

**Sustainable Buildings –
The Challenge of the Existing Stock**

A Technical Working Paper

July 2005

Acknowledgements

This paper has been developed with the generous help of the following organisations:

- The Office of the Deputy Prime Minister
- The Department of Environment, Food and Rural Affairs
- The Building Research Establishment
- The Energy Saving Trust
- The Environment Agency
- WWF-UK
- English Heritage
- The Commission on Architecture and the Built Environment
- London School of Economics – Centre for Analysis of Social Exclusion

To comment on this report please contact:

Sustainable Development Commission, Ergon House, Horseferry Road, London SW1P 2AL
Tel: 020 7238 4999 **Email:** enquiries@sd-commission.org.uk

To find out the latest news and information about the Sustainable Development Commission, please visit our website: www.sd-commission.org.uk

Executive Summary

Existing buildings represent around 99% of the building stock at any one time, with new construction at a rate of less than 1% of the total stock per year. As the vast majority of housing to be occupied in the UK for the next 50 years already exists, improvements made within the existing stock will yield significant environmental savings immediately and for years to come. This existing housing is currently largely inefficient, and therefore has significant environmental impacts in terms of energy and water wastage, and unnecessarily high carbon emissions. With moderate investment most homes could potentially reach excellent environmental performance standards. In this paper we focus on the improvements that can be made in existing homes to reduce their impacts, relating to energy and climate change, water, materials and waste. The UK building stock needs to be improved so it contributes to the UK target of 60% reduction in CO₂ emissions by 2050; and a range of policies is needed to support these improvements in efficiency.

Based upon a review of technical measures and existing policies, this paper identifies the opportunities for and barriers to refurbishment. Initial policy recommendations are tabled. Further work is being taken forward on the policies and incentives needed to enable a step change in the environmental performance of buildings. In order to deliver this, we are examining the potential for a joined up programme of higher standards, regulation, financial incentives and the provision of information. We hope this study will influence the development of sustainable housing policy.

Existing Buildings - the opportunities

Existing buildings provide a wealth of opportunities for creating truly

sustainable communities. Maximising the use of existing housing stock is the cheapest and most environmentally beneficial way of achieving good quality housing with lowest environmental impact. The policy framework must support increased use of existing buildings while improving their environmental performance.

Government policy on climate change and energy efficiency actively supports the environmental improvement of existing buildings. Studies show that existing properties may be upgraded at acceptable costs to high environmental standards, and that repairing a typical Victorian terraced house is significantly cheaper than replacing it with a new home. Improving the resource efficiency of the existing housing stock brings additional benefits in relation to the Government's broader sustainable development objectives of equity and equality.

The following are our initial recommendations, on which we are doing further work:

- focus on minimising energy and wider resource use in existing buildings
- prioritise the optimal use of existing buildings in existing communities before new developments are approved
- identify how to communicate benefits of environmental homes to homebuyers

Existing Buildings - the challenge

UK domestic buildings are responsible for:

- 25% of UK greenhouse gas emissions;
- over 50% of water consumption; and
- 8% of waste generation is from households, 24% of waste generation is from construction and demolition.

Buildings that are inefficient in their consumption of resources such as energy and water, are expensive to operate, leading to disproportionate spending on resources by the occupants.

Much of current Government policy is encouraging the development of new housing in new communities, and both financial and regulatory support is available for this policy. There are a number of existing barriers that inhibit improvements within existing communities. These include: the planning system; site constraints in existing areas; and poor local environments in some existing communities discouraging investment.

A number of policy barriers also currently exist that limit the level of improvements measures in existing homes, including: unequal levels of VAT; financial barriers; apathy or hassle; and the landlord-tenant relationship.

This study identifies some of the policies needed to overcome these barriers in a concerted programme of housing and community improvement.

The following are our initial recommendations, on which we are doing further work:

- equalise rates of VAT on new build and refurbishment works to create a level playing field
- signal that reinvesting in the existing stock is more sustainable than building new
- capture value from new developments to benefit of local communities and minimise pressure on infrastructure
- support the upgrading of existing housing through a co-ordinated programme of voluntary standards, enforced regulation, financial incentives and provision of information
- extend Decent Homes standard to cover all types of resource efficiency to high environmental standards

compliant with the Code for Sustainable Buildings.

Existing Buildings – The policy framework

We need to identify the best way to support the sustainability of existing communities whilst meeting the demand for increased housing provision. Both the Planning system and the Building Regulations are now aligned to further sustainable development.

The 2004 amendment to the Building Act opens up new opportunities to tackle sustainable development and the energy efficiency of the existing building stock through Building Regulations, however we are concerned at low levels of compliance with current regulations. A new Code for Sustainable Buildings is currently being developed as a national standard for sustainable buildings.

The following are our initial recommendations, on which we are doing further work:

- demonstrate public sector leadership through sustainable refurbishment of existing social housing
- develop best practice guide for delivering sustainable buildings including clear guidance on sustaining the existing housing stock to accompany PPS1
- further amend Schedule 1 of the Building Regulations to cover a wider range of sustainability issues when refurbishing the existing building stock
- review the mechanisms for enforcement of Building Regulations and overall rates of compliance
- develop the Code for Sustainable Buildings to set a high standard for sustainable refurbishment of existing housing in 2006
- extend English House Condition Survey to wider environmental performance of existing stock

- developed Home Condition Report to include a range of resource efficiency criteria.
- develop guidance and skills to support delivery in existing housing including for local authorities and Housing Associations
- identify how private sector financial mechanisms may deliver improvements
- develop the green landlords scheme to reward holistic resource efficiency
- develop a 'one stop shop' package for resource efficient refurbishment of homes
- consider introducing incentives to building companies to refurbish properties to a high standard.

Energy and Carbon

Housing has a key role to play in meeting the UK's challenging carbon targets for 2010 and 2050. Existing homes can be refurbished to a high carbon performance standard through cost effective means providing comfortable and healthy places to live.

Energy efficiency in buildings may be increased through improving the thermal efficiency of the building fabric and heating systems, and installing efficient plant and appliances. Poor energy efficiency has negative socio-economic impacts including fuel poverty and health impacts. The Government uses a range of policies to tackle fuel poverty and carbon emissions.

A wide range of data is available on costs, benefits and financial paybacks of the various energy efficiency measures available. The current take-up of energy efficiency improvements through the existing policies will not deliver the carbon emissions savings required to achieve targets, therefore a strengthened policy framework for energy efficiency must be developed.

The following are our initial recommendations, on which we are doing further work:

- require whole house carbon reduction when undertaking notifiable building work in Part L of the Building Regulations 2005
- deliver a 25% reduction in carbon emissions from new homes in Building Regulations 2005
- consider whole house carbon reduction at time of sale in Part L of the Building Regulations
- develop the Code for Sustainable Buildings to set higher standards of energy efficiency in new and refurbished buildings.
- consider using Council Tax rebates to reward improvements in energy efficiency of homes
- set EEC3 energy savings target at triple the EEC1 target, with a major programme of householder engagement
- use Winter Fuel Payments to improve energy efficiency in homes.
- introduce reduced rate VAT on all energy saving technologies and equipment
- publicise the landlords' energy saving allowance (LESA) to increase awareness and uptake
- require energy metering billing to show clear consumption information
- promote energy services schemes to offset up-front costs of investment in carbon reduction.

Water

There is currently great inefficiency in supply infrastructure and in the consumption of water in UK households, and shortage of supply in many areas of the UK, particularly in Southern England. Water supply and waste treatment in the housing growth areas is currently close to capacity, with little headroom for increased demand. There is great scope for water efficiency improvements to existing homes, which may be refurbished to very high water efficiency standards for minimal cost.

Water conservation measures include: addressing leakage; fitting water meters; fitting water efficient appliances and using non-potable quality water for low quality purposes.

Regular refitting of kitchens and bathrooms, (which house the majority of water consuming appliances in a house), provides opportunities for tackling domestic water efficiency rapidly, but will only be achieved with the support of appropriate products, information and incentives.

The following are our initial recommendations, on which we are doing further work:

- accelerate water metering in homes with an immediate focus on homes in areas of water shortage
- consider introducing a fair incentive to install water meters
- require 25% saving in water consumption in new homes through Building Regulations
- develop the Code for Sustainable Buildings to set higher standards of water efficiency in new and refurbished buildings.
- introduce fiscal incentives to reward installation of water efficient appliances and fittings
- develop standardising labelling of water efficient products
- reward water efficiency through the green landlords' scheme
- consider the feasibility and benefits of a water efficiency commitment scheme.
- consider feasibility and benefits of a Water Saving Trust.
- use tariff structuring to reduce demand for water
- requirements water metering billing that show clear consumption information
- use retailer engagement to raise public awareness of water conservation
- extended the Home Condition Report to show water efficiency information.

Materials

Refurbishment of buildings requires significantly fewer materials than redevelopment. Reuse of built elements results in lower environmental impact than redevelopment even using recycled materials. The environmental consequences of materials use in construction and refurbishment include depletion of natural resources, local and global impacts of extraction and processing activities, and transport effects. Many materials have harmful impacts during their manufacture, or contain substances harmful to health.

The main barrier to improving use of materials is the lack of available information on materials sustainability at point of sale. Existing materials labelling schemes are insufficient to support consumer choice.

The following are our initial recommendations, on which we are doing further work:

- require sustainable use of materials through Building Regulations
- develop the Code for Sustainable Buildings to set higher standards of sustainable use of materials in new and refurbished buildings
- review life cycle analysis tools for inclusion in standards
- develop a national materials labelling scheme
- broaden the dissemination of timber information
- use DIY retailer engagement to raise public awareness of materials impacts
- review options for raising the recycled content in construction in order to promote a market for demolition waste products.

Waste

Almost half of the total 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 by Government to achieve national targets.

Construction Waste

Construction and demolition waste is becoming a major environmental concern in relation to housing policy. Construction waste should be considered as potential construction material in order to promote reuse and recycling.

Refurbishing existing housing stock rather than development of new homes is a key route to reducing this waste. Waste reduction efforts should address materials procurement where over-ordering is common. Mitigation of waste generation may result in cost savings in relation to waste disposal. However, it is in small scale building works that sustainable waste management practices are least likely to be implemented.

The following are our initial recommendations, on which we are doing further work:

- consider measures to promote sustainable waste management for small sites
- require sustainable site waste management through Building Regulations
- develop the Code for Sustainable Buildings to set higher standards for reduction, reuse and recycling of construction waste for new and refurbished buildings
- consider a zero landfill target for new and refurbished buildings
- consider requirement for construction materials retailers to retrieve unused materials
- use retailer engagement to raise awareness of waste management legislation and measures.

Household Waste

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. In 2004, the national 17% recycling target was met, however the target increases annually up to 33% by 2015. Measures to reduce waste and increase recycling include providing facilities for recycling and composting waste. The refitting of kitchens in existing buildings where much waste separation and storage is sited provides the opportunity to improve recyclable materials storage. We will identify best practice in design of kitchens and waste storage containers, including opportunities through the supply chain.

The following are our initial recommendations, on which we are doing further work:

- require increased storage and separation of waste through Building Regulations, including better provisions for multiple occupancy buildings such as apartments
- develop the Code for Sustainable Buildings to set higher standards for sustainable household waste management in new and refurbished homes.
- encourage local authorities to take forward incentive schemes to reduce waste and increase recycling.
- reviewing current national municipal waste recycling targets
- consider setting targets for home composting.
- work with domestic waste bin manufacturers to encourage increased choice of waste/recycling bins.

Policy directions

The Government is committed to making buildings much more resource efficient – existing buildings are a key part of this. This must be central to all housing policy. Current policies do not tackle

significant parts of the housing stock or supply chain. This requires a major campaign in terms of 'hearts and minds' as well as traditional policy mechanisms of enforced standards, incentives and information. We propose the development of a full policy programme to improve resource efficiency in existing housing in existing communities.

Contents

1. The Sustainable Buildings Work Programme the Existing Housing Stock.....	11
2. The Sustainable Development Commission	11
3. The Policy Context	11
4. Sustainable Communities and Sustainable Development	13
5. Existing Buildings - the Opportunities	14
5.1 Recommendations.....	17
6. Existing Buildings - the Challenge	18
6.1 Recommendations.....	20
7. Existing Buildings – the Capacity to Deliver.....	20
7.1 Recommendations.....	24
8. Energy and Carbon	25
8.1 Policy Context.....	25
8.1.1 Housing Growth	27
8.2 Carbon Reduction Opportunities.....	28
8.2.2 Barriers	33
8.2.3 Information.....	34
8.2.4 Incentives	34
8.2.5 Delivery.....	35
8.3 Energy and Carbon Policy Recommendations	37
9. Water.....	38
9.1 Policy Context.....	39
9.1.1 Housing Growth	39
9.2 Water Efficiency Opportunities	40
9.2.1 Barriers	42
9.2.2 Information.....	43
9.2.3 Incentives	44
9.2.4 Delivery.....	44
9.3 Water Policy Recommendations.....	45
10. Materials	45
10.1 Policy Context.....	46
10.1.2 Housing Growth	46
10.2 Materials Opportunities	47
10.2.1 Barriers	49
10.2.2 Information.....	49
10.2.3 Delivery	49

10.4 Materials Policy Recommendations.....	50
11. Waste	51
11.1 Construction Waste.....	51
11.2 Policy Context.....	51
11.2.1 Housing Growth.....	52
11.3 Construction Waste Opportunities	52
11.3.1 Barriers	53
11.3.2 Information.....	53
11.3.3 Delivery	53
11.4 Construction Waste Policy Recommendations.....	54
11.5 Household Waste.....	55
11.6 Policy Context.....	55
11.6.1 Housing Growth.....	55
11.7 Household Waste Opportunities	55
11.7.1 Barriers	56
11.7.2 Information.....	57
11.7.3 Incentives	57
11.7.4 Delivery	57
11.8 Household Waste Policy Recommendations.....	58
12. Overview	59
13. Conclusion	59
Bibliography	61

1. The Sustainable Buildings Work Programme the Existing Housing Stock

The Sustainable Development Commission (SDC) is currently working with the Office of the Deputy Prime Minister (ODPM) to identify opportunities to improve the sustainability of existing housing through the implementation of the Sustainable and Secure Buildings Act 2004 in Building Regulations, through the development of the new Code for Sustainable Buildings and a range of other policy recommendations.

This paper is an initial 'think piece' on the range of work that is being undertaken throughout 2005. It explores the technical issues relating to improving the resource efficiency of the existing housing stock, within the context of sustainable housing policy. Further work is being taken forward through 2005 on the policies and incentives needed to enable a step change in the environmental performance of buildings. The recommendations in this paper apply to the English policy context, although many of the ideas are applicable across the Devolved Administrations.

