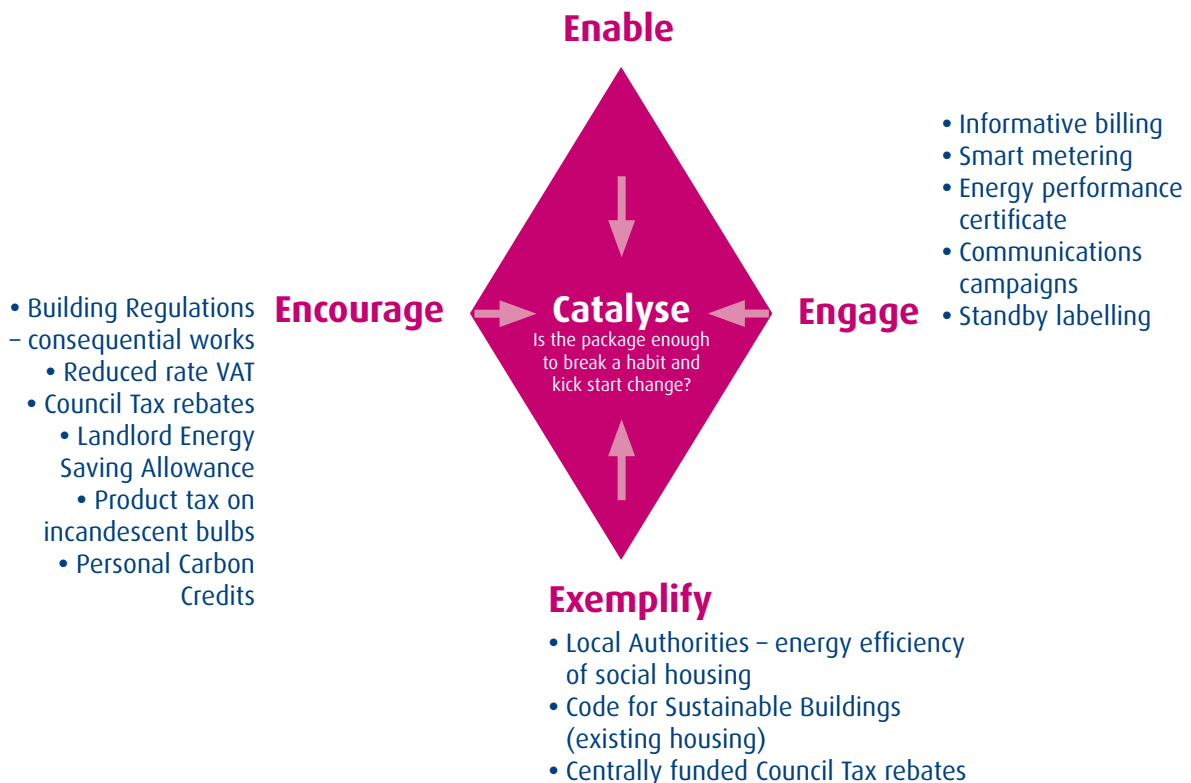
5.10 Delivering the savings: personal carbon credits

Personal Carbon Credits, (also called Domestic Tradable Quotas) are a relatively recent concept, which may have great potential. This proposal is a market mechanism like emissions trading: putting an absolute cap on carbon emissions, with reductions in this cap over time. The difference from the emissions trading

schemes is that a personal carbon credit scheme would include individuals, bringing the need for carbon reductions directly into peoples' lives, and stimulating action at every level of society. Personal Carbon Credits (PCC) would be guaranteed to achieve the Government's carbon dioxide reduction targets, but at less cost, and in a way that is both equitable and flexible. PCCs manage to unite many of the Government's objectives (individual action, progressive, fair, market-based), but at least cost to society in general. PCCs would also stimulate innovation in the UK business sector because consumers will actually seek the lowest carbon-price for goods and services as part of overall value for money.

We propose that pilot projects are established to test methodologies and evaluate the costs and benefits. This alone could be the single most important driver for reducing carbon emissions because of its impact across all sectors of the economy.

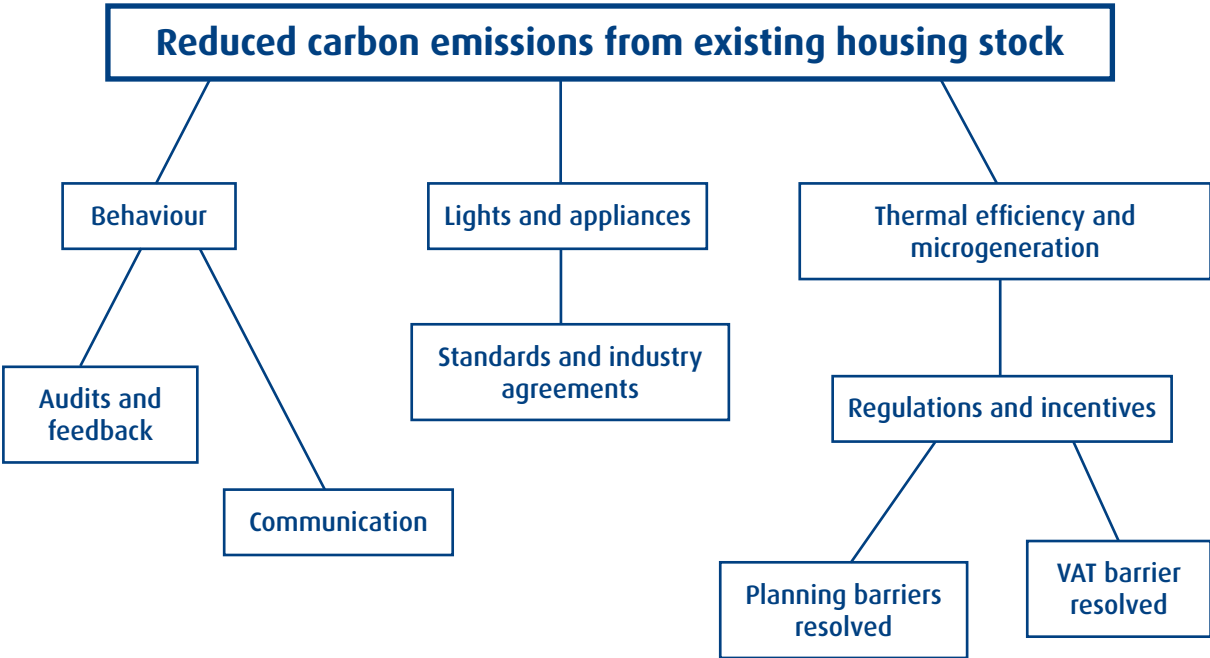
- Remove planning barriers
- Market transformation of appliances
 - Energy services
 - Micro-generation commitment
- Good practice for passive cooling
- Energy Efficiency Commitment 3



Recommendation: Government makes a commitment to formally consider Personal Carbon Credits in 2007, and launches a pilot project to evaluate costs and benefits.

5.11 Summary

The diamond model on the previous page summarises the key policy recommendations for reducing carbon emissions from the existing housing stock. The chart below shows the steps that need to be taken to deliver change.



6. Water

Water is a natural resource and is severely limited in some parts of the UK, although public perception is generally that water is plentiful. Households use half of the water publicly supplied in the UK (Environment Agency 2001). Per capita consumption averages 154 litres per day in the UK and is steadily increasing (Ofwat 2005b). A reduction of 30% per home is achievable. Water is a necessary requirement for public health; all homes must have a clean, safe and secure supply of water. There is currently great inefficiency in supply infrastructure and in the consumption of water in UK households. Additionally, water affordability has been identified as a concern by government.

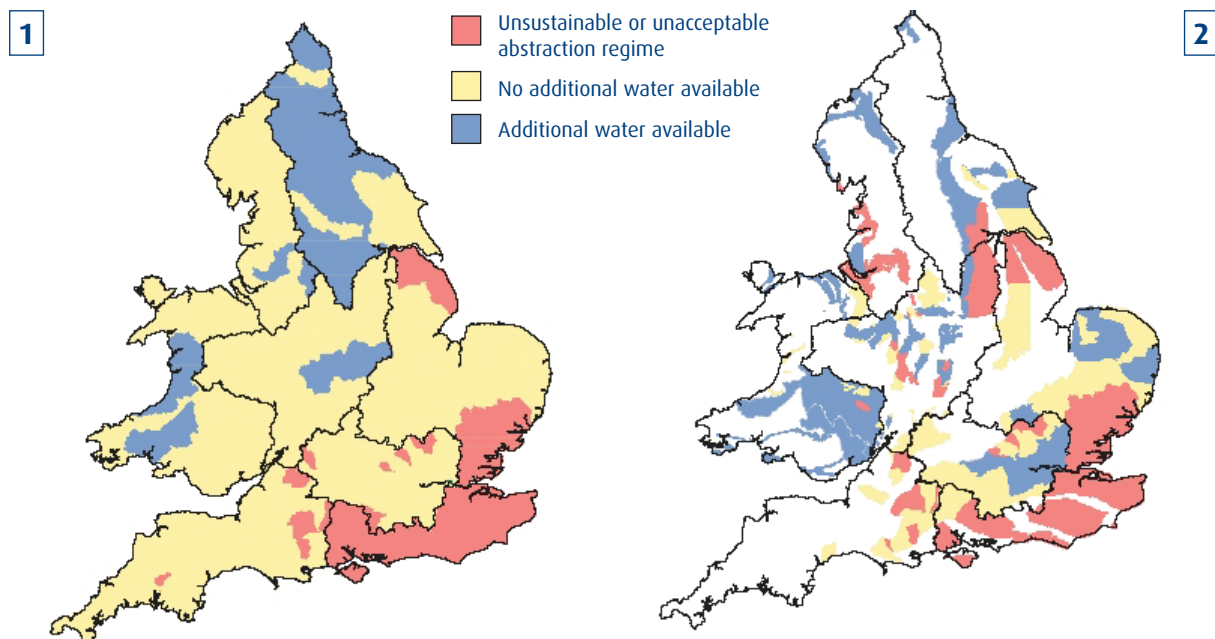
Mains water has an embodied energy element (from energy consumption in pumping and treatment), estimated to be 0.5kWh/m³ including both supply and treatment (BioRegional 2004). Although this is low in relation to total home energy consumption, we estimate that a 30% saving

in water consumption across the UK housing stock would deliver around 0.04MtC saving per year. Proposals for resource intensive water supply measures (including desalination) have higher embodied energy (at 2-5kWh/m³) and financial costs. If water demand management solutions are not successfully implemented, the UK will be forced to introduce some of these less sustainable solutions.

Many areas of the UK are suffering from water shortages, although this is not a nation-wide issue (see Figure 6). Climate change is predicted to reduce summer rainfall by up to 60% by 2080, with increasing water stress in the most populated areas. The current environmental impacts of over-abstraction include low flow rivers, drying wetlands, damage to the habitats of flora and fauna and polluted groundwater. All of these are likely to be exacerbated by the effects of climate change.

The scale of housing development proposed for the UK, in the context of limited water

Figure 6 – Indicative summary of water availability in England and Wales for summer surface water (1) and annual ground water (2) (Environment Agency 2001)²⁹



²⁹ 68% of water supplied in England is from surface water, and 32% from ground water.

resources in many areas, means that a major programme of demand management (water efficiency), as well as exploiting new resources such as reservoirs, is necessary. Around one million new homes are proposed for the south east of England, where water consumption per head of population is already the highest in the UK (Ofwat 2005b), and water resource availability is among the lowest in the UK (Environment Agency 2001). South East Water’s supply demand balance is described by the Environment Agency as ‘precarious’, the company has been encouraged to apply for water scarcity status. Existing water resource capacity will not be able to meet projected demand beyond 2025 (Environment Agency 2004a).

Waste water and its treatment is also a concern in the light of the housing growth proposals as sewage treatment works in SE England are currently already close to capacity. The Environment Agency has identified seven sewage treatment works in the Thames Region

alone that are at the limits of traditional technology. Flooding and water quality are increasing concerns in the south east.

Leakage in the water supply system is an issue of concern, which is currently limiting sustainable water cycles in the UK, however the measures to manage this are largely outside of the scope of this report.

There is great scope to improve the water efficiency of the existing housing stock. Almost all homes use 100% fully treated water for all uses when only a small proportion is actually used for drinking. However there is relatively little research or policy activity regarding water consumption in existing buildings. Existing policies relating to domestic water efficiency are listed in Annex B: The Policy Context. Existing homes and their curtilages also impact on rainwater drainage and measures may be implemented to mitigate flooding.

In order for water savings in existing and new homes to be considered in the water companies’ plans, the economic regulator

Box 7 – Key water saving measures

- Metering (to allow monitoring of demand and feedback) and raising awareness of waste
- Use of water efficient fittings - low flow taps and showers, low flush WCs
- Devices that alter the operation of existing fittings, such as retrofit variable toilet flush devices or tap inserts
- Use of water efficient appliances – dishwashers and washing machines
- Leak detection (to facilitate prompt maintenance)
- Opportunities for grey water and rainwater recycling, including garden water butts
- Behavioural measures: turning off taps when not required, wider ‘water consciousness’.

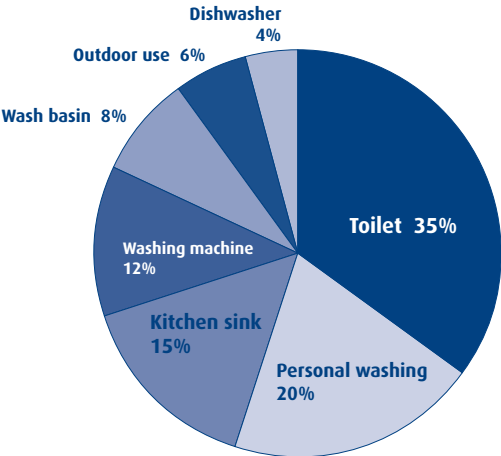


Figure 7 – Water consumption in housing by end use (Environment Agency 2005b)

needs to be assured that the business case for sustained water savings is robust. The evidence base for water savings through demand management needs to be further developed and this is a priority for the water industry Price Review for 2009.

6.1 Water saving measures

A wide range of cost effective water efficiency and water conservation measures exist (see Box 7).

- Water efficiency means using less water to derive the same water service. Water efficiency in the existing stock is achieved through retrofitting – either altering an existing appliance or replacing an existing appliance with a more efficient one, especially at end of its life
- Water conservation relates to using less water by behaviour change to reduce waste, and using grey or rain water for non-potable needs. There is a lack of evaluated data for behaviour-related water-conservation policy measures.

The UK has not traditionally taken a co-ordinated approach to promoting water demand management. For water companies and their economic regulator to have confidence in the costs and reliability, repeatability and

sustainability of water savings, any water efficiency research must be co-ordinated and shared. We welcome the creation of the independent body established by the water industry ‘waterwise’, which will work to establish the business case for water conservation. We propose that its role also includes provision of advice and guidance to the public.

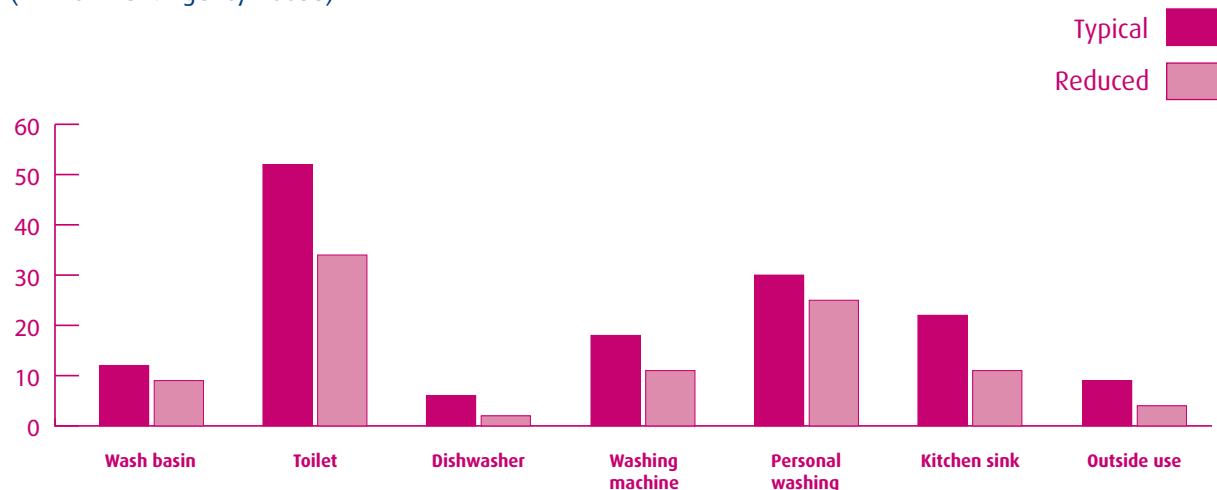
Recommendation: The remit of the new water industry initiative ‘waterwise’ should include provision of advice to consumers, promoting best practice guidance on water efficiency. This body should co-ordinate with energy efficiency advice initiatives.

The Environment Agency (Entec 2005) assessed the potential for water efficiency savings within the existing housing stock in south east England. The study considered a range of options:

- water metering on change of occupancy
- subsidy of low flush toilets and appliances
- low use fittings (including taps and showers)
- cistern displacement devices (that reduce the volume of WC flush water in older cisterns).

Measures should be installed in combination in order to reduce capital costs. Metering may encourage householders to then take up other water efficiency measures. If fully applied, these

Figure 8 – Potential savings (litres per household per day) from water efficient appliances (Environment Agency 2005a)



measures could significantly reduce demand in the existing stock in SE England, meaning that the additional requirement for water investment in the region for new homes could be reduced by 40%. Costs of implementation were found to be comparable to those for new water resource investment. The study did not consider compulsory metering.

Recommendation: Growth area water demand management findings should be verified by further research including a full cost benefit analysis to evaluate avoided environmental costs, alongside benefits to householders in reduced bills.

6.1.1 Water efficiency

The potential for water efficiency in existing homes is similar to that in new homes – there is great scope to achieve significant environmental improvements in the existing stock through water efficiency. Water savings of over 30% may be achieved through water efficiency (see Figure 8). Kitchens and bathrooms are typically refitted every 7-15 years (Mulligan and Steemers 2002). These rooms contain the majority of the water consuming appliances in a house, and offer great opportunity to install water efficient appliances if consumers can be influenced through advice and incentives. The supply chain (for taps, WCs etc) will need to be willing and able to supply water efficient options.

