All Party Parliamentary Group for Excellence in the Built Environment

Inquiry into Sustainable Construction and the Green Deal

Sarah Kaethner

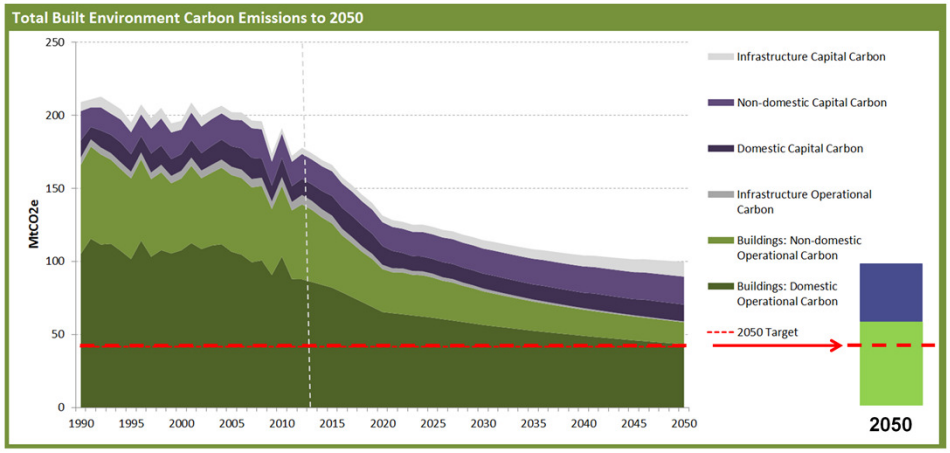
Institution of Structural Engineers

Chair of Sustainability Panel

20th May, 2013

The Institution of Structural Engineers

UK Built Environment CO_2 Timeline



The Low Carbon Routemap for the Built Environment
The Green Construction Board

http://www.greenconstructionboard.org/index.php/resources/routemap

The Institution of Structural Engineers

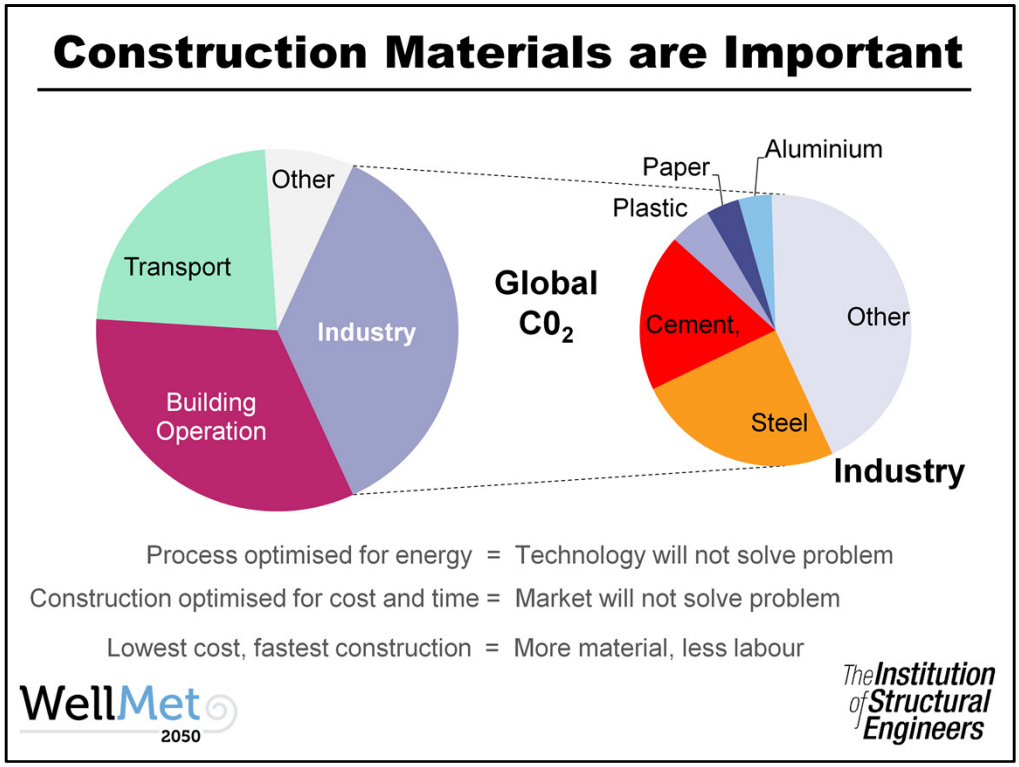
The Inquiry has asked if the 'Green Deal' is the right policy.
This graphic is extracted from the Green Construction Board Route map tool. It represents the annual UK CO_2 emissions from the built environment and predicts how they will change from 1990 to 2050 with a best practice, 'business as usual' scenario.