2. The Sustainable Development Commission

The Sustainable Development Commission (SDC) is the UK Government's independent, advisory body on sustainable development. The SDC is chaired by Jonathon Porritt and is a non-departmental public body (NDPB), reporting to the Prime Minister and the First Ministers of the Devolved Administrations. The SDC is charged with advocating sustainable development across all sectors of the UK, particularly within Government, and building consensus on the actions needed, where further progress is to be achieved.

3. 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. However, this paper illustrates that not all these policies are 'joined up' or delivering the sustainable outcomes required.

The key related current policies are listed below:

Box 3.1 – Sustainable Housing Policy Context

The Government's **Sustainable Communities Plan** (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 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.

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 **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.

Planning Policy Statement 1 (PPS1) (ODPM 2005) 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.

The **UK Sustainable Development Strategy** (HMG 2005) sets four key priorities: sustainable consumption and production; climate change and energy; natural resource protection and environmental enhancement; and sustainable communities. The strategy is based around five new principles: Living Within Environmental Limits; Ensuring a Strong, Healthy and Just Society; Achieving a Sustainable Economy; Promoting Good Governance; and Using Sound Science Responsibly.

4. Sustainable Communities and Sustainable Development

Sustainable development provides the overarching framework for this study. Issues relating to existing housing have resonance with each of the four key priorities identified in the Sustainable Development Strategy (HMG 2005). The five new principles presented below (see Figure 1) provide the framework for our approach to existing communities, and existing buildings as a core component.

Housing policy must ensure that homes are provided that are safe, comfortable and affordable to obtain and operate, whilst minimising inequality and polarisation of communities. The provision of this housing must respect the limits of the planet's environment, maximising efficiencies of resource use to minimise consumption of natural

resources. These goals may be achieved through:

- Achieving a sustainable economy that maintains affordable living, whilst ensuring that the polluter pays environmental and social costs, and occupants are incentivised to make sustainable choices;
- A system of governance that promotes transparency, participation and engagement in the development of policy;
- Using sound science responsibly to take precautionary action where necessary to implement policy, such as on the basis of limiting climate change.

The SDC report Mainstreaming Sustainable Regeneration (SDC 2003) set ten action points for mainstreaming sustainable regeneration which identify the centrality of sustainable development principles,

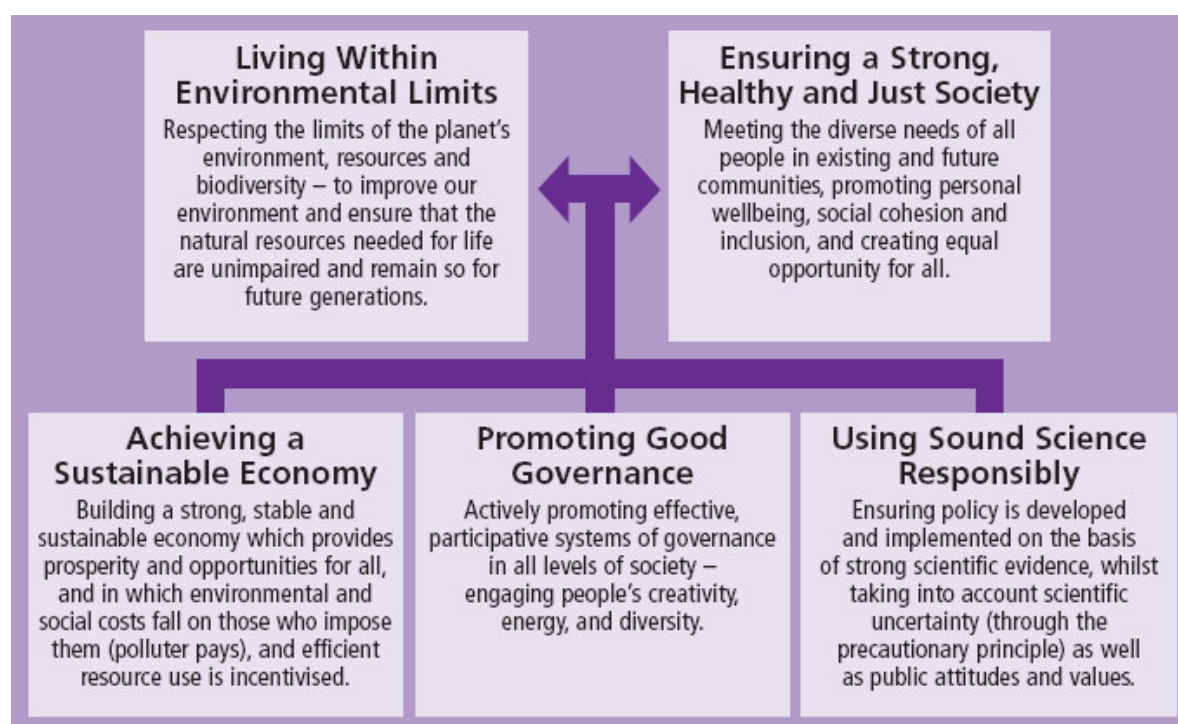


Figure 1 – the Five Sustainable Development Principles (HMG 2005)

local people, training, local environmental quality, national environmental priorities, taking a long term approach, the built environment, the planning system, employment programmes and the role of good practice.

Many UK neighbourhoods are in decline, with physical assets in disrepair, poor local environments and concerns regarding crime and security. These challenges are a result of under investment, lack of community involvement, and political leadership. They are part of a vicious circle, driving more affluent people out of city centre neighbourhoods to sprawling suburbs, which are land hungry and drive private car ownership. Marginalised communities are left in emptying streets with declining prospects.

A sustainable urban neighbourhood approach is needed to tackle these inequalities. Cities need to attract a social mix living at a reasonable density that helps create secure neighbourhoods, that maintain their buildings and environments and can pay for necessary services. The urban renaissance will deliver lower impact living, attracting people back to urban neighbourhoods through renovation and modernisation of buildings at a density to support neighbourhood activity.

New homes are currently constructed at a rate of less than 1% of stock per year, and even under the most ambitious demolition scenario 70% of 2050's homes are already existing (ECI 2005). The slow rate of turnover of our housing stock means improving community and housing conditions must focus on existing homes. Radical improvements to existing communities and housing may be achieved more quickly and cost effectively than a programme of demolition, redevelopment and replacement by new settlements.

Existing communities may be regenerated or through densification and infill, providing more homes for new households, which will reuse and reinvest in infrastructure and support better services. In this way, historic character of existing neighbourhoods, and social networks of existing communities need not be broken up, but reinforced. Much of the environmental costs of new build may be avoided including land take, construction of new infrastructure and transport impacts.

Existing homes may be brought up to modern standards through cost effective measures that will significantly reduce their current environmental impact, providing viable comfortable affordable homes in central locations. Effort should be focused initially on low-cost improvements to inefficient dwellings, drawing up performance evenly across the whole housing stock, which will be more effective than making a small number of homes extremely resource efficient. This strategy brings additional benefits in relation to the Government's broader sustainable development objectives of equity and equality.

This report reviews the measures necessary to upgrade existing housing to high environmental standards, radically reducing consumption of resources, whilst making vital progress towards social and environmental policy goals.

5. Existing Buildings - the Opportunities

Existing buildings provide a major opportunity in terms of creating sustainable communities. Existing communities must be sustained through repair and maintenance of existing homes as well as identification of appropriate infill sites for new homes. Improving and maximising use of existing stock is the cheapest and lowest impact solution to the provision of housing. It is possible to refurbish almost

all existing housing to a very high environmental performance. Housing policy must support the best utilisation and environmental performance of existing buildings.

Our existing buildings and communities can house more households, in better conditions and with better resource efficiency than at present. Most existing communities include the potential to increase housing provision on infill sites, if new build is necessary. Integrating additional housing within the urban fabric of existing communities has multiple sustainability benefits including: densification of the existing community leading to improved viability for services (shops, amenities and public transport); reduced environmental impact of the new build; and benefits through reuse of and reinvestment in existing infrastructure. Existing buildings may be converted from other uses to housing and from single houses to multiple flats, and empty homes should be brought back into use. The alternative solution is an inherently unsustainable massive expansion in new building across our finite supply of land, with enormous environmental consequences.

Government policy on climate change and energy efficiency actively supports the environmental improvement of existing buildings. The reduction of carbon emissions from energy consumption in existing buildings is vital if we are to achieve the national 60% reduction in CO₂ emissions by 2050. Other construction impacts such as energy consumption in manufacture and transport of materials, and greenhouse gas emissions from landfilled waste are also of importance in mitigating climate change effects. Adaptation to inevitable levels of climate change impacts requires a reduction in water consumption, and better measures to deal with flooding issues. Resource efficiency is the most cost effective and environmentally benign means of addressing the limited supply of non-

renewable resources, and should be applied as a priority before exploiting alternative resources.

The existing stock must be considered in the light of the Sustainable Communities Plan (SCP): both for the housing growth areas and the areas of low demand. The SCP presents major environmental, social and economic challenges. Avoiding waste, minimising impact and reducing resource use have become the overriding concerns of sustainable development in the context of sustainable housing policy (SDC 2004). There is currently a risk that the Sustainable Communities Plan could jeopardise the sustainability of existing communities, which would require further costly intervention in the medium term.

In the growth areas, the opportunities to use existing buildings (including using long-term empty homes – 1.5% of all dwellings in England - and converting other suitable building types into housing) and to densify existing developments, must be examined in order to minimise the environmental impact of this major development programme. Further, the scale of development proposed provides the opportunity to mainstream sustainable construction in new build and refurbishments, using the scale of operations to generate economies in what may have traditionally been seen as less cost effective options such as building integrated renewable energy systems. The growth in housing provision must contribute to the regeneration of existing communities, by ensuring that value is captured from new development. Any new housing developed or refurbishment works must adhere to high environmental standards to minimise environmental impacts of this programme.

In the low demand Housing Market Renewal areas, SDC are working with the Commission for Architecture and the

Built Environment (Cabe), English Heritage, the Environment Agency and the Commission for Integrated Transport to highlight the key factors for successful housing renewal, including to refurbish and refit housing and convert other existing buildings of value into housing (Cabe 2003). Together these organisations are supporting the development and sharing of best practice in the sustainable regeneration of areas of low demand, including consideration of the part that refurbishment of existing buildings will play in the creation of a virtuous circle of economic revival, as an alternative to demolition.

Cabe recently called upon decision makers in the Housing Market Renewal areas to 'positively address heritage as an asset' proposing a process of evaluation of the physical assets of an area to inform decisions about 'what to retain, enhance and celebrate' (Cabe 2005). The research suggests that low housing value and obsolescence is a function of three factors: poor physical

form and structural condition; social reasons (such as appropriate provision for household size and cultural requirements); and the quality and management of the surrounding environment. It is therefore necessary not only to address the physical condition of housing (including energy efficiency) but also how the existing buildings meet the changing social needs of the market, and how the public space between buildings is designed and managed.

English Heritage have developed guidance on how an understanding of the historic environment can guide decisions in regenerating areas of low demand (EH 2005). The organisation has shown that the cost of repairing a typical Victorian terraced house can be between 40-60% cheaper than replacing it with a new home (English Heritage 2003). Imaginative design solutions can give a new lease of life to derelict and unpopular built assets as is being demonstrated in some Pathfinder areas.

Box 5.1 – BRE research on refurbishment of office buildings.

The Building Research Establishment (BRE) has studied the comparative sustainability impacts of refurbishment and redevelopment of office buildings (BRE 2002b). This research identified environmental impacts related to the construction materials, transport, maintenance and disposal of the building fabric and operational energy consumption and running costs over a 60 year period (following refurbishment or redevelopment) and eventual demolition of the building.

The study suggests a 20% saving in environmental impact through refurbishment, and 12% saving in whole life costs, largely due to the saving in demolition and materials that would be involved in redevelopment. This is despite the constraints on performance efficiency of an existing structure. These results are very interesting in the context of this paper, and further analysis is required to understand how far these conclusions apply to housing.

The transfer of council owned housing to housing associations and creation of arms length management organisations (ALMO) provide routes for major investment in upgrading of this stock. Around 150,000 homes are currently transferred per year. The transfers currently require that homes are brought

up to the Decent Homes standard. Much higher standards should be set for upgrading, including sustainability standards for energy, water, materials and waste. Development of a national standard for sustainable refurbishment should be prioritised in the light of this opportunity.

Box 5.2 – Consumer demand for environmental homes

Research by Cabe, WWF and HBOS showed that there is a keen demand for homes with environmental credentials:

- 87% of buyers want to know if their homes are environmentally friendly
- 84% will pay 2% extra on the purchase price for an eco home
- 66% of buyers say they are not given adequate information about the technical specifications of a new home

The environmental assets that consumers value include:

- improved levels of energy efficiency
- lower running costs
- enhanced air quality and daylight
- use of low allergy and environmentally friendly material
- water efficiency

(Cabe 2004b)

5.1 Recommendations

The SDC's recommendations for effective action to improve the sustainability of the existing housing stock are that:

Housing policy focuses on minimising energy and wider resource use in existing buildings.

Housing policy prioritises the optimal use of existing buildings in existing communities before new developments are approved.

Government identifies how to communicate benefits of environmental homes to homebuyers.

6. Existing Buildings - the Challenge

UK domestic buildings are responsible for significant environmental impacts, including a quarter of UK greenhouse gas emissions, over half of water consumption and a quarter of waste generation. Buildings that are inefficient in their consumption of resources are expensive to operate, leading to disproportionate spending on resources, and may lead to poor health. Resource use in buildings relates to their built form, products and appliances that occupants/landlords choose to purchase, and how occupants operate their building. Much of the impact of the construction and operation of buildings could be reduced through improved efficiency.

Existing buildings represent around 99% of the building stock at any one time,

with new construction at a rate of less than 1% of the total stock per year. Approximately two thirds of the existing building stock pre-dates the introduction of any environmental requirement in the Building Regulations (SBTG 2004). Improvements made within the existing stock will yield significant environmental savings in the immediate future and for years to come. The UK building stock needs to play its part in contributing to the UK target of 60% reduction in CO₂ emissions by 2050 – a range of policies is needed to support these improvements in efficiency.

The existing housing stock has been identified as a difficult sector to reach because of diverse ownership, ages and condition of stock, and for this reason Government intervention (through Building Regulations) has traditionally been applied to the performance of new stock.

Box 6.1 – Decent Homes

A decent home is one that: meets the current statutory minimum standard for housing; is in a reasonable state of repair; has reasonably modern facilities and services; and provides a reasonable degree of thermal comfort. The Decent Homes standard triggers works to refurbish homes to bring them to a suitable standard for occupancy.

Almost one third of all housing does not meet the Decent Homes standard (ODPM 2003b) – and 80% of these (5.5 million) fail due to thermal inefficiencies, of which three quarters (over 4 million) fail due to lack of insulation. Nearly 40% of social housing and nearly 50% of private rented dwellings are non-decent.