Water efficient washing machines and dishwashers already account for around 80% of the market as EEC has transformed demand for energy 'A-rated' products which are also water efficient.

Recommendation: Social landlords ensure retrofitting/refurbishment programmes such as Decent Homes include water efficient appliances and fittings.

6.1.2 Water conservation

Water conservation may be achieved by changing customer behaviour. Water conservation measures include not leaving taps running,

fixing leaks and washing the car by bucket rather than hose. Water metering encourages water saving behaviour in householders. Water audits raise customer awareness and are very popular with households. Essex and Suffolk Water offers its customers water audits which are taken up by customers at a rate of over 20%.

However, there is no standardised audit method in the UK, and no central collection of data. This means that there is no clear understanding of the efficiency of the existing stock, the number of inefficient fittings currently installed and therefore the potential for reduction. A database of efficiency would allow more targeted policy development and evaluation of achievements. Social landlords should be encouraged to undertake water audits of their properties and to seek advice on improving water savings.

Recommendation: Establish a national water audit methodology to be adopted by all water companies and ensure data is collated into a database.

Almost all water companies provide water efficiency information on their website. However the quality and range of information provided is varied. Many water companies focus on communicating to school children who have a role in passing on messages to their entire household.

Further water efficiency benefits may be achieved through the supply of non-potable water to meet non-potable demands, such as garden watering and WC flushing. Non potable sources such as locally harvested rain water, or grey water (collected from household waste water sources such as baths and showers) can satisfy the requirements of non potable demands. However these systems are costly to retrofit and there are acceptability issues for customers. Existing homes with gardens would benefit from the installation of simple rain water butts.

6.1.3 Metering

Metering is the key measure to persuade householders to conserve water, and innovative tariffs may then be used to further incentivise

efficiency. Currently, only 21-26% of households in England and Wales have meters installed (Water Voice 2004). Ireland and the UK are the only OECD countries not to have universal water metering. Unmeasured households are largely unaware of their water consumption, and any water efficiency measures they implement would not be measurable.

On average, households with water meters consume around 9% less water per head than those without meters installed (Environment Agency 2004a). No full evidence of water savings exists for the different routes of meter installation (optional/selective/change of occupancy/mandatory).

Water metering on a district scale will enable water companies to better manage supply and to identify and locate losses.

Water companies have the power to install meters in properties:

- when they are sold, however this option is considered expensive so is not applied universally
- in households with high consumption, although this opportunity is rarely exercised
- on a mandatory basis in supply zones designated as 'water scarce'.³⁰

Those who opt for meter installation are more likely to be small households in larger properties (who will save money by being metered). Ekins and Dresner (2004) studied the effects of metering and found that all forms of metering would be more progressive than the current system of unmeasured supply. Low income households can be protected using a tax credit system similar to that used for energy customers.

Further savings may be achieved through the installation of a meter with intelligible feedback display inside the home to raise householder awareness. Smart water meters that could be read remotely would enable companies to introduce tariffs encouraging water conservations, such as seasonal tariffs to reduce peak demands.

Existing legislation requires water companies to have considered all other means of optimising the supply demand balance before

applying for water scarcity status. We propose that mandatory water metering should become a standard measure for zones where water supply is limited. Metering is a reliable way of delivering demand reduction (Environment Agency 2004a).

Recommendation: Ofwat sets targets for meter penetration by water companies. Legislation is amended to allow water companies to apply mandatory metering as a standard demand management measure. Comprehensive water saving advice packs are provided to complement water company metering programmes.

Recommendation: Government considers the measures available to encourage retailers to inform water companies of the sale of 'notifiable items' as defined in the Water Regulations to increase metering.

6.1.4 Demand management tariffs

The use of water pricing to reward low water usage through variable tariff structures would create a further incentive to manage demand. Metering is an essential first step for setting demand management tariffs. There are currently two forms of demand management tariffs being discussed – a seasonal tariff to increase unit rate in summer (drier) months, and a rising block tariff that sets a basic unit rate for low water consumption and the unit rate increases as consumption exceeds set levels.

The evidence base is not yet proven on the effectiveness of demand management tariffs due to the lack of meter coverage for a major trial. A trial of variable tariff structures is taking place in Kent using a seasonal tariff which is designed to be cost neutral to consumers over the whole year, but encourages water conservation in the summer.

Recommendation: The results of the Kent demand management tariff trial are

³⁰ Water scarcity status permits compulsory metering for zones where supply is limited. Compulsory metering as a result of water scarcity status can improve the supply demand balance. Folkestone and Dover Water will be the first company to apply for water scarcity status, and forecasts metering of over 90% of households by 2015.

widely disseminated. Government and water companies commit to reviewing the potential for implementing demand management tariffs in Periodic Review 2009.

6.2 Rainwater and drainage

Rainfall onto homes and gardens drains into natural ground and surface water courses, or enters the sewer infrastructure. Surface water run-off should be managed as close to its source as possible in order to minimise the risk of flooding. ‘Sustainable urban drainage systems’ include measures to attenuate the peak flow of storm water into the sewer system. Drainage via combined sewers (which combine storm water and foul water) puts pressure on the sewage system and can result in major pollution events such as heavy rainfall which resulted in one million tonnes of raw sewage being discharged into the river Thames in the summer of 2004. Sewers in many urban areas are combined and increased intensity of rainfall through climate change is increasing the risk of pollution of water courses.

There is a trend for increasing the proportion of impervious surfaces in urban areas, such as making front gardens into car parking spaces. In London, around two-thirds of front gardens (3% of London land area) are now either

partially or wholly hard landscaped – much of this is to create off-street car parking (London Assembly 2005). This reduces the attenuation of rainwater runoff, and is increasing the pressure on sewers.

Rainwater collection and reuse, and use of porous paving materials can reduce peak rainfall runoff significantly. These measures can be retrofitted to existing properties.

Recommendation: Planning policy formally recognises the importance of existing sustainable drainage elements such as front gardens. Government raises public awareness of the problems associated with paving over front gardens and promotes alternatives including water butts and porous paving systems.

6.3 Cost Effectiveness

There is limited information available on the cost-effectiveness of specific water efficiency measures, particularly over the longer term and there are few properly evaluated projects. A UKWIR project co-ordinated by research and consulting company WRc is aiming to address this through establishing a standard methodology for evaluating water efficiency projects and developing a project database.

Table 6 – Costs and benefits of retrofit water efficiency measures³¹

Retrofit measure	Saving (% of total household consumption)	Cost of appliance and installation
Cistern displacement device	2.2%	£0.80-2.00
Variable flush retrofit device	7.8-8.7%	£20-40
Ultra low flush WC	14.3%	£40-80 (subsidy)
Efficient washing machine	0.7-1.4%	£20-40 (subsidy)
Efficient dish washer	0.4-0.6%	£20-40 (subsidy)
Low use taps	1.3%-2.3%	£15
Low use shower	3%	£30-50
Meter on change of occupancy	6-9%	£71-250

³¹ Source for this data is Entec 2005, assuming typical household water consumption 366.5 litres/day, wash basin use 8% of consumption, shower use 20% of consumption. Metering savings of 9% source Environment Agency (2004a).

Waterwise will encourage more co-ordination between water companies for data collation and sharing. A forthcoming quadripartite study into the cost effectiveness of demand management between Ofwat, Defra, the Environment Agency and Three Valleys Water will develop a database of best practice and cost benefits of water efficiency measures. This study will urgently input into economic appraisals for the Periodic Review 2009.

Some indicative water savings and costs have been collated in Table 6. These are not definitive but useful to give an indication of the scale of savings and costs.

Some data exists for water efficiency in new build developments, but there is no evidence to show how this relates to the retrofit market.

Costs published vary between costs of DIY purchase and installation, and costs of full marketing and professional installation programmes.

Some water efficient fittings and appliances have a small cost premium over non-efficient fittings, but with a wider market share of these devices this differential would disappear. Non-potable water systems can save around a quarter of household water use, but costs for installation of such a system are likely to be in the region of £1000-2000 (Environment Agency 2004) for new build and higher for existing homes.

Meter costs range from £113-183 for internal meters and £29-301 for external (dependent on whether there is an existing meter box) (Ofwat 2005a).

6.4 Overcoming barriers

There are several barriers to water saving for householders and the water industry.

6.4.1 Evidence base

The water companies do not consider the evidence base for water savings from demand management sufficiently developed to allow them to use demand management as a significant measure in their plans. Therefore, they are not able to invest significantly in demand management.

Recommendation: Evidence base for sustained water savings from demand management is developed in time for Price Review 2009.

6.4.2 Consumer awareness

Consumer awareness of and interest in water efficiency has found to be low in the UK (MTP 2005). There is a general perception that there is plentiful rainfall in this country, therefore little need to save water. This may be illustrated by experience from a 6 month highly targeted multi media campaign on water efficiency that showed disappointing results for increases in awareness or measurable response and demonstrates the difficulty in communicating water efficiency (Environment Agency 2003a).

Water bills do not currently provide sufficient information to householders to influence their water consumption. In fact water bills are often confusing, with a range of charges for water consumption, sewerage and standing charges.

Recommendation: Ofwat requires water companies to provide informative bills.

There is a need for centralised dissemination of best practice and advice on water efficiency. The industry's independent water saving body waterwise could fulfil this role. Water advice should be coordinated with energy efficiency advice, in order that information can be provided to householders in a single package, which should be more cost effective. Information campaigns need to be sustained, consistent and locally specific.

There is currently no standardised labelling scheme for water efficiency in the UK, and this lack of information is a barrier to improving water efficiency. Some water efficiency labels exist, however they are not widespread and are insufficiently promoted. There may be a perception that water efficient appliances and fittings are less functional than their non-water efficient counterparts. A national voluntary water-consumption labelling scheme for appliances, supported by a communication programme, would aid consumer choice. The Defra Market Transformation Programme is researching a labelling scheme to apply to dishwashers, washing machines, WCs, showers

and bathroom taps; the project will report in April 2006.

Recommendation: Government takes forward a voluntary labelling scheme with industry on the water efficiency of appliances and fittings in 2007.

Recommendation: Information on water efficiency of fittings and appliances is communicated to consumers via waterwise and Environment Direct

A programme of fiscal incentives for householders such as reduced rate VAT on a range of water efficient products suitable for homes, may make water efficient fittings and appliances slightly cheaper than non-efficient items. We would encourage the Chancellor to press for such a change as part of the overall review of the 6th VAT Directive.

6.4.3 Supply chain

Lack of choice of water efficient fittings at point of sale is a barrier as most retailers do not offer these items. In refitting bathrooms, many plumbing items are chosen by the plumbing contractor.

Recommendation: Waterwise works with major retailers to enable them to provide the right advice to consumers and plumbers at point of purchase.

Recommendation: Government procurement of water-using fittings and appliances across the Government estate should set minimum standards for water efficiency in order to encourage the market for water efficient products.

6.4.4 Split incentive

There is currently no scheme to incentivise private landlords to invest in water efficiency.

The 'split incentive' exists where the landlord would pay a marginal cost, but metered tenants would benefit from the cost savings. Most private landlords are not corporation tax payers, and therefore do not benefit from the Enhanced Capital Allowances³² afforded to water-efficient goods.

6.5 Delivering the savings: water efficiency regulation

The Government's response to the Barker Review of Housing (2004) sets out a commitment to regulate for dual-flush or low flush toilets to become standard in all new homes, saving around 10% of water consumption in the average household. The Government will consult early in 2006 on the best means to regulate – whether through the Water Fittings Regulations or through Building Regulations. The main aim should be to create the best outcome in terms of delivering water efficiency. As the consultation for the Code for Sustainable Homes (ODPM 2005c) states, introducing standards to deliver a 20% saving is cost neutral and will deliver annual savings of £48 per home (to metered homes), therefore it seems that the regulated standard should also be designed to deliver a 20% saving.

The regulations that currently exist in relation to household water efficiency are Defra's Water Supply (Water Fittings) (WS(WF)) Regulations 1999 which include measures to control contamination and address waste, misuse and undue consumption of water. These Regulations set specific limits on consumption of washing machines, dishwashers and WCs. The WS(WF) Regulations include a requirement to notify the water company when installing high water use items such as booster pumps and automatic garden watering systems so the water company can meter the property. These Regulations apply to the installation of all plumbing goods and therefore have greater scope than the Building Regulations to address water efficiency in both new and existing homes.

³² Enhanced Capital Allowances are currently available for corporation tax payers installing water efficient fittings and appliances such as flow controllers, meters, leakage detection, efficient WCs, efficient taps and rainwater harvesting equipment.

However, the WS(WF) Regulations are applied 'appliance by appliance' and do not currently have any consideration of whole house water efficiency – i.e. there is no flexibility for a performance-based outcome. The WS(WF) Regulations do not currently set stretching requirements for water efficient appliances, and could be developed to increase standards. Also, the enforcement of these Regulations has been the source of concern for Defra's Water Regulations Advisory Committee, and these concerns are outlined below (see Box 8).

A review of the Building Regulations Part G (Hygiene) is currently being undertaken by ODP to consider whether to incorporate water efficiency. The Sustainable Buildings Task Group recommended that Government set a 25% saving in water consumption in Building Regulations by 2005. If Building Regulations were used to set uniform water efficiency standards, it would promote consistency of regulation across Government and is likely to simplify compliance. There is no provision within the Sustainable and Secure Buildings Act to apply water efficiency to existing buildings.

Box 8 – Water regulations enforcement

Water companies' enforcement is based around risk of contamination rather than water efficiency. A number of companies were found to have poor enforcement performance.

It was noted that enforcement is necessary in domestic properties due to poor skills in the plumbing industry. The industry self-certification scheme promotes competent plumbers and provides protection for consumers, which is positive.

There is no point of sale control for water fittings which is a cause of concern when there is significant DIY activity. Point of sale control would require primary legislation and should be supported in the short term by the introduction of a labelling system to cover compliance with the Regulations and to rank water efficiency.

Very few notifications for notifiable products are received and companies rarely take the option to meter as a result. Increased liaison with Building Control and Planning Departments was identified as a route to improve notifications.

Sources: Water Regulations Advisory Committee 2002, 2003.

However, if water efficiency is established in Building Regulations Part G for new build, then water-using fittings (taps, WCs, shower heads) should become 'controlled fittings' as defined in Regulation 2 (1) of the Building Regulations. Building work should be carried out so that any replacement controlled service or fitting complies with the applicable requirements of the regulations. This would ensure that when replacing water using appliances and fittings in existing homes they are replaced with water conserving items.

There is a concern that adding further requirements to the Building Regulations will require enforcement action to a level that cannot be met by Local Authority building control officers.

If water efficiency measures are introduced into the Building Regulations to apply in the existing housing stock, the SDC recommends they should be delivered through an industry self certification scheme.³³

It is not possible for water efficiency regulation to be split under the remit of two

33 The ODPM previously set up a self certification scheme that allowed individuals registered with the Institute of Plumbing's Approved Contractor Person Scheme (Building Regulations) to undertake the installation of services or fittings in relation to Part G in housing of no more than three storeys without notification of the Building Control body. However, the Institute of Plumbing (Now renamed the Institute of Plumbing and Heating Engineers) scheme has recently been withdrawn as it was not being operated satisfactorily.

different government departments, and the decision must be made on the basis of which statutory framework will deliver the best outcome in terms of water saving.

Recommendation: Water efficiency standards for all new and existing buildings are established for conservation of water resources, and to protect households from water affordability issues.³⁴

6.6 Delivering the savings: water efficiency commitment

Consumers may need more support to encourage the installation of water efficient appliances and fittings. A suitable model may be an equivalent to the Energy Efficiency Commitment, where water companies could be required to install water efficient fittings and appliances in homes for reduced or zero cost. The Sustainable Buildings Task Group proposed that a Water Efficiency Commitment (WEC) could be established. Ofwat could take

responsibility for co-ordinating the Water Efficiency Commitment (as Ofgem does for the EEC) with guidance from government.

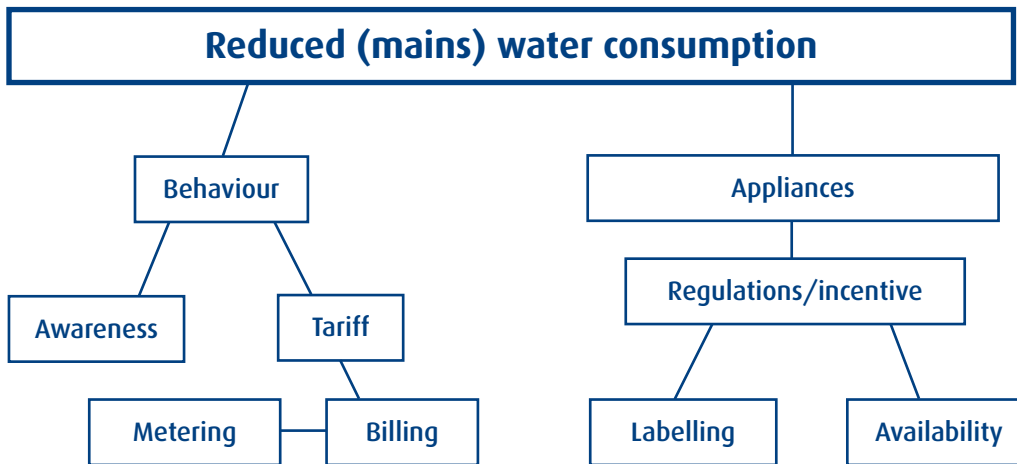
As with the EEC, the Water Efficiency Commitment should also require that a proportion of activity takes place in 'vulnerable' households—to support those who may experience difficulties in affording water. A WEC could be operated regionally rather than nationally. The IPPR is currently researching household water efficiency and the potential for a trial WEC in the south east; IPPR will report in Autumn 2006.

Recommendation: Government reviews the potential for a Water Efficiency Commitment and supports a trial in 2007.

6.7 Summary

The diamond model on the next page summarises the key policy recommendations for reducing water consumption in the existing housing stock. The chart shows the steps that need to be taken to deliver change.

³⁴ We are aware that ODPM and Defra are jointly taking forward proposals for water efficiency regulations.