The red line represents the target emissions rate in 2050.

The green area represents emissions from building operation (heating etc) and is almost entirely due to existing buildings. So we agree that the green deal is a policy aimed at an important area of concern.

However the purple area represents the CO_2 embodied in the construction materials (termed Capital Carbon). The Routemapping work concludes that it is not possible to achieve the 2050 targets without reducing the impacts of the materials in construction significantly. There are comparably few incentives to do this.

Our position is that the focus of attention needs to encompass both retrofit of existing buildings and reduction of CO_2 from use of construction materials.



Taking the current global picture - This is a representation of global CO_2 emissions.

The pie-chart on the right extracts emissions from Industry, much of which is emitted by just two materials: cement and steel. The Construction industry consumes all the cement and nearly half the steel.

Process technology improvements alone will not achieve the target reductions.
The construction industry is optimised toward least cost and shortest construction programme, where more material is used to reduce labour. Therefore market forces alone will not lead to a reduction in CO_2 emissions.

Individual Projects

http://www.istructe.org/awards/2013/categories/sustainability-award

Wales Institute for Sustainable Education

The Wales Institute for Sustainable Education (WISE) building is a flagship education centre and exemplar of sustainable ...read more

Commendation

London 2012 Velodrome

The 6000 seat London 2012 Velodrome will serve as an Olympic and Paralympic stadium for track cycling during the Games ...read more

Commendation

Open Academy

The Open Academy in Norwich is a £20m new school building. The building has three storeys and houses classrooms, a ...read more

Commendation

Queen Elizabeth II Court

This refurbishment of a dilapidated 1960s office block creates a modern, efficient and highly sustainable working environment ...read more

the Institution of Structural Engineers

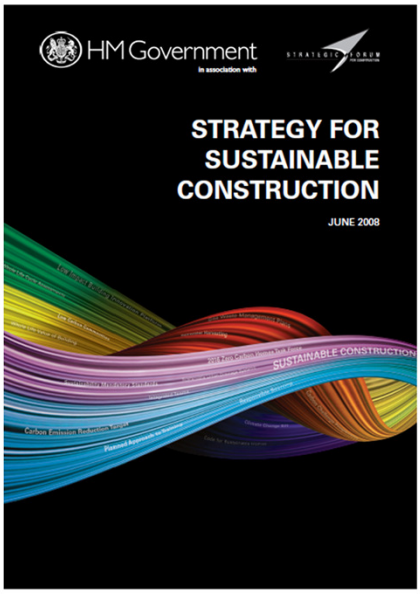
The inquiry asked for examples of best practice. These are available on our website.
However the inquiry also asked how this can be extended across industry.
The answer is that in the 'business as usual' scenario these will remain niche projects.

A Whole Industry Challenge

http://www.ukgbc.org/content/london-2012-sustainability-lessons-learned-0

In addition to the lack of financial incentives, and the limited potential for production process improvements to reduce the impact of materials, change is hampered by complexity in the supply chain.
It is only with large projects such as the Olympics and Crossrail that industry change can be leveraged on a project basis.
The task of extending the lessons from these projects across the industry is a challenge.

