



# Issues Paper



This paper provides some context for current thinking on 'Better Buildings' including some best practice, looks at barriers to progress, and poses questions to stimulate deliberation and debate in the workshops and beyond.

Although initiated by the Energy White Paper, the debate is not just about energy efficiency in buildings. A broader agenda of sustainability covering public and private development – homes, retail, offices, health, education and infrastructure – has to be addressed.



Construction has a huge contribution to make to everyone’s quality of life. At its best it can stimulate economic development, build communities people want to live in and enhance the environment. But construction is also responsible for some of the most serious impacts on the environment and society. Responsibility for the success and impact of our built environment will intensify as the rate of construction increases under Government investment and the Sustainable Communities Plan.

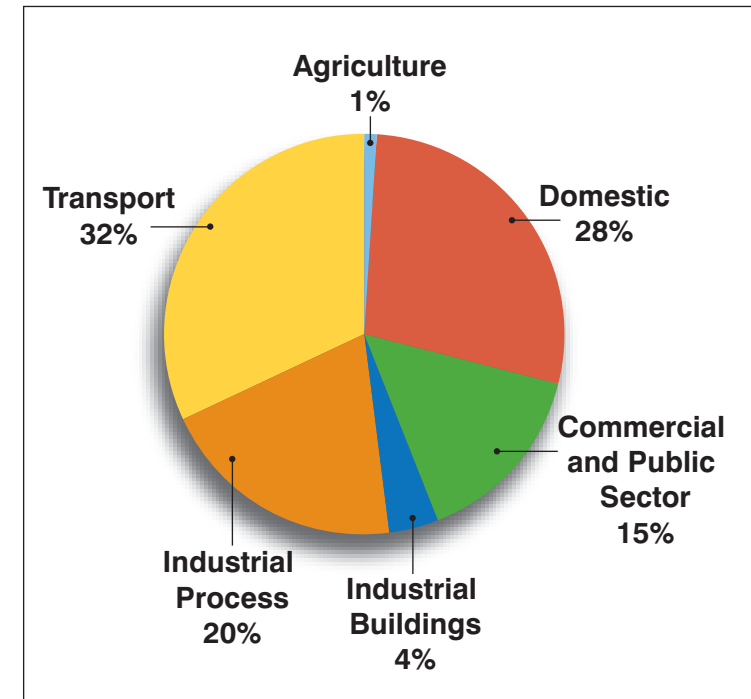
Best practice has been achieved, yet the take up of sustainability principles varies significantly, with some leading firms following recognised good practice, but others making little effort. The current emphasis on more efficient and effective development represents a unique opportunity that all tiers of government and industry must not miss.

The UK Government has defined sustainable development as:

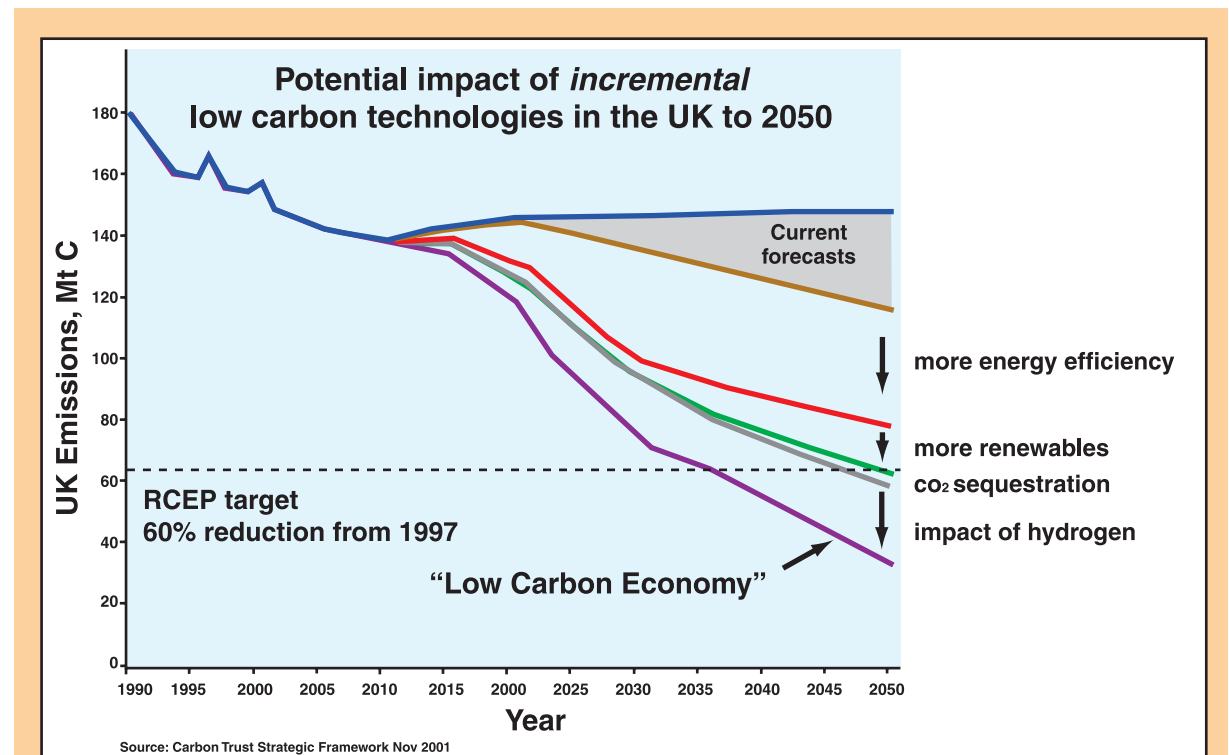
- progress which recognises the needs of everyone;
- effective protection of the environment;
- prudent use of natural resources; and
- maintenance of high and stable levels of economic growth and employment.