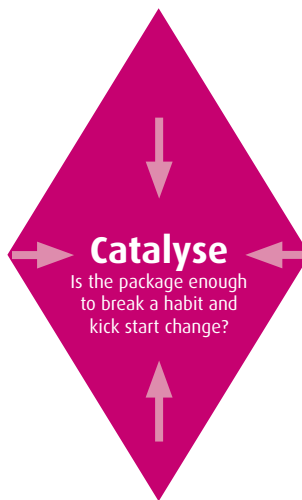


- Retailers to promote water efficiency
 - Labelling scheme
- Water efficiency commitment

Enable

- Water efficiency regulations
 - Metering
- Discretionary items notified to water companies
 - Demand management tariffs
 - Water efficiency commitment
- Landlords Energy Saving Allowance to include water
 - Sustainable drainage systems

Encourage



Engage

- Waterwise
- Water metering
- Informative billing
- Auditing
- Labelling scheme

Exemplify

- Government procurement standards
- Local Authority stock to set high water efficiency standards
- A national database of water efficiency in homes
- Code for Sustainable Buildings

7. Materials and construction and demolition waste

The UK Sustainable Development strategy identified the protection of natural resources and environmental enhancement, and sustainable consumption and production as key priorities for action. Sustainable consumption and production requires us to do 'more with less'. In order to live within environmental limits, consumption of limited natural resources should be minimised through finding alternative resources. The treatment and disposal of construction and demolition (C&D) waste creates significant environmental impacts in the UK.

The construction and demolition industry contributes 33% to the UK's volumes of waste (Defra 2005c). This is four times the waste produced by all UK households. Existing licensed landfill sites only have capacity to take waste for 6.5 more years at current rates of disposal. Thirty percent of UK fly tipped waste is currently construction waste. Mitigation of construction and demolition waste generation may be implemented at zero extra cost, with potential cost savings in relation to waste disposal. We estimate that total savings of 50% can be achieved on construction sites over the next decade if our proposals are put in place. Refurbishment waste is made up of a combination of construction and demolition wastes.

The key players are manufacturers, clients, specifiers/consumers, retailers, builders, the waste management industry and demolition contractors. The materials proposals developed in this study apply to professional specifiers, individual consumers and small building firms who buy materials.

Existing policy measures to reduce C&D waste to landfill include the landfill tax,³⁵ the aggregates levy (and associated sustainability fund) and the introduction of site waste management plans (see Annex B: The Policy Context). The Environmental Protection Act 1990 introduced statutory requirements for responsible waste practices. The Defra review of the Waste Strategy in 2006 should provide the framework for construction and demolition waste.

Waste management hierarchy covers:

Reduction

- reducing the amount of waste produced
- reducing the hazard of the waste produced.

Reuse

- putting objects back into use so that they do not enter the waste stream.

Recovery

- recycling – collecting and separating materials from waste and reprocessing them to produce marketable products
- composting – processing biologically degradable organic waste aerobically to produce a reasonably stable, granular material
- energy – incinerating waste to generate energy.

Disposal

- Disposal of waste to a landfill site or land raised site (CIRIA 2004).

The Sustainable and Secure Buildings Act makes specific reference to the recycling of construction and demolition waste, and the reuse of materials in order to encourage better 'closed loop' thinking. In order to close the loop we recommend government considers how to:

- encourage manufacturers to minimise environmental and social impacts of supplying materials
- encourage specifiers to use materials that are low impact, incorporating recycle (recycled material)
- encourage designers to allow reuse and recycling at end of building life by deconstruction and advanced demolition techniques
- encourage demolition or refurbishment contractors to maximise high value reuse of products.

³⁵ Landfill tax rates for active waste increased in 2005 to £18 a tonne. The rate will increase by at least £3 a tonne annually to a rate of £35 a tonne in the medium-to longer term.

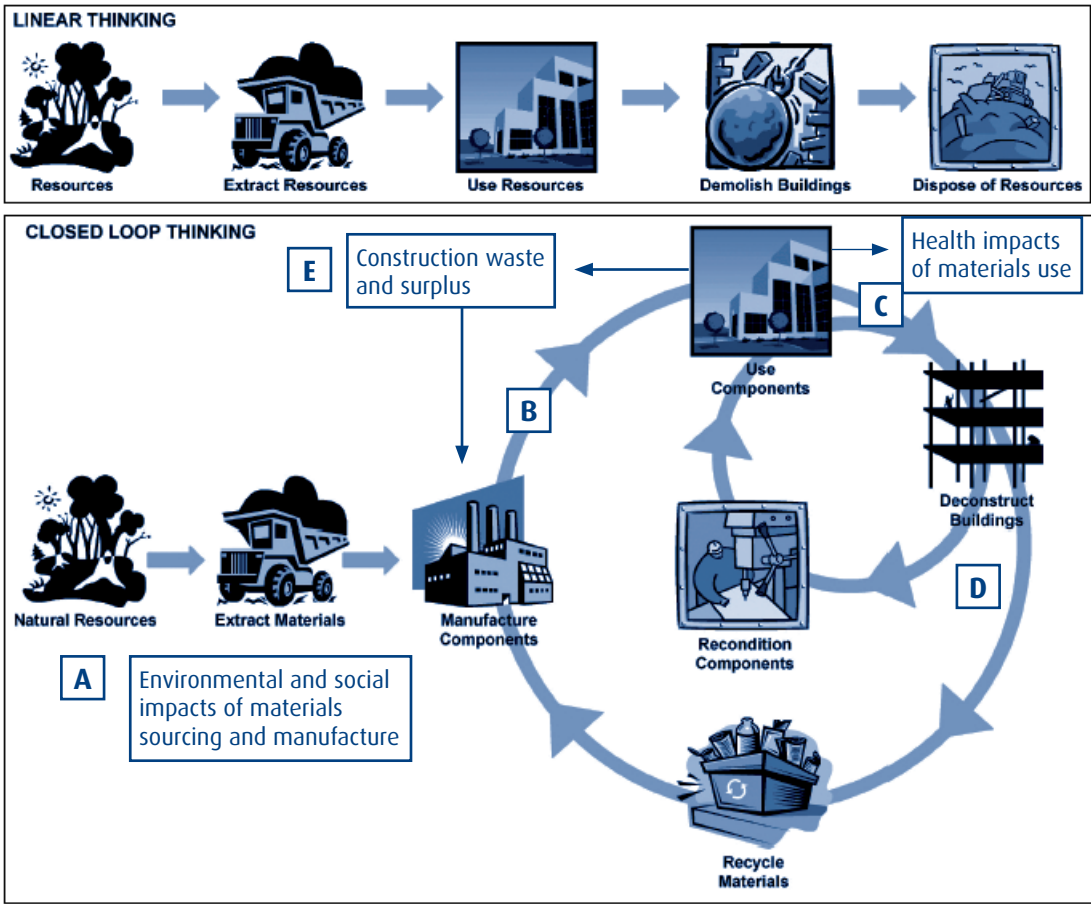
Use of construction materials in the UK is typically characterised by a linear process as follows: extraction; manufacture; assembly; construction; maintenance and refurbishment; demolition; disposal. Sustainable consumption and production would promote a continuous loop, which allows materials and components to be reclaimed, reused and recycled (see Figure 9), reducing consumption of new resources.

The following notes explain key stages within Figure 9.

A Sourcing materials with consideration

- of environmental and social impacts
- B** Specifying low impact materials that will promote health and wellbeing in buildings, will be durable in use and will allow the building to be deconstructed at end of life
- C** Pre-demolition audit and deconstruction planning
- D** Separation and storage of reusable and recyclable materials
- E** Separation and storage of reusable construction materials and recyclable construction waste.

Figure 9 – Change from linear thinking to closed loop thinking (Ciria 2004)



The most environmentally benign and economically advantageous start point is to minimise the overall consumption of materials and generation of waste. Refurbishment of buildings consumes significantly less material and generates less waste than redevelopment.

7.1 Sourcing and manufacture of materials

The environmental consequences of materials’ sourcing and manufacture for construction include depletion of natural resources and local and global impacts of extraction and processing

activities and transport effects. More than 90% of non-energy minerals extracted in the UK are supplied as construction materials, of which the vast majority are aggregates (sand, gravel and crushed rock). The visual, landscape and pollution impacts of quarrying and mining of minerals in the UK and across the globe give cause for environmental and social concern. This was the basis for the introduction of the Aggregates Levy in the UK.

The manufacture of some conventional construction materials involves the use of toxic chemicals, and may result in pollution and toxic wastes. 'Off-gassing' of toxic emissions such as volatile organic compounds (VOC) from materials during construction and in the indoor environment may have consequences for health.

Custody chains should be used to give evidence of responsible practice at every link in the supply chain. An example is the use of timber certification such as the Forestry Stewardship Council (FSC) scheme which is widely used. Custody chains for other materials are not yet well developed.

In order to reduce transport impacts of construction materials, it is possible to source locally available materials. This has been achieved successfully in some projects³⁶ to date, but the shortage of information regarding local materials' availability hampers these efforts. Establishing a national requirement to source locally available materials would contravene the provisions of the EC Treaty, discriminating against trade from European Member States that are not nearby. However, it is possible to specify local materials' use in individual projects.³⁷

The issue of embodied energy and CO₂ in homes is poorly addressed due to lack of available data. A range of 300-1000 kgCO₂/m² (floor area) is considered typical in the construction of a dwelling (Constructing Excellence 2001). Demolishing and rebuilding 1,000 homes per year would increase carbon emissions (from embodied carbon) by 0.007-0.02MtC, whereas refurbishing to high resource

efficiency standards would have around one tenth of the carbon impact.

7.1.1 Stimulating manufacturers

The use of life cycle analysis (LCA) can inform manufacturers of the environmental performance of their products. Many construction product trade bodies and manufacturers are improving their practices as part of their corporate responsibility.

We propose that in the medium term, all materials should carry a verified Environmental Product Declaration (EPD) based on life cycle analysis, in line with the emerging standards from ISO (see 7.2.4). However, social issues such as timber sourcing and health impacts are not covered in EPDs, by definition. This is a major undertaking, and will require significant policy support for delivery. But it is the only way that environmental impacts can be considered holistically for materials and their use in buildings.

The BRE's Environmental Profiles Methodology life cycle analysis system (see Box 9) assesses environmental impacts of construction materials, products, systems and processes. The BRE produces generic life cycle assessments for material types as well as product-specific certification in line with the emerging ISO standard. Generic materials labelling can stimulate manufacturers to ensure their material performs well within its class. But costs of product-specific certification may be considerable³⁸ for SME businesses. This is currently voluntary in the UK, and manufacturers who are using good practice in the sourcing and manufacture of their products are likely to use materials labelling to demonstrate this, as part of their corporate responsibility and to create product differentiation.

There is a role for materials trade associations to support manufacturer members to produce information on materials, with further support from government where necessary.

36 For example, 50% of the construction materials used at BedZED were sourced from within a 35-mile radius of the construction site.

37 http://www.europa.eu.int/comm/environment/green_purchasing/html/general/overview_en.cfm

38 Typical cost of LCAs for a single product is £8-10k, a pan-industry assessment £15-40k, and a considerable amount more if on an international basis.

Box 9 – BRE Ecopoints Environmental Rating System (BRE 2000a)

The BRE life cycle analysis system is expressed in ‘ecopoints’, derived by scoring a material for each issue category (below) and creating an ecopoints score through normalising and weighting. The weightings are agreed by expert panels. The annual environmental impact caused by a typical UK citizen creates 100 Ecopoints. More Ecopoints indicate higher environmental impact.

Category	Weighting
Climate change	35
Fossil fuel depletion	11
Ozone depletion	8
Freight transport	7
Human toxicity to air	6.5
Human toxicity to water	2
Waste disposal	6
Water extraction	5
Acid deposition	5

Recommendation: Materials manufacturers and their trade bodies are encouraged and supported by government to improve product sustainability and to implement Environmental Product Declarations

All these objectives are to be achieved whilst allowing materials to meet all other specifiers’ performance requirements including aesthetics, fire performance, etc.

The client has an important role in materials specification. By setting materials standards and applying these to all public procurement for construction, the government can transform the market. For example, a number of local authorities establish materials specifications for all council property work, major PFI contracts could specify high standards.

Recommendation: Local authorities establish sustainable materials specifications for all council property works.

7.2 Specification of Materials

A building is an integrated assembly of materials, therefore assessment of the sustainability of the building is based upon consideration of the material elements as well as its operational resource impact.

Sustainable materials policy should aim to stimulate continuous improvement in materials sourcing, manufacture and delivery, whilst ensuring high performance in use (after BioRegional 2004). In specifying materials for use in construction and refurbishment, it is necessary to:

- optimise performance of materials in use (e.g. to make energy efficient buildings)
- maximise durability to ensure materials last a long time
- make sure materials contribute to good internal air quality and do not negatively impact on health.

7.2.1 Recycled and reclaimed materials

Recycling and re-using construction and demolition waste as a substitute for new materials has a double environmental benefit – reducing both the impact of waste treatment and the impacts of sourcing primary minerals.

Ten percent of the materials (by value) of a construction project can be recycled content (WRAP 2004). This requirement, when agreed up-front in a contract, can be delivered at no

extra cost. A significant proportion of materials used in construction already include recycled content as a matter of course (WRAP 2004).

In general, materials with a higher recycled content have a lower environmental impact when compared to 100% virgin materials. There are a few exceptions where it can be more energy intensive to recycle than use virgin renewable material, for instance if substantial transport distances are required. BRE data shows that, almost invariably, using higher recycled content within a material specification gains or retains a life cycle analysis 'A' rating (WRAP 2005). Therefore the use of recycled and reclaimed material should be stimulated through the use of life cycle analysis in order to encourage holistic improvements in sustainability.

The use of recycled and reclaimed content in construction is a good proxy for progress in use of sustainable materials – this should be monitored and reported as a national indicator.

Recommendation: Government develops an indicator on recycled and reclaimed content (pre and post consumer waste) in construction, and monitors and reports progress.

7.2.2 Recyclable components and materials

In order to promote closed loop thinking, and facilitate the high value reuse and recycling of materials at the end of a building's life, design of buildings should ensure that materials can be easily removed and separated to maintain quality. There is little incentive for developers to ensure buildings can be deconstructed as the building is likely to change ownership over its life and therefore developers will not be responsible for costs of demolition.

Guidance has been developed for the design and construction industry under the name 'Design for Deconstruction' (CIRIA 2004). The guidance establishes a process for designers to follow to ensure materials may be deconstructed, to provide a plan for materials reuse and recycling at end of life and guidance for deconstruction.

The Design for Deconstruction guidance

has not been well tested in industry in order to assess its practicality and any unintended consequences. For example, there are concerns that industry developments to promote airtightness have increased the use of adhesives, which go against the ethos of design for deconstruction. If design for deconstruction is found to be suitable, it will have to be encouraged through regulation as there are weak drivers for developers to use this method.

Recommendation: The Design for Deconstruction method is piloted on a range of projects to assess suitability for implementation through standards.

The BRE's Green Guide (BRE 2000b) includes a rating for the recyclability of materials and construction types, which gives guidance on the potential for material to be recycled or reused at the end of life of the product.

7.2.3 Cost effectiveness

Materials prices do not generally reflect true environmental costs. In general, the more sustainable option is considered (anecdotally) to carry a cost premium; however this may be due to poor economies of scale, or to considering niche 'eco' materials. The Aggregates Levy is designed to tip the balance, improving the cost effectiveness of recycled aggregates.

Market research evidence shows that alternative cost-competitive mainstream brands are available with higher recycled content across a range of common product types (WRAP 2005).

7.2.4 International and European standardisation

International Standards Organisation (ISO) is currently developing standards for environmental declaration of building products, to be published as ISO 21930: "Building construction – Sustainability in building construction – Environmental declaration of building products" in 2008. The standard for environmental product declarations (EPD) will

be based on life cycle analysis, as established in the ISO 14040 standard series, covering all life stages of the building product (including product, building and end of life). Information on environmental impacts, life cycle impacts and impacts on indoor air quality should be provided.

The draft standard states that declarations for building products should include data on:

- use of renewable and non renewable energy sources
- use of renewable and non renewable materials resources
- use of recycled materials
- water use
- land use
- emissions to air, water and soil
- waste to disposal (hazardous, non hazardous)

Life cycle impacts should be categorised according to impact upon:

- climate change
- destruction of the ozone layer
- formation of photochemical oxidants
- acidification of land and water sources
- eutrophication
- human toxicity
- ecotoxicity.

ISO is also developing a standard that provides a framework for methods of assessment of environmental performance of whole buildings (this will become standard ISO 21931: "Sustainability in building construction – Framework for methods of assessment for environmental performance of construction works – Part 1: Buildings"), which will use the information from the EPD as well as other information to assess:

- environmental impacts of the building
- environmental and social aspects of the building
- environmental impacts related to building management
- issues relating to the indoor environment.

The European Committee for Normalisation (CEN) is also developing standards at a

European level to develop "horizontal standardised methods for the assessment of the integrated environmental performance of buildings", following mandate M/350 EN from the European Commission. This work will build on the work of the ISO committees.

The work of ISO and CEN will establish the framework that should be used in the UK for life cycle analysis of materials. This includes the framework for analysis and presentation of information on life cycle impacts of construction materials, but will not allow straightforward comparison of materials. These standards will go on to create a framework for the way whole building environmental assessments are carried out, but with a narrower scope than existing assessment schemes such as EcoHomes. This work will influence the Code for Sustainable Buildings.

7.2.5 Stimulating professional specifiers

Specifiers' choice is influenced by the information available to them on the product performance and cost. There is a shortage of data on sustainability impacts available to specifiers. The Building Research Establishment's (BRE) materials life cycle analysis system (see 7.1.1 Stimulating manufacturers) enables specifiers simply to compare different construction elements on the basis of life cycle environmental analysis (BRE 2000b). Comparable building specifications are given a simplified rating to aid decision making. This approach currently gives information on generic materials but is increasingly being expanded to include real product data from the BRE Environmental Profiles Certification Scheme. The Green Guide to Specification does not yet cover all possible construction elements.

Professional specifiers should be able to understand the impact of materials choices in the context of the whole building performance. The BRE design tool Envest³⁹ enables designers to do this. Professional specifiers can be expected to use complex information to inform their decisions about how to maximise sustainable performance of buildings.

39 <http://www.bre.co.uk/service.jsp?id=52>

Recommendation: Professional choice of construction materials is supported by generic materials information in the short term, and Environmental Product Declarations on all materials in the medium term.

Professional specifiers will need training in the use of this information to compare products and to use in the full assessment of sustainability of a building.

Recommendation: A training pack is developed for professional specifiers of construction materials to raise awareness of labelling schemes and the use of materials information.