The Decent Homes standard does not target energy efficiency directly; only 'thermal comfort' - which may be improved by *increasing* energy use rather than *reducing* energy loss. A dwelling is non-decent if it has less than 50mm of loft insulation (if there is a loft and there is no cavity wall insulation) but Building Regulations require around 300mm of loft insulation. A good standard of energy efficiency is a pre-requisite of improved thermal comfort without greater carbon emissions and climate change impacts.

The Government has set a target to bring all homes up to a decent standard by 2010 and transfer, setting up an ALMO, or using PFI are the options open to local authorities to enable it to deliver against this target.

Much of Government policy and existing market trends point towards the development of new housing on large clear sites (whether previously developed or not), supported by a number of financial and regulatory drivers. A series of barriers currently exist against the physical improvement of existing community neighbourhoods including:

- planning system procedures limiting opportunities for improvements and slowing progress;
- infrastructure complexity in existing areas leading to unforeseen costs and risks; and
- poor local environments in some existing communities discouraging investors.

Further barriers exist to the implementation of improvement measures in existing homes including:

- unequal levels of VAT between new build (zero rated) and repairs and refurbishment (17.5% VAT);
- barriers relating to access to finance for householders;
- householder apathy due to lack of interest or awareness;
- lack of information about how to improve properties; and
- landlord-tenant share of benefits where the landlord may invest in resource efficiency improvements but the tenant receives the benefits of reduced bills.

This study identifies the policies needed to overcome each of these barriers in a concerted programme of existing housing and community improvement.

Within the existing housing stock, the private rented sector has the poorest energy performance, and may be considered the most difficult sector in which to promote energy efficient measures, as the most tangible benefits of energy efficiency, in the form of reduced spending on energy and increased comfort, are not realised by the landlord. The 2001 English House

Condition Survey (EHCS) showed that for the private rented sector (which represents 8% of the total UK housing stock), the average SAP¹ rating was 45, compared with an average of 51 for all English housing. 12% of the private rented sector has a SAP rating of 20 or less, compared with 5% for all English housing. The EHCS includes potential technical improvement measures (in terms of thermal comfort and energy efficiency) for the private rented sector: 35% could be fitted with cavity wall insulation and 35% could be fitted with central heating. Policies should be developed to support and encourage the investment in resource efficiency in existing private rented sector housing.

The disparity between VAT rates for new build and refurbishment give a perverse incentive towards demolition and redevelopment rather than refurbishment of existing homes. This has become particularly acute for major renovation projects where some developers are planning to demolish and rebuild viable properties because the economics are favourable, when it would be less environmentally and socially harmful to refurbish the existing properties to high energy efficiency standards.

The SDC would support a review of the VAT regime for refurbishment works. We understand that this is a complex subject and that the UK has limited discretion to vary the VAT regime, but can reduce VAT to 5%. The SDC would support the creation of a more level playing field so that essential refurbishment and repair is not discouraged.

¹ The Government's Standard Assessment Procedure (SAP) for Energy Rating of Dwellings 2001. SAP Ratings range between 0-120 where 120 is most efficient.

6.1 Recommendations

The SDC's recommendations for effective action to meet the challenge of improving existing homes are that:

Government equalises rates of VAT on new build and refurbishment works to create a level fiscal playing field.

Government creates the necessary signal that reinvesting in the existing stock is more sustainable than building new.

Government considers capturing value from developments to benefit local communities and minimise pressure on infrastructure.

Government policy supports the upgrading of existing housing through a co-ordinated programme of voluntary standards, enforced regulation, financial incentives and provision of information.

The Decent Homes standard is extended to cover all types of resource efficiency to high environmental standards compliant with the Code for Sustainable Buildings

7. Existing Buildings – the Capacity to Deliver

The resource efficiency of existing housing is largely a devolved matter in the UK, and the recommendations in this paper relate mainly to England. The issue of sustaining existing communities, and within them, existing buildings, is an issue pertinent to all parts of the UK. Many of the technical measures to deliver the improvements that are identified here are relevant to the whole UK, but the recommendations for implementation through policy will differ between regions.

Planning Policy Statement 1 (PPS1) and local planning laws provide the framework for delivering sustainable communities (ODPM 2005). However, there is better guidance should be made available to planners on sustaining existing communities through refurbishing existing buildings or in the use of urban infill sites to densify existing developments. Planning policy also needs to address (with due consideration of heritage issues) the barriers to carbon reduction improvements to existing homes in conservation areas where external insulation and renewable energy systems are often not permitted. Planning policy must allow these homes

to be brought up to an acceptable standard in order to ensure their long term viability.

The 2004 amendment to the Building Act through the Sustainable and Secure Buildings Act opens up new opportunities to address the energy efficiency of the existing building stock and furthering of sustainable development through Building Regulations. Building Regulations may now be developed to require a reduction in greenhouse gas emissions from existing homes when carrying out building work or at change of occupancy. Building Regulations already apply to replacement boilers and glazing in existing buildings, but there is as yet no implementation of this new legislation. The SDC are working with ODPM to identify how best to implement the Act through new regulations.

However, compliance with current regulations has been demonstrated to be very low. The control of new building is understood to be a low priority for councils, and full enforcement is not sufficiently funded; there is a national skills shortage for Building Control Officers; and it is not easy to tell if internal building work is being carried out on existing buildings without notification. One third of properties

tested in a recent survey did not achieve the required standard of air tightness, which may be used as a proxy for overall build quality (EST 2004). Recent developments in self-certification schemes for building contractors have shown positive results (ODPM 2003c), and it may be worth extending the self-certification schemes to a limited number of areas of Building Regulations. The methods of enforcement of, and levels of compliance with Building Regulations must be urgently reviewed in order that improvements in Building Regulations actually deliver environmental improvements.

Building Regulations should be developed with consideration of acceptability of regulation by householders. It is important that householders are made aware of the purpose of the Regulations and the benefits to them of ensuring compliant work. Building Control inspections provide a means of protecting householders from perceived 'cowboy' builder practices and therefore should be desirable.

Following recommendation from the Sustainable Buildings Task Group, the Code for Sustainable Buildings is currently being developed by Government and industry (SBTG 2004). This provides the opportunity for a national standard for sustainable buildings to be established. The Code should set challenging targets for sustainable design and construction to be applied to all building types. The Code will initially be developed for and trialled on some elements of new-build housing in the Sustainable Communities Plan both in a growth area and a Housing Market Renewal area. Early progress on the Code is very encouraging. The public sector is demonstrating leadership in sustainable procurement by committing to use the Code on all public-private partnership developments and developments on publicly owned land. The Code should be

explicitly linked to the Building Regulations in order that it will give clear messages to industry of 'future thinking' for the regulatory standards.

The Code for Sustainable Buildings must also set the standard for sustainable refurbishment, but there is currently no timetable for the development or implementation of this element. It is necessary that this refurbishment element is developed and introduced as soon as possible. The BRE are currently developing a version of their BREEAM² tool 'Ecohomes XB' to assess existing housing, which may provide a useful basis for the development of this element of the Code. A sustainable standard for existing buildings may be used in the future to set a standard for major refurbishment by landlords. Alternatively, future versions of the Home Condition Report could audit the home on its sustainability according to the Code's criteria.

In order to develop strong policies for resource efficiency and environmental improvements, robust data on the existing housing stock is required. The English House Condition Survey (ODPM 2003) provides very useful data on energy efficiency of the entire housing stock in England. It would be very useful if this survey were extended to collect a wider range of data on the resource efficiency of existing homes as a vital data resource for the development and evaluation of policy.

Moving house is a key moment to exploit householders' interest in improving the state of their property. House sale transactions take place at a rate of around 1.2 million units per annum, with new build at about 12% of this (SBTG 2004). Additionally, there are 1.8 million rental movements per year providing an additional 'trigger' to inform tenants and landlords of

² Building Research Establishment Environmental Assessment Method

opportunities for improving the energy efficiency of the home. The introduction of the Home Condition Report within the Home Information Pack in 2007 will ensure that all home movers have up to date information about the energy performance of their property. Developing a system of labelling homes will raise consumer awareness of 'invisible' energy efficiency and will give sellers an opportunity to add value to their property through energy efficiency measures. The Home Information Pack

should be able to include information on wider resource efficiency in the future. Policies to promote improving the environmental standard of homes at change of occupancy should be identified to coincide with the introduction of the Home Information Pack. Options include using regulation and/or incentives to bring about a step change in environmental performance through co-ordinated policy making.

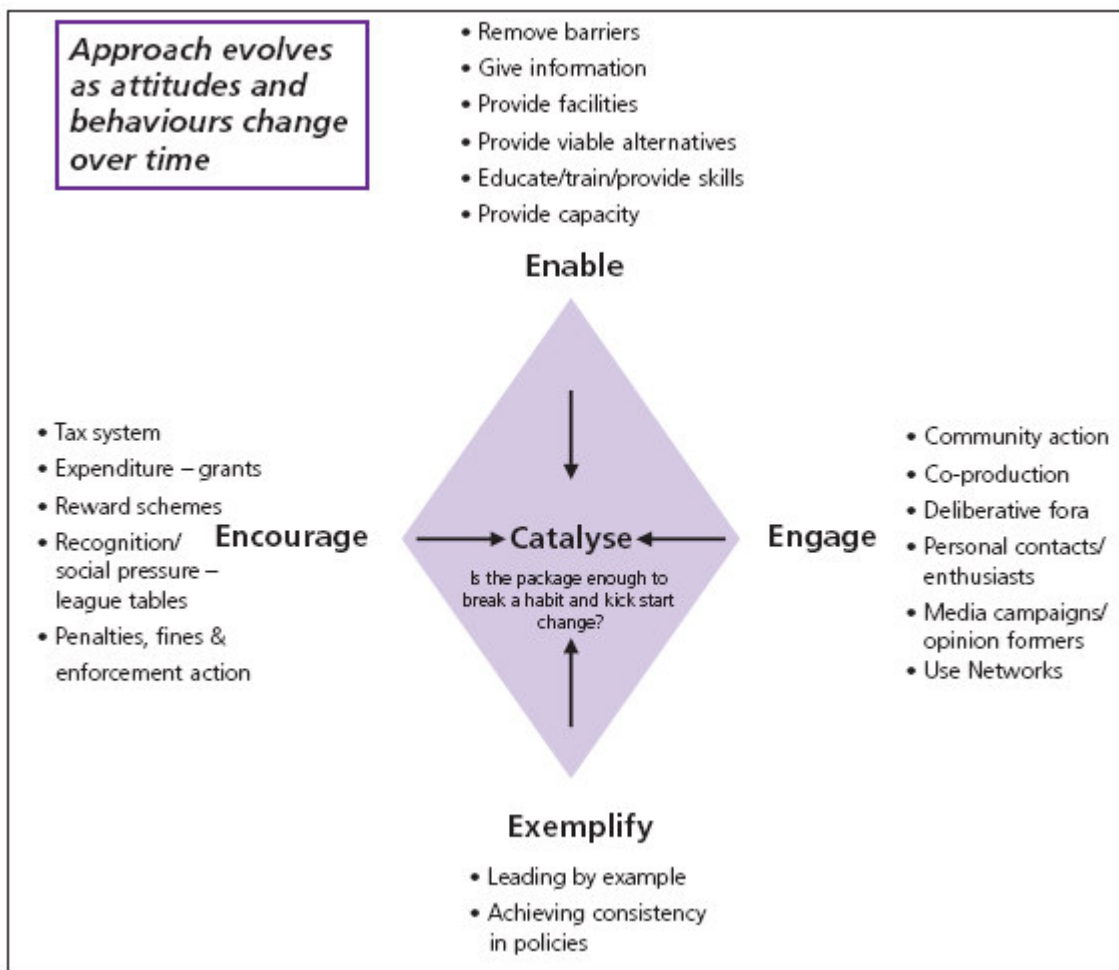


Figure 2 - A model to enable, encourage, engage and exemplify sustainable behaviour (HMG 2005)

The recent UK Sustainable Development Strategy (HMG 2005) provides the framework for sustaining existing communities and housing in the UK with respect to ensuring sustainable consumption and production, mitigating climate change and ensuring natural resource protection. The Strategy identifies new means of influencing behaviour (see Figure 2) to deliver more sustainable outcomes. The 'diamond' provides a model to rationalise co-ordinated policy steps required to bring about a change in behaviour, and this model is appropriate to apply to the issue of existing housing. It focuses on the need to enable, encourage and engage people and communities in the move toward sustainability; recognising that Government needs to lead by example. This approach suggests that policies should be targeted at occupants, major retailers, developers, builders and product manufacturers. The Strategy recognises that regulation and enforcement can only get us so far, and that there is a major role for encouraging sustainable behaviour. Engagement with the public is a very important element of sustainable development and is especially important for involving consumers in decisions about their own activity, and their contribution to meeting UK sustainability goals.

There is an overall shortage of skilled operatives in the construction industry, with an ageing workforce, and increasing numbers of low skilled construction workers. The skills required in sustaining existing communities and improving the existing housing stock and identifying opportunities for refurbishment, conversion and infilling were not explored in the Egan Review (ODPM 2004a).

There are around 50,000 building and construction firms in England of which the majority are small firms with few staff. Due to low regulation of

construction firms and shortage of skills, householders are often distrustful of builders and therefore opt to have the minimum amount of work carried out on their homes in order to reduce the risk of being overcharged. Schemes such as Trustmark³ provide an opportunity to engage the SME builders in schemes to promote resource efficient refurbishments. A 'one stop shop' for resource efficient refurbishment works packaged for householders would overcome some of these barriers.

A good resource of information regarding sustainable refurbishment is available through the Green Street⁴ initiative funded by the Housing Corporation and Energy Saving Trust. This includes information on technical measures to sustainably refurbish the fabric of different housing typologies, as well as funding sources.

³ <http://www.trustmark.org.uk/>

⁴ <http://www.greenstreet.org.uk/>

Box 7.1 – Environment Direct

Defra is currently developing an environmental information initiative 'Environment Direct'. This will be developed to provide an information source to consumers on making good environmental choices, covering products and perhaps services. Environment Direct will be established in 2006. The initiative must be based on robust analysis, requiring significant research and access to data. Environment Direct has the potential to provide much of the information for consumers that has been identified during this study to be lacking.