What role does the construction industry play in efforts to become more sustainable? The industry employs 1.5 million people and accounts for at least 8% of GDP. Our use of materials for construction is around 6 tonnes each year for every man, woman, and child in the UK. Construction and demolition produce at least 70 million tonnes of waste each year, three times the amount of household waste. 13 million tonnes of this waste is unused materials. Over 44,000 megalitres of water is abstracted every day, with demand close to exceeding effective rainfall in some areas. Some estimate that in the UK we are using 3 times our global share of resources.

The following charts illustrate the role of the built environment in the UK’s carbon emissions – a major cause of climate change – and how these need to change if we are to achieve a 60% reduction in emissions by 2050. Note that the servicing of buildings produces about half of UK carbon emissions, and that the single biggest action is improving energy efficiency in new and existing stock.



2000 UK carbon emissions<sup>1</sup>.  
152.6 million tonnes using IPCC estimates



- Carbon Trust analysis demonstrate that the transition to a low carbon economy is feasible under a number of economic scenarios, with a combination of more energy efficiency, renewables and hydrogen.
- The reductions shown are incremental to current assessments of business as usual and current government interventions.

Carbon Trust chart showing 60% reduction on 1997 to 2050<sup>2</sup>

Does the industry have the capacity to react to these challenges? The Construction Industry KPIs published in June this year showed annual improvements, but also cause for concern. Over 50% of projects are delivered late and 60% of projects overrun on cost. Considering this, clients are quite forgiving, as rating product satisfaction out of 10, only 20% of clients gave a score of less than 7. The service satisfaction score showed 30% of clients giving a score of less than 7 out of 10. When the economics of companies are investigated, 80% of staff provide less than £50,000 added value, and 20% of companies were unprofitable before taxes. The rate of fatal and major injuries among workers has not shown a significant downward trend for a decade.

Altogether these are major challenges facing the UK and it is critical that they are addressed through concerted action now. Strategic action now to underpin a managed transition to a sustainable low carbon economy may avoid the need for more drastic action in the future. What kind of 2030, described in the next table, do you look forward to?



Is this the worst case?	Is this the best case?
<ul style="list-style-type: none"> <li>UK dependent on fossil fuel from unstable sources. Unreliable supply means electricity rationing has reduced productivity by a third.</li> </ul>	<ul style="list-style-type: none"> <li>Renewable energies provide 40% of UK heat and power. Many domestic customers are now net suppliers to the grid through wind and solar schemes.</li> </ul>
<ul style="list-style-type: none"> <li>National average SAP remains below 60. Tenant and owner relationships break down due to energy costs.</li> </ul>	<ul style="list-style-type: none"> <li>Fuel poverty eliminated in 2013. Homes refurbished to meet national average SAP of 100 by 2015.</li> </ul>
<ul style="list-style-type: none"> <li>Water rationing throughout the UK and water piped from North to South.</li> </ul>	<ul style="list-style-type: none"> <li>Reduction in water use, increase in recycling and biological sewage treatment maintain supplies and keep costs low.</li> </ul>
<ul style="list-style-type: none"> <li>Road and runway building still underway as gridlock increases. Air pollution contributing to one million premature deaths per year.</li> </ul>	<ul style="list-style-type: none"> <li>Walking, cycling and public transport now the most popular choice for journeys under 10 kilometres. Air traffic taxed in line with other modes of transport.</li> </ul>
<ul style="list-style-type: none"> <li>Record numbers of directors in prison for corporate manslaughter. UK construction industry shrunk to half of 1990 levels due to overseas competition offering more predictable services.</li> </ul>	<ul style="list-style-type: none"> <li>Modern methods of construction have eradicated accidents and maximised UK construction productivity, predictability, profitability and energy efficiency.</li> </ul>
<ul style="list-style-type: none"> <li>Adversarial contracts lead to sub-optimal design to the detriment of clients, users, and communities.</li> </ul>	<ul style="list-style-type: none"> <li>Integrated teams on non-value-linked fees work with clients, users and communities to create best value products and services.</li> </ul>
<ul style="list-style-type: none"> <li>Landfill capacity reached in 2017. Waste disposal is single biggest construction cost.</li> </ul>	<ul style="list-style-type: none"> <li>Construction became a zero waste industry in 2023.</li> </ul>