The Demolition Protocol (Institute of Civil Engineers 2004) establishes a model to effectively link the resource efficiency of demolition with new build. The Protocol's New Build Recovery Index determines the potential for reusing or recycling demolition waste into the new building, with consideration for performance specifications.

7.2.6 Stimulating consumers and small building firms

Small building companies are mainly influenced by regulation and cost. They do little forward planning, and purchase the materials that are cheap and available on the day. They are unlikely to seek out information on environmental impacts. Similarly the householder carrying out DIY refurbishment is likely to select readily

available and affordable products without actively seeking out information on wider sustainability impacts.

Information on the environmental or sustainability impact of materials is not currently available at point of sale for builders and householders. There is a need for more communication of materials' sustainability by business to consumer. Individual consumers purchasing materials are not likely to carry out a sustainability assessment of their whole building, therefore awareness should be raised of high impact materials that are likely to be used in this refurbishment. The environmental impacts of kitchen worktops and cupboards, internal walls, windows and floors make up a quarter of the total environmental impact of the construction materials of a whole dwelling (BRE 2000b). However, there is no analysis focused on the materials used in refurbishments.

The information presented to individual consumers and builders should be based on the sustainability impacts of sourcing and manufacture of the material, health impacts of the material in use, as well as measures of the performance of the material in use (insulation value, durability). The Government's forthcoming information portal Environment Direct may be a useful route of communication (see Box 10).

Consumers are likely to choose the most sustainable, low impact material if all other materials performance properties (appearance, durability, and cost etc) are equal.

Recommendation: Consumer and small builder choice of construction materials is provided by retailers, supported by

Box 10 – Environment Direct

Defra is currently developing an environmental information initiative 'Environment Direct'. This will be developed to provide clear information to consumers on making good environmental choices about what goods and services to buy, how to use the goods and services, and how to dispose of those goods.

The service should provide simple information to allow people to see the main sourcing and impacts messages, but also detailed information for how to weigh up different impacts.

Environment Direct will work in conjunction with policies such as EU labelling directives and voluntary agreements, which require or encourage businesses to provide similar information. (ERM 2005)

Environment Direct. Information is based on generic materials ratings in the short term and Environmental Product Declarations in the medium term.

7.2.7 Stimulating retailers

The role of retailers in stocking more 'sustainable' materials is likely to increase through the growing corporate responsibility agenda. Retailers using Environmental Management Systems (EMS) will consider the sustainability of the materials they stock. But this will not improve the availability of sustainable materials and provision of materials information sufficiently.

Retailers provide an important interface with consumers. For consumers and builders to change their buying behaviour, retailers and builders' merchants must stock the 'sustainable' products/materials. If low impact materials are specified on large projects, through public procurement, such that builders' merchants choose to respond, then the stock of sustainable products will improve for all purchasers, big and small. There may also be a marginal cost increase associated with the selection of sustainable materials which will act as a barrier to most procurers who choose least cost options.

Retailers should be encouraged to provide simplified information to consumers on key environmental impacts of materials. This may be delivered in partnership with Environment Direct, industry bodies or NGOs.

7.3 Pre-demolition audit and deconstruction planning

Good practice in management of demolition waste requires contractors to consider possibilities for reclamation of products and components, and then recycling materials. This requires planning and assessment of materials removal, consideration of deconstruction techniques and equipment, and management of the materials once removed.

Pre-demolition audits can be used to identify waste and target it at source, and identify key materials and components that will be generated from a demolition project. Audits should be used to plan the deconstruction process, identify costs, identify types and volumes of materials to be produced, and markets and values for those materials. However it is important to plan the additional time into the project to deconstruct rather than demolish the building. Planning deconstruction will enable reduced transport of bulky waste by locating nearby waste reclamation sites in advance. A pre-demolition audit service is offered by the BRE.⁴⁰

The Demolition Protocol (Institute of Civil Engineers 2004) links demolition materials with their use in new build. The Demolition Protocol includes a pre-demolition audit to establish the Demolition Recovery Index (DRI), which quantifies the potential for material recovery from the site. The Protocol's New Build Recovery Index then determines the potential for reusing or recycling demolition waste in a new building. The Demolition Protocol has not been widely implemented to date.

Recommendation: The Demolition Protocol is piloted on a range of projects to assess its suitability for implementation through standards.

7.4 Deconstruction and demolition waste materials

Demolition waste results from demolition of all or part of a building, contributing 10-20% of C&D waste across Europe (European Commission 2001). The Sustainable and Secure Buildings Act 2004 (SSBA) provides the new opportunity for regulations to be made concerning waste from demolition of buildings. Most demolitions require planning permission, and the management/transportation/disposal of demolition waste is then regulated by the Environment Agency. Deconstruction is a process of demolishing a building to maximise the opportunities for reuse of materials – and is

40 <http://www.smartwaste.co.uk/>

thus the better environmental option in terms of the waste hierarchy.

Demolition and deconstruction waste can comprise of:

- strip out waste (internal fixtures and fittings)
- inert waste (concrete, brick, tile, ceramic)
- wood, glass, paper, plastic, metals
- naturally excavated material
- insulation; plasterboard
- mixed waste.

Around 90% of demolition waste is currently recycled in the UK but is largely being down-valued (it may just be crushed and used as hardcore). This is because it is not sufficiently segregated – mixed waste can only be used for low specification uses such as landscaping, whereas segregated waste can be used for high specification applications. There is little potential to reduce total demolition waste, beyond not demolishing a building. However, the method of demolition will greatly influence the quantity and quality of waste that can be diverted from

landfill, and reused in construction – saving a range of other environmental impacts.

Large volumes of C&D waste (around 70%) are made up of inert waste. This can be sorted, crushed and screened to create aggregates for the base material of new concrete if not highly contaminated. Currently much inert material is crushed into a poor quality material as pre-treatment for landfill or for landscaping, which does not replace the use of virgin aggregates.

Timber waste may be reused or sorted and chipped to form chipboard and other processed timber products. If not suitable for these uses, timber waste may be used as source materials for biomass boilers. Some plastics can be cleaned and recycled, although plastic waste on demolition sites is often contaminated and dirty.

In addition, many reprocessors require the plastics to be sorted into polymer type, which is largely impractical on site. Two key streams are window components and plasterboard, and these are discussed in Box 11. Materials that are joined using adhesives, or composites are difficult to separate, and therefore to reuse or recycle.

Box 11 – Refurbishment waste materials case studies: windows and plasterboard.

Windows

6.4 million windows and doors were replaced in 2004. Windows are a key component of refurbishment waste as domestic energy efficiency standards are implemented. Windows are generally replaced before the end of their service life for reasons of aesthetics and energy efficiency. Over ¾ of the window waste predicted for 2020 is glass and PVC. 70% of replacement windows are PVC-u framed. Removed windows are generally landfilled, and there is little segregation of waste other than stripping off metals.

Glass and PVC-u have high potential to be recycled but separation is currently more costly than landfilling and the recycling infrastructure is not developed in the UK.

Plasterboard

In 2005, new waste acceptance criteria have been introduced to require that waste with a high sulphate content has to be segregated or disposed of in a high sulphate mono-cell at landfill which increases the cost of landfill options. Plasterboard has a high sulphate content.

Plasterboard already has 36% recycled content as standard, but 98% is possible. The new waste acceptance criteria has encouraged new development in plasterboard recycling infrastructure.

Plasterboard waste from refurbishment and demolition is likely to be contaminated with screws and paints, which makes it more difficult and costly to recycle. There is currently insufficient data on refurbishment waste streams to support recycling industry investment decisions.

Recommendation: Provide demolition contractors with training on waste issues to enable separation of waste streams for reuse and recycling. Use the planning system to encourage deconstruction rather than demolition of buildings.

Any demolition that is carried out as part of a government funded programme should use best practice in maximising the recycling and reuse of demolition waste.

7.5 Construction waste materials

Construction waste results from over-ordering, off cuts, damaged materials and packaging and other causes. This constitutes 40-50% of C&D waste across Europe (European Commission 2001). This suggests that a high proportion of all the materials that enter a construction site leave again without having added value to the process.

Construction waste is benchmarked at 5-16 m³ of waste to landfill per 100m² floor area developed (Constructing Excellence 2001). However, this indicator is based on limited data. There is no data currently available that benchmarks waste generated from refurbishment or that identifies the main materials waste streams. Defra is currently developing waste benchmarks across construction, refurbishment and demolition projects across the UK. This information will be useful in establishing standards.

Construction waste may be reduced through better design and construction management practices. Site management practices determine the quality of spare and off cut materials, and access to them, and therefore the potential for reuse and recycling of waste.

Over-ordering is a key cause of waste materials, and is driven by construction programme and cost pressures. Lean construction techniques contribute to improving efficiency, creating a closer relationship between the ordering, delivery and installation of materials and reducing spoiling of materials. Promoting a 'use or take back' scheme or reverse

logistics will encourage better storage of these materials, and will prevent waste. In addition, the principles of Lean Construction also aid in minimising waste such as consolidation centres and just-in-time delivery.

Recommendation: Government works with retailers to encourage development of 'use or take back' schemes from small and large sites.

Good practice in site waste management may be implemented at low cost, with significant cost savings in relation to waste disposal. A waste minimisation and auditing procedure implemented at Greenwich Millennium Village resulted in construction waste reductions of 50% and cost savings of £150,000.⁴¹

A programme of reducing construction waste impacts would include raising awareness and training at all levels, identifying opportunities to reduce waste generated, and implementing waste management strategies and a process of targeting and evaluation of waste minimisation.

Site waste management plans (SWMP) being developed by Defra following the passing of the Clean Neighbourhoods and Environment Act 2005 will address construction site waste management. The SWMPs will require developers and contractors to account for all waste and encourage thorough consideration of waste management options, including recycling and reuse. This will contribute to minimising the risk of fly tipping and associated costs. Current proposals suggest this may be implemented through the planning system, however this will not 'catch' all domestic refurbishments or demolition activities which do not always require planning permission. The Building Regulations may also be an appropriate means of delivering good practice in construction site waste management.

Recommendation: Government considers how Site Waste Management Plans will be applied to include small domestic refurbishments.

⁴¹ www.smartwaste.co.uk/smartaudit/downloads/gmv_Site_Guide.pdf

7.6 Overcoming barriers

7.6.1 Awareness

On many construction sites, there is little awareness of construction and demolition waste issues, or the existing good practice that could be applied. Contractors are often paying significant costs for waste disposal and are not aware of the savings that could be made. This is particularly likely to be the case on small sites including refurbishments where many site operatives may be unskilled and opportunities for training are very limited.

Awareness of separation of materials may be improved by introducing colour coding of skips in the same way as WRAP are promoting the use of colour coded recycling bins in schools and the work place (see Figure 11). Although construction skips are often coloured with the company colour for branding, there is potential to use colour coding to raise awareness and promote good recycling behaviour on site.

Contractors need to be aware of the opportunities and markets locally for reuse and recycling of their C&D waste. Information on the local market for these materials is not always readily available to contractors. There is a role for local authorities to provide this local information to site operatives/managers when giving planning permission or when a Building Control Officer visits the site. This could be based upon the BRE's tool BREMAP⁴², which is a web based Geographical Information System (GIS).

Recommendation: Local authorities provide information to building sites on local materials reclamation sites and local markets for reused or recycled materials.

7.6.2 Small refurbishment sites

The waste from small-scale refurbishments can result in nuisance fly tipping, causing local environmental quality problems for neighbourhoods. There is insufficient information available regarding recycling of construction waste at a domestic refurbishment level and insufficient awareness in the refurbishment construction industry.

There is great scope to improve domestic refurbishment waste management. On a small scale it may also be easier to sort waste than on large sites but it is harder to reach the economies of scale that make it worthwhile separating, storing and transporting waste for a variety of waste streams.

Training is required to raise awareness of the issues surrounding waste and landfill. An example of an existing training scheme for small sites is outlined in Box 12.

Recommendation: Government works with retailers to inform small building firms and DIY consumers about waste issues, good practice in waste management including local recycling and reuse options, industry take-back schemes, and highlights penalties for fly tipping.

Box 12 – Case study: Kotuku construction resource efficiency training

Kotuku⁴³ is a London based organisation promoting sustainable materials use and waste management on small construction sites. Following research into the attitudes and awareness of site operatives as well as clients, contractors, professionals and merchants, the organisation has developed a resource efficiency training package.

The organisation delivers good practice training for free to SME builders' firms on building sites. The training is designed to be engaging and accessible, for example during tea and lunch breaks. Training is endorsed by the Construction Industry Training Board.

⁴² <http://www.bremap.co.uk/bremap/about.jsp>

⁴³ www.kotuku.org

Recommendation: Government increases support for construction site training on waste issues and good practice through ‘toolbox talks’.

Builders in some urban areas currently have to pay to suspend parking bays for skips, which is expensive, therefore they are likely to have the minimum number of skips, and will not segregate waste. Local authorities could trial ‘free parking’ for storage of recycled materials, and full price for residual waste skips.

Recommendation: Government considers introducing incentives to small building firms to separate waste and encourage reuse and recycling, with a pilot trial in 2006.

7.6.3 Cost

The costs of new materials and the costs of disposal are still not high enough to stimulate the recycled/reused materials markets. The costs of landfill, including landfill tax, remain low compared to more sustainable alternatives and waste disposal costs represent a relatively small proportion of business operating expenses (Strategy Unit 2002). The medium term Landfill Tax rate of £35/tonne may be sufficient to drive change.

The waste Duty of Care requirements (legislation resulting from the Environmental Protection Act 1990) add to the cost of using recycled and reused materials. Any recycle will be classified as waste until it is actually used as a recycled material.

WRAP has been involved in a pilot initiative of reduced gate fees for small construction companies at materials reclamation facilities (MRFs).

7.7 Delivering the savings: Building Regulations

At present materials are barely covered in the Building Regulations except by Regulation 7, which requires building work to be carried out with adequate and proper materials, in a workmanlike manner. There is very little further detail provided, and Regulation 7

does not lend itself to being extended to include wider materials sustainability issues. The Building Regulations do not currently cover construction or demolition waste, and do not establish standards for construction or demolition processes, concentrating the building performance in operation.

The Sustainable and Secure Buildings Act (SSBA) enables Building Regulations to be made for the purposes of furthering sustainable development, and materials and waste have been identified in this study to be of considerable importance within the sustainable development agenda. The SSBA promotes the use of a closed loop of recycling and reuse of materials at the end of a building’s life, and the use of recycled and reused materials in construction.

The Scottish Building Standards include a regulation on demolition requiring:

- all service connections to the building to be properly closed off and neighbouring buildings to be left stable and watertight
- the demolition site to be graded and cleared or securely fenced following demolition.

We propose that a new Approved Document is needed to provide guidance on materials’ use in construction, and on waste in construction and demolition. We recognise that this is a departure from the normal use of Building Regulations, but consider that it would be an appropriate framework to deliver improvements. The existing AD Part D addresses toxic substances, but we consider it inappropriate to extend this to cover the health impacts of a wider range of materials.

Recommendation: A new Building Regulations Approved Document is created that will cover materials use in building works, waste in demolition, and potentially waste in construction.

This new Building Regulation should promote closed loop resource use. This AD could be developed to set standards for:

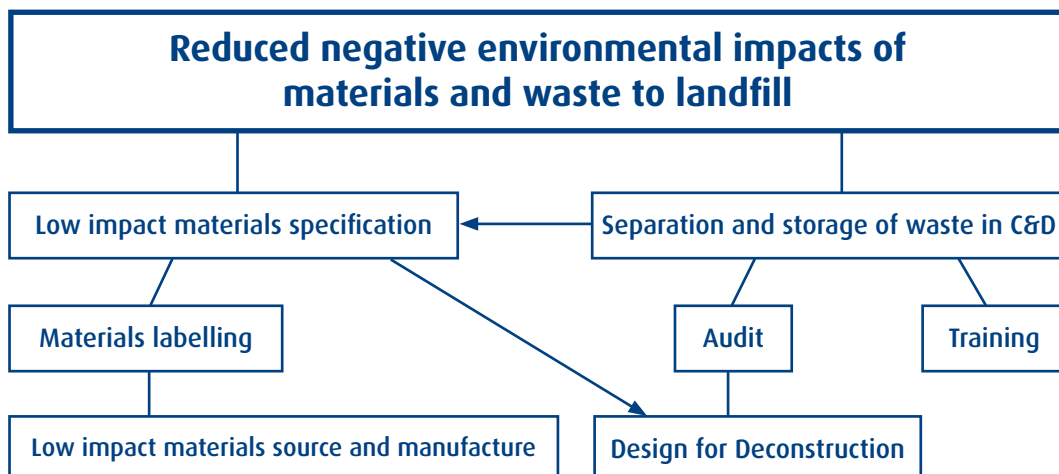
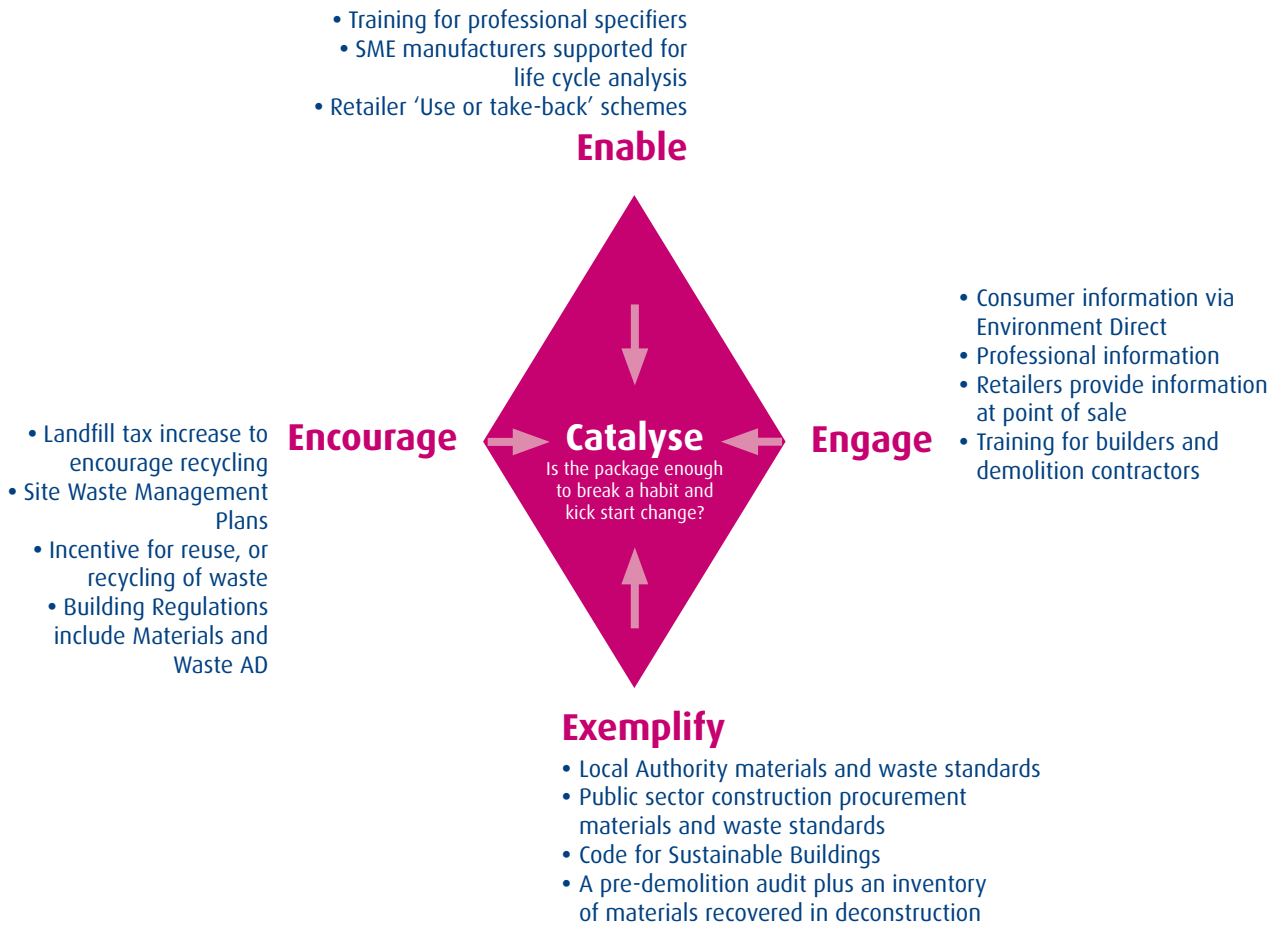
- a pre-demolition audit plus an inventory of materials recovered in deconstruction
- determining the potential for reusing or recycling demolition waste into the new building

- designing for deconstruction
- planning for deconstruction at end of life
- an inventory of materials used and their impacts (based on the generic product life cycle analysis, followed by product specific Environmental Product Declaration)
- minimising environmental impact (potentially based on BRE's ecopoints/ m² of building floor area)

- minimising construction waste and good practice in site waste management.