7.1 Recommendations

The SDC's recommendations for effective delivery of improvements in existing housing are that:

<i>Government and the public sector demonstrate leadership through sustainable refurbishment of existing social housing</i>
<i>A best practice guide for delivering sustainable buildings including clear guidance on sustaining the existing housing stock is developed to accompany PPS1- Creating Sustainable Communities.</i>
<i>Government considers further amending Schedule 1 of the Building Regulations, extending their scope to cover a wider range of sustainability issues when refurbishing the existing building stock.</i>
<i>Government reviews the mechanisms for enforcement of Building Regulations and overall rates of compliance.</i>
<i>A high standard for sustainable refurbishment of existing housing is introduced through the Code for Sustainable Buildings</i>
<i>The English House Condition Survey is extended to collate data on wider environmental performance of existing stock.</i>
<i>The Home Condition Report is developed to include information on not only energy efficiency but also compliance with a range of other resource efficiency criteria.</i>
<i>Delivery capacity is raised through the development of guidance and support of skills including for local authorities and housing associations.</i>
<i>The Government identifies how more private sector financial mechanisms may be used to deliver improvements in existing homes</i>
<i>Government develops the green landlords scheme to reward holistic resource efficiency (energy, water, materials, waste)</i>
<i>Government considers developing a 'one stop shop' package for resource efficient refurbishment of homes.</i>
<i>Government considers introducing incentives to building companies to refurbish properties to a high standard.</i>

8. Energy and Carbon

Housing has a key role to play in meeting the UK's challenging carbon targets for 2010 and 2050 (SDC 2005). In support of the national carbon emissions targets, the Government should adopt a target for a 60% cut in emissions from buildings by 2050 by the latest. Existing housing may be refurbished to a high standard of energy efficiency, although costs of achieving this will vary with building type. The energy efficiency of the existing stock should be considered within growth areas when new housing is developed in order to reduce pressure on infrastructure.

All buildings contribute almost half of the UK's carbon dioxide (CO₂) emissions. The UK's homes contribute almost a third of emissions. These emissions of carbon dioxide are attributed to the consumption of fossil fuels for the generation of heat and power. Energy consumption and carbon emissions from existing housing are already the subject of significant research and policy.

8.1 Policy Context

The Government's Energy White Paper (DTI 2003) set a new UK carbon

reduction target of 60% by 2050, with real progress by 2020. The Energy White Paper identifies energy efficiency as the cheapest, cleanest and safest way to achieve the UK carbon reduction targets. 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 (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').

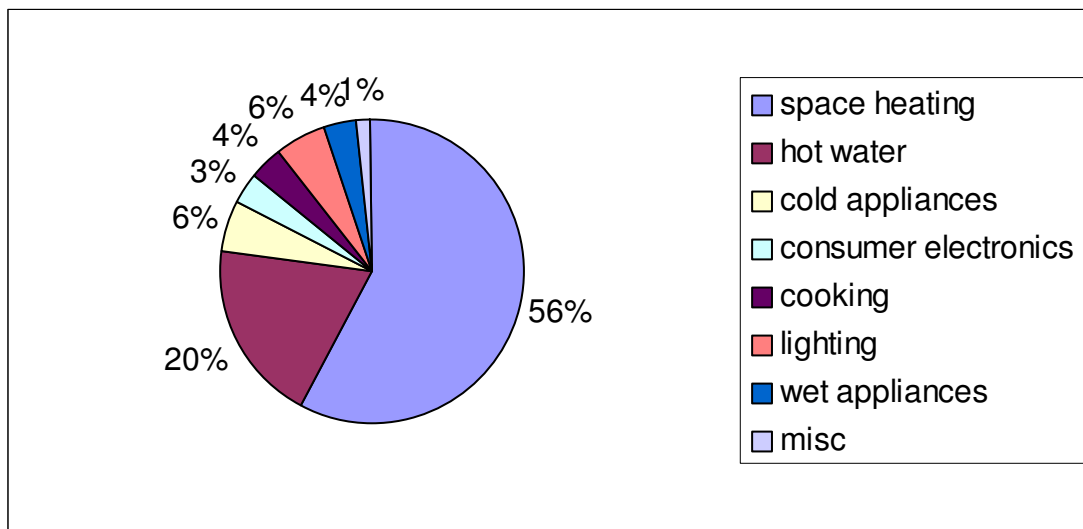


Figure 3 - Energy consumption in households by end use (ECI 2005)

Box 8.1 – Fuel Poverty

Adequate and affordable heating is a key aim of UK energy policy. A person 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. Improving energy efficiency is one of the strongest ways to reduce fuel poverty, however vulnerable groups also benefit from advice regarding social security payments.

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'.

Warm Front is the Government's main grant-funded programme for tackling fuel poverty. The scheme was launched in June 2000. The scheme is currently assisting over 200,000 households per year. The Warm Front programme aims to bring all households up to a SAP rating of 65.

Recent 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. The Housing Act 2004 provides the route for EPBD implementation in 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 SAP⁵, 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 consumers 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 energy service packages and appliances, which have been effective in boosting these markets. However, consumers that do not have access to the gas grid and live in a solid wall property have been disadvantaged within this scheme to date.

The **Decent Homes** (ODPM 2004b) standard establishes four criteria that

⁵ Standard Assessment Procedure – Government approved energy rating for homes.

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 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 UK Sustainable Development indicators (Defra, ONS 2005):

- *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 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.

8.1.1 Housing Growth

Carbon dioxide (CO₂) emissions associated with the construction at the maximum level proposed in regional plans, the Sustainable Communities Plan and by the Barker Review could represent 5% of annual UK CO₂ emissions, and CO₂ emissions associated with occupation of new homes as proposed by could represent up to 12% of current household CO₂ emissions (Defra 2004c).

The construction of new homes has major energy impacts through the manufacture and transport of materials for construction of homes and infrastructure, and operation of the homes has the greatest energy impact, therefore considering refurbishment and urban infill sites should be prioritised.

The University of Oxford's Environmental Change Institute (ECI) recently completed a study examining the feasibility of achieving a 60% cut in CO₂ emissions from the growing household sector by 2050 (ECI 2005).

8.2 Carbon Reduction Opportunities

Carbon emissions from housing may be reduced through improving the thermal efficiency of the building fabric, improving the efficiency of products installed within the building, improving control of energy use, and reducing the carbon content of energy sources. Policies for carbon emissions reductions need to also focus on total energy consumption/carbon emissions, requiring both efficiency and number of appliances/hours of operation to be controlled.

The measures that are appropriate to improve the thermal efficiency of the building are dependent on the type of construction of the building. There is a range of data available on the type of stock in England (ODPM 2003b) and on appropriate thermal improvement measures from the Energy Saving Trust Energy Efficiency Best Practice Programme⁶.

Box 8.2 - Key proposals of the ECI study:

- 10M new homes will need to be built (to increase stock by 33%) by 2050, at a rate of 220,000/year
- That 2/3 of the dwellings standing in 2050 exist today and these will need to receive the following measures:
 - 100% cavity wall fill; 15% solid wall insulation; 100% loft insulation at 300mm; 100% high performance windows.
 - The average SAP rating brought up to SAP80, compared to average of SAP 51 today
- 3.2M homes (14% of the current housing stock) will need to be demolished at a rate of 80,000/year
- 72% of homes will have low and zero carbon technologies (renewables, micro CHP) providing the main heating and hot water energy supply in homes
- All homes have more warmth, hot water and access to appliances; however the use of domestic air conditioning is not modelled.

Box 8.3 – Key Carbon Efficiency Measures

Insulation (walls, ground floor, loft, glazing) and draught proofing

Energy efficient equipment – boilers, lighting, electronics

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 technologies such as solar water heating, mCHP and photovoltaics.

Behavioural measures: using controls to limit consumption.

6

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

A wide range of data is available on costs, benefits and financial paybacks of the various energy efficiency measures available. Many significant improvement measures are cost effective - see Table 1. Investments in insulation of housing fabric may be paid back in savings in energy bills in less than six years. Households move on average every 7-10 years therefore there is a chance to see the return on their investment plus sell on their home in a better condition (and potentially at a higher value). However, the capital cost of significant fabric insulation improvement may be a very real barrier to implementation. Cost barriers may be partly overcome through reduced rate VAT for all energy efficiency measures.

A study by the Energy Saving Trust (EST 2003) showed that refurbishment costs for thermal improvements range from £500 (1920's semi) - £1100 (1950's terrace) to bring an average property up to current (2002) Building Regulations Part L standards. These improvements would generate cost savings of £150-270, and carbon reductions of 80-90%.

Data suggests that although greatest carbon savings may be achieved from an efficient replacement boiler (see Figure 4); the most cost effective measure for energy efficiency and carbon savings is cavity wall insulation (see Figure 5); this is the main focus of current policy on building fabric.

Heating system efficiency may be improved through the installation of efficient boilers and the use of heating system controls. Improved energy efficiency of heating systems may be achieved at minimal technical risk, and without significant extra cost when a boiler or heating system is being routinely replaced. 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.

Future policy programmes will need to address the less cost-effective measures such as solid wall insulation. There are currently 7 million solid walled homes in the UK. Solid wall insulation is at the moment either applied as internal insulation, which reduces the size of rooms marginally and can be very disruptive to occupants, or is applied externally, which can be costly, requires whole apartment blocks to be treated simultaneously, and may be limited by planning constraints due to visual impacts. We would support further investment into innovation in useable and affordable solid wall insulation that would improve the prospects for uplifting the energy efficiency standards of both solid wall homes, and as secondary insulation to older cavity wall properties. This is vital in providing appropriate and cost effective solutions to a large proportion of the UK housing stock.

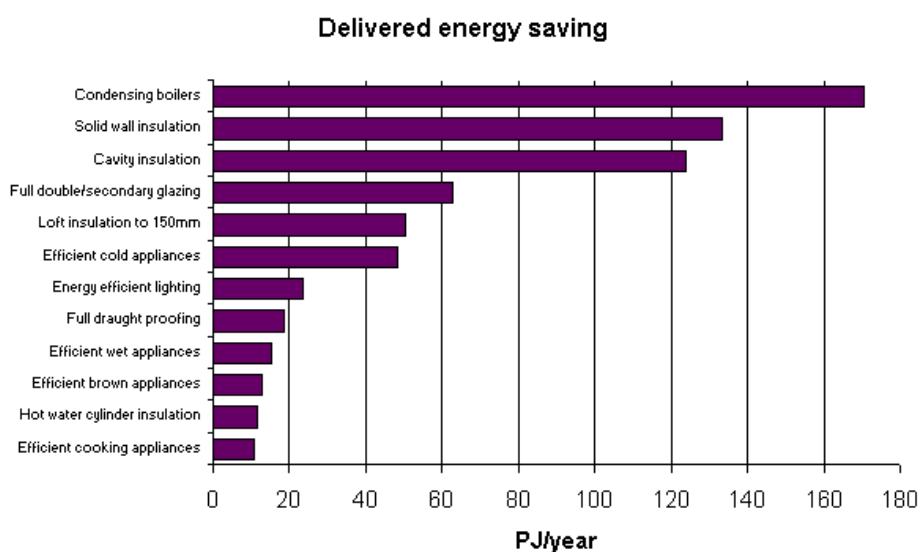
A study for the Energy Saving Trust (EST 2003) reviewed costs of energy efficient refurbishment of housing against demolition and new build of Building Regulations compliant homes. The study indicated that it is in the order of ten times more expensive to replace housing than to do an energy refurbishment.

Table 1 - Average costs and savings from typical energy efficiency improvements (Defra 2004d)⁷

Measure	Installation cost (inc. VAT at 17.5%) (£)	Average annual saving (£)	Payback (years)
Cavity wall insulation	314	58	5.4
Solid wall insulation*	800-2300	70-250	8-11
Loft insulation	259	23	11.3
Draught proofing	95	7	13.6

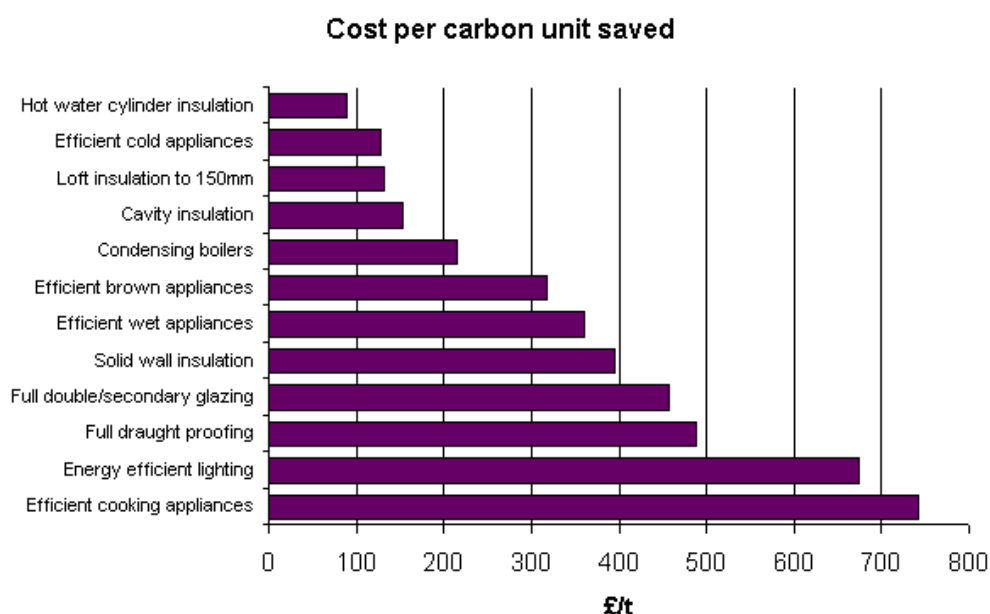
* Data from EST 2000b

Figure 4 - Delivered energy saving per measure (MTPa)



⁷ Note this table shows an illustrative range of costs and benefits of energy efficiency measures. Data will vary for type of dwelling.

Figure 5 - Cost per carbon unit saved for range of measures (MTPa)



The growth in use of electrical appliances and domestic cooling are concerning trends. Energy efficiency savings through improved thermal performance could be matched by rapid increases in energy consumption from these demands. The carbon intensity of electricity is almost 2 ½ times that of gas therefore carbon emissions could increase rapidly if the efficiency, switching and proliferation of these appliances is not managed. For example, lights and appliances represent the area of greatest growth in residential energy use, predicted to increase by 14% by 2010. Half of this predicted growth is in digital TV energy consumption (MTPb).

Another growth product with concerning carbon implications is domestic air conditioning. In 2000, around 1million domestic air conditioners were sold in the UK – projected steep increases in demand for and sales of air conditioning will make this a significant energy demand for UK housing. Modern construction methods are more likely to lead to overheating requiring active

cooling measures than traditional ‘heavy weight’ construction, and rising temperatures are likely to exacerbate this problem.

There is currently great scope to improve the efficiency of lighting and appliances and the range of low energy household appliances is increasing, encouraged through the Energy Efficiency Commitment (the Government regulation on energy suppliers to offer energy saving products to households) and the Government’s Market Transformation Programme.

