

DTI 'Strategy for Sustainable Construction'- consultation events

CLIMATE CHANGE / ENERGY

1. OBJECTIVE

This is a short discussion paper aimed at encouraging debate of the major issues that the construction industry needs to address associated with climate change. The main questions for the workshop to address are:

- What are the key climate change issues facing the construction industry?
- What changes in construction are necessary to contribute towards the targeted 60% reduction in UK CO₂ emissions by 2050?
- Are the current interim targets in the DTI sustainable construction strategy review achievable, can they be refined, what needs to be done to achieve them, and how do we assess our progress against targets over time?
- What changes in construction are necessary to help adapt UK buildings to cope with expected changes to the climate?
- What are the barriers and opportunities to change, and how can the construction industry make the most of these?

2. SETTING THE SCENE

Climate Change

The Stern report provides a compelling economic argument for undertaking action now to reduce greenhouse gas emissions to limit the much greater costs of climate change that will be faced by future generations.

Climate change will influence buildings and other construction projects in two ways:

- **Mitigation measures.** Government targets to reduce greenhouse gas emissions will mean that we will have to change the quantity and type of energy used in buildings, and by the construction industry. The government has also announced targets for all new homes to be 'zero-carbon', meaning that no net CO₂ is generated from the site over the course of the year, by 2016. There are questions about how realistic this target is (see below). (Others have put forward the idea of 'carbon-neutral' buildings – where any unavoidable CO₂ emissions over the year are offset by funding energy efficiency projects or tree-planting.)
- **Adaptation.** The climate will change over the next 50 years more or less whatever we do about greenhouse gas emissions because of the current build up of greenhouse gases in the atmosphere. This means the buildings and infrastructure that are in place now, and will be built in the future, will have to deal with a different range of climatic conditions and sea levels than is currently the case. The UK Climate Impacts Programme (UKCIP) provides a very comprehensive set of predicted climates, down to a regional level.

Some Basic Statistics

To put buildings, and the wider construction industry into perspective, in round terms:

- Nearly half of UK carbon dioxide emissions, the major greenhouse gas, are building-related.

- 27% of UK CO₂ emissions come from housing, and 73% of this is for space and water heating.
- In the region of 10% of UK carbon dioxide emissions are associated with the manufacture and transport of construction materials, and the construction process (although data on this 'embodied energy' is poor). Estimates of embodied energy for a typical new house range from 22-90 MWh, or around 50 tonnesCO₂.
- There is a very slow renewal of our building stock (around 0.6% pa). However, for practical reasons, the easiest opportunity is to reduce emissions by constructing new (unoccupied) buildings, whereas the greatest potential to reduce emissions is associated with the existing (occupied) building stock.
- In homes constructed to the 2006 Building Regulations standards, around a third of building related emissions are from unregulated end uses (eg appliances).
- A major barrier to energy efficiency to date in both the residential and commercial market is the division of responsibilities between tenants and landlords in rented property. Landlords are usually responsible for capital investment to cut carbon emissions, while tenants pay for energy consumption. Most commercial property is leased.

Adaptation

There is no longer any question that the UK's climate will change in the future, but it is not possible to predict exactly what those changes will be.

Current forecasts are that some parts of the country will suffer increasing challenges with water availability, putting more pressure on infrastructure. Milder winters should reduce CO₂ emissions from heating, but hotter summers may lead to increased demand for air conditioning, raising CO₂ emissions.

More extreme weather will also have a significant impact on flood defences, structural stability (greater wind loading and higher risk of subsidence), which in turn will influence future construction and remediation activities as well as planning policies and land use changes.

TARGETS AND VISIONS FOR SUSTAINABLE CONSTRUCTION TO 2015 AND BEYOND

What changes in construction are necessary to contribute towards the targeted 60% reduction in UK CO₂ emissions by 2050?