The Summit proposes four main themes, to be explored in separate workshop sessions:

- **Investment**
- **Design**
- **Building Services**
- **Building Fabric**

Cutting across all these themes is the need for skills. Most recently, the Egan's Skills and Training Review has focussed attention on industry wide barriers to and opportunities for managerial and professional improvement. Recruitment and retention is a key issue at all levels of the industry, and training will play a significant role in any action to encourage people into the industry. We need to ask ourselves, is the industry represented by profitable companies, which train and treat staff well, and if not, why not? Construction Best Practice has published many example of companies, large and small, improving training, processes and profitability. Recent examples include Colledge Trundle and Hall increasing repeat business from 10% to 50% and Smoke Control Services Ltd increasing skills capacity as much as 60%.

Keeping this in mind, the following is a set of briefings for each of the workshops.

# Investment

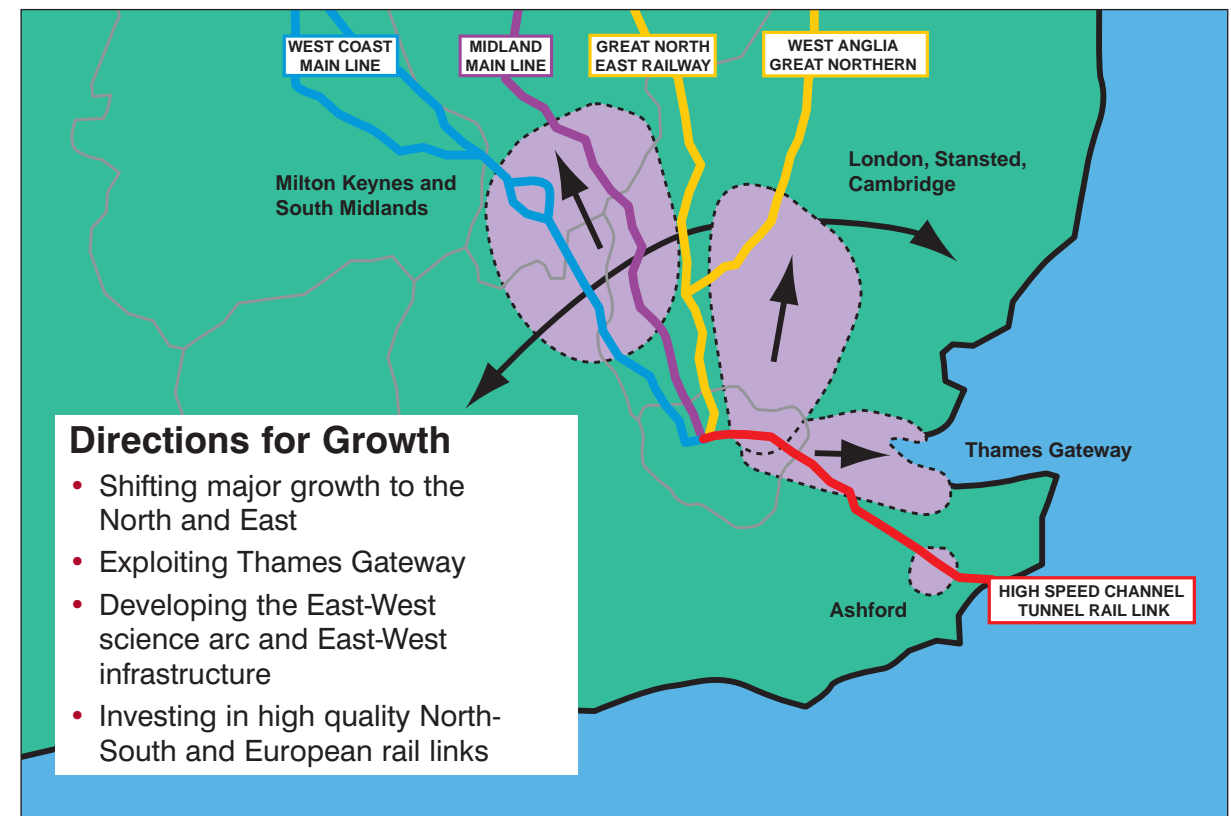
Ever more institutional equity investors, who invest in the stock and bonds of construction sector companies, are incorporating social and environmental analysis into their investment concerns. They put particular emphasis on assessing whether those companies understand and manage their key environmental and social impacts and risks effectively. Around £400-600 billion is managed in this way in the UK. Many also use their influence as shareholders to demand improvement from those companies, which can be a significant driver of improvement. Government support, through changes to the Pensions Act in 2000, and the Modernising Company Law White Paper for example, is crucial and must continue.