7.8 Summary

The diamond model below summarises the key policy recommendations for reducing environmental impacts of materials and construction waste. The chart shows the steps that need to be taken to deliver change.



8. Household waste

The treatment and disposal of household refuse creates significant environmental impacts in the UK. Most of the household waste generated in the UK is sent to landfill – a process that contaminates large areas of land, and generates greenhouse gases. A national strategy of ‘reduce, reuse, recycle’ is promoted to achieve national targets. Current policies for household waste are listed in Annex B: The Policy Context.

Household waste generation results from activities in the home and may be influenced by occupant behaviour as well as provision of facilities for recycling and composting. Household waste accounts for 8% of UK waste generation (Defra 2003a) (See Figure 9). In 2004, the national recycling target of 17% was met, and indicative figures for 2005 suggest 23% of waste has been recycled. Adopting the measures promoted in this report could cut household waste to landfill by around 50%.

Currently, total household waste generated is increasing in the UK,⁴⁴ and waste to landfill is not being reduced. Sustainable development will not be achieved through recycling alone and measures to reduce total waste arisings through change in consumption patterns are

also vital, but beyond the scope of this report.

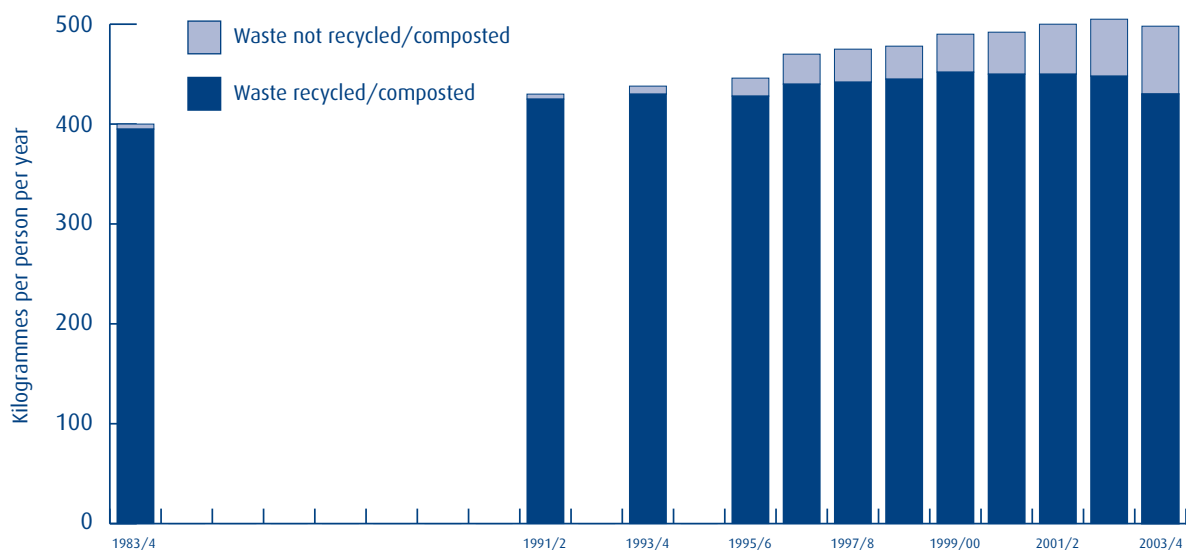
Opportunities to reduce waste and increase recycling include provisions for recycling and composting waste, which may be addressed at the building level. Sustainable waste management, through provision of recycling facilities, should be promoted in new and refurbished buildings, along with the provision of information on recycling and composting. Refitting kitchens in existing buildings, where much waste separation and storage is sited, can improve recyclable materials storage.

The Government’s Sustainable Communities plan provides an opportunity to innovate and “design in” waste separation and recycling facilities into new homes and communities. Urban areas perform poorly on household waste recycling and composting. However best practice in designing for sustainable household waste management is not well defined and urgently needs further research.

8.1 Household waste recycling and composting

Recent reports suggest that the UK’s recycling rates are increasing in line with targets and this

Figure 9 – Household waste and recycling (Defra 2003b)



⁴⁴ Between 1999-00 and 2003-4 household waste per person increased by 1.4 % per year, with each person generating half a tonne on average. (Defra, ONS 2005)

Table 7 – Proposed recycling/composting targets (Friends of the Earth 2005)

	Defra Waste Strategy 2000	Strategy Unit	House of Commons EFRA Committee	Friends of the Earth
2010	30	-	50	50
2015	33	45	60	75

is very encouraging. However each year the targets increase, and new and innovative ways have to be found to encourage greater numbers of people to recycle greater proportions of their waste. Recycling and composting targets for the UK appear to plateau at around 33% when studies suggest that this could be increased to at least 45% (see Table 7).

Improving household recycling requires householder behaviour change. This is a complex issue which requires a coherent framework of policy interventions. Households currently pay the same Council Tax no matter how much waste they produce or recycle. This means that they currently have no incentive to manage their waste sustainably. Householders need to be made aware of the issue, and how it relates to them, they need to have facilities provided to make it easy for them to recycle or compost waste and need to feel that recycling of waste is the ‘norm’.

Recommendation: Government raises household recycling and composting targets for 2010, 2015 and 2020.

Recycling and composting can be stimulated through incentives and disincentives. Incentive schemes have been piloted in local authorities across England, and Defra has recently launched a £3.5million major pilot of 50 incentive schemes for waste minimisation, recycling and composting. The incentive schemes are based on developing community league tables with rewards to the leading community, lottery-style prize draws, household performance rewards

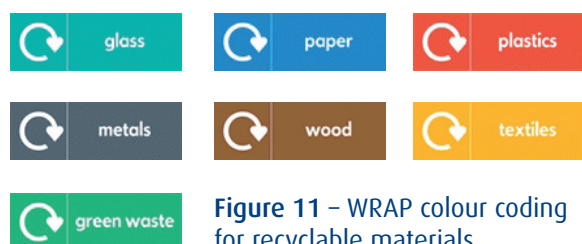


Figure 11 – WRAP colour coding for recyclable materials

and awareness raising schemes. Previous pilots of incentive schemes have been poorly monitored and evaluated, but suggest that financial incentive schemes may offer greatest and fastest success.

Recycling practices may be influenced further by promoting continuity between work place/school and home. WRAP has developed a national colour coding scheme to promote consistent recycling facilities (see Figure 11).

A colour coded recycling bin scheme should be rolled out nationally.

Recommendation: Government reviews success of WRAP colour coded bin scheme and considers national roll-out across all sectors.

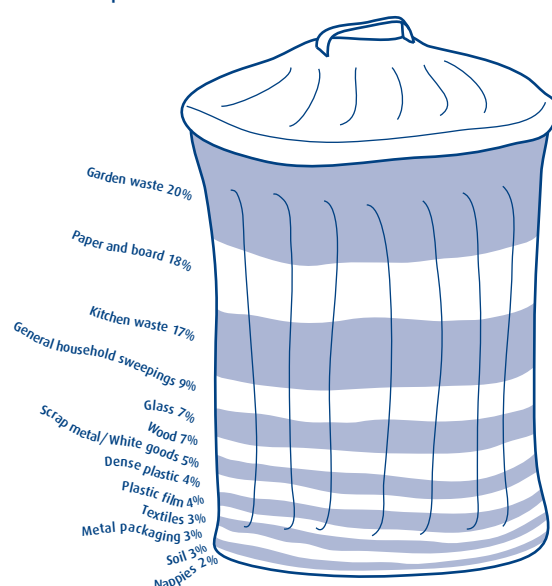
However, waste management and recycling is a sensitive issue for communities as it relates to hygiene and may impact on activities within the home. It is important that recycling and composting schemes are developed with consideration of public acceptability and in full consultation in order to establish what will work well for different members of the community. Schools may be good routes to communicate with ‘hard to reach’ households through recycling awareness programmes in the curriculum. Further communication with communities may be achieved via Environment Direct, and by working with supermarkets and other retailers.

Recommendation: Government considers delivering recycling communication in partnership with schools and supermarkets through Environment Direct

8.1.1 Dry recyclables

Dry recyclables includes paper, card, glass, metals and plastics. The introduction of kerbside collection of recyclable wastes by waste

Figure 10 – Household waste composition
(Strategy Unit 2002)



collection authorities has had a positive impact on recycling levels in the UK. For the first time, England achieved its national recycling and composting target (of 17 per cent) in 2003/04, with the South East and Eastern regions leading with 19.5% recycling, and the North East lagging at 6.6%.

Research suggests that where local authorities currently provide a recycling service for a wide range of recyclate streams there is high participation. The Household Waste Recycling Act requires all local authorities to collect 2 types of recyclate by 2010 (except where it is not cost effective: potentially in

rural areas or tower blocks where an alternative service should be provided). This will improve standardisation of recyclate collection across the country. However, the Act does not require that recyclates are collected weekly which may lead to potential storage issues.

Providing services for collection of recyclates should ensure that it is as simple for householders to recycle as to dispose of residual waste.

Packaging waste is an issue for household waste streams. Reducing packaging waste may be achieved through raising awareness in order to influence purchasing choices. WRAP is

Box 13 – Case Study: RoWAN Waste Free Households project

A project run by Ross-shire Waste Action Network (RoWAN) in Scotland supported households in reducing their waste to landfill by providing education and awareness raising.

Households undertook to collect 13 months of household waste data and record their waste behaviour. The project was self-selecting and attracted people who already were already motivated in waste reduction, but it showed that significant additional improvements were possible.

Results of the project showed that landfill decreased by 58%, total waste arisings reduced by 22% and recycling rates increased from 35% to 49%. Household data showed behavioural changes with quantifiable effects on waste, ranging from waste avoidance to increasing recycling and composting. This project demonstrates the major contribution that targeted education and support can make, to attaining the goal of domestic waste reduction and in changing behaviour and lifestyle.

working collaboratively with supermarkets to reduce packaging waste.

8.1.2 Organics

The reduction of the organic stream of household waste to landfill is vital to achieve the requirements of the EU Landfill Directive. However recycling of food and garden waste in the UK is largely carried out by home composters with some kerbside collection of garden waste; there is little experience of kerbside collection of kitchen waste.

A pilot scheme in west London (the Recycling Organics in West London project Waste Recycling Environmental (WREN) Ltd. 2004) found that around 0.5kg/household/week could be collected from around 18% of residents. But composting has negative associations for many householders and any programme must be supported by a communications campaign giving clear unambiguous instructions and employing face-to-face promotional methods.

Improving composting rates requires identification of good practice for home composting that includes safe storage and is acceptable to all sections of the community.

8.1.3 Building design

The British Standard relating to space standards for waste infrastructure (BS 5906) is currently being updated. The standard is currently set at 0.8m³ of external waste storage space per dwelling. There is currently no standardised guidance regarding optimal provision of facilities (particularly indoor) to promote household recycling.

Facilities should be provided at point of waste generation (i.e. in the kitchen for much food, glass and metal waste) in order that it is separated at source. Further storage should be provided externally for collection. In multiple occupancy buildings, design guidance should consider centralised waste storage and transfer if appropriate.

Research by BRE suggests that to encourage a 25% recycling rate, three internal storage bins (for paper/cardboard, plastic, glass and metals) should be provided with a minimum

total capacity of 30 litres and no individual bin smaller than 7 litres. Bins should be in a dedicated position in the kitchen or in an adjacent room with easy access. Three external recycling bins should also be provided with a minimum total capacity of 180 litres and no individual bin smaller than 40 litres. These should also be in a dedicated hard-standing position within 10 metres of the external door (cited in Environment Agency 2005c).

Internal space provision is decreasing in new housing developments, which means less space for recyclable materials separation and storage.

8.1.4 Blocks of flats

There are variations in recycling rates by housing type and between rural and urban areas. Local authority performance for recycling and composting shows recycling rates vary from 46% maximum to below 5% at the least (Defra 2005d). An initial review of the data suggests that at least 12 of the 14 poorest performing authorities are in urban/metropolitan areas, whereas the 14 top performing authorities are predominantly rural.

Potential reasons for the disparity include the difficulty of collecting recyclables from high rise buildings, higher urban black and ethnic minority (BME) communities who have not been targeted with specific promotional campaigns, and the fact that many urban councils have other higher priorities than recycling. Further research is required to understand what barriers or drivers are determining these variations and how poor performing sectors may be supported to improve recycling and composting.

Recommendation: Government researches the drivers determining the variations in recycling rates in urban and rural areas, and develops policies to support increased recycling in urban areas.

There is little properly audited evidence about the performance of flats recycling initiatives. Purpose-build-blocks of flats cannot generally offer kerbside collection facilities. Research suggests that the most important issue for high rise residential buildings is the provision of convenient and reliable recycling infrastructure

Box 14 – Attitudes to recycling

A survey by the Environment Agency (2002) reported encouraging data on public attitudes to recycling:

- if councils provided and collected containers for recycling, 90% of respondents said they would be certain or very likely to sort their waste
- 55% consider that it is their responsibility to sort their own waste
- 74% of respondents would support a deposits scheme for returning bottles and containers run by supermarkets
- 60% of respondents would support a charging scheme for unsorted waste if containers were provided for recyclable waste.

(Safe Neighbourhoods Unit 2005a). Without this, little recycling is likely to happen. Secondly, there is a need for sustained communications through estates newsletters, tenants associations and doorstepping. Progress towards targets should also be fed back through these routes.

The provision of space for recycling in blocks of flats is generally significantly less than the facilities provided for street level properties. Provision in communal containers varies widely. The most effective infrastructure for recycling is either 'bring' containers co-located with communal refuse containers, or door-to-door collection where refuse is disposed of in chutes (Safe Neighbourhoods Unit 2005b).

8.2 Overcoming barriers

Barriers to recycling include householder apathy, lack of information on recycling options, and lack of recycling facilities or service. However, research suggests that people would respond well to the provision of facilities if recycling were made easy (see Box 14). There is little popular understanding of where waste goes, and cynicism about whether recyclates are actually eventually landfilled. Recycling generally has a low profile politically.

A campaign to promote recycling across the UK should provide information regarding:

- the recycling processes themselves (the EA survey reported that 24% of respondents think that waste sorted for recycling doesn't end up being recycled)
- doorstep collection services (which waste streams should be put out for recycling: when and how)

- local recycling centre locations (for all further recyclable/compostable waste streams)
- simple guidance on composting and
- regular progress updates on meeting recycling targets.

Recommendation: Local authorities take a leading role in developing sustained and locally specific information campaigns.

Research by WRAP found that many BME households would be willing to participate in recycling schemes but may feel excluded from mainstream programmes. Additionally the study found that where there is non-participation in recycling schemes does not mean lack of engagement in recycling; "the type of materials generated within households may differ within certain ethnic groups, for example Asian households buy more fresh food than the white majority and are likely to use fewer cans and bottles so may not use their kerbside collection as they produce few of the materials collected" (WRAP 2005). However, another study found very little variation in composition of waste produced by different ethnic groups (cited in Safe Neighbourhoods Unit 2005a). The report recommends a long term programme including communication with consideration of language barriers and establishing a relationship through community groups.

8.3 Delivering the savings: Building Regulations

Household waste is currently covered in the

Building Regulations Approved Document H which includes a requirement for provision of indoor storage space for storage of separated recycled materials up to 0.25m³, and provision of and access to individual or communal waste containers.

There is no provision under the Sustainable and Secure Buildings Act 2004 to apply Building Regulations to existing homes to improve management of household waste. As there is no available good practice guidance on the optimal provision of facilities within the home for recycling, it would be appropriate to carry out research in this area to establish whether the standards in the Building Regulations are satisfactory, and to inform development of the Code for Sustainable Buildings.

Recommendation: Government reviews best practice in provision of facilities in the home for recycling and composting, (with particular consideration of high density housing) with a view to reviewing the Building Regulations Part H if necessary.