Additionally, there is the opportunity to realise savings through reducing the ‘standby’ energy consumption of a range of electrical goods. The standby problem is becoming increasingly serious, because more and more appliances have standby functions with much higher energy consumption than necessary.

Consumer information through standardisation and labelling is very important in this area, and should be

expanded to a wider range of appliances.

Further carbon savings may be achieved through the introduction of efficient generation technologies (such as micro Combined Heat and Power (CHP)). These systems may be integrated into existing buildings. Following ongoing field trials, Micro CHP units may be able to replace

boilers, generating heat and power at high efficiencies (although they are most likely to be used most widely in larger domestic properties where the greatest return on generating electricity in the home will be realised). The Budget 2005 included a reduced rate of VAT (5%) on domestic CHP units. However, the carbon savings are not yet fully proven.

Box 8.4 – Consumer electronics standby power

A report from the recent international “Action on 1 Watt” conference in Denmark recommended that:

- typically about ten percent of the electricity consumption is used for standby functions;
- regulation should secure minimal standby efficiency, while public procurement and voluntary agreements should pave the way for the most efficient products; and
- analysis shows that in Denmark the total electricity consumption could be reduced by three percent by implementing the saving potential of standby consumption in households and the private and public service sectors.

Box 8.5 – Embodied Energy

The embodied energy of construction materials should be considered in the light of the Sustainable Communities Plan and decisions to refurbish or redevelop housing. Embodied energy is the energy that has been used in the manufacture and transportation of materials used in housing and physical infrastructure of communities. Embodied energy typically accounts for around 10% of lifetime carbon emissions (including operational heat and power), however, with higher efficiency in buildings, the embodied energy will represent a higher proportion. Future stages of this study will investigate the effect on lifetime energy of refurbishment versus redevelopment of buildings.

A study by the Empty Homes Agency suggests that the embodied energy in refurbishment works is one sixth of that in redevelopment works.

Renewable energy systems allow essential heat and power to be delivered carbon-free. A programme to improve carbon efficiency should follow a hierarchy to enable greatest cost effectiveness as follows: energy efficiency measures; carbon efficient systems (such as CHP); renewable energy. The use of renewable energy technology at a household scale, known as 'micro renewables' can bring significant reductions in carbon emissions. A solar water heating system may provide around 50% of domestic hot water demand, carbon free, with acceptable financial pay back times.

The Clear Skies⁸ programme grant-funds a range of micro renewable technologies available to householders including solar water heating. Photovoltaic (PV) electricity generating systems may replace standard roofing materials to generate carbon-free power. There is currently a major grant funding programme⁹ to support the installation of PV systems in households in the UK. The DTI is currently developing a Micro Generation Strategy for the UK (DTI 2005). This will cover technologies available, barriers to penetration and policies to support increased micro generation penetration in the UK.

8.2.2 Barriers

A range of real or perceived barriers currently exists that are limiting the implementation of energy efficiency in existing homes.

The right information is not available to consumers about the benefits of energy efficiency, and critically it is not available to consumers when they are making major purchasing decisions. Promotion and availability of products in retail outlets strongly influence consumer uptake. Consumer awareness of their

household carbon emissions is low, therefore they are unlikely to actively seek ways to reduce their carbon emissions.

Energy prices are currently low for most householders, and as a result many people are not aware of their annual expenditure on fuel bills. This sector of 'able to pay' householders are not actively looking to explore ways of reducing their bills. Further, householders as consumers do not generally calculate savings in energy consumption when they buy an energy efficient product, partly because this information is not readily available to them. 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. Policies should be specifically developed to be attractive to the 'able to pay' sector without disadvantaging other groups.

There are high up-front costs to taking action to reduce carbon emissions, which provide a barrier to householders. If the benefits are explained, and costs may be spread over a longer period, householders may be persuaded that investment is worthwhile.

The fiscal message from Government is currently confused: there is a reduced rate (5%) VAT on fossil fuels, and yet full rate (17.5%) VAT for many energy efficient products. This does not send a clear message about Government priorities regarding climate change.

Planning may provide a barrier to some energy efficiency improvements, particularly in conservation areas where external insulation of solid wall homes and the installation of micro renewable energy systems may not be permitted.

Landlords are reluctant to invest in energy saving in private rented properties as rental values do not normally reflect energy efficiency and

⁸ <http://www.clear-skies.org>

⁹ DTI Major Photovoltaic Demonstration Programme at <http://www.est.org.uk/solar/>

the landlords themselves will not benefit from the reduced energy bills or improved comfort conditions.

Current barriers to the wider installation of micro renewables in housing include the planning system still precluding visible systems in some sensitive areas, and the complexity of arranging connections to the electricity grid.

Finally one of the key barriers to improving household energy efficiency is the inconvenience of having works carried out in the home to install energy efficiency measures such as insulation or improved heating. Householders may carry out home improvements in order to enjoy the improved aesthetics or space but may be reluctant to carry out 'invisible' improvements to energy efficiency. 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 an appropriate amount is being charged or quality achieved.

8.2.3 Information

Providing information (through labelling and promotional activities) allows consumers to distinguish between good and bad performing products. Robust data is required to support all information campaigns in order to engender and maintain public trust.

The role of raising awareness and providing information is very important in encouraging energy efficiency in the home, as noted above. Labelling schemes such as are used for white goods, and now to be extended to houses (through the Housing Act 2004), will enable consumers to make better choices, understanding the benefits to them and to the wider environment of more efficient products. However, in isolation this may not have a significant effect on purchaser behaviour if there is not sufficient availability of highly

energy efficient products or indeed properties, and if this information is not backed up by a wider engagement and advice programme. The Energy Efficiency Partnership for Homes (EST 2005) have shown that provision of information without verbal follow-up results in a 40% reduction in the potential carbon savings being implemented. It may be necessary to use financial incentives or regulation to promote the uptake of energy efficient products or properties to coincide with labelling initiatives.

Energy bills do not currently provide sufficient information to householders to influence their energy consumption. The provision of historical or comparative data on customer bills would enable consumers to understand trends in their energy consumption – for example: how much is being spent this year compared to last; comparisons between the occupant's energy consumption and that of a typical/good practice house. Such information may motivate people to act, and in providing positive feedback, would reward the implementation of energy efficiency measures. The current campaign by London Energy to promote accurate meter reading, reward reduced energy consumption and provide informative bills will be an interesting case study.

8.2.4 Incentives

Incentives may be used to reward sustainable carbon emissions behaviour. Incentives can encourage use of preferred equipment in two ways: they can act to narrow or eliminate any price difference that may exist between efficient and non-efficient products; and can demonstrate government approval of one product compared to another.

Fiscal measures include directly targeting certain products with a reduced level of VAT in order that clear signals are given to consumers. There is currently reduced VAT (5% rather than 17.5%) on some professionally installed energy efficiency

products¹⁰ such as insulation, however this is not applicable to all energy efficient products, and not to DIY installations. Reduced rate VAT is currently restricted to products for which energy efficiency is their main purpose, rather than to differentiate particular energy efficient models. We would support policies to set reduced rates of VAT on a wider range of energy efficiency measures in homes including secondary glazing. We welcome Government negotiations with its European partners to extend the categories of permitted reduced VAT rates to include a significantly wider range of carbon efficient products including low energy lighting and DIY energy efficient materials. Incentives may be 'matched' with penalties on poorly performing products in order to widen the signal to consumers.

The Landlords Energy Saving Allowance (LESA), introduced in 2004, provides income tax-paying private landlords with up-front relief on capital expenditure for installations of loft, cavity wall and solid wall insulation for their rented property (up to a maximum £1,500). There is an opportunity for the Treasury to amend or extend the definition of allowable expenditure. This could include extending the LESA to include draught proofing, hot water systems insulation and floor insulation. However, primary legislation is required to extend the LESA to plant items – we would support a review of the success of the LESA and consideration of extension of the scheme.

¹⁰ 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.

The Treasury's 2004 Budget also included the introduction of a 'green landlord scheme', incentivising landlords to invest in energy efficiency, possibly through recognition of properties achieving a certain level of energy efficiency. This scheme should lead to wider encouragement from the Treasury for holistic whole-house solutions in promoting energy and carbon efficiency although details of how to implement the scheme have not yet been fully explored.

A wider range of incentives could be introduced to target specific occupant behaviour, encouraging carbon reductions. Introducing a reduced rate of Council Tax or Stamp Duty would encourage whole house scale carbon reduction improvements. The current scheme giving £100 rebate on Council Tax promoted by British Gas in Essex will provide an interesting case study.

8.2.5 Delivery

The Energy Efficiency Commitment (EEC) is the Government's main mechanism to address energy efficiency in existing households. The EEC also plays a major role in elimination of fuel poverty. This scheme was successful for the period 2002-2005 where the target was to reduce domestic energy consumption by 62TWh – reducing UK CO₂ emissions by 1%. 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 EEC target for 2005-2008 is energy savings of 130TWh. Fuel switching, window glazing and efficient digital set top boxes have been included within 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. The EEC target will be

reviewed again for the period 2008-2011.

Energy services provide a key 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. The householder uses less energy as a result, and the savings on the energy bill are used to repay the cost of the measures. So, worthwhile home improvements are installed with no up-front cost to the householder, who benefits from a warmer, more comfortable home and lower energy bills for years to come once the initial investment has been repaid. There is currently a two-year pilot trial of energy services being undertaken by Ofgem¹¹, and a number of suppliers are offering energy service contracts for their customers with fixed repayment costs over two years or more. However, the success of energy services to deliver carbon savings depends on two things:

- The trust of the consumer in the deal being offered by the energy provider; and
- Sufficient competition between energy providers to ensure the consumer feels they are getting a good deal.

Further exploration of how to engage consumers satisfactorily to maximise demand for energy services is needed. The energy service tariffs available with selected utilities currently will provide useful case studies. We welcome the announcement in the 2005 Budget of a summit on energy services later in 2005. We are working with other bodies to explore how an attractive offering of

energy services might enable significant progress in carbon emissions reductions.

The amendment to the Building Act in 2004 will allow Building Regulations to be developed to address the energy efficiency of the existing building stock. We support indications that the revision to Part L of the Building Regulations 2006 will include a requirement to make cost effective and practical improvements to the energy efficiency of the whole dwelling when carrying out major notifiable works. We support the use of regulation, with consideration of enforcement issues, as a mechanism to reduce carbon emissions in the existing housing stock. It is important to note that the current low enforcement of and compliance with Building Regulations standards means that the tightening of regulations will not necessarily result in the anticipated carbon savings being realised unless post-completion checks become standardised.

The Code for Sustainable Buildings, which is currently being developed to set higher standards for carbon emissions for new housing, should also set stretching standards for carbon efficient refurbishment in the next stage.

The Market Transformation mechanism may be used to introduce minimum performance standards for all traded products. This may also be used to remove the most inefficient items from the market. This mechanism can be used to tackle parts of the supply chain that have traditionally been out of reach of housing policy. The Energy Efficiency Commitment has already been used to deliver a marked increase in efficiency of cold household appliances such as fridges and freezers.

¹¹ Office of Gas and Electricity Markets

8.3 Energy and Carbon Policy Recommendations

Despite the fact that many energy efficiency measures have been demonstrated to be cost-effective, and there are existing incentives through VAT reductions and energy supplier and Government funding schemes, the take-up of many of these measures remains

too low. It is therefore necessary to identify how Government can actively encourage and support take up of these measures.

The SDC's recommendations for effective action to improve the energy efficiency and carbon emissions from existing homes are that:

<i>The revision to Part L of the Building Regulations 2005 delivers a requirement to improve the whole house energy performance when undertaking notifiable building work.</i>
<i>The revision to Part L of the Building Regulations 2005 delivers a 25% reduction in carbon emissions from new homes.</i>
<i>Government considers developing to set minimum standards for whole-house carbon reductions at time of sale</i>
<i>The new Code for Sustainable Buildings is developed to set higher standards of carbon efficiency in new and refurbished homes.</i>
<i>Government considers using Council Tax rebates to reward improvements in energy efficiency of homes</i>
<i>The EEC3 energy savings target is set to a level of triple the EEC1 target, with a major programme of householder engagement.</i>
<i>Government pursues the potential to use Winter Fuel Payments to improve energy efficiency in homes.</i>
<i>Reduced rate VAT is introduced on all energy saving technologies and equipment to encourage their uptake.</i>
<i>Government gives the landlords' energy saving allowance (LESA) wider publicity with the aim of increasing awareness and uptake.</i>
<i>Government sets requirements for energy metering billing that show clear consumption information to raise householders' awareness of their consumption patterns.</i>
<i>Government raises awareness of and promote energy services schemes available to offset up-front costs of investment in energy efficiency or carbon reduction measures.</i>

9. Water

Households use more than half of the water supplied in the UK, and overall water demand is rising. Per capita consumption averages 150 litres per day in the UK. There is currently great inefficiency in supply infrastructure and in the consumption of water in UK households, and there is shortage of supply in many areas of the UK. There is great scope to improve the water efficiency of the existing housing stock. The Environment Agency predicts that climate change will reduce summer rainfall by up to 60% by 2080, with related effects on water resources for domestic consumption.

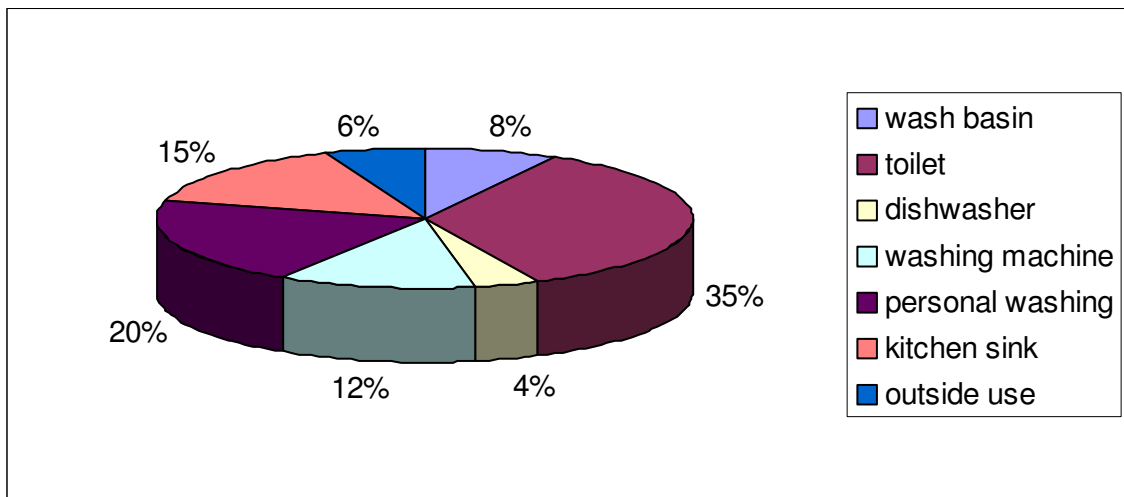
Water is a natural resource that is consumed in the construction and operation of buildings. Water is a necessary requirement for public health and wellbeing, therefore housing developments must provide a clean, safe and secure supply of water.