Property investors, many of whom invest on behalf of institutional funds, control much of the direct investment into large commercial property development. Playing a major role as an influential client, some are starting to bring environmental and social considerations into their procurement strategies, but there is certainly room for them to do more to take their investor responsibility seriously.

In social sector investment, the Housing Corporation and English Partnerships have provided leadership by stipulating social and environmental standards. This has supplied many best practice examples in housing and commercial developments. They have recognised a significant environmental benefit can be gained from a relatively small investment, especially compared to the whole construction cost or retail price.

Individual investors, i.e. house buyers and small businesses, need encouragement, incentives and education to demand more environmentally sound buildings. The Home Information Pack is helping fill the current information void. WWF's One Million Sustainable Homes initiative also aims to explain the benefits of more sustainable construction in this sector. Providers of green mortgages also push forward change. More is needed, in the way of fiscal incentives and support from government to accelerate change in this sector.

The Government's Sustainable Communities Plan calls for "... successful, thriving, inclusive, urban and rural communities ... that will stand the test of time and in which people want to live...". The plan is also an appeal to each type of investor to alter their behaviour. The Plan particularly requires interdisciplinary thinking and working for the provision of energy, water and transport infrastructure, allowing for mixed use developments that integrate with existing communities.



### Some best practice

Investment in more sustainable construction can, at best, be described as patchy, although the number of projects seeking to demonstrate 'sustainability' credentials is growing. Some investors and developers are providing incentives that will help:

- In 2000 the Japan Housing Loan Corporation provided premium loans for 180,000 energy efficient homes, and also provides premium loans for using recycled materials.
- In the UK, English Partnerships require a 'Very Good' BREEAM and EcoHomes standard for all developments, and Millennium Communities must additionally reach an 'Excellent' Standard. Greenwich Millennium Village and Chatham Maritime (pictured) are vibrant developments that have used such targets.
- In supporting and encouraging sustainable development the South East England Development Agency has produced a Sustainability Checklist for Developments. It enables local authorities and developers to implement sustainability in a considered and practical way, using a common framework. This increases certainty for the investor and opens up new areas for investment.



Greenwich Millennium Village



Chatham Maritime

### Some barriers

The built environment is long-lived and economic systems and institutions can find it difficult to deal with future risks and responsibilities. This is particularly so when attempting to value social and environmental factors in an uncertain climate. Valuing the built environment is skewed by location and historic perceptions, and the valuation of related environmental and social benefits is even more distorted or not attempted.

To advance the creation and regeneration of more sustainable communities the planning system must make timely, well-informed decisions that have broad acceptance. This is a tall order. The planning reform agenda advanced by Government is seeking to deliver this but will it succeed? The planning system can be the ready scapegoat for wider failures but is this fair? Planning gets the blame for the current low levels of house building. But is this down to planning and if it is does it result from wider concern about the quality of private and speculative developments and where new housing has been built? Some rightly criticise delay in the planning process, but others with equal force claim planning is right to protect the public interest, even if this means delays to investment.

Many cite this 'circle of blame' between investors, the construction industry, owners and users – *its always someone else's responsibility* – as the principle barrier to progress. Investors can no longer hide behind the claim that there is no demand as there is not only demand but a need. The investment community's traditionally conservative nature must be challenged to favour construction that is more resource efficient and socially effective.