The DTI Sustainability Strategy has put forward a number of targets based around the idea that buildings can be designed to be 'zero-carbon'. However, concerns have been raised that this is impossible for most buildings and sites because of limits on space, wind speeds, and planning restrictions. A more realistic target is to reduce CO₂ dramatically below the current standards – say 1 tonne CO₂/home/y, or 25kg CO₂/m²/y for non-domestic buildings, which is about 25% of current consumption figures, and right on the upper limit of what has been proven to work in the UK.

To encourage debate, the following table summarises the DTI's sustainability targets relating to climate change, but using this idea of 'very low carbon' in place of zero-carbon. We intend to discuss this substitution during the workshop.

AREA	EXISTING TARGETS	COMMENTS
1. New homes	All new homes to be built to very low carbon standard within 10 years	Recently announced Government target on 'zero-carbon homes' (Consultation underway until March 8) <ul style="list-style-type: none"> ▪ Is this fast enough to achieve the CO₂ savings we need? ▪ Or too fast for the industry to deliver?
2. New non-domestic buildings	DTI Strategy Review 20% of new build very low carbon by 2010	<ul style="list-style-type: none"> ▪ All sectors? - (eg schools v data centres)? ▪ Site wide developments v "one-off" buildings? ▪ Are technologies in place? ▪ Are skills in place? ▪ What can developers do beyond regulatory requirements? ▪ What assumptions are we making about the carbon intensity of the electricity generating mix? ▪ How can we include a target for "embodied energy" in our target? ▪ What are the most important things we can do tomorrow to achieve these targets?
3 Existing buildings	20% of existing buildings very low CO ₂ by 2015. 100% of existing buildings very low carbon by 2030.	<ul style="list-style-type: none"> ▪ Questions as above. ▪ Should target be based on % low carbon buildings or % carbon reduction achieved? ▪ How much more challenging is dealing with the existing building stock than new build? ▪ Should we factor in typical periods for major refurbishment of say commercial properties when developing targets? ▪ Should we be pushing buildings to reduce by more than the national 60% target?
4 Climate change adaptation – buildings	No specific targets in DTI strategy. Do we need targets for adaptation in buildings?	<ul style="list-style-type: none"> ▪ What targets can we set to ensure that buildings and infrastructure projects are better prepared to cope with likely changes in climate? ▪ Should we design all new buildings now to withstand the changes by, say, 2050? e.g. target of "all new buildings by 2016 will cope with likely changes in temperature, rainfall, sea level and water availability through to 2050" ▪ Or should we design them to make them easy to adapt if/when the changes materialise? e.g. target of "all new buildings by 2016 will <i>permit easy adaptation</i> to cope with likely changes in temperature, rainfall, sea level and water availability through to 2050" ▪ Do we need targets for adapting the existing building stock?
5 Climate change adaptation – infrastructure.	No specific targets in DTI strategy Do we need targets for adaptation in infrastructure?	(Note flooding is being covered in a separate workshop.) <ul style="list-style-type: none"> ▪ As above, do we aim for resilience now, or adaptation when the changes materialise? e.g. by 2016, all new infrastructure likely to be affected by higher sea level should cope with expected sea level rise up to 86cm by the 2080s ▪ Again, how do we deal with existing infrastructure (bearing in mind difficulties of working on facilities while they are in use)?

		<ul style="list-style-type: none"> Do we need targets for existing infrastructure? e.g. by 2016 adapt 25% of UK sewers to cope with peak rainfall intensities 10% higher in 2025-2055
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The DTI's sustainable construction review focussed on the energy performance of buildings, and we will discuss adaptation strategies during the workshop. In addition, the construction sector could help reduce carbon by:

- Reducing carbon emissions during construction phase
- Reducing embodied energy of constructed product (albeit with due consideration to overall long-term performance)

These too could be translated into targets for the sustainable construction strategy.