In the UK there is increasing pressure on our water resources, particularly in

highly developed areas such as the South East, where the energy intensive exploitation of new water resources is proposed in order to supply new developments envisaged in the regional plans and the Sustainable Communities Plan. It is possible to significantly reduce this projected demand through increasing the water efficiency in existing buildings and setting challenging standards for water efficiency in new buildings. Improved water efficiency will bring both environmental and financial benefits. However there is currently little research or policy activity regarding water consumption in existing buildings.

Mains water has an embodied energy element (through energy consumption in pumping and treatment), estimated to be 0.5kWh/m³. Therefore potable water consumption also contributes to overall energy consumption. It is possible to use non-potable quality water for non-potable household demands in order to reduce the environmental impact of water consumption.

Figure 6 - Water consumption in housing by end use (EA 2005b)



9.1 Policy Context

The **Water Act** (HMSO 2003) introduced a new duty to conserve water, which must be undertaken by all public authorities and bodies.

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.

Water Industry (Prescribed Conditions) Regulations 1999 provided a choice for household customers over whether to be metered or not.

The Water Supply (Water Fittings) Regulations 1999 included controls on products, for example by reducing the maximum flush volume specification for new WCs by 20% and specifying water consumption limits for domestic washing machines, washer dryers and dish washers. These regulations cover a wider range of water using appliances than may be covered by the building regulations.

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).

UK Sustainable Development Indicators (Defra, ONS 2005):

- *Domestic water consumption:* Households consumed an average of 154 litres per person each 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

9.1.1 Housing Growth

The scale of development proposed for the UK, in the context of limited water resources in many areas, means that a major programme of demand management (water efficiency) will be necessary to ensure water supplies are maintained, as well as exploiting new resources. 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, and water resources are among the lowest in the UK. The water companies, funded by consumers' bills, currently pay for all new water supply and treatment works.

Flooding is also a major issue in southeast England and must be addressed as part of the housing growth plans. Flood defences such as the Thames Barrier are being used more frequently now than ever before and yet a number of Local Authorities continue to allow development on flood plains contrary to Environment Agency advice.

Research by the Environment Agency (EA 2004a) suggests that existing water resource capacity will not be able to meet projected demand beyond 2025. Water consumption is increasing by around 1% per year and the additional demand from strong growth expected in household formation poses a challenge for water use and water quality. This is likely to have several effects, including additional pressure on water demand, on sewerage systems and on pollution. These effects are complex and inter-related: for example increased development increases the level of abstraction of water, which may lead to

low flow in rivers, lower river water quality, loss of habitat as well as increase the input of polluted runoff. Pressure on water supply and sewerage systems is projected to be most acute in the South East due to low rainfall and high demand.

The Environment Agency proposes a 'twin track' approach to this issue through demand management and development of new supplies. For example, it has successfully secured a 25% efficiency target within the development strategy for the Milton Keynes South Midlands sub-region.

The RSPB have suggested that, for the cost of the proposed increased supply infrastructure proposed for the Thames Gateway (an energy intensive desalination plant producing 20 mega litres a day); 200,000 homes could be made water efficient, saving 55 mega litres a day (Sustain Magazine 2004).

Many of the lessons of efficiency that have been developed for energy conservation may be relevant to the development of policy for water. However waste water and its treatment is also a key concern in the light of the housing growth areas. Sewage treatment works in the southeast are currently already close to capacity. Further housing development will require the costly development of further capacity.

9.2 Water Efficiency Opportunities

Water conservation measures include addressing leakage, fitting water meters, fitting water efficient appliances and the use of non-potable quality water for low quality demands. Water meters should be installed as a priority in order to ensure consumers benefit from saving water by also saving money.

Box 9.1 – Key water efficiency measures

Use of water saving fittings – spray taps, dual low flush WCs and showers
Retrofitting variable flush devices in existing WCs
Use of water efficient appliances – dishwashers and washing machines
Metering (to allow monitoring of demand and feedback)
Sub-metering in apartment buildings
Leak detection (to facilitate prompt maintenance)
Opportunities for grey water and rainwater recycling and use
Low water demand planting in gardens
Use of sustainable drainage systems
Behavioural measures: turning off taps when not required, wider 'water consciousness'.

It is possible to achieve significant water savings through the use of water efficient fittings and appliances. The same water efficiency may be achieved in existing, as in new homes, with little limitation on water savings – there is therefore great scope to achieve significant environmental improvements in the existing stock through water efficiency. Overall household water consumption of existing homes may be reduced by 20% by the installation of dual flush (4litre/6litre) WC cisterns. Personal washing, including use of wash hand basins and bathing accounts for a third of domestic water consumption. The use of spray or aerated tap fittings will reduce the water flow from a running tap leading to savings of up to 10% of household water use.

Regular refitting of kitchens and bathrooms, every 7-15 years (Mulligan and Steemers 2002) which comprise the majority of water consuming appliances in a house, provides the opportunity to address domestic water efficiency rapidly if consumer choices are supported through information and incentives. Water efficient washing machines and dishwashers may be specified to reduce water consumption further.

Water efficient fittings and appliances do not attract a significant cost premium, therefore there is no real financial barrier associated with the implementation of water efficiency. However, there is currently limited information on the cost-effectiveness of specific water efficiency measures, particularly over the longer term.

Research by the Environment Agency (EA 2005a) suggests that retrofitting

water efficient appliances in existing homes could reduce household water consumption by almost 40% without requiring behavioural changes (see Figure 7). These water savings could equate to a saving of around £100 per year per occupant.

Consumers who decide to routinely replace water-using appliances should be encouraged to purchase water efficient alternatives. However, replacement of appliances with efficient alternatives is only possible if such alternatives are easily available. There is currently almost no information on appliance water use available at the point of sale, making it difficult to make an informed choice.

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. This may require the installation of a parallel non-potable water system, using labelling and consumer awareness to avoid contamination risks. The installation of a parallel non-potable supply can save up to a third of household water use; costs for installation of such a system are likely to be in the region of £1000-2000 (EA 2004) for new build. There is no data available for costs of retrofitting these systems into existing housing. The scope of these opportunities is lower for retrofitting in existing buildings. Existing buildings would benefit from the installation of simple rain water systems for garden watering.

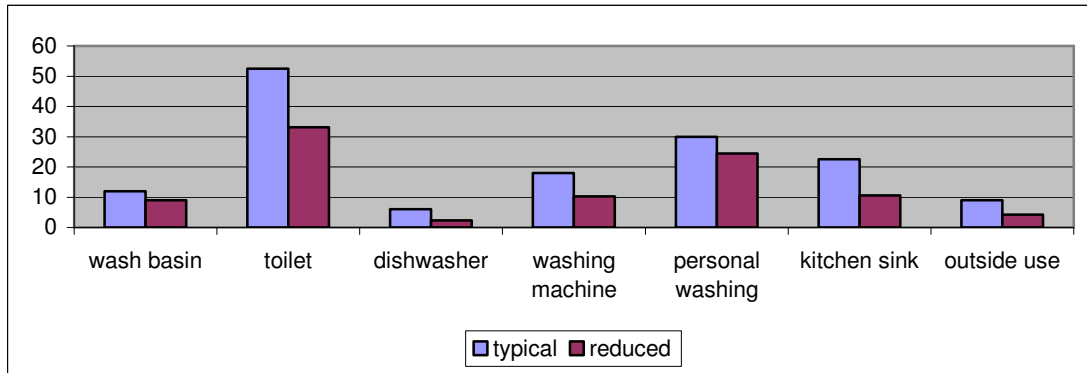


Figure 7 - Potential savings (litres per household per day) from water efficient appliances (EA 2005a)

9.2.1 Barriers

The barriers to water efficiency in households have been explored by the Government's Market Transformation Programme (MTP 2005).

Not having a meter is a key barrier to consumers installing water efficient appliances in their home, as they will not benefit from the water savings financially. The focus group studies found that water meters were often fitted by single or two-person households for cost saving purposes. All surveyed who had moved to a metered property or had a meter installed had noticed cost savings. Reasons for not having a meter installed included householder apathy, lack of awareness and concern that their water bill might increase.

Consumer awareness of and interest in water efficiency has found to be low in the UK (MTP 2005). Most surveyed did not consider their use of water even during droughts. The main incentive to save water is cost, although environmental issues play an increasing part through education. There is a perception that there is plentiful rainfall in this country, therefore little need to save water.

The presence of hard water in many areas of the UK may be a barrier to the use of some water efficient appliances (such as spray taps), however this may

be addressed through the use of water softening equipment, with the benefit of reduced maintenance and increased longevity of water using appliances.

There may be a perception that water efficient appliances and fittings are less functional than their non water efficient counterparts.

Cost is unlikely to present a barrier for water efficiency in homes where appliances are being replaced routinely. However, a programme to accelerate take up of water efficient appliances faster than the typical appliance turnover rate would have cost implications. However, retrofitting parallel potable and rainwater/greywater systems are likely to be cost prohibitive in existing homes.

There is currently no standardised labelling scheme for water efficiency in the UK, and this lack of information presents a barrier to improving water efficiency.

In refitting bathrooms, many plumbing items may be chosen by the plumbing contractor. Householders are often not involved in the selection of appliances and fittings.

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

9.2.2 Information

The water saving nature of new technology is currently being outstripped by changes in consumer behaviour suggesting that technical solutions are not the only answer. Intensive education campaigns for consumers, including improved consumer information on water efficiency of equipment, through labelling showing relative performance, would support consumer choices at point of sale. A national voluntary water-consumption labelling scheme for appliances, with a communication programme, would aid consumer choice.

The BRE are currently carrying out research into how a voluntary labelling scheme could be achieved through the Government's Market Transformation Programme – a Defra initiative that develops policy strategies for improving

the resource efficiency of traded goods and services in the UK.

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. The provision of historical or comparative data on customer bills would enable consumers to understand trends in their water consumption – for example: how much is being used this year compared to last; comparisons between the occupant's water consumption and that of a typical/good practice house. Such information may motivate people to act, and in providing positive feedback, would reward the implementation of water efficiency measures.

Box 9.2 – Metering

Currently, only 22% of households in England and Wales have meters installed. Therefore householders are largely unaware of their level of 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 (EA 2004a). Households with water meters will also benefit financially from any water efficiency savings.

The Water Industry Act 1999 introduced the right to free meter installation for households. Those consuming water on an unmetered basis may choose whether to be metered or not. The installation of meters is funded by water companies, and in turn through water bills. Those who opt for meter installation are those who are likely to save money on their bills – generally households with few occupants. However the people least likely to save through metering – households with many members – are likely to be poorer and yet they are paying for the metering programme.

The present distribution of water charges among unmetered households is loosely related to the ability to pay. This is because they are charged according to rateable value, which is loosely correlated, via property size and value, with household income. A new approach of innovative tariff structures could reward low water use without disadvantaging vulnerable households.

Water companies may install meters in properties when they are sold, however few exploit this opportunity currently.

9.2.3 Incentives

There is currently an incentive to switch to a metered supply through tariff pricing which favours metered homes with low-average consumption. Switching to a metered supply is provided at no cost to the householder.

The use of water pricing to reward low water usage through variable tariff structures (including higher charges for using water at peak times or above a certain threshold) would provide financial savings to those who manage their demand effectively.

Enhanced Capital Allowances are 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. A programme of fiscal incentives for householders such as reduced rate VAT on a similar range of water efficient products suitable for homes would send a strong message to consumers.

9.2.4 Delivery

The Water Supply (Water Fittings) Regulations 1999 include guidance on maximum WC cistern capacity and tap flow rates, however the purpose of these regulations is primarily to address issues of potential contamination, and water efficiency has not been prioritised. These regulations should be updated to reflect improved water efficiency of appliances, and to include a wider range of water efficient fittings and appliances.

Building Regulations are being developed to require water efficiency in new homes. These are likely to set limits on water consumption by appliance type. An outcome-focused holistic water consumption target should be developed which would allow developers and designers flexibility to innovate. The regulations are currently only being

developed to apply to new homes. There is a range of consumer acceptability and product availability issues to overcome in the development of these regulations. Currently the enforcement of Building Regulations is low on issues other than life safety, therefore full potential water savings through Building Regulations may not be realised.

The new Code for Sustainable Buildings should set high standards for water efficiency in new build in the first instance, and refurbishment. The Code should be used to trial the use of whole house water consumption targets as a clear signal of future direction of Building Regulations.

A number of organisations have proposed the creation of an independent organisation to promote water efficiency (EA 2001). This organisation would undertake research, promotional work and the active identification and implementation of water efficiency measures, taking a similar role to that of Energy Saving Trust on promotion of energy efficiency.

Ofwat, the regulator for the water and sewerage industry, is responsible for setting the framework for water tariffs. Ofwat should identify how water tariff structuring could be used to promote water efficiency without disadvantaging vulnerable households.

The water supply companies could play a greater role in the provision of information and could be required to run an equivalent to the Energy Efficiency Commitment, installing water efficient fittings and appliances in homes for reduced or zero cost. Water supply companies could play a much greater role in promotion of water metering, and in the delivery of informative billing.

Retailers of plumbing fittings and water consuming appliances could play a greater role in the provision of information regarding water efficiency.

9.3 Water Policy Recommendations

The SDC's recommendations for effective action to improve the water conservation in existing homes are that:

<i>A major initiative of water metering in homes is introduced, with an immediate focus on homes in areas of water shortage.</i>
<i>Government considers introducing a fair incentive to install meters.</i>
<i>Building Regulations are revised to require a 25% saving in water consumption in new homes.</i>
<i>The Code for Sustainable Buildings is developed to set higher standards of water efficiency as a requirement in new and refurbished buildings.</i>
<i>Government introduces fiscal incentives to reward installation of water efficient appliances and fittings, including reduced rate VAT.</i>
<i>A programme of awareness raising is developed through standardising labelling of water efficient products, financial incentives for installing water saving appliances and integrated action through local authorities and water companies</i>
<i>The green landlords' scheme is used to reward water efficient installations in tenanted households.</i>
<i>Government considers the feasibility and benefits of a water efficiency commitment scheme.</i>
<i>Government considers feasibility and benefits of a Water Saving Trust.</i>
<i>Ofwat examines the potential to use tariff structuring to reduce demand for water (without discouraging essential use).</i>
<i>Government sets requirements for water metering billing that show clear consumption information to raise householders' awareness of their consumption patterns and give advice water saving equipment available.</i>
<i>Government considers how greater public awareness of water conservation might be delivered through retailer engagement.</i>
<i>The Home Condition Report is extended to show information regarding water efficiency of a property at change of occupancy.</i>

10. Materials

Refurbishment of buildings consumes significantly less material than redevelopment. The environmental consequences of materials use in construction and refurbishment include depletion of natural resources, local and global impacts of extraction and processing activities, and transport effects. Many materials have significant environmental impacts during their manufacture, or contain substances harmful to health.