### Opportunities for change

1. Pressure is growing on the institutional investment community to demonstrate more socially and environmentally responsible investment, both in equity and property. Social housing investors are under similar pressures. How can they all:

- Be encouraged to promote more sustainable construction?
- Be incentivised to invest in new technologies and materials?
- Provide sufficient resources for affordable housing?
- Make the link between regeneration of the built environment and socio-economic regeneration?

2. How can planning better support property investors in making more sustainable decisions?

3. At a more domestic scale, can changes to mortgages, Council Tax, stamp duty, personal tax, VAT, other taxes or incentives encourage energy efficient refurbishment?

4. Could other sources of government investment entail:

- Furthering the remit of the Climate Change Levy?
- Using the proceeds of emissions trading?

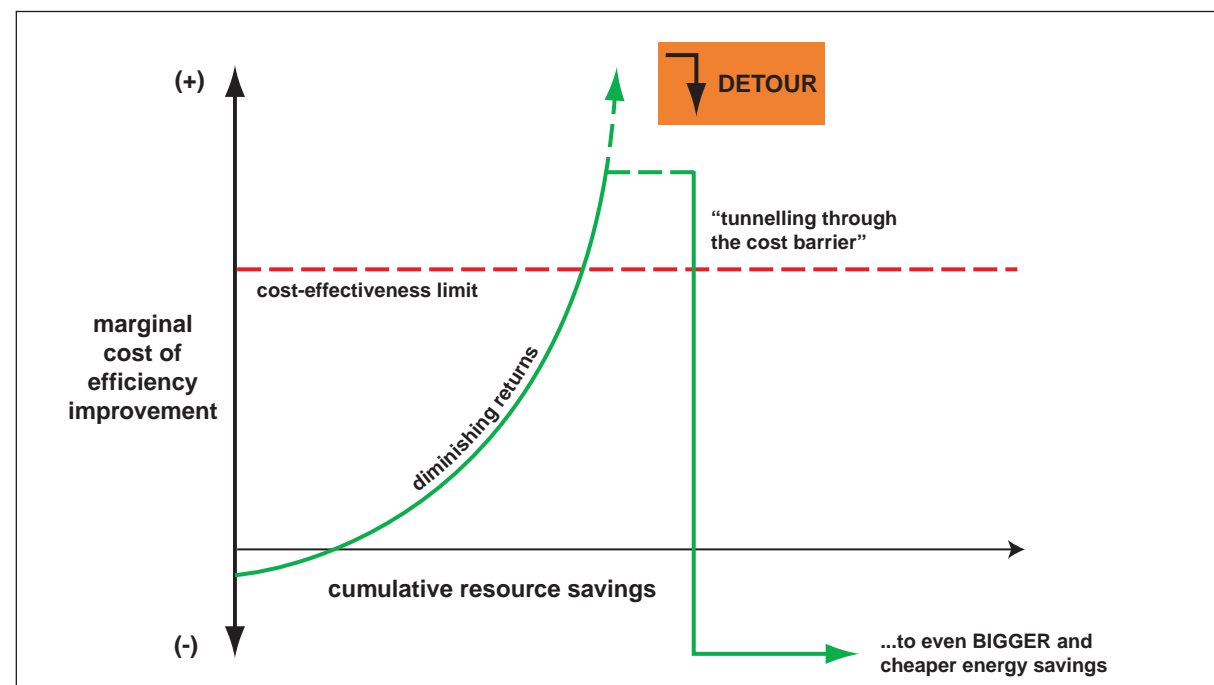
## Design

A well-informed client with a robust output specification is vital to the delivery of better design and construction. To help the client, there are tools such as the Clients Charter and recent guidance from CIC, CABE and CIOB. They aim to help the client make informed decisions about whether they need to build and what to build, and communicate their aspirations to designers and contractors.

In most cases, the ‘community’ for a project is the client, users and the wider community. Recognition of this has added value to projects, by encouraging consultation and participation in the vision and design, with a wide range of people. Partnerships between architects, urban designers and local communities bring many benefits.

The design community is also recognising how it can change how people live. Building and urban design can encourage living and working patterns that are less reliant on the car and natural resources. Well designed buildings and spaces will also deliver a host of social and economic benefits, such as higher educational achievement, reduced crime rates, increased levels of inward investment and the encouragement of civic pride and community spirit. Design can also prepare for the inevitable change that will occur in a community, by providing spaces and buildings that can be used flexibly over time, by a wide variety of users.