Leadership and Direction

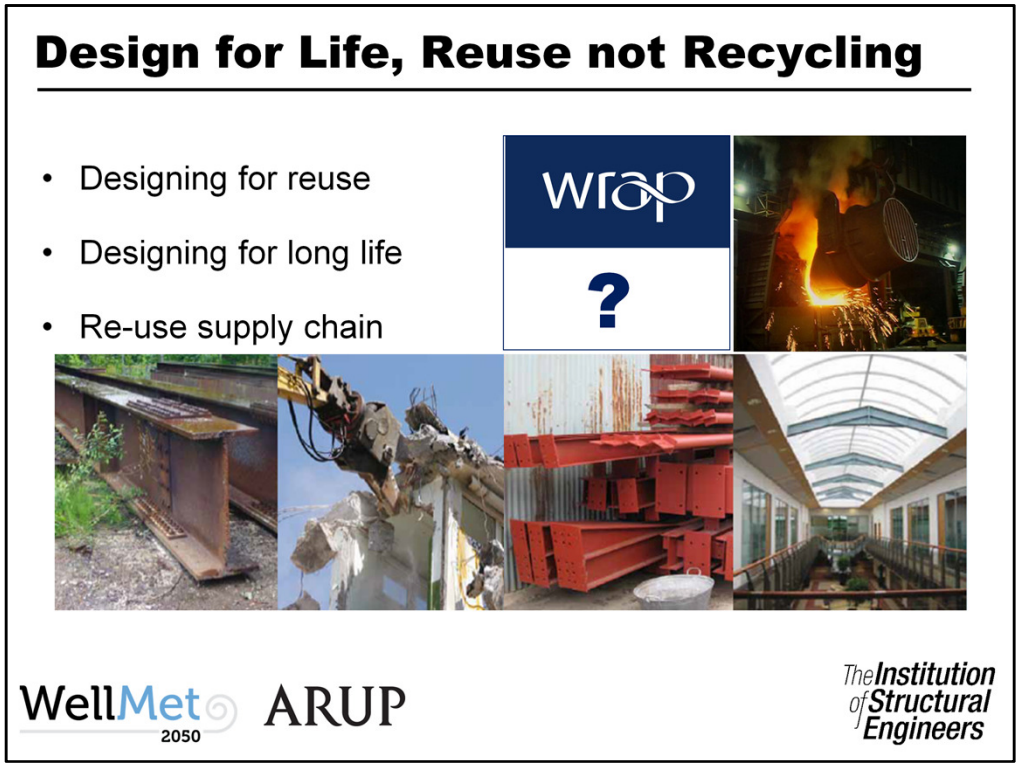


Targets:

- Reduction of **waste to landfill** Reducing (CO_2) emissions.
- 25% of products **responsibly sourced**.
- Improve access to **Life Cycle Inventory information**. *(includes embodied CO_2)*

The Institution of Structural Engineers

Clear leadership and direction is needed to support change. In 2008 there was a clear plan, set by Government - with specific measurable targets for 2012. The following slides consider 3 topics identified in the plan: waste, responsible sourcing and CO_2 measurement.



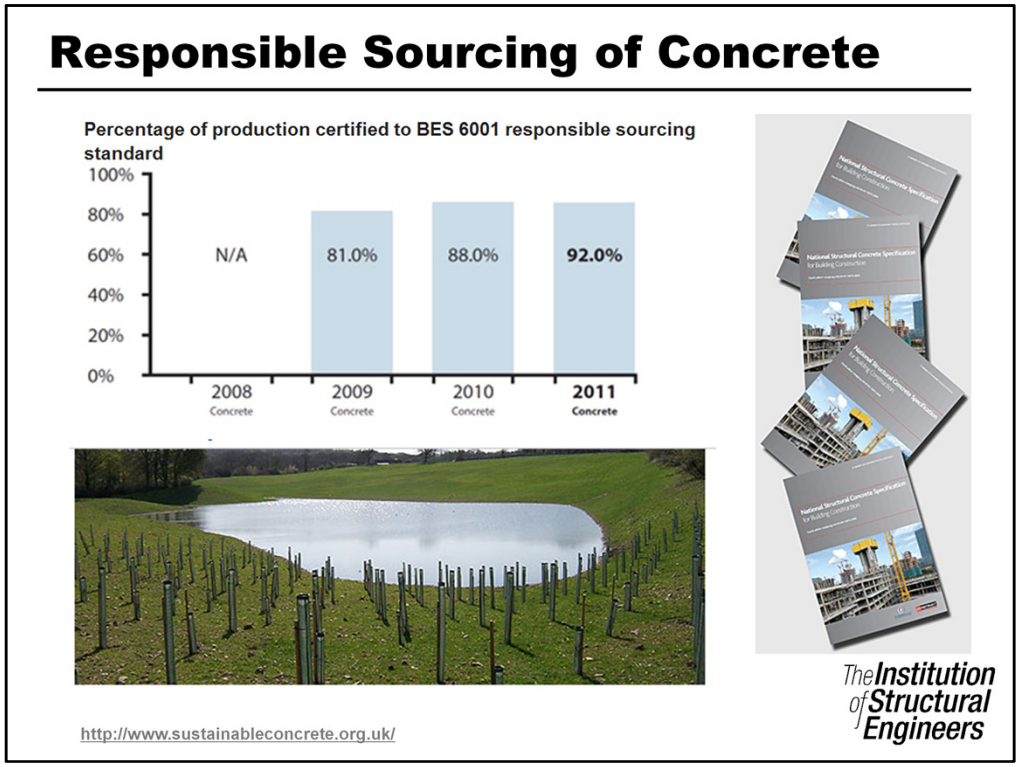
Reduction of waste leads to consideration of demolition. This example considers steel. Steel is efficiently recycled. Scrap has a high value and is traded globally.
However it is rare for a building to be demolished because the structure has reached the end of its physical life. Recycling steel involves enormous energy to re-melt the steel, with associated CO_2 emissions. So we are not using the stock of materials held in existing buildings appropriately.