New housing developments should consider planning for its own waste management infrastructure.

Recommendation: Government reviews best practice in design of waste management infrastructure at a community scale.

8.4 Delivering the savings: Incentives and disincentives

Policies to enable recycling can no longer increase recycling rates. Facilities provision and communication need to be backed up with a price signal.

Householders currently pay a fixed charge as part of their Council Tax. The Environmental

Protection Act 1990 does not allow householders to be charged according to the amount of waste that they produce. It is however possible to reward the householders for reducing the waste they produce or for increasing the amount of recyclables they separate out; this can be implemented at the local authority level. This could be an effective measure with personal gain being one of the main motivators behind changes in behaviour patterns.

Financial incentives should be introduced at local authority or national level. Defra is currently piloting schemes to incentivise people to recycle and reduce waste. The results should be broadly disseminated and used to inform policy.

Recommendation: Local Authorities take a leading role in developing local recycling and composting incentive schemes following the Defra pilot.

The London Borough of Barnet has established a compulsory recycling scheme, which includes penalties for putting recyclable waste in the residual waste bin. The unusual scheme has been implemented through Section 46 of the Environmental Protection Act 1990,³³ although no penalties have yet been awarded, and it is extremely difficult to prove responsibility for non-compliance. This may be a positive model to roll out more widely.

Many countries operate a scheme to charge households for the unseparated waste they produce that can not be recycled. A 'pay as you throw' charge to households would send a strong signal to households and would be a powerful way to increase recycling rates. We propose that local authorities should be given the power to charge for unseparated waste from at least 2010 when all local authorities must have in place the facilities to collect separated waste for recycling.

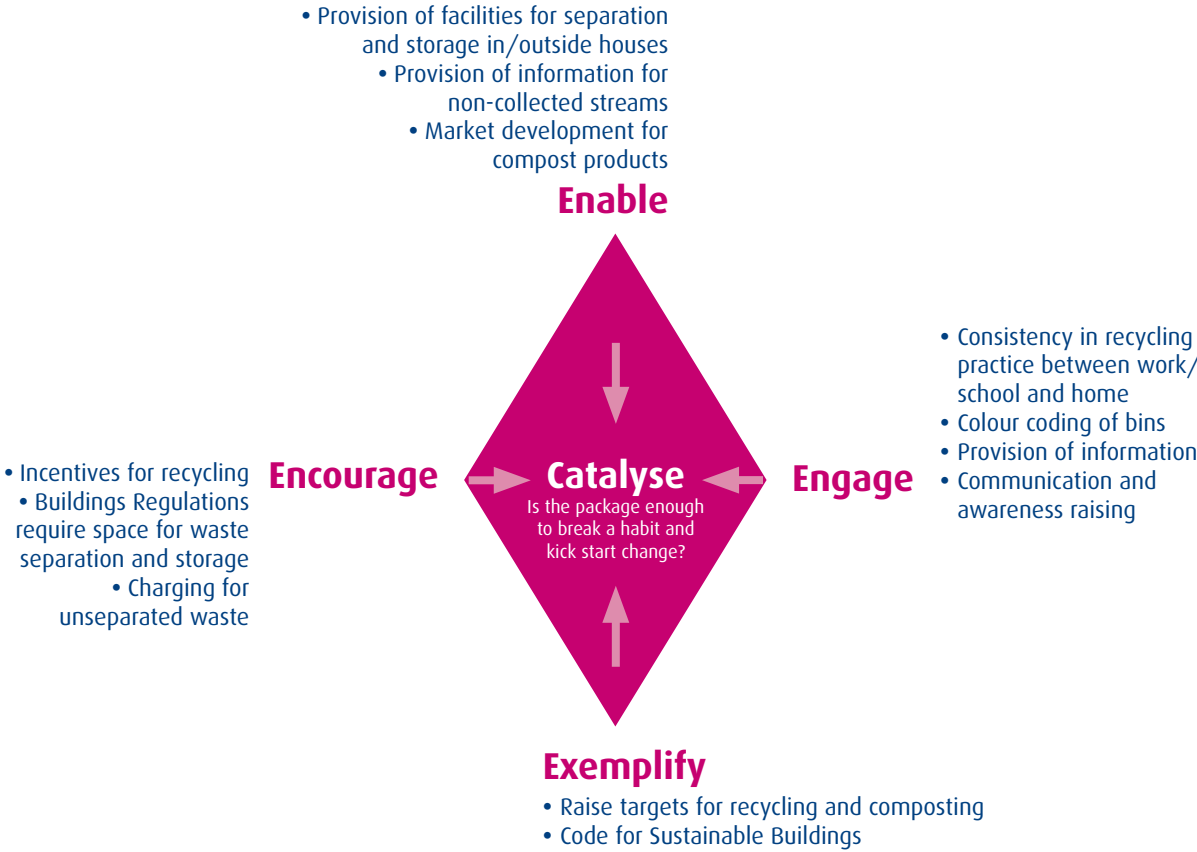
45 (1) Where a waste collection authority has a duty by virtue of section 45(1)(a) above to arrange for the collection of household waste from any premises, the authority may, by notice served on him, require the occupier to place the waste for collection in receptacles of a kind and number specified.

(2) The kind and number of the receptacles required under subsection (1) above to be used shall be such only as are reasonable but, subject to that, separate receptacles or compartments of receptacles may be required to be used for waste which is to be recycled and waste which is not.

(6) A person who fails, without reasonable excuse, to comply with any requirements imposed under subsection (1), (3)(c) or (d) or (4) above shall be liable on summary conviction to a fine not exceeding level 3 on the standard scale. (Environmental Protection Act 1990)

Recommendation: Government amends legislation to allow local authorities to charge households for unseparated waste by 2010.

8.5 Summary
The diamond model summarises the policy recommendations to deliver a reduction in household waste to landfill.



9. Conclusion

This study has identified the need for Government policy to focus on the existing stock because of the volume of properties and the significant environmental and social benefit that will derive from the range of policy interventions that we are recommending. The technical solutions are well known and simple, and many have reasonable payback times. However, a number of barriers exist which mean that these improvements are not being delivered fast enough and therefore further intervention is needed.

We have identified several themes for future action:

- the role of Regulations and Standards in setting the baseline
- Encouraging householder awareness and engagement
- The need for future research
- The need for rigorous implementation of all our policy recommendations

Standards

Households and the environment must be protected to a reasonable level by regulations or industry standards to ensure that all households can afford sufficient resources for comfort and health, without causing profligate consumption and environmental damage.

The Building Regulations provide a strong policy framework for delivering standards for homes, and the Sustainable and Secure Buildings Act allows some of these regulations to be applied to existing homes, and allows standards to be set for a wider range of sustainability issues.

The SDC would welcome further engagement with the Building Regulations Advisory Committee Working Party on Sustainability to discuss our findings and the implementation of the Sustainable and Secure Buildings Act.

Householder awareness and engagement

Householder interest in their homes is high, especially among owner occupiers. People are interested in the sustainability of homes and respond well to information on the performance of their own home, especially audits and smart meter feedback.

As the physical efficiency of homes improves, the impacts of householder behaviour will increase in significance. Behavioural impacts on resource efficiency such as 'water awareness' or the ownership and use of electronic goods are considered a cause for concern. Government policy has not previously engaged with consumer behaviour nor used levers to engage consumers towards more sustainable behaviour.

We recommend a major campaign of providing information and advice to consumers that will raise awareness and enable consumers to make sustainable choices. Such a campaign must be a two-way process, backed up by feedback on progress. The Government should ensure that all regulation and incentives are delivered with full consumer engagement.

Future Research

There are a number of areas where we found the evidence base to be incomplete. In these cases we have recommended that further research is carried out to establish best practice, or costs and benefits, in order that policy can be made with full recognition of the advantages, both short and long term.

For water efficiency, the business case for water companies to implement demand management is not fully established, but it would be precautionary to establish further water efficiency in regulation and in the Code for Sustainable Homes as the benefits to households and the environment are clear.

Implementation

In order for these recommendations on existing housing to be implemented, a new focus on improving the sustainability of the existing housing stock should be established within government and the remit for local communication delivery given to an independent body.

For our recommendations on the implementation of the Sustainable and Secure Buildings Act to be delivered, the ODPM needs to embed sustainability at the heart of the Building Regulations and use sustainable development as the central organising principle in developing standards in the future.

Our recommendations regarding a Code for Sustainable Buildings for the existing housing stock will create a powerful framework for communicating, incentivising and delivering higher standards in resource efficiency in the existing housing stock. We would welcome the opportunity to be involved in the development of these standards.

The recommendation to set a short term target to deliver new housing with commensurate improvements in the existing stock will require an understanding of the existing communities, and where the opportunities lie for technical measures and the capacity in relevant bodies to deliver the measures. The SDC would be keen to help with further researching this proposal if accepted.

This report will provide timely input into the cross-departmental review into improving resource efficiency in existing buildings and we look forward to ongoing engagement in this initiative.

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UK HECA Forum 2004, HECA Officers' views of the future of HECA. Final report on a consultation survey

Waste Recycling Environmental (WREN) Ltd. 2004, Recycling Organics in West London project.

Water Regulations Advisory Committee 2002 A review of the enforcement of the Water Supply (Water Fittings) Regulations 1999 from 1 April 2000 to 31 March 2001

Water Regulations Advisory Committee 2003 Follow up to WRAC's review of the enforcement of the Water Supply (Water Fittings) Regulations 1999

Water UK, Environment Agency 2001, Water efficiency awards.

Water UK, 2004 Saving Water

Water Voice 2004, Policy Statement: Metering

WRAP 2004, Opportunities to use recycled materials in house building

WRAP 2005, What is recycled content in construction? Resource Sheet 6

WRAP 2005b, Engaging black and minority ethnic communities in recycling activity

Annex A: The Approved Documents of the Building Regulations

Summary of analysis of the Approved Documents and Sustainable Development, including potential for incorporating further measures to promote sustainable development.

Approved Document	Sustainability issues and recommendations for additions
AD Part A: Structure	Materials use
AD Part B: Fire Safety (2002)	Water consumption of sprinkler systems, pollution to land, air and water of fire incidents, property protection.
AD Part C: Site Preparation and Resistance to Moisture (2004)	Resistance to climate change (heavier rainfall and flooding), brownfield land and land remediation issues. Add: flood resistant design standards.
AD Part D: Toxic Substances (1992)	Control of toxic fumes from UF insulation foams.
AD Part E: Resistance to the Passage of Sound (2004)	Health and wellbeing for occupants, enabling higher density living.
AD Part F: Ventilation (2005 Interim)	Health and wellbeing of occupants. Add: indoor environmental quality – control of pollutants from construction materials, daylight.
AD Part G: Hygiene (1992)	Health and safety Add: water conservation - if not covered in Water Supply (Water Fittings) Regulations to include standards for remotely read water meters, water efficiency, performance standards for water recycling systems.
AD Part H: Drainage and Waste Disposal (2002)	Sustainable drainage systems, recycling/reuse of rain water and grey water, control of pollution of water courses, facilities for recycling/composting waste. Add: requirement for separate sewers (storm and foul) to avoid overloading; performance standards for water recycling systems; increase standards for household waste (recycling and composting) storage.
AD Part J: Combustion Appliances and Fuel Storage Systems (2002)	Control of pollution of water and soil from fuel storage, control of pollution to air from products of combustion.
AD Part K: Protection from falling, collision and impact (1998)	Health and safety of people in and around buildings. Stairs are ‘biggest killer’ in UK households ⁴⁶ but necessary for high density housing.

⁴⁶ Source: personal communication with ODPM

AD Part L: Conservation of Fuel and Power (2005 Interim version)	Energy efficiency of new and existing housing stock. Add: consequential works for existing homes; improved standards for 'passive cooling' of homes (new and existing) to avoid energy consumption from cooling; promotion of CHP and microgeneration; standards for smart meters for new homes.
AD Part M: Access to and Use of Buildings (2004)	Accommodating changing lifestyles and circumstances in buildings. Add: standards for access to housing, including accessibility for visitors
AD Part N: Glazing – Safety in relation to Impact, Opening and Cleaning (2000)	Health and safety of people in and around building. Potential to combine this AD with Part K.
AD Part P: Electrical Safety (2005)	Safety of people in the home.
New AD: Construction Materials and Waste	Standards for pre deconstruction audit, Standards for use of the Demolition Protocol New Build Recovery Index; Environmental and social standards for materials sourcing, using life cycle analysis; (potentially based on BRE's Ecopoints/m2 floor area), Standards for implementing design for deconstruction principles (including an inventory of materials and deconstruction plan for end of life).

The following pages list the Building Regulations Approved Documents in detail with explanation of relevant sustainability issues.

AD Part A – Structure (2004)

AD Part A covers structural requirements of buildings, to ensure they are structurally safe.

Relevant sustainability issues

Durability of structure and materials through suitable use, detailing and construction methods. Existing buildings – there may be a role to provide guidance on assessment of structural capacity for refurbishment/reuse although ICE and I Struct E already provide some guidance.

Current Regulation

Loading

A1. (1) The building shall be constructed so that the combined dead, imposed and wind loads are sustained and transmitted by it to the ground - (a) safely; and (b) without causing such deflection or deformation of any part of the building, or such movement of the ground, as will impair the stability of any part of another building. (2) In assessing whether a building complies with sub paragraph (1) regard shall be had to the imposed and wind loads to which it is likely to be subjected in the ordinary course of its use for the purpose for which it is intended.

Ground Movement

A2. The building shall be constructed so that ground movement caused by : (a) swelling, shrinkage or freezing of the subsoil; or (b) land-slip or subsidence (other than subsidence arising from shrinkage), in so far as the risk can be reasonably foreseen, will not impair the stability of any part of the building.

Disproportionate Collapse

A3. The building shall be constructed so that in the event of an accident the building will not suffer collapse to an extent disproportionate to the cause.

AD Part B: Fire Safety (2002)

AD Part B covers the fire safety requirements of buildings including means of warning (fire alarms etc) and means of escape (protected corridors, fire stairs) as well as how materials should be used to inhibit the spread of fire within the building and to the structure and to adjacent buildings and the provision of facilities for the fire service.

Relevant sustainability issues

Property protection for buildings (currently not covered, £6bn due to fire losses per year) through prevention and protection.

Environmental/health impacts of fire (water run off, air pollution)

Water consumption of sprinkler systems, including during testing.

Current Regulation

Means of warning and escape

B1. The building shall be designed and constructed so that there are appropriate provisions for the early warning of fire, and appropriate means of escape in case of fire from the building to a place of safety outside the building capable of being safely and effectively used at all material times.

Internal Fire Spread (linings)

B2.- (1) To inhibit the spread of fire within the building, the internal linings shall- (a) adequately resist the spread of flame over their surfaces; and (b) have, if ignited, either a rate of heat release or a rate of fire growth, which is reasonable in the circumstances. (2) In this paragraph internal linings means the materials or products used in lining any partition, wall, ceiling or other internal structure.

Internal fire spread (structure)

B3.- (1) The building shall be designed and constructed so that, in the event of fire, its stability will be maintained for a reasonable period. (2) A wall common to two or more buildings shall be designed and constructed so that it adequately resists the spread of fire between those buildings. For the purposes of this sub-paragraph a house in a terrace and a semi-detached house are each to be treated as a separate building. (3) To inhibit the spread of fire within the building, it shall be sub-divided with fire-resisting construction to an extent appropriate to the size and intended use of the building. (4) The building shall be designed and constructed so that the unseen spread of fire and smoke within concealed spaces in its structure and fabric is inhibited.

External fire spread

B4.- (1) The external walls of the building shall adequately resist the spread of fire over the walls and from one building to another, having regard to the height, use and position of the building. (2) The roof of the building shall adequately resist the spread of fire over the roof and from one building to another, having regard to the use and position of the building.

Access and facilities for the fire service

B5.- (1) The building shall be designed and constructed so as to provide reasonable facilities to assist fire fighters in the protection of life. (2) Reasonable provision shall be made within the site of the building to enable fire appliances to gain access to the building.

AD Part C: Site Preparation and Resistance to Moisture (2004)

AD Part C covers the requirements for foundations, (ground drainage, damp proof courses, protection from radon) and overall building resistance to moisture.

Relevant sustainability issues

Health and safety: health risk of radon and contaminants

Climate change: building resistance to changing rainfall intensity

Emissions: guidance on retrofitting cavity wall insulation

Transport: reduction in transport through onsite contaminated land remediation (not 'dig and dump')

Land use: guidance on using brownfield land reduces impact on greenfield landscape and biodiversity.

Current Regulation

Site preparation and resistance to contaminants and moisture

Preparation of site and resistance to contaminants.

C1. (1) The ground to be covered by the building shall be reasonably free from any material that might damage the building or affect its stability, including vegetable matter, topsoil and pre-existing foundations.

(2) Reasonable precautions shall be taken to avoid danger to health and safety caused by contaminants on or in the ground covered, or to be covered by the building and any land associated with the building.

(3) Adequate sub-soil drainage shall be provided if it is needed to avoid- (a) the passage of ground moisture to the interior of the building; (b) damage to the building, including damage through the transport of water-borne contaminants to the foundations of the building.

(4) For the purpose of this requirement, "contaminant" means any substance which is or may become harmful to persons or buildings including substances, which are corrosive, explosive, flammable, radioactive or toxic.

Resistance to moisture

C2. The floors, walls and roof of the building shall adequately protect the building and people who use the building from harmful effects caused by: (a) ground moisture; (b) precipitation and wind-driven spray; (c) interstitial and surface condensation; and (d) spillage of water from or associated with sanitary fittings or fixed appliances.

AD Part D: Toxic Substances (1992)

AD Part D covers the protection of building occupants from toxic substances used in cavity wall insulation.

Relevant sustainability issues

Toxicity of a much wider range of substances and materials used in construction could be addressed in this regulation.

Current Regulation

Cavity Insulation

D1. If an insulating material is inserted into a cavity in a cavity wall reasonable precautions shall be taken to prevent the subsequent permeation of any toxic fumes from that material into any part of the building occupied by people.

AD Part E: Resistance to the Passage of Sound (2004)

AD Part E covers the requirements for acoustic separation between dwellings and within dwellings, it also covers acoustics in schools.

Relevant sustainability issues

Good resistance to sound enables people to live at high density

Good resistance to sound promotes occupant wellbeing

Current regulations

Protection against sound from other parts of the building and adjoining buildings

E1. Dwelling-houses, flats and rooms for residential purposes shall be designed and constructed in such a way that they provide reasonable resistance to sound from other parts of the same building and from adjoining buildings.