Sustainable construction can cost less, and certainly need not cost more than average. The chart below shows the cost and resource savings that can be achieved when considering the whole life performance of a building (Amory Lovins 2003). The ‘detour’ is often due to innovative group thinking, for example in the design of the Great Western Hospital, insulation was increased and then radiators could be removed, reducing capital cost and life costs of energy and maintenance. Similar thinking should also be applied to the creation and regeneration of communities, ensuring they enjoy the social and economic benefits outlined above.



Voluntary labelling systems such as BREEAM, EcoHomes and CEEQUAL provide independent assessment that aims to encourage good environmental design in buildings and infrastructure. Energy labelling of new homes should have encouraged household knowledge, but this requirement under the Building Regulations is largely ignored. The introduction of the Home Condition Report in 2005 will significantly increase householder awareness. Organisations such as INREB are helping to disseminate knowledge about integrating renewable energy sources into buildings. Schemes such as the Design Quality Indicator provide a framework to involve users and achieve high quality design.

However good the design of new buildings, we are not going to build our way out of our problems. Of the current building stock, 90% will still be operational in 30 years time and performance is low. For example the average SAP of existing homes is 48 out of 120. Designers need to work within the constraints of the current built environment, regenerating it when possible. Better management and refurbishment are vital, as is learning from current best practice.

### Some best practice

The UK has many exemplar sustainable buildings and communities, thanks to the efforts of dedicated planning authorities, clients and design teams:

- BedZED and Millennium Green are examples of very different housing developments, which both seek to reduce energy use and promote a better lifestyle.



Millennium Green, Collingham



Photo courtesy of Bill Dunster Architects

BedZED

- Birmingham MailBox is an outstanding example of mixed used development, using an existing building.



The Mailbox, Birmingham

**Some barriers**

Uninformed clients and uninvolved users reduce the chance of achieving more sustainable designs. Achieving optimal designs is difficult with design team members on value-linked fees, which generally leads to an elemental approach to specification, rather than a whole life cost approach. When clients or designers hold the perception that 'it always costs more', the uptake of more sustainable solutions will be limited.

The Government has updated planning policy guidance to support new urban design, but the initiative has to come from the client or developer. Also the guidance does not have the power to require changes in other regimes. For example frustrations form between highway engineers and urban designers, who are effectively working towards different aims. Planning authorities are constrained to what can be enforced through the Building Regulations. Cultural barriers within the commercial and housing sectors still prevent the creation and regeneration of mixed use developments, which facilitate walking and other sustainable modes of transport. Local authorities are also sometimes limited by the skills of their members.



Designing sustainable, low carbon buildings is not an isolated process at the “front end” of the construction process. The ability of building managers to run their buildings as close to their design targets depends very much on the extent to which they, as a profession, have been consulted in the design phase. Time and funding constraints, as well as cultural barriers, usually prevent consultation with management completely.

Great design is sadly too often compromised by the quality of build. Unfortunately poor commissioning can further constrain user understanding and enjoyment of the finished building. When exacerbated by inadequate management and maintenance, the original grand design may well be unrecognisable. The barrier to much progress is training and commitment, but opportunities abound. First, professionals, tradespeople and building control must all accept that learning is a life-long occupation. Second, all those engaged can reap the benefits of design and construction staff staying involved well into the life of the building. The skills and information gained will trickle down to benefit every project undertaken.

### Opportunities for change

1. Much change needs to come from the client. Are they well enough informed to decide whether to build, and what they want? Are more formal incentives needed? Should conversion to facilitate mixed use and support socio-economic improvement be encouraged further? Which financial levers could promote consideration of whole life value and stimulate refurbishment and maintenance?
2. Are most designers ready to consider the community as the client? Do we need to guard against excessive demands from communities and planning policies restraining regeneration?
3. Are the policies, leadership and training in place to achieve high quality design? What more is needed to turn exemplars into normal practice? Is the main need for training, or is it the certification of design or building work that is most needed?
4. What is needed to encourage the management community to become more involved in design, and the design community to remain involved throughout construction into the finished building?

# Building Services and Fabric

Although inextricably linked to the design process, low environmental impact and socially responsible buildings rely upon the effective integration of services and fabric, with effective management in use:

#### The new rule ...

Achieve:

- Maximum energy efficiency
- Maximum user health, satisfaction and productivity
- Minimum whole life cost

by a sequential integrated approach using these steps ...