Present performance

MECHANISMS

When considering mechanisms for change, it is worth considering the sustainable development behavioural change model

Catalyse – Is the package enough to break a habit and kick-start change?			
Encourage	Enable	Engage	Exemplify
Tax system	Remove barriers	Community action	Leading by example
Expenditure – grants	Give information	Co-production	Achieving consistency in policies
Reward schemes	Provide facilities	Deliberative forums	
Recognition	Provide viable alternatives	Personal contact/enthusiasm	
Social pressure	Educate/train/provide skills	Media campaign/opinion formers	
League tables	Provide capacity	Use networks	
Penalties, fines and enforcement action			

3.1 Government response

The Government response continues to evolve, but a good summary is the DEFRA report "Climate Change: The UK Programme 2006". This has been updated by a number of statements by Government including those from Ruth Kelly on 13th December 2006.

A brief summary of some of the many measures associated with the Government's targeted reduction of CO₂ emissions of 20% below 1990 levels by 2010, and 60% by 2050 include:

- Nationally, 10% of renewable energy resources from renewables by 2010 and 20% by 2020.
- Tighter energy regulations for buildings through Part L and the Code for Sustainable Homes (CSH).
- Tighter planning requirements on developers aimed at cutting carbon emissions. The Greater London Authority (GLA) requires developers to generate 10% of their energy on site (the 'Merton Rule'), and this may increase to 20% in the future. This is in addition to considering the use of CHP. A growing number of local authorities are developing similar targets, with ministerial encouragement.
- A draft Planning Policy Statement on Planning for Climate Change says that "a significant proportion of the energy supply of new development should come from low carbon sources".

- English Partnerships and the Regional Development Agencies are increasingly requiring developers to meet sustainability targets.
- DTI, EPSRC, DEFRA, The Carbon Trust, and Energy Saving Trust, operate a number of initiatives aimed at supporting energy efficiency, CHP, and renewable energy in buildings and the construction industry more generally.
- A variety of fiscal initiatives like the Climate Change Levy exist to encourage CO₂ reduction.
- The Energy Performance of Buildings Directive (EPBD) requires energy performance certificates (EPCs) for all buildings by January 2009, together with air conditioning inspection.
- DEFRA is consulting on the potential implementation of the Energy Performance Commitment (EPC) which could lead to carbon trading for many more organisations than participants in the EU Emissions Trading Scheme (EU-ETS).
- DEFRA has also developed a climate change 'Adaptation Policy Framework', and intends to assess existing and new policies for vulnerability to climate change, as well as studying the potential role of regulations and standards in adaptation.
- The Energy Efficiency Commitment imposes a statutory obligation on energy suppliers to promote energy efficiency measures directed at householders. This is one of the main mechanisms driving CO₂ savings in existing buildings, expected to save 1.6MtC by 2010.

3.2 Industry and client drivers

The Egan and Latham reports both recognised the importance of clients as a driver of change in the construction industry. Clients are being driven to reduce carbon emissions not just by regulation and cost pressures, but also because environmental performance is seen by many to be part of "brand development", and a requirement to attract quality customers and staff.

With housing, many householders have more spending power than ever before with one retailer seeing wind turbines "as their faster growing major price items". A possible argument, therefore, is that the construction industry has always responded to market requirements, and as such the construction industry will see a demand for environmentally sensitive products and services as an opportunity rather than an onerous regulatory requirement.

However, technology alone is not enough: behavioural change, particularly amongst homeowners and other building users is needed as well to achieve the scale of CO₂ savings needed.

3.3 Matching mechanisms to targets

Given the variety of building and construction types and sustainability drivers in each sector, progress in each of the sector will depend on different players, actions and mechanisms. The workshop will consider the information in the tables below.

Note – The workshop will focus on the clients and supply chains in construction. It will not focus on manufacture of white goods, TV and other consumer products.