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 quarrying primary minerals.

The environmental consequences of materials use in 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. 82% of non-energy minerals extracted in the UK 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. Materials extraction has long term major consequences through transportation (congestion and emissions), land use and scarring, and consumption of a non-renewable resource.

The manufacture of many conventional construction materials involves the use of toxic chemicals, and may result in atmospheric pollution and toxic wastes. In addition, ultimate disposal of materials and process wastes through incineration or landfill results in further pollution, through the leaching of toxins into the ground and greenhouse gas emissions. The 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.

The embodied energy and CO₂ of materials means they are important contributors to UK carbon emission levels. Life cycle impacts should be considered for materials, including how they are used in a building, how durable they are and impacts of maintenance and replacement in the building's lifetime.

10.1 Policy Context

The EU Construction Products Directive sets the framework for materials policy in the UK. This Directive sets out to harmonise standards across the EU with regard to materials performance. 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

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.

UK Sustainable Development Indicators (Defra, ONS 2005):

- *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.

10.1.2 Housing Growth

Aggregates use associated with construction at the proposed levels could represent 10% of annual total quarried products (Defra 2004c). The proposals within the Sustainable Communities Plan will require materials not only for house

building but also for the construction of infrastructure for transport and associated services. Reusing existing buildings through refurbishment will reduce materials consumption. Similarly, developing new housing within existing towns and cities will enable existing infrastructure to be reused. Building at higher density requires less infrastructure investment per home than low density development.

10.2 Materials Opportunities

Around 10% of the UK CO₂ emissions arise from the production and use of building materials (BREa). The issue of 'materials' covers a wide range of types of materials used in construction, each of which have differing sustainability implications and mitigation measures.

The most environmentally benign start point is to minimise the resource consumption of materials by refurbishing and minimising over ordering and profligacy in design.

Research by the Waste and Resources Action Programme (WRAP 2004) suggests that 10% of the materials (by value) of a construction project can derive from recycled sources. Such a requirement, when agreed up-front in a contract, may be delivered at no extra cost. Indeed WRAP's research shows that a significant proportion of materials used in construction already include recycled content as a matter of course.

In order to reduce transport impacts of construction materials, it is useful to source locally available materials. This has been achieved with some success in some projects¹² to date, but the shortage of information regarding local materials availability hampers these efforts. In order to enable transport impacts to be reduced, a strong network of recycled

materials resource centres would have to be developed with a sophisticated information system available to those procuring materials.

The issue of embodied energy and CO₂ is poorly addressed in policy and practice largely due to lack of available data. A range of 300-1000 kgCO₂/m² (floor area) is typical in the construction of a dwelling (Constructing Excellence 2001). This data may be analysed to provide guidance on good practice. Energy consumption in domestic buildings suggests that this embodied CO₂ would be outweighed by operational CO₂ within 10 to 30 years of occupation. However, as energy efficiency in buildings improves, the relative significance of embodied CO₂ over the building's lifetime will increase.

It is desirable to use materials that have a low sustainability impact. Given the wide range of types of construction materials, it is not easy to make the right choice. The process of standardising the sustainability impact of materials is very complex. The BRE have developed an environmental profiling system to underpin an environmental life cycle analysis rating of materials which assesses impacts of materials on a range of environmental indicators.

This system provides a useful start point from which to consider how the use of low impact materials might be supported by standards, regulation and information. It shows strong importance for climate change and fossil fuel depletion, with lower importance given to pollution effects on water. The issues of embodied energy and recycled content are incorporated within this Ecopoints system. Other issues of concern such as timber sourcing, producer responsibility are not included. The Government Environment Direct initiative should standardise materials impacts ratings.

¹² For example, 50% of the construction materials used at BedZED were sourced from within a 35-mile radius of the construction site.

Box 10.1 – Key materials measures

Refurbish rather than redevelop to reduce materials demand
Use lean construction methods – do not over-specify or over-engineer
Use low impact materials, which are renewable
Avoid of waste in design and manufacture
Use local materials and suppliers
Avoid of CO2 intensive components
Consider life cycle impacts of materials
Design for deconstruction.

Box 10.2 – BRE Ecopoints Environmental Rating System (BRE 2000)

BRE UK Ecopoints are derived by adding together the score for each issue, calculated by multiplying the normalised impact with its percentage weighting. The annual environmental impact caused by a typical UK citizen therefore 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
Ecotoxicity	4
Eutrophication	4
Summer smog	3.5
Minerals extraction	3

This Ecopoints methodology provides much of the data underpinning the BRE's BREEAM, "Green Guide to Specification" and software tool Invest.

10.2.1 Barriers

The lack of standardised information on all materials choices is currently the greatest barrier to making sustainable choices. Consumers are likely to choose the most sustainable, low impact material if all other materials properties (appearance, durability, and cost) were equal, but this guidance is not currently available at point of sale for builders and householders. Limited information is available for professionals within the construction industry but the information does not cover the full materials range and there are concerns regarding transparency of the rating system.

Low impact materials may also be perceived to be of poorer quality and higher costs than alternatives. The concern over quality may apply particularly to recycled or reused materials. Labelling and certification may be used to support choices of reused or recycled materials. In many cases, reused bricks, slate, stone, cobbles, may be more durable than modern equivalents.

Availability of low impact materials is also currently a barrier. However, standardisation of labelling may be required first in order to differentiate between materials.

10.2.2 Information

Existing materials labelling schemes are currently insufficient to support consumer choice. The issue of embodied energy and CO₂ is poorly addressed in policy and practice largely due to lack of available data. New product information and labelling schemes including Environment Direct may enable consumers to make better-informed choices.

For some materials sustainability impacts such as sustainable sourcing of timber, or ozone depletion potential of insulation materials, the information is

made available on the low impact materials, as a means of promoting that material.

The environmental impacts of construction encompass a wide range of issues, including climate change, mineral extraction, ozone depletion and waste generation. Assessing such different issues in combination requires subjective judgements about their relative importance. The BRE scheme of environmental profiling (see Box 9.2 above) includes a limited range of manufacturers' products. Guidance is also available for specifiers on generic materials and construction choices (BRE 2002).

Further improvements in standardisation and labelling schemes, such as the SBTG recommendation of the development of an Environmental Product Declaration scheme to support professional and DIY consumer choices, would enable more sustainable consumption of materials.

10.2.3 Delivery

The proposed Central Point of Expertise (CPE) for timber will set environmental standards for purchases of timber and products made from wood. This CPE will initially assess existing forest certification schemes and publish clear guidance on the extent to which schemes will meet sustainability criteria.

The Waste and Resources Action Programme's (WRAP) have researched the feasibility of including recycled materials in construction. The organisation is involved in recycling for glass, plastics, paper, timber, organics and aggregates. WRAP is funded through Defra's Business Resource Efficiency & Waste Programme (BREW) from Landfill Tax receipts.

Following the amendment of the Building Act in 2004, there is an opportunity for Building Regulations to address the sourcing of materials in

order to reduce environmental impacts. The SDC is working with the Building Regulations Advisory Committee to identify how Building Regulations may be able to tackle the issue of impacts of construction materials.

The new Code for Sustainable Buildings must address sustainable use of materials in new and refurbished

buildings to improve resource efficiency and address health impacts.

The use of life cycle analysis of materials is being considered for use in the Code for Sustainable Buildings and the Building Regulations, but databases of materials would need to be complete and the underlying analysis openly available.

10.4 Materials Policy Recommendations

The SDC's recommendations for effective action to improve materials use in existing homes are that:

<i>Building Regulations are developed to address sustainable use of materials.</i>
<i>The new Code for Sustainable Buildings is developed to address sustainable use of materials.</i>
<i>Government reviews life cycle analysis tools for inclusion in the Building Regulations and Code for Sustainable Buildings to support sustainable materials standards.</i>
<i>A national materials labelling scheme is developed to include information on sourcing, embodied energy/CO₂ and life cycle cost, environmental and health impacts.</i>
<i>Government considers introducing a programme to broaden the dissemination of timber information.</i>
<i>Information on materials impacts is provided to consumers via DIY materials retailers in order to promote awareness</i>
<i>Government reviews options for raising the recycled content in construction in order to promote a market for demolition waste products.</i>

11. Waste

The treatment and disposal of construction waste and household refuse creates significant environmental impacts in the UK. Most of the 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.

The EU Landfill Directive is implemented through UK initiatives to reduce the amount of biodegradable municipal waste going to landfill. A hierarchy of ‘reduce, reuse, recycle’ is promoted by Government to achieve national targets. Waste is addressed in this paper under two sections; from construction activities and from household activities.

11.1 Construction Waste

Construction waste may be considered the most significant environmental impact of the construction process. The construction and demolition industry contributes 24% to the UK’s volumes of waste (Defra 2003). The construction industry produces annually three times the waste produced by all UK households. Existing licensed landfill sites only have capacity to take waste for 6.5 years at current rates of disposal.

Refurbishment rather than redevelopment is a key route to reducing construction waste generation from increased provision of housing. Policy measures to reduce waste to landfill include raising awareness of waste generation, identifying opportunities to reduce waste generated, implementing waste management strategies and a process of targeting and evaluation of waste minimisation. Waste reduction efforts in construction should address materials procurement where over-ordering is common. Waste reduction in demolition

should include a pre-demolition audit to assess what materials may be recycled or reused. Mitigation of waste generation may be implemented at zero extra cost, with potential cost savings in relation to waste disposal.

Construction waste includes all waste materials generated through the processes of construction (including refurbishment and demolition). This may include demolition materials, packaging, off-cuts and surplus construction materials. We will identify the links between Construction Waste and Construction Materials in order that these wastes may be considered as potential materials.

11.2 Policy Context

The Landfill Tax, introduced in 1996, influences waste management practices 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 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 landfilled to 75% of that produced in 1995

- By 2013 to reduce biodegradable municipal waste landfilled to 50% of that produced in 1995
- By 2020 to reduce biodegradable municipal waste landfilled to 35% of that produced in 1995.

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 requirement for site waste management plans for construction and demolition projects. Site waste management plans for works of value >£200,000 are currently a voluntary measure under guidance from the DTI (DTI 2004). There is a need for guidance on site waste management for small sites where contract values are below £200,000 as this will form the majority of domestic refurbishment works, where waste is likely to be poorly managed.

Defra is currently consulting on changes to the Waste Strategy 2000 in relation to planning of municipal waste management facilities. There is no specific national target for waste reduction, reuse or recycling from construction practices.

UK Sustainable Development Indicators (Defra, ONS 2005):

- *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.

11.2.1 Housing Growth

Construction waste associated with construction in the proposed housing plans could represent an additional 15% of total construction waste to landfill (Defra 2004c). Additionally, there would

be significant transport impacts through congestion and air pollution and emissions. This significant increase in potential construction waste to landfill will reduce the projected life of our limited landfill capacity and shows that policies to reduce construction waste to landfill through maximising use of the existing building stock, and mainstreaming sustainable construction practices must be prioritised.

11.3 Construction Waste Opportunities

Waste from construction and demolition materials totals over 90M tonnes annually, and a significant of this consists of materials delivered to sites but never used.

The environmental impacts of construction waste may be mitigated through reductions in overall waste generated, and through targeting particular waste streams. On many construction sites, there is little awareness of waste being generated and poor management (separation for recycling, auditing) of this waste. A programme of reducing construction waste impacts would include raising awareness, identifying opportunities to reduce waste generated, implementing waste management strategies and a process of targeting and evaluation of waste minimisation. Waste reduction efforts should address materials procurement where over-ordering is common. Mitigation of waste generation may be implemented at zero extra cost, with potential 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 £150,000¹³.

The SDC are keen to identify the links between Construction Waste and

¹³ www.smartwaste.co.uk/smartaudit/downloads/gmv_Site_Guide.pdf

Construction Materials in order that construction wastes may be considered as potential materials. This requires that construction waste should be handled as a potential resource, with awareness of the requirements of the construction materials market. The 'closed loop' waste recycling and recycled materials markets are currently immature and will require some support in order to deliver the environmental benefits needed in this area. The Waste and Resources Action Programme (WRAP) are carrying out significant work in this area.

11.3.1 Barriers

Good site waste management practices are often very cost effective due to charges avoided from Landfill Tax. However these are often not used due to poor information.

It is in small scale building works that sustainable waste management practices are least likely to be implemented. The waste from small-scale refurbishments often results in nuisance fly tipping, causing local environment 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.

Refurbishment waste management is currently worse than necessary – many manufactured items including windows, doors, fitted kitchen and bathrooms are removed and discarded when they could be reused and repaired. On a small scale it may also be easier to sort waste than on large scale sites but it is harder to reach the economies of scale that make it worthwhile separating and sorting waste for a variety of waste streams.

11.3.2 Information

Greater provision of information to designers and contractors of the opportunities presented by techniques such as Design for Deconstruction (CIRIA 2004), the Demolition Protocol (ICE 2004) and site waste management plans would reduce the environmental impact of demolition and construction wastes.

Information provision via DIY retailers and construction materials retailers on recycling and reuse options, as well as penalties for fly tipping would improve awareness.

11.3.3 Delivery

The Waste and Resources Action Programme (WRAP) is funded to support waste minimisation and recycling activities. WRAP's waste minimisation programme should be extended to small-scale construction waste.

The Demolition Protocol (ICE 2004), developed by the Institute of Civil Engineers Waste Management Board and the Chartered Institution of Wastes Management to support innovative construction waste management projects. The Protocol has two main elements: the Demolition Recovery Index which establishes the potential for cost effective recovery of materials from demolition, and is a tool for Local Authorities to assess demolition plans; and the New Build Recovery Index which establishes the potential percentage of recycled material that can be specified in the redevelopment of the site. The Protocol strengthens the link between demolition and new build. The Protocol is likely to be applied through the planning process rather than Building Regulations.

Design for Deconstruction (CIRIA 2004) provides guidance on the opportunities for maximising the reuse of components and recycling of materials when a

building is wholly or partially deconstructed or demolished. The guide identifies the processes by which buildings are demolished and can be deconstructed.

There are currently no requirements within the Building Regulations covering construction waste management. The amendment to the Building Act 2004 provides the opportunity for Building Regulations to address the management of waste materials in construction (especially for demolition). No regulations have yet been developed but regulation has the potential to enforce sustainable construction waste management practices. Any regulation developed could use data from the Demolition Protocol and Design for Deconstruction.