- Well insulated, air tight structure +
- Efficient, responsive heating and controls +
- Appropriate glazing and shading +
- Controlled ventilation +
- Energy efficient lighting and appliances +
- Passive or energy efficient cooling +
- Efficient water heating +
- User involvement during the design, remaining committed and knowledgeable during use +
- Passive solar design, with renewable energy incorporated as all the above are optimised

Optimising the elements above, in new build or refurbishment, is technically no mystery. However it does require interdisciplinary teams, working with the latest information. It has been achieved, and the challenge now is to make it mainstream. Can all new build aim for carbon neutrality? Will carbon neutral buildings be built even if the client does not ask for them?

The Energy Performance of Buildings Directive is bringing new opportunities to inform the property market about the huge range of energy performance across the UK. The Directive will require changes to the Building Regulations (and equivalent standards in Scotland and Northern Ireland). The energy certificates required by the Directive will ensure owners, occupiers, prospective tenants and letting agents are made aware of the comparative energy performance of different accommodation options. Market forces such as these are improving the energy and water efficiency of working components and systems.

CHP has the potential to provide heat, power and cooling in buildings for a substantially lower carbon footprint than by conventional boilers, air-conditioning systems and grid supplied electricity. The opportunities will vary from building to building but they should be considered at design or major refurbishment. The current relatively high gas and low electricity prices makes CHP investment unattractive considered on a short term horizon. But taken over the building lifetime, the investment may look more attractive. Groups of buildings with mixed energy use patterns may offer opportunities for local heat and electricity networks. These opportunities are being explored and encouraged in the public sector with support from the Government's Community Energy £50M grant programme. The Government has set a target that there should be 10GWe of installed CHP capacity by 2010. Additionally biomass for local heat, micro CHP, fuel cells, hydrogen, PV and solar water heating all present opportunities.

In some areas of the UK, the current supply arrangements for water result in abstract regimes which cause environmental damage. With the planned increase in housing, particularly in the South East, water efficiency must be improved. Installing water efficient fittings in a new house saves 20% of water use at negligible cost. A further 13% can be saved by installing rainwater recovery. Additional savings are achieved by choosing efficient appliances.

The supply chain for construction materials is worth at least £30 billion, which will gain through more efficient processes. Increasing numbers of materials suppliers are considering environmental impact from cradle to grave and providing information on whole life cost and performance. Sectoral strategies, for example for brick, steel and concrete, outline improvements in the production process and the products themselves. The transport of materials has a significant impact, which could be ameliorated by shifting mode to rail. Value is being maximised through producing less waste and using wastes as construction products. Increasing numbers of specifiers care about where materials come from and how they were manufactured, and they can ensure the design uses materials efficiently.

The optimum design requires optimal performance on the construction site, for performance in practice to be achieved. The original Latham and Egan reports highlighted progress needed in this area, leading to the formation of Rethinking Construction and Construction Best Practice. Now under the umbrella of Constructing Excellence, these organisations have provided examples of the industry at its most innovative; increasing profitability, predictability and satisfaction. The Strategic Forum, through Accelerating Change, is focussing on clients, integrated teams and supply chains and the value of the product. Predictability in construction cost, time and the quality of the finished product can be more assured when using modern methods of construction. Recent projects also show far better safety records on more modern construction sites, for example where scaffolding is minimised or not required.

**Some best practice**

As in the design section, there are many examples of best practice in buildings around the UK.

- This naturally ventilated arts theatre cuts energy costs significantly and improves the theatrical experience. As a Rethinking Construction demonstration, ongoing monitoring will check building performance.



Garrick Theatre, Lichfield

- The new ZICER building at the University of East Anglia incorporates renewable energy into a light, airy, naturally conditioned space. PV integration, design and natural ventilation cfd modelling of the top floor was by Whitby Bird engineers.



Photo courtesy of Heidi Grassley

External view of ZICER Building, University of East Anglia



Photo courtesy of Heidi Grassley

Top floor room in ZICER Building

- The Norton Park upgrade converted a redundant Victorian school into offices, specified to a high environmental performance, including materials, energy and water. The client, Albion Trust, and The Carbon Trust have both supported studies of the project, through a CIBSE document<sup>3</sup> and an Action Energy case study<sup>4</sup>.



Refurbished space within Norton Park



Front elevation of Norton Park, Edinburgh

- There are many examples of the construction process being improved to save resources. For example, during construction of the new Safeway at Stratford, waste was cut by 80% saving £77,000.