Mechanisms for Target Group 1 – Very Low Carbon NEW Build

TARGET Note target may have more than one outcome	Which industry sector or client body would need to drive/ own this?	What can the industry/sector do voluntarily without intervention/support from Government?	MECHANISMS How can Government enable/facilitate/accelerate this change?
Homes Public-funded Small scale			
Homes Private Small scale			
Homes Public funded Larger scale			
Homes Private Larger scale			
Non-domestic buildings - Private funded			
Non-domestic buildings - Public funded			

Mechanisms for Target Group 2 – Very Low Carbon REFURBISHMENT

TARGET Note target may have more than one outcome	Which industry sector or client body would need to drive/ own this?	What can the industry/sector do voluntarily without intervention/support from Government?	MECHANISMS How can Government enable/facilitate/accelerate this change?
Homes Public funded refurb projects			
Homes Privately funded refurb projects			
Non-domestic buildings -Public funded			
Non-domestic buildings - Privately funded			

Mechanisms for Target Group 3 – Climate adaptation

TARGET Note target may have more than one outcome	Which industry sector or client body would need to drive/ own this?	What can the industry/sector do voluntarily without intervention/support from Government?	MECHANISMS How can Government enable/facilitate/accelerate this change?
Climate change adaptation new – Buildings			
Climate change adaptation existing Buildings			
Climate change – new infrastructure			
Climate change – existing infrastructure			

APPENDIX 1

The tables on this page provide a (subjective) assessment of the practicality in terms of various criteria. The range of building and construction types results in this being a very general approach.

Table A1.1 – Targets for new build

Rating 0 (low/none) to 5 (high/maintenance) (see TableA1.4 for details)	100% of new build zero CO2 by 2020	Comment (scores vary for different types of developments e.g. Public /Private /Scale)
1 Established principles / sound science	3-4	More options for larger developments
2 Widely understood across industry	2-3	Not necessarily related to volume developed – e.g. specialist housebuilders
3 (Technically) attainable with no risk and no skills shortage	2-3	e.g. air-tightness exposing shortage in skills
4 Impact on construction costs	1-3	Questions over cost-effectiveness / payback period / return
5 Compelling business case	1-3	Limited, though growing awareness and demand
6 Strong Market pull	1-2	As above
7 Established metrics and performance data	2-3	Limited
8 Degree of regulation	4	Hlgh
9 Target date for achieving 100%	2016 homes	Code for Sustainable
10 Target date for achieving 50%		

Table A1.2 – Targets for existing build

Rating 0 (low/none) to 5 (high/maintenance) (see TableA1.4 for details)	Zero CO2 buildings – existing stock	Comment
1 Established principles / sound science	3-4	As above
2 Widely understood across industry	2-3	
3 (Technically) attainable with no risk and no skills shortage	2-3	
4 Impact on costs	1-4	
5 Compelling business case	1	
6 Strong Market pull	1-2	
7 Established metrics and performance data	1-3	
8 Degree of regulation	4	
9 Target date for achieving 100%	Viable?	
10 Target date for achieving 50%	2050	

Table A1.3 – Climate adaptation – buildings / infrastructure

Rating 0 (low/none) to 5 (high/maintenance) (see Table A1.4 for details)	Able to adapt to best estimates of conditions in 2050 – major infrastructure	Able to adapt to best estimates of conditions in 2050 – buildings	Comments
1 Established principles / sound science	2	3	
2 Widely understood across industry	2	3	
3 (Technically) attainable with no risk and no skills shortage	4	4	
4 Cost-effective	2	2	

5 Compelling business case	2	2	
6 Strong Market pull	n/a?	n/a?	
7 Established metrics and performance data	1	1	
8 Degree of regulation	2	2	
9 Target date for achieving 100%			
10 Target date for achieving 50%			

Table A1.4

1	2	3	4	5	6	7	8
Principles established and practice within reach of most companies	Widespread understanding of principles across most parts of the industry	Technically attainable with little or no risk	Cost effective to implement within present fiscal / regulatory regime	Compelling and well promoted business case	Strong market pull from both public sector and private sector	Published metrics on current performance / benchmarking	Highly regulated, clear signals of future policy / regs
SCORE 5	5						
SCORE 0	0}						
Gaps in scientific / social / economic principles	Knowledge and understanding across most parts of the industry non-existent	Technical risks / serious skills shortages	Not presently cost effective in competitive market or using conventional business case justification	Little in the form of case studies and evidence of business case	Little market pull beyond regulatory minima	Little in the form of any current openly available data	Largely unregulated and reliant on voluntary action