Protection against sound within a dwelling-house etc.

E2. Dwelling-houses, flats and rooms for residential purposes shall be designed and constructed in such a way that – (a) internal walls between a bedroom or a room containing a water closet, and other rooms; and (b) internal floors, provide reasonable resistance to sound.

Reverberation in the common internal parts of buildings containing flats or rooms for residential purposes

E3. The common internal parts of buildings which contain flats or rooms for residential purposes shall be designed and constructed in such a way as to prevent more reverberation around the common parts than is reasonable.

Acoustic conditions in schools

E4. (1) Each room or other space in a school building shall be designed and constructed in such a way that it has the acoustic conditions and the insulation against disturbance by noise appropriate to its intended use. (2) For the purposes of this Part - “school” has the same meaning as in section 4 of the Education Act 1996[4]; and “school building” means any building forming a school or part of a school.

AD Part F: Ventilation (2005 Draft)

AD Part F covers the requirements for ventilation for removal of CO₂, odours and tobacco smoke from all buildings, and the supply of fresh air. Recently been revised along with Part L.

Relevant sustainability issues

Inherent energy consumption of ventilation (fan power and thermal)

Responding to Part L air-tightness requirements (continually tightening, towards state where less infiltration air available for dilution of pollutants therefore greater use of trickle vents and mechanical vent will be required)

Air pollutants impacting on health, safety and wellbeing: VOCs, CO₂, CO, humidity...

Current Regulations

Means of ventilation

F1. There shall be adequate means of ventilation provided for people in the building.

AD Part G: Hygiene (1992)

AD Part G applies to the provision of WCs and washing facilities (bath, shower) in homes and other buildings. It also applies to the safety issues surrounding storage of hot water. This AD is currently being revised.

Relevant sustainability issues

Water regulations to address conservation of water

NB: Only some areas of the country are water-poor. Take care not to impose unnecessary requirements on areas that are water-rich.

Recycling of water

Current Regulations

Sanitary conveniences and washing facilities

G1. (1) Adequate sanitary conveniences shall be provided in rooms provided for that purpose, or in bathrooms. Any such room or bathroom shall be separated from places where food is prepared. (2) Adequate washbasins shall be provided in (a) rooms containing water closets; or (b) rooms or spaces adjacent to rooms containing water closets. Any such room or space shall be separated from places where food is prepared. (3) There shall be a suitable installation for the provision of hot and cold water to washbasins provided in accordance with paragraph (2). (4) Sanitary conveniences and washbasins to which this paragraph applies shall be designed and installed so as to allow effective cleaning.

Bathrooms

G2. A bathroom shall be provided containing either a fixed bath or shower bath and there shall be a suitable installation for the provision of hot and cold water to the bath or shower bath.

Hot water storage

G3. A hot water storage system that has a hot water storage vessel which does not incorporate a vent pipe to the atmosphere shall be installed by a person competent to do so, and there shall be precautions – (a) to prevent the temperature of stored water at any time exceeding 100°C; and (b) to ensure that the hot water discharged from safety devices is safely conveyed to where it is visible but will not cause danger to persons in or about the building.

AD Part H: Drainage and Waste Disposal (2002)

AD Part H covers the management of all waste water from buildings and the storage of solid waste.

Relevant sustainability issues

Sustainable Drainage Systems – including flooding issues

Recycling/reuse of waste water and rainwater.

Control of pollution of water courses

Consideration of climate change effects on rainfall intensity and flooding

Recycling/composting of waste

Current Regulations

Foul water drainage

H1. (1) An adequate system of drainage shall be provided to carry foul water from appliances within the building to one of the following, listed in order of priority – (a) a public sewer; or, where that is not reasonably practicable, (b) a private sewer communicating with a public sewer; or, where that is not reasonably practicable, (c) either a septic tank which has an appropriate form of secondary treatment or another wastewater treatment system; or, where that is not reasonably practicable, (d) a cesspool. (2) In this Part “foul water” means waste water which comprises or includes – (a) waste from a sanitary convenience, bidet or appliance used for washing receptacles for foul waste; or (b) water which has been used for food preparation, cooking or washing.

Wastewater treatment systems and cesspools

H2. (1) Any septic tank and its form of secondary treatment, other wastewater treatment system or cesspool, shall be so sited and constructed that – (a) it is not prejudicial to the health of any person; (b) it will not contaminate any watercourse, underground water or water supply; (c) there are adequate means of access for emptying and maintenance; and (d) where relevant, it will function to a sufficient standard for the protection of health in the event of a power failure. (2) Any septic tank, holding tank which is part of a wastewater treatment system or cesspool shall be – (a) of adequate capacity; (b) so constructed that it is impermeable to liquids; and (c) adequately ventilated. (3) Where a foul water drainage system from a building discharges to a septic tank, wastewater treatment system or cesspool, a durable notice shall be affixed in a suitable place in the building containing information on any continuing maintenance required to avoid risks to health.

Rainwater drainage

H3. (1) Adequate provision shall be made for rainwater to be carried from the roof of the building. (2) Paved areas around the building shall be so constructed as to be adequately drained.

Building over sewers

H4. (1) The erection or extension of a building or work involving the underpinning of a building shall be carried out in a way that is not detrimental to the building or building extension or to the continued maintenance of the drain, sewer or disposal main. (2) In this paragraph “disposal main” means any pipe, tunnel or conduit used for the conveyance of effluent to or from a sewage disposal works, which is not a public sewer. (3) In this paragraph and paragraph H5 “map of sewers” means any records kept by a sewerage undertaker under section 199 of the Water Industry Act 1991.

Separate systems of drainage

H5. Any system for discharging water to a sewer which is provided pursuant to paragraph H3 shall be separate from that provided for the conveyance of foul water from the building.

Solid waste storage

H6. (1) Adequate provision shall be made for storage of solid waste. (2) Adequate means of access shall be provided – (a) for people in the building to the place of storage; and (b) from the place of storage to a collection point (where one has been specified by the waste collection authority under section 46 (household waste) or section 47 (commercial waste) of the Environmental Protection Act 1990 or to a street (where no collection point has been specified).

AD Part J: Combustion Appliances and Fuel Storage Systems (2002)

AD Part J covers the safety of boilers, stoves etc and safety and environmental hazards of fuel storage (i.e. oil).

Relevant sustainability issues

Protecting fuel store from fire inside or outside of building

Oil storage – prevention of pollution of soil and water courses from leakage

Pollution to air from products of combustion

Current Regulations

Air supply

J1. Combustion appliances shall be so installed that there is an adequate supply of air to them for combustion, to prevent overheating and for the efficient working of any flue.

Discharge of products of combustion

J2. Combustion appliances shall have adequate provision for the discharge of products of combustion to the outside air.

Protection of building

J3. Combustion appliances and fluepipes shall be so installed, and fireplaces and chimneys shall be so constructed and installed, as to reduce to a reasonable level the risk of people suffering burns or the building catching fire in consequence of their use.

Provision of information

J4. Where a hearth, fireplace, flue or chimney is provided or extended, a durable notice containing information on the performance capabilities of the hearth, fireplace, flue or chimney shall be affixed in a suitable place in the building for the purpose of enabling combustion appliances to be safely installed.

Protection of liquid fuel storage systems

J5. Liquid fuel storage systems and the pipes connecting them to combustion appliances shall be so constructed and separated from buildings and the boundary of the premises as to reduce to a reasonable level the risk of the fuel igniting in the event of fire in adjacent buildings or premises.

Protection against pollution

J6. Oil storage tanks and the pipes connecting them to combustion appliances shall – (a) be so constructed and protected as to reduce to a reasonable level the risk of the oil escaping and causing pollution; and (b) have affixed in a prominent position a durable notice containing information on how to respond to an oil escape so as to reduce to a reasonable level the risk of pollution.

AD Part K: Protection from falling, collision and impact (1998)

AD Part K covers the safe design of stairs and handrails as well as other physical hazards in buildings.

Relevant sustainability issues

Stairs enable high density/high rise development

Accidents involving stairs are the 'biggest killer' in UK households, therefore to improve health and safety would choose to reduce steepness of stairs, hence higher space take.

Current Regulations

Stairs, ladders and ramps

K1. Stairs, ladders and ramps shall be so designed, constructed and installed as to be safe for people moving between different levels in or about the building.

Protection from falling

K2. (a) Any stairs, ramps, floors and balconies and any roof to which people have access, (b) any light well, basement area or similar sunken area connected to a building, shall be provided with barriers where it is necessary to protect people in or about the building from falling.

Vehicle barriers and loading bays

K3. (1) Vehicle ramps and any levels in a building to which vehicles have access, shall be provided with barriers where it is necessary to protect people in or about the building. (2) Vehicle loading bays shall be constructed in such a way, or be provided with such features, as may be necessary to protect people in them from collision with vehicles.

Protection from collision with open windows etc

K4. Provision shall be made to prevent people moving in or about the building from colliding with open windows, skylights or ventilators.

Protection against impact from and trapping by doors

K5. (1) Provision shall be made to prevent any door or gate: (a) which slides or opens upwards, from falling onto any person; and (b) which is powered, from trapping any person. (2) Provision shall be made for powered doors and gates to be opened in the event of a power failure. (3) Provision shall be made to ensure a clear view of the space on either side of a swing door or gate.

AD Part L: Conservation of Fuel and Power (2005 Draft)

AD Part L covers the energy conservation and carbon emissions of buildings. It has recently been revised.

Relevant sustainability issues

Energy efficiency of existing building stock

Renewable energy and low carbon technologies

Concern over energy implications for domestic air conditioning in UK. (Note: French regulations will require 1 bedroom to be provided with a/c following 2002 heat wave).

Domestic solar overheating.

Air tightness/ventilation/indoor environment links.

Current Regulations

Dwellings and Buildings other than dwellings

Reasonable provision shall be made for the conservation of fuel and power in dwellings by:

- (a) limiting (i) heat losses through the fabric of the building; (ii) excessive solar gains; (iii) heat gains and losses from pipes, ducts and vessels used for space heating, space cooling and hot water storage;
- (b) providing energy efficient and properly commissioned fixed building services with effective controls;
- (c) providing to the owner sufficient information about the building and its building services so that the building can be operated and maintained in such a manner as to use no more fuel and power than is reasonable in the circumstances.

AD Part M: Access to and Use of Buildings (2004)

AD Part M covers the accessibility of buildings for mobility impaired.

Relevant sustainability issues

Accommodating changing lifestyles and circumstances in housing through design (currently people tend to accommodate change by moving house.)

Social equity by enabling access

New direction for regulations to address accessibility for visitors rather than just occupants in housing.

Current Regulations

Access and use

M1. Reasonable provision shall be made for people to - (a) gain access to; and (b) use the building and its facilities.

Access to extensions to buildings other than dwellings

M2. Suitable independent access shall be provided to the extension where reasonably practicable.

Sanitary conveniences in extensions to buildings other than dwellings

M3. If sanitary conveniences are provided in any building that is to be extended, reasonable provision shall be made within the extension for sanitary conveniences.

Sanitary conveniences in dwellings

M4. - (1) Reasonable provision shall be made in the entrance storey for sanitary conveniences, or where the entrance storey contains no habitable rooms, reasonable provision for sanitary conveniences shall be made in either the entrance storey or principal storey. (2) In this paragraph "entrance storey" means the storey which contains the principal entrance and "principal storey" means the storey nearest to the entrance storey which contains a habitable room, or if there are two such storeys equally near, either such storey.

AD Part N: Glazing – Safety in relation to Impact, Opening and Cleaning (2000)

AD Part N covers safety of impact with and opening and cleaning of glazing.

Relevant sustainability issues

Health and safety of people in and around the building.

Current Regulations

Protection against impact

N1. Glazing, with which people are likely to come into contact whilst moving in or about the building, shall (a) if broken on impact, break in a way which is unlikely to cause injury; or (b) resist impact without breaking; or (c) be shielded or protected from impact.

Manifestation of glazing

N2. Transparent glazing, with which people are likely to come into contact with while moving in or about the building shall incorporate features which make it apparent.

Safe opening and closing of windows etc

N3. Windows, skylights and ventilators which can be opened by people in or about the building shall be so constructed or equipped that they may be opened, closed or adjusted safely.

AD Part P: Electrical Safety (2005)

AD Part P covers the safety of electrical installations in buildings. This is a new regulation and has caused ODPM to consider political acceptability of regulations as it appears to be fairly intrusive regarding individuals' DIY practices and increased costs.

Relevant sustainability issues

Safety of people in the home

Promotion of renewable/embedded generation

Current Regulations

Design, installation, inspection and testing

P1 Reasonable provision shall be made in the design, installation, inspection and testing of electrical installations in order to protect persons from fire or injury.

Provision of information

P2 Sufficient information shall be provided so that persons wishing to operate, maintain or alter an electrical installation can do so with reasonable safety.

Regulation 7: Materials and Workmanship (2000)

This Regulation is very limited, with no additional guidance. There are many materials sustainability aspects that are not covered here.

Relevant sustainability issues

Environmental impacts of materials sourcing, manufacture and transport.

Health impacts of materials

Producer responsibility in materials sourcing and supply chain.

Durability of materials/whole life costing.

Current Regulations

Materials and workmanship

7. Building work shall be carried out - (a) with adequate and proper materials which - (i) are appropriate for the circumstances in which they are used; (ii) are adequately mixed or prepared; and (iii) which are applied, used or fixed so as adequately to perform the functions for which they are designed; and (b) in a workmanlike manner.

Annex B: The Policy Context

There is currently significant activity in housing and environmental policy making. The current Government is attempting to shift housing policy in the direction of greater sustainability.

Housing Policy

The Government's Sustainable Communities Plan, (SCP) (ODPM 2003a) addresses the housing shortage in growth areas; low demand and abandonment in areas including parts of the North and Midlands; the problem of affordability and quality of homes and neighbourhoods; the need for improving the quality of public spaces; and the need to protect the countryside and green belts. The SCP is fundamentally important to the sustainable development of this country. It sets out action plans for Decent Homes, 'liveability' and protection of the countryside, and addresses the differing issues relating to areas of high demand and areas of low demand. Four growth areas have been identified in the high demand South East for a major building programme to increase supply of housing. In areas of low demand, the SCP proposes a programme of large scale clearance, refurbishment and new build work (Housing Market Renewal) to address the issues of unpopular housing suffering from low value and, in extreme cases, abandonment.

The Barker Review (Barker 2004) investigated why house prices in the UK are increasing above the EU average, and identified the need for a flexible housing market that responds to the demands of consumers, providing affordable houses of the type that are needed. The report recommends a further increase in the supply of housing. The Government responded in 2005 with a commitment to deliver more homes and with proposals to fund infrastructure and for the Code for Sustainable Homes (HM Treasury, ODPM 2005).

The Sustainable and Secure Buildings Act (SSBA), passed in 2004, extends the scope of Building Regulations to address protection and enhancement of the environment, sustainability and security. The SSBA also allows the purposes of some Building Regulations to be extended to

include application to buildings during design and construction, change of use, alterations, demolition and change of occupancy. This significant development gives the Government much greater opportunities to address the environmental performance of the existing building stock through regulation.

The Sustainable Buildings Task Group (SBTG) published their report *Better Buildings, Better Lives* (SBTG 2004), with the central recommendation that the Government produce a Code for Sustainable Buildings as the single national standard to bring together best practice in a measurable way and raise sustainability standards of design and construction. This report was predominantly about new build housing.

Planning Policy

Planning Policy Statement 1 (PPS1) (ODPM 2005a) sets key principles to ensure that new development contributes to the delivery of sustainable development. PPS1 provides the policy framework for the reformed planning system, setting out the spatial planning approach, promoting good design and community involvement. It requires policies to encourage protection and enhancement of the environment and prudent use of natural resources, encouraging a long term approach.

Energy and Climate Change Policy

The Home Energy Conservation Act (HECA) 1995 placed a duty on all local authorities to encourage improvements in energy efficiency of the housing stock in their area of 35% from 1996-2011, and report on progress annually. Despite being broadly well qualified and having sufficient expertise in home energy, the great majority of HECA officers consider themselves to be under-resourced for the task, with over half feeling they are unlikely to meet the 30% target, and only a quarter considering their approach to monitoring and reporting progress to be accurate (UK HECA Forum 2004).

The Government's **Energy White Paper** (DTI 2003) set a new UK carbon reduction target of 60% by 2050, with a goal of achieving real

progress by 2020. Half the carbon savings to be made by 2020 are to be achieved through energy efficiency in homes and commercial buildings. Given the slow rate of replacement in UK building stock, this highlights the importance of addressing the energy efficiency of existing buildings.

The Government's **Energy Efficiency Action Plan** (Defra 2004a) acknowledges that the progress in households' energy efficiency will not currently achieve targets set in the Energy White Paper. The take-up of cost-effective improvements to energy efficiency is currently not as high as is necessary to deliver the carbon emissions savings required. This is due to the lower than expected take-up of insulation measures (through the Energy Efficiency Commitment), and the fact that for homes which are not currently adequately heated, the addition of thermal insulation may not reduce energy consumption, although occupants will benefit from improved comfort (this is known as 'comfort taking').

Fuel poor households are addressed through the **Fuel Poverty** programme (Defra 2004b) which funds energy efficiency improvements in homes. There are currently estimated to be around 2.25 million households in fuel poverty in the UK. In the Warm Homes and Energy Conservation Act 2000, the UK Government pledged to ensure that by 2016 'as far as practicable persons do not live in fuel poverty'. Adequate and affordable heating is a key aim of UK energy policy. A household is in 'fuel poverty' if they need to spend more than 10% of their income to afford adequate warmth in the home. Fuel poverty is caused by a combination of factors, including energy inefficient dwellings, low incomes, under-occupancy and the cost of fuel. Warm Front is the Government's main grant-funded programme for tackling fuel poverty, the scheme assists over 200,000 households per year. Recent and further predicted increases in fuel costs will increase the number of fuel poor households, and reiterates the need to improve energy efficiency in homes to reduce households' vulnerability.