We would like to see targets develop beyond avoiding landfill and achieving high recycled content. Strengthened incentives are needed for consideration of end-of-life during initial design and procurement. That may mean dismantling and reuse for the Olympic venues, adaptablity for schools and hospitals, or design for durability for long-life public buildings.

Development of a lower CO_2 waste strategy for steel from industrial and retail shed structures would help keep steel and skills in the UK, and avoid re-melting. This could be supported through the efforts of an organisation such as WRAP.

Further Information

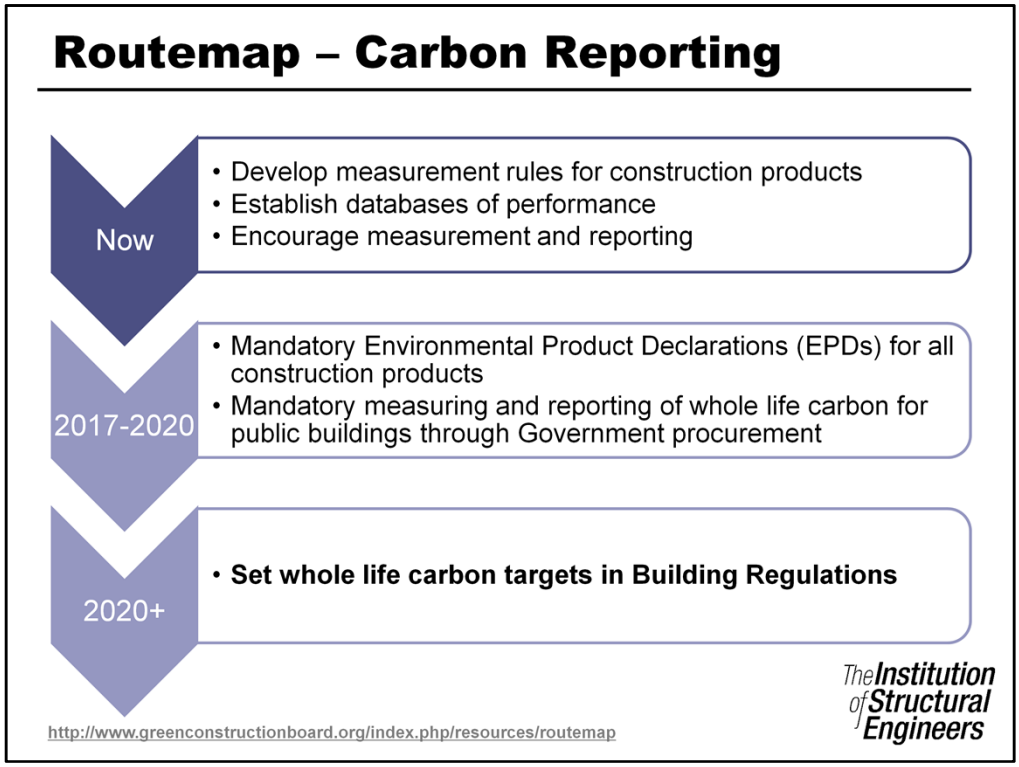
The barriers to process improvement here are:
-demolition is optimised for extracting value in least time.
-the costs and benefits of sustainable material use generally fall to different parties in the supply chain.
-the separation of cost and benefit may spread across the life of the built asset, which may be 20 -100years.