The **Code for Sustainable Buildings**, currently under development, should set

higher standards for sustainable waste management practices than the Building Regulations for construction, demolition and refurbishment to include requirements for site waste separation, storage and recycling.

11.4 Construction Waste Policy Recommendations

Through refurbishment and conversion of existing buildings, rather than demolition and new construction, major savings may be achieved in the generation of waste, and the use of materials. The opportunity exists to reduce construction waste through re-using existing built assets.

The SDC's recommendations for effective action to improve the management of construction waste in existing homes are that:

<i>Government considers measures to promote sustainable waste management for small sites.</i>
<i>Building Regulations are developed to tackle construction and demolition waste.</i>
<i>The new Code for Sustainable Buildings is developed to set higher standards for reduction, reuse and recycling of construction waste for new and refurbished buildings</i>
<i>The Building Regulations and the Code for Sustainable Buildings are developed to move towards a zero landfill target for new and refurbished buildings.</i>
<i>Government considers establishing voluntary codes of practice for construction materials retailers to retrieve unused materials, with the potential to enforce these requirements if not successful</i>
<i>Government considers provision of information in DIY retailers and construction materials retailers regarding waste legislation, recycling and reuse options.</i>

11.5 Household Waste

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 2003). In 2004, the national recycling target of 17% was met, however the target increases annually up to 33% by 2015. Waste generation due to increases in housing provision is likely to increase significantly over the next 20 years.

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. The refitting of kitchens in existing buildings where much waste separation and storage is sited provides the opportunity to improve recyclable materials storage. We will identify best practice in design of kitchens and waste storage containers, including opportunities through the supply chain.

11.6 Policy Context

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. A number of recent reports have called for these targets to be increased in line with good practice in Europe.

The Household Waste Recycling Act 2003 set a new requirement for all Local Authorities to collect at least two types of recyclable waste together or individually separated from the rest of the household waste by 2010.

UK Sustainable Development Indicators (Defra, ONS 2005):

- *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.

11.6.1 Housing Growth

Household waste associated with the occupation of proposed new homes could represent an additional 25% of UK household waste (Defra 2004c). It is therefore very important that sustainable waste management including recycling facilities, is promoted in new buildings, and should be included in Building Regulations and the Code for Sustainable Buildings.

Table 2 - Proposed recycling/composting targets (FOE 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

11.7 Household Waste Opportunities

Major opportunities exist regarding the provisions for recycling and composting

waste, which may be addressed at the building level. The introduction of kerbside collection of recyclable wastes by waste 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%. The household waste generated is currently increasing annually, however the recycling target increases annually, with 25% of household waste to be recycled/composted by 2005, to 33% by 2015. Around 50-60% of household waste could be recycled or composted.

There is currently no standardised guidance regarding optimal provision of facilities 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 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. (BRE 2003).

Consideration of recycling provision in kitchens will have an impact on kitchen design, and any guidance produced should include consultation with suppliers of fitted kitchens. Kitchen space provision is decreasing in new housing developments, which means less space for recyclable materials separation and storage. It is also useful to identify best practice in the sizing and design of storage bins that encourage recycling.

11.7.1 Barriers

Barriers to recycling include householder apathy, lack of information on recycling options, and lack of recycling facilities or service. The recycling service provided by Local Authorities across the UK varies enormously, with some councils collecting up to 6 separate waste streams, and others preferring to collect unseparated wastes for central separation to promote employment opportunities. Until Local Authority and Waste Authority requirements are standardised, it is not possible to set clear guidance for design of separation and storage facilities in homes.

There are variations in recycling rates by housing type and between rural and urban areas. 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.

Box 11.1 – Attitudes to recycling

A survey by the Environment Agency (EA 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.

11.7.2 Information

There is a key role here for local authorities or waste collection authorities in provision of information on recycling.

A campaign to promote recycling across the UK through provision of 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 are covered);
- local recycling centre locations (for all further recyclable/compostable waste streams); and
- simple guidance on composting would aid householders in making good choices for the disposal of their waste.

11.7.3 Incentives

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 a

highly effective measure with personal gain being one of the main motivators behind changes in behaviour patterns.

11.7.4 Delivery

Local authorities and supermarkets have a key role to play in promoting good waste management practices and providing facilities to enable householders to recycle their waste.

The Waste and Resources Action Programme (WRAP) is currently working to promote home composting through their Home Composting Scheme. Their target is to divert 400,000 tonnes of waste from landfill by April 2006 by encouraging people to purchase compost bins at a subsidised price and to compost their kitchen waste as well as their garden waste.

The Building Regulations do not explicitly cover the recycling or composting of household waste, however Building Regulations Part H6 (Solid Waste Storage) sets out general requirements for solid waste storage, including volumetric space requirements for storage of containers of separated waste. Further requirements for the storage of separated recyclable and compostable waste may be developed through the provisions in the Sustainable and Secure Buildings Act.

The Code for Sustainable Buildings should set a high standard for the storage of recyclable and compostable wastes in housing. The refurbishment element of the Code should exploit the opportunities to redesign storage space within kitchens when refitting works are carried out, to enable better waste management to be achieved. For apartment blocks, household waste management provisions should also include the provision of central chutes

and waste separation and storage facilities.

Financial incentives may be introduced to encourage waste reduction and increase rates of recycling. These may be introduced at a Local Authority or national level. A full programme of intelligent, variable charging by councils should be researched, including 'pay as you throw' and rewards for diverting waste from landfill.

11.8 Household Waste Policy Recommendations

The SDC's recommendations for effective action to improve sustainable household waste management in existing homes are that:

Building Regulations are developed to increase the current minimum standards for storage and separation of wastes to include greater space provision for more waste streams, including better provisions for multiple occupancy buildings such as apartments.

The new Code for Sustainable Buildings is developed to address sustainable household waste management in new and refurbished homes.

Government encourages local authorities to take forward incentive schemes to reduce waste and increase recycling.

Government considers reviewing current national municipal waste recycling targets are not sufficiently aspirational.

Government considers setting targets for home composting.

Government considers working with domestic waste bin manufacturers to encourage increased choice of waste/recycling bins

12. Overview

The Government is committed to making all buildings much more resource efficient – existing housing is a key part of this. Sustainable development must be central to all housing policy. Current policies do not tackle significant parts of the housing stock or supply chain. This requires a major campaign in terms of ‘hearts and minds’ as well as traditional policy mechanisms of regulation, incentives and information. We propose the development of a full co-ordinated policy programme to improve existing housing in existing communities. This will require engagement across Government departments to deliver the best outcome.

Influencing householders’ behaviour and decision making is vital to improving sustainability of the existing housing stock. Policies should also be developed to target builders, manufacturers and suppliers to improve the sustainability of existing buildings.

A housing development ‘sequential approach’ should be developed to prioritise refurbishment of existing housing, conversion of other buildings; and urban infilling within existing communities, making new build on new sites the lowest priority.

Refurbishment and urban infill developments have been shown to be a beneficial route to urban regeneration, with sustainability benefits from densification and from reuse and reinvestment in all infrastructure: both physical (roads, utilities) and community (including schools and hospitals). However, a range of practical and cost barriers are associated with this. These include the unequal levels of VAT, planning barriers and site complexity. These barriers must be tackled through a co-ordinated housing strategy.

The wider ‘liveability’ agenda must be addressed in the revitalisation of existing communities. For example good quality water in rivers and canals provide a catalyst for urban regeneration, and similarly improved urban environments will bring residents back to urban areas. More attention needs to be given to the management of open spaces and problems of urban pollution, including from urban transport and construction. The Cleaner Safer Greener programme is addressing some of these issues.

This is a timely moment to consider the opportunities provided by existing housing, in the context of a major house building programme which is likely to have huge environmental consequences, and potential negative impacts on existing communities. Traditional existing housing may be upgraded to modern environmental standards at moderate costs, continuing to provide homes for communities at viable densities with low environmental impact. Further housing provision may be achieved through infill developments in existing communities while there is large unexploited capacity. But we need to overcome barriers to neighbourhood regeneration and refurbishment relating to unequal VAT, planning, complexity of existing sites, negative perceptions and lack of Government will.

13. Conclusion

The existing housing stock in the UK plays a major role in the UK’s overall environmental impact. In this paper, the effects of the UK housing stock in relation to energy, water, waste and materials has been briefly examined, improvement measures and barriers identified, and potential policies identified in relation to improving the sustainability of housing provision.

The implementation of these measures must be supported by regulation and

standards. We are currently working with the ODPM to identify how new Building Regulations may be developed to address improvements in the sustainability and resource efficiency of the existing building stock. With our involvement in the development of the Code for Sustainable Buildings, we will continue to press for the highest environmental standards and the introduction of a 'refurbishment' element to this Code that will enable sustainable improvements to be optimised through refurbishment.

We will continue to develop these policy proposals that will underpin a major programme to improve existing buildings in existing communities. To do this we need to pull together all available evidence from the many organisations working in this area to demonstrate that the investment the existing stock needs is worth making; environmental improvements can be cost effective; and sustainability gains in terms of climate change and sustainable communities will be significant. We will also gather case study evidence on successful refurbishment schemes and relevant initiatives and policies that have driven sustainable refurbishment.

Bibliography

- Barker, K. 2004, *Review of Housing Supply*
- Building Research Establishment a, *BRE Envest website:*
<http://envestv2.bre.co.uk/detailsLCA.jsp>
- Building Research Establishment 2000, *Assessing Environmental Impacts of Construction BRE Digest 446*
- Building Research Establishment 2002, *Green Guide to Specification: An Environmental Profiling System for Building Materials and Components*
- Building Research Establishment 2002, *IP9/02 Refurbishment of Redevelopment of Office Buildings? Sustainability Comparisons*
- Building Research Establishment 2003, *Eco-homes and Government Targets*
- Cabe 2005, *Creating Successful Neighbourhoods: Lessons and Actions for Housing Market Renewal*
- Cabe 2004, *Environmental Sustainability and the Built Environment*
- Cabe 2004b, www.cabe.org.uk/news/press/showPRelease.asp?id=647
- Cabe 2003, *Building Sustainable Communities: Actions for Housing Market Renewal*
- Constructing Excellence 2001,
<http://www.constructingexcellence.org.uk/resourcecentre/kpizone/search/details.jsp?id=213>
- Defra 2000, *Waste Strategy*
- Defra 2002, *Directing the flow – Priorities for future water policy*
- Defra 2003 accessed from website
<http://www.defra.gov.uk/environment/statistics/waste/kf/wrkf02.htm>
- Defra 2004a, *Energy Efficiency: the Government's Plan for Action*
- Defra 2004b, *Fuel Poverty in England - The Government's Plan for Action*
- Defra 2004c, *Study into the environmental impacts of increasing the supply of housing in the UK*
- Defra 2004d, *Energy efficiency commitment 2005-2008, Illustrative mix of possible measures.*
- Defra 2004e, *Cross-Government Review of Water Affordability Report.*
- Defra, ODPM, DTI 2004, *Government response to Sustainable Buildings Task Group Report.*
- Defra 2005 accessed from website:
<http://www.defra.gov.uk/environment/statistics/waste/wrconstruc.htm>
- Defra, ONS 2005, *Sustainable Development Indicators in your Pocket 2005*
- DETR 2000, *Building a better quality of life: A strategy for more sustainable construction*
- DTI 2003, *Our Energy Future – Energy White Paper*
- DTI 2004, *Site Waste Management Plans – Guidance for Construction Contractors and Clients – Voluntary Code of Practice*
- DTI 2005, *Microgeneration Strategy and Low Carbon Buildings Programme - Consultation*
- Energy Saving Trust 2000, *External insulation systems for walls of dwellings – Energy efficiency best practice in housing*
- Energy Saving Trust 2000b, *Domestic energy efficiency primer – Good Practice Guide 171*
- Energy Saving Trust 2003, *Refurbish or Replace? A context report.*
- Energy Saving Trust 2004, *Assessment of energy efficiency impact of Building Regulations compliance*
- Energy Saving Trust 2005, *Energy Conscious Behaviour Saves Money (EPPfH)*
- English Heritage 2003, *Heritage Counts 2003: The State of England's Historic Environment*
- English Heritage 2005, *Low Demand Housing and the Historic Environment*
- Environment Agency 2001, *Water resources for the future – A strategy for England and Wales*
- Environment Agency 2002, *Household Waste Survey*

Environment Agency 2003, *The Economics of Water Efficient Products in the Household*.
Environment Agency 2004a, *Water Efficiency in Development*
Environment Agency 2004b, *State of the Environment 2004 South East England*
Environment Agency 2005a, *Increasing water efficiency in existing housing stock in London*.
Environment Agency 2005b, website: www.environment-agency.gov.uk/savewater
Environment Agency 2005c, *Sustainable Homes: the Financial and Environmental benefits*.
Environmental Change Institute 2005, *40% House*
Friends of the Earth 2005, *Target recycling: Aiming for 50 percent and beyond*.
Institute of Civil Engineers 2004, *The Demolition Protocol*
HM Government 2005 *Securing the future: Delivering UK Sustainable Development Strategy*
HMSO 2003 *Water Act 2003 Chapter 37*
Market Transformation Programme a, *Ranking of Energy saving measures in the Home – Briefing Note*
Market Transformation Programme b, *BNXS28: Did You Know? Energy Facts & Figures*
Market Transformation Programme 2003, *Regulatory impact assessment – the energy information (Household Air Conditioners) Regulations 2003*.
Market Transformation Programme 2005, *The impact of water metering – summary report*
Mulligan and Steemers 2002, *Total Energy use in Refurbishment*
ODPM 2003a, *Sustainable Communities: Building for the Future*
ODPM 2003b, *English House Condition Survey*
ODPM 2003c, *Report on Competent Person Self-Certification Schemes in 2003*

ODPM 2004a, *The Egan Review: Skills for Sustainable Communities*
ODPM 2004b, *A Decent Home - The definition and guidance for implementation*
ODPM 2005, *Planning Policy Statement 1: Delivering Sustainable Development*
Ofwat 2004, *Future water and sewerage charges 2005-10, Final determinations*.
Sustain Magazine 2005. *Vol. 05, Issue 06*
Sustainable Buildings Task Group 2004, *Better Buildings Better Lives*
Sustainable Construction Task Group 2003, *Making the Most of our Built Environment*
Sustainable Development Commission 2005, *Climate Change Programme Review - response*
Sustainable Development Commission 2004, *Sustainable Communities and Sustainable Development – A review of the Sustainable Communities Plan*
Sustainable Development Commission 2003, *Mainstreaming Sustainable Regeneration*
Tyndall Centre 2003, *Establishing research directions in Sustainable Building Design*
WRAP 2004, *Opportunities to use recycled materials in house building Ref*