The **EU Energy Performance of Buildings Directive** (EPBD) requires new and existing homes to have an energy rating displayed when the building changes hands (through rental or sale). Additionally, EU member states will be required to review Building Regulations at least every five years, and update them to reflect technical progress. The Housing Act 2004 provides the route for EPBD implementation for labelling homes, requiring an Energy Performance Certificate to be produced at the time of construction, sale or letting of a property which will include information on the energy performance of that dwelling in the form of an easy to understand A-G rating, based on the SAP,⁴⁷ plus property-specific recommendations for cost effective energy efficiency measures to be carried out. This certification will be implemented in 2007 and will allow home buyers to choose between energy efficiency of properties.

The Energy Efficiency Commitment (EEC) is the Government's main vehicle for delivering energy efficiency in the existing buildings stock. All licensed energy suppliers with at least 15,000 gas or electricity domestic customers are subject to a target for installing energy efficiency measures in the household sector, for example by subsidising the cost of installing a condensing boiler, wall or loft insulation, or energy efficient lights and appliances either directly or through retailers. There are incentives (in terms of uplifts in savings to suppliers) for delivery of appliances and energy service packages. The energy suppliers are now spending £350M/year on energy reduction in the existing stock. The EEC is projected to deliver carbon savings of 1.8MtC/year by 2010.

The EEC1 (2002-2005) target of 62TWh was exceeded by suppliers. The majority of savings in the first years were from insulation with the largest energy savings from cavity wall insulation, and 20% of energy savings from compact fluorescent lights. Half of the activity was applied in vulnerable households. The EEC2 (2005-2008) target has been set at 130TWh. Fuel switching, window glazing and efficient digital set top boxes have been included within

⁴⁷ Standard Assessment Procedure Government approved energy rating for homes.

the illustrative mix for the EEC2. The proposed mix of measures will contribute a reduction of around 0.68 million tonnes of carbon per year (MtC/yr) to the Climate Change Programme. There is concern that this target will be more challenging to deliver due to industry capacity and insufficient willing householders. Suppliers have identified difficulty in attracting owner occupiers to install insulation – 1 million owner occupier insulation installations are needed to deliver the requirements of EEC2, the Energy White Paper suggested that 4.5 million out of a possible 10 million cavity walls need to be filled with insulation between 2005-2010.

The current structure of EEC requires each highly competitive supplier to deliver their commitment, with little flexibility or opportunity to trade their obligation. The system encourages energy suppliers to deliver the most cost effective measures first and therefore the greatest concentration is on insulation. As the Commitment is a regulation on suppliers, there is little scope for third parties to get involved, as they would have to undercut the suppliers themselves in order to make a profit, and this is very unlikely to be possible.

There are opportunities for innovative solutions but suppliers approach these with varying degrees of enthusiasm. The target for EEC3 (2008-2011) has not yet been set, but the sooner it is agreed, the greater certainty for the insulation and other installers who will be able to invest in capacity building as necessary. It appears that suppliers are well on track to meet the EEC2 target in advance of 2008 and we recommend Government acts early to set the EEC3 target at a level commensurate with the savings and at least the triple the EEC1 level.

The **Decent Homes** (ODPM 2004b) standard establishes four criteria that housing should meet: a housing fitness standard; reasonable state of repair; reasonably modern facilities and services; and a reasonable degree of thermal comfort. The Decent Homes thermal efficiency standard is below that set by the Fuel Poverty Warm Front programme of SAP65, and well below the Building Regulations standard for new homes. The thermal comfort definition requires a dwelling to have both efficient heating and effective insulation. Because of the

differences in efficiency heating systems, the level of insulation that is required also differs:

- For dwellings with gas/oil heating, cavity wall insulation or at least 50mm loft insulation;
- For dwellings heated by electric storage heaters/ solid fuel or LPG, a higher specification of insulation is required of at least 200mm of loft insulation and cavity wall insulation.

It is designed as a 'trigger' standard, to trigger improvement action but is in practice often applied as a 'maximum' requirement. This means for example that homes with only 100mm of loft insulation are not required to be topped up to the Building Regulations new build requirement of around 300mm even though this could save tenants around £50/year. The Decent Homes standard commitment is only projected to deliver carbon savings of 0.05MtC/year by 2010.

The Government is committed to ensuring that all social housing is decent by 2010, and to reducing the number of vulnerable households in non-decent private housing. The energy efficiency of the existing housing varies greatly across the stock: 31% were non-decent in 2003, and 23% of all homes fail due to thermal comfort. The poorest energy efficiency is exhibited by the private rented sector, of which 48% are non decent, and 19% having an energy efficiency SAP rating of 30 or below. 40% of all ethnic minority households live in non-decent homes, and 28% of all ethnic minority households' homes fail for reasons of thermal comfort (ODPM 2003b).

The **Building Regulations** cover the conservation of fuel and power through Approved Document Part L. This Regulation sets minimum standards for new buildings including insulation values of the building fabric and efficiency of heating plant and controls. The standards also apply to replacement boilers and fabric elements such as glazing and roofs, which must be replaced with high standard components. Recent revisions to the Building Regulations will have delivered 0.08 MtC/year from construction of new dwellings and 0.5MtC/year from new & replacement condensing boilers in dwellings by 2010. The new regulations will not deliver any

increase in carbon savings from the fabric of the existing stock.

The DTI has published a consultation on the Government's **Microgeneration Strategy** which reviews technologies available, barriers to penetration and policies to support increased micro generation penetration in the UK. The draft Strategy proposes a new funding programme for Microgeneration through the Low Carbon Buildings Programme. The DTI recently announced a £30million funding package over 3 years for the Low Carbon Building Programme for microgeneration technologies. This represents a cut of around 10% compared to the packages it replaces (Clear Skies and the Major Photovoltaic Development programmes). It is therefore now very important that the Government's Microgeneration Strategy, due to be published in March 2006, shows how microgeneration can realise its potential to make a significant contribution to the Government's target to cut by 2050 emissions of CO₂ by 60%.

Water Policy

The Water Act (HMSO 2003) introduced a new duty to conserve water. Government water policy in relation to households (Defra 2002) includes a series of actions to deliver more effective use, covering demand and supply, but does not address the existing housing stock explicitly.

The Water Supply (Water Fittings) Regulations

1999 include limits on water consumption of various products, for example by reducing the maximum flush volume specification for new WCs by 20% and specifying water consumption limits for domestic washing machines and dish washers. These regulations cover a wider range of water using appliances than may be covered by the Building Regulations. They also apply to retrofitted items in the existing housing stock. The Water Supply (Water Fittings) Regulations are poorly enforced currently: enforcement is carried out by water companies.

The Sustainable Buildings Task Group report (SBTG 2004) recommended that Government should 'enshrine a 25% saving on average per capita water consumption in regulation by

2005'. The Government responded by stating 'we do believe that achieving water savings of 25-30% are feasible' (Defra, ODPM, DTI 2004).

The Government has identified that a significant proportion of the population are spending more than three percent of their income on water charges. A local-scale pilot scheme has been established to target water affordability assistance to lower income households in the south west. The pilot will help households make savings on their water bills and increase their income through benefit checks.

Waterwise is a new organisation set up and funded jointly by all the water companies. The organisation will be focusing on demand side efficiencies including establishing the business case, tackling affordability issues and promoting the social and environmental benefits of water conservation.

Materials Policy

There is currently significant activity at an international and European level to establish assessment methods of the sustainability of buildings and their material components. This work is ongoing but we understand that the ISO committees are developing standards on environmental product declarations based on life cycle analysis as well as methods of assessment of environmental performance of buildings. This work will be complete in 2007/8. A mandate has been issued by the European Commission to the Committee for European Normalisation (CEN) to establish a work programme based on the work of ISO to develop "horizontal standardised methods for the assessment of the integrated environmental performance of buildings" which will be completed in 2009.

The EU Construction Products Directive (CPD)

sets the framework for construction materials policy in the UK. This Directive sets out to harmonise standards across the EU with regard to materials performance in order to remove barriers to trade. The Directive requires that products must be suitable for construction works, which (as a whole and in their separate parts) are fit for their intended use. Requirements cover the following areas:

1. Mechanical resistance and stability
2. Safety in case of fire
3. Hygiene, health and the environment
4. Safety in use
5. Protection against noise
6. Energy economy and heat retention

Policies developed to promote the sustainable use of materials in the UK must not create a barrier to trade of construction products that meet the requirements of the CPD.

The Aggregates Levy, introduced in 2002, encourages economy in the use of construction aggregates and more recycling of construction and demolition waste in place of new quarrying. The Levy reduces demand for primary aggregates by increasing their cost, making the use of recycled and secondary materials more viable. The Aggregates Levy Sustainability Fund uses revenue from the Aggregates Levy to reduce the environmental impacts of aggregate extraction and helps to stimulate the market for recycled and secondary materials. The Government's assessment in the 2005 Budget was that the levy is achieving its primary objectives. The Government therefore announced a freeze in the Aggregates Levy rate at £1.60 a tonne. This rate has not been raised since its introduction.

Construction and Demolition Waste

The Landfill Tax, introduced in 1996, influences waste management practises by encouraging greater diversion of waste from landfill. The annual cost of sending active waste to landfill is increasing from £15/tonne in 2004 towards a medium-term rate of £35 per tonne. This gives a financial incentive to contractors diverting waste from landfill through reduction, reuse and recycling measures. Waste minimisation delivers further cost savings to the contractor through savings in overall waste management processes.

The **Clean Neighbourhoods and Environment Act** 2005 gives local authorities and the Environment Agency additional powers to deal with issues affecting the local environment including fly-tipped waste and litter. The Act will introduce a new statutory requirement for site waste management plans for construction projects. Site waste management plans are

currently a voluntary measure under guidance from the DTI (DTI 2004).

Defra is currently reviewing the Waste Strategy 2000. The revision will include consideration of C&D waste.

Household Waste

Current recycling/composting targets (Defra 2000) set an increasing amount of waste to be recycled each year. However this target appears to 'plateau' at 33% of waste in 2015. Recycling and composting in comparable European countries reaches 50-60%, suggesting that UK targets could be more aspirational.

The Household Waste Recycling Act 2003 set a new requirement for all local authorities to collect at least two types of recyclable waste separated from the rest of the household waste by 2010.

The EU Landfill Directive 1999 determines the current policy on waste management in the UK. The Directive's overall aim is to "to prevent or reduce as far as possible negative effects on the environment, in particular the pollution of surface water, groundwater, soil and air, and on the global environment, including the greenhouse effect, as well as any resulting risk to human health, from the landfilling of waste, during the whole life-cycle of the landfill". It sets demanding targets:

- By 2010 to reduce biodegradable municipal waste (BMW) landfilled to 75% of that produced in 1995
- By 2013 to reduce BMW landfilled to 50% of that produced in 1995
- By 2020 to reduce BMW landfilled to 35% of that produced in 1995.

Local authorities across England have been set limits on the amount of BMW they can dispose of by landfill. These allowances are tradable – authorities can buy more allowances if they expect to landfill more than the allowance they hold, similarly authorities can sell surplus allowances. Disposal authorities that exceed their allowance will be fined £150 for every tonne over the limit.

Skills

The Egan Review of Skills for Sustainable Communities (ODPM 2004a) considers the range of skills, behaviour and knowledge required

to deliver the Sustainable Communities Plan. The Review outlines the competencies necessary for planning, delivering and maintaining sustainable communities and how these can be developed and managed.

In 2005, the Government launched the Academy for Sustainable Communities,⁴⁸ an

initiative of the ODPM to provide the focus for skills for creating and maintaining sustainable communities. The Academy will work with training and development bodies across the range of core skills needed for sustainable communities in response to the Egan Review (ODPM 2004a).

Annex C: Monitoring

The progress towards achieving the objectives of the Sustainable Development Strategy 2005 are monitored and reported annually. Those indicators relevant to this report are listed below (Defra and ONS, 2005).

Energy and carbon

- Domestic energy consumption increased by 18 per cent between 1990 and 2003, but the associated domestic carbon dioxide (CO₂) emissions have remained at 1990 levels – largely the result of electricity generators switching from coal to gas or nuclear fuels.
- Percentage of households living in non-decent housing: in 2003 1.4 million dwellings (35 per cent) in the social sector were below the Decent Homes Standard in 2003, down from 2.3 million in 1996. 28 per cent of owner-occupied and 48 per cent of private rented dwellings were below the Standard in 2003.
- Thermal efficiency of housing stock: shows a positive trend. 15% of houses were considered fully insulated in 2002, compared with 10% in 1998. The percentage of houses with no insulation fell from 18% in 1987 to 7% in 2002.
- Fuel poverty: In 2001, 1.7 million households in England were ‘fuel poor’, needing to spend more than 10 per cent of their income on fuel to keep warm. The number of fuel poor households fell by around 60 per cent between 1996 and 2001.
- Energy efficiency of new appliances: New cold appliances continue to show

improvements in efficiency since 1998, particularly on the introduction of EU-wide minimum efficiency performance standards in 1999. The greatest improvements among cold appliances were for refrigerators, with new models in 2002 consuming on average 36 per cent less electricity than new models in 1989.

Water

- Domestic water consumption: Households consumed an average of 154 litres per person per day in 2003. It is believed that there has been no clear underlying increase in per person consumption rates. Household water consumption accounts for around two thirds of water in the public supply (excluding leaks).
- Water affordability: Between 1997-8 and 2002-3, the proportion of households spending more than three per cent of their income on water charges fell by 6 percentage points – from 15 per cent to 9 per cent
- Water stress: (indicator to be developed to monitor the impacts of water shortages) (HMG 2005a).

Construction materials

- Construction output and extraction of construction materials: This is a contextual indicator for Domestic Material Consumption (DMC). Mineral extraction, primarily used for construction, accounted for 39 per cent of DMC in 2003. The level of construction mineral extraction decreased by 23 per cent between 1990 and 2003.

48 www.ascskills.org.uk

Construction and Demolition waste

- Construction and demolition waste going to landfill: In 2003 around a third less waste was sent to landfill against 1999 figures. In 2002-3, 43 per cent of the waste was disposed of in landfill sites. The amount disposed of in this way had not changed compared with 1998-9.

Household Waste

- Household waste per person: Between 1999-00 and 2003-4 household waste per person increased by only 1.4 per cent, with each person generating half a tonne on average. The amount of non-recycled waste per person has decreased in the last two years – most of this goes to landfill.

Annex D: SDC Stakeholder Workshops

The SDC ran a series of Stakeholder Workshops on topics covered in this study in September and October 2005. We are very grateful to participants for their input. Attendees are listed below.

Energy and Carbon – 14 September 2005	
Cecila Bågenholm – BRE	Ross Hollerton – BRE
Paul Evans – BRE	Claire Taylor – Energy Watch
Florence Salberter – RBKC	Martin Fodor – EA
Zoltan Zavody – EST	Diana Wilkins – RCEP
Andrew Eagles – Housing Corporation	Stephen Wise – Knauf Insulation
Paul Egerton – DTI	Alan Christie – Defra
Paul Ruyssevelt – ESD	Mark Hinnels – ECI
Robert Shaw – TCPA	Andrew Judge – London Borough of Merton, London SDC
Jean Roberts – RBKC	Joanne Wheeler – WWF-UK

Materials – 23 September 2005	
Ben Gill – BioRegional	Diana Wilkins – RCEP
Lynne Sullivan – BRAC/Broadway Malyan	Martin Fodor – EA
David Moon – WRAP	Stephen Wise – Knauf Insulation
Kristian Steele – BRE	Jane Thornback – CPA
Terry McDermott – Jewson	Martin Townsend – Defra
Ieuan Compton – Kingspan Insulation	Chris Buchan-Hepburn – Hyde HA
Michael Sansom – Steel Construction Institute	

Waste – 30 September 2005

Katharine Adams – BRE	Andrew Pears – Kotuku
Anthony Lord – Defra	Jonny Wentworth – RCEP
Russel Smith – Parity Projects	Martin Fodor – EA
Julie Hill – Green Alliance	Mervyn Jones – WRAP
Matthew Hampshire – Defra	Julie Philips – CPA
Jessica Binks – Southwark	Chris Buchan-Hepburn – Hyde HA
Samantha Connolly – CIRIA	

Water – 6 October 2005

Nicci Russell – Waterwise	Magdalena Styles – EA
Phil Burston – RSPB	Louise Every – IPPR
James Duggin – Atkins	Stephen Phillips – ODPM
Peter Jiggins – Defra	Alan Turner – Kent County Council
Russel Smith – Parity	

Annex E: Refurbishment Projects

During this project, the SDC has become aware of a number of other projects ongoing within the area of resource efficient refurbishment that will be of interest to any future work in this arena. A selection of projects that we are aware of are presented below:

DTI funded project: Towards Zero Emission Refurbishment.

The aim of the feasibility study by the BRE is to identify, assess and evaluate the requirement for a long term programme of work for moving towards zero emission refurbishment housing options. The project will identify refurbishment measures including products, technologies and techniques; investigate future trends of refurbishment; assess options for moving towards zero emission refurbishment; consult stakeholders; formulate a programme of work to realise zero emission refurbishment on a number of typical dwelling types.

INREB Faraday Partnership: Generation Homes

Generation homes is an initiative that aims to reduce carbon emissions from existing homes by 2/3. The project has taken a typical 3-bed semi-detached house and developed a specification for its refurbishment including insulation, hot water and heating systems, and efficient appliances. The project will demonstrate feasibility on a small scale (10 properties) and a large scale (100-200 properties) in partnership with social housing providers and private sector technology suppliers.

Empty Homes Agency

The Empty Homes Agency is undertaking a project concerning the environmentally sustainable refit of empty property. This project will be funded by the GLA, and will commence in January 2006.

Green Alliance: A green living initiative – Engaging households to achieve environmental goals

This project identifies the need for government to engage households in achieving environmental goals relating to energy and water use and waste generation. The study proposes a 'green living initiative' which brings together information, advice and incentives to encourage action by households.

Bill Dunster Architects: Zed upgrade.

This project has developed a standard package of measures that can be applied to homes to make them zero carbon, when carrying out a loft conversion or extension. The package includes insulation and microgeneration measures; low energy appliances; financing options and sustainable lifestyle measures including travel.

WWF and BioRegional: One planet living – Retrofitting the suburbs

This proposed project follows on from the study of One Planet Living in the Thames Gateway. Using ecological footprinting and other social and environmental indicators, the study will examine the environmental impact of an existing community and measures to refurbish and retrofit this to improve standards at the community level considering shared infrastructure and services.

Design Council: Future Currents – Designing for a changing climate

This project approaches energy efficiency and carbon reduction using a service design approach to inform policy development. The project argues that an approach is needed that engages the householder, developing innovative financial and incentive products for the able to pay sector.



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