Responsible Sourcing provides us with a best practice example of the whole industry working together.
Responsible sourcing is a standardised approach where a product supplier considers their process, supply chain and end user. Continuous improvement targets are set for measuring a full range of sustainability issues, such as health and safety, community engagement, biodiversity, quality, carbon, water, waste etc. The UK is the world leader in this approach.

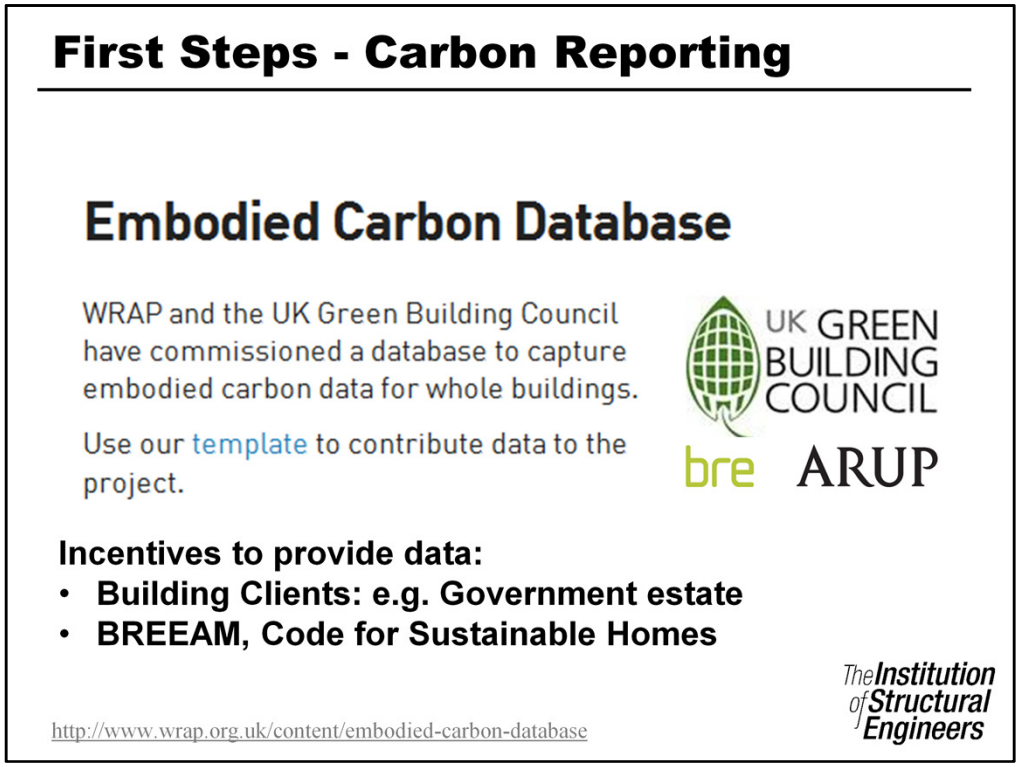
In this example
-The Government set a target.
-A standard was developed.
-Building rating schemes and key clients such as Crossrail set requirements and provided incentives.
-The designers & contractors agreed National Specifications.
-The concrete industry worked together, treating sustainability as a business opportunity, and invested in adopting responsible sourcing across the board.
-Sadly this is being undermined as the Govt. has yet to report on the target for 2012.
We are facing a push-back from the concrete industry which is unhappy to invest in further initiatives as they need to see the Government following through on its plan.

Further Information
British Standard (BS8902) , Certification standard (BES 6001)
Reporting on 2012 targets could be achieved through a limited sample eg MoD, HA, Education buildings



We now look to a new organisation: The Green Construction Board. In March 2013 they published a route map to low carbon construction. This includes recommendations for materials and CO_2 reduction.