There are also tools, legislation and specialist organisations that are helping progress:

- Invaluable advice and financial assistance is available from Action Energy, Carbon Trust, The Energy Saving Trust, INREB, Clear Skies, Community Energy grants, The Natural Step, Forum for the Future and many more.
- Legislation also plays a role. For example in America, Federal law requires minimum levels of energy efficiency in a range of commercial and residential products such as air conditioners and heat pumps. Current voluntary measures in the UK could be translated into legislation, for example through the Market Transformation Programme.
- Best practice is also encouraged by post occupancy evaluation tools such as PROBE, Continuous Commissioning, and BRE's POE tool. Crucially their results must inform the next projects. In practice, initiatives such as 'Soft Landings' encourage professional involvement in the life of the building.
- Modern methods of construction have had their benefits proven through many Rethinking Construction demonstrations. Now a DTI and industry funded initiative 'promoting Off-Site Production applications' (prOSP) aims to disseminate understanding of modern methods to a wider audience.

### Some barriers

Designing out services, and achieving the correct balance between fabric and services must be a key aim of the design team to achieve best value and whole life performance for the client. Unfortunately whole life costing is still not the norm, only being carried out on when the client asks. The expansion of air-conditioning, in new build and refurbishment, is a problem facing clients and design teams. What is often missing is an integrated understanding of sustainability throughout the team.

Even for skilled engineers and installers, product development and information can be a source of frustration. Producers of materials and systems must consider the environmental impact from cradle to grave, the regulations, and the ease of installation, use and maintenance. Providing information on product whole life performance is a crucial challenge. Specifiers need to keep themselves apprised of the latest materials, particularly those with reused and recycled content.

Overall the large number of small firms makes dissemination of new ideas and technologies problematic. Prejudice against modern methods of construction has so far constrained its role in improving construction.

Physical barriers within the built environment are manifold. Insulating single brick skin houses presents one such barrier. Constraints relating to the fabric and glazing will limit any efforts in “extreme” refurbishments, which aim to address the carbon reduction challenge by reducing energy use by 60%. The lack of accurate plans for most buildings and brownfield sites limits the reuse and recycling of buildings, materials, foundations and facades.

**Opportunities for change**

1. Legislation provides opportunities for further improvements in fabric and services. Will rigorous enforcement with legal sanctions and fines for non-compliance be the most significant driver for improvement? Which technical features must be considered in the 2005 Building Regulations:

**FABRIC – What should be included?:**

- More emphasis on carbon standards?
- Mandatory pressure testing of more buildings?
- Broader issues such as embodied environmental impact?

**SERVICES – What should be included?:**

- Best practice standards for lights and appliances?

**What should be tightened up?:**

- Boiler control requirements?
- Controlled ventilation (ideally with heat recovery)?
- Lighting fittings and efficacy, sensing and zoning?

2. Beyond Building Regulations, can mandatory training, information and monitoring aimed at lay occupants be delivered? Should broader issues such as embodied environmental impact be considered? Would redefining waste as ‘recycled raw materials’ for construction improve resource productivity? Can Enhanced Capital Allowances play a greater role in water, energy and other resource efficiency?

3. What kind of support can be given to managers receiving energy certificates from the Energy Performance of Buildings Directive? Can performance be linked to taxes? What will be the most successful approaches to tackling the poor insulation of most existing buildings?

4. Considering the construction phase as the most important time for ensuring performance of the building in practice:

- Should new build and refurbishment be aiming for zero waste?
- Is the industry safely on the way to achieving integrated teams and supply chains that share commitment to the output specification and communicate effectively?
- Is best practice reaching small and medium sized contractors – if not why not?
- Are initiatives such as prOSP a enough to encourage modern methods of construction?
- Can information technology be used to aid the efficiency of the construction process?
- Can the construction process be effectively extended to include commissioning and revisiting projects?



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<sup>1</sup> Carbon dioxide emissions from non-domestic buildings: 2000 and beyond. BRE. 2003.

<sup>2</sup> Making business sense of climate change. Carbon Trust. 2002.

<sup>3</sup> Guide to building services for historic buildings. CIBSE. 2002.

<sup>4</sup> Norton Park Building, Edinburgh – feedback for designers and clients (NPCS127). Action Energy. 2002.

This paper has been prepared through the Sustainable Construction Task Group, Chairman Sir Martin Laing. A range of sources has been used, and the paper does not reflect the views of any single organisation. SCTG members are the British Property Federation, CABA, Construction Confederation, Construction Industry Council, Construction Products Association, Electrical Contractors' Association, Forum for the Future, House Builders Federation, Housing Corporation, Insight Investment, Office for Government Commerce, Sponge, and WRAP. The secretariat for the group is provided by BRE.