This is a summary of the route-map to low CO_2 materials use.
The end-game is the inclusion of embodied CO_2 from materials in Building Regulations from 2020.
The first phase builds capacity. Without this, the subsequent steps will unravel and the needed CO_2 reductions will not be achieved.
To achieve a fair comparison of materials that grow, such as timber, with a complex material chain such as steel is a challenge.
A clear commitment to a timeline is needed in order for industry to be persuaded to invest in these early stages.



A best practice example from this early phase is the development of an embodied CO_2 database to capture the results from building studies. The importance is that this is a publicly available independent data sharing initiative within the industry.

To ensure this database develops into a useful tool we need it to be used. To ensure success -submission of data could be mandated in procurement and rewarded in Green Building rating schemes.

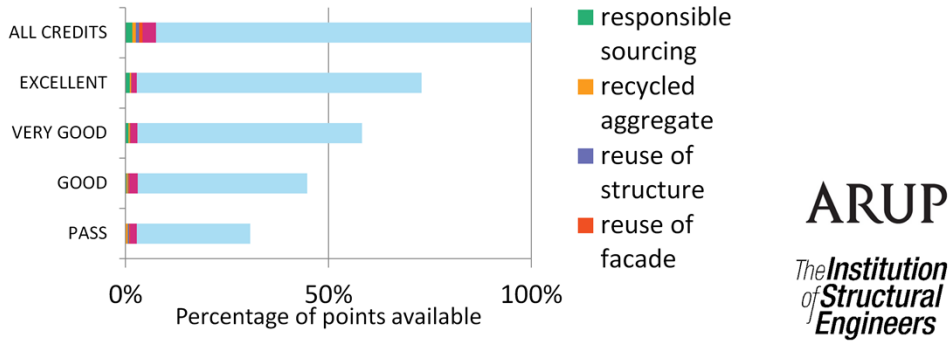
Note: Early results will be dubious, as measurement standardisation is still developing. However the database is intended to provide the first steps to benchmarking of embodied CO_2 of buildings. We wish to learn from the experiences of the Carbon Buzz website included in the RIBA submission.

More Information on Innovation and Growth Team(IGT) recommendations:
IGT report includes 18 recommendations including a trajectory showing the change from **operational CO_2** being the driver in 2010 through to **embodied CO_2** being the driver by 2040. In more detail this includes:
-standards and tools to evaluate embodied carbon in place by 2014
-embodied CO_2 being routinely included in design by 2018.
Ref IGT: Final Report Annex D: Carbon, Major Climate Change and Energy Policies

Incentive – Rating Schemes

"In most cases the (BREEAM) Mat1 system is opaque, complicated, counter-intuitive and not linked to significant sustainability improvements. If you change to a high fly ash concrete or a lightweight steelwork structure, you should get credits."

http://www.istructe.org/resources-centre/technical-topic-areas/sustainability/value-of-structural-engineering-to-sustainable-con



ARUP

The Institution of Structural Engineers

Until consideration of material sustainability is mandated, by whatever means, the biggest incentive for clients and direction for industry comes from Green Building Rating Schemes. The Inquiry has asked about the Code for Sustainable Homes. This leans heavily on the content of BREEAM.

Our research has shown that BREEAM is not providing what is needed in terms of incentive for reduction of materials impacts, in particular for structural materials, which make up ~1/2 of the CO_2 footprint of the materials. Our findings are corroborated as clients, such as the Olympics, Crossrail, major developers and planners, set additional requirements for materials in their briefs.

This leads to a confused, wasteful and uncoordinated approach at a time when we need strong direction.

BRE has responded positively to our findings. We hope that consideration of Code for Sustainable Homes will refer to our research and detailed proposals.

Summary

Reduction in the CO_2 emissions from construction materials is important.

Materials in existing buildings are a resource to be managed.

More incentives to reduce impacts from materials are needed.

The industry has demonstrated it can respond to initiatives.

Code for Sustainable Homes and BREEAM need modification.

A commitment to a programme of change is needed in order to encourage participation and investment.

The Institution of Structural Engineers

Principles of sustainable materials

1 Use Resources Efficiently
2 Minimize Embodied Environmental Impacts
3 Source Responsibly
4 Minimize Harm to Health
5 Contribute to In-Use Sustainability
6 Future-proof