MOTT MACDONALD

Output from the third Carbon Crunch seminar hosted by Mott MacDonald, 25 November 2015 at the Institution of Civil Engineers, London

Carbon Crunch: how to manage infrastructure carbon and cost

Whether it’s for the environment or to improve your bottom line, cutting carbon is the responsible thing to do

“It’s time to take carbon management seriously.”

Keith Howells
Chairman, Mott MacDonald

It’s increasingly clear that cutting carbon cuts costs

A causal link between carbon and cost was identified by the Treasury’s Infrastructure Cost Review in 2010. But direct cost benefit is only one part of the carbon reduction story. The climate is now an average 1°C warmer than it was before the Industrial Revolution and the pace of warming has accelerated in the last 50 years.

On our current emissions trajectory, our planet will be 5°C hotter by the end of the 21st century than it was at the start of the 19th – this is clearly unsustainable!

World diplomats gathered at the COP21 climate change negotiations in Paris in December 2015 to discuss carbon reduction measures that would keep the temperature rise below 2°C, and there’s hope that their agreement will lead to a step change in global emissions reductions.

But we can’t rely on governments to solve the problem. It is down to individuals and organisations to act.

In June 2015, a report by Mott MacDonald and Anglia Ruskin University showed that global insured losses attributed to climate change have risen from US$40bn a year in 1980 to about US$160bn now.

The changes in store over the coming two decades are locked in due to historic emissions, and the report calls for investment to build resilience to the already ‘locked-in’ impacts.

But we have the power to change things beyond that. By acting now to reduce carbon emissions, we can influence the Earth’s climate beyond 2035. And that should be a key priority for everybody involved in operating, designing and delivering infrastructure.

The Infrastructure Carbon Review (ICR) in 2013 set out 10 recommendations, encompassing leadership, communication and culture, metrics and governance, commercial solutions, innovation and standards.

One of these recommendations was the creation of a new publicly available specification on carbon reduction in infrastructure.

PAS 2080 was developed by the British Standards Institution with Mott MacDonald and Arup under the aegis of the Green Construction Board (GCB) and the Department for Business, Innovation & Skills (BIS).

There is every possibility that this new specification – the world’s first for carbon management in infrastructure – could evolve into an international standard. For now, it remains a practical and useful tool to help asset owners and managers understand and manage the carbon footprint of their assets.

"Cut carbon for more sustainable assets."

Davide Stronati
Global sustainability leader at Mott MacDonald

Cutting capital and operational carbon

Diligent carbon management can unleash innovation

Cutting capital and operational carbon has helped some of the UK's biggest clients to slash costs by bringing material and whole-life efficiencies to their assets.

Diligent carbon management has also unleashed innovation in design and procurement. However, these benefits are only realised through strong leadership and by embracing new thinking in asset development.

This was the key message at the 2015 Carbon Crunch conference which saw representatives of key clients discuss the benefits of low carbon thinking.

The third annual event also saw more than 100 senior figures from the industry discuss the impact of a new publicly available specification (PAS) which will provide guidance on carbon management.

PAS 2080: Carbon Management in Infrastructure will provide a common language for all parts of the industry on how to integrate greenhouse gas emissions with infrastructure delivery, how to measure carbon, information management, and differing responsibilities within the industry.

Leading clients have shown that carbon is a good proxy for the use of resources and energy, and therefore cost. I hope the new industry specification gives impetus to other clients hoping to realise the benefits of low carbon assets.

Key messages from the conference include:

Importance of leadership
Strong leadership is needed to steer change, both within businesses and across the supply chain. This has to come from the top of an organisation, as without the approval of those at board level it is difficult to make the decisions necessary to change behaviours.

Challenge suppliers to reduce carbon
Rather than specifying methods, asset managers need to specify outcomes, allowing their supply chains to meet the challenge. Even carbon-heavy products such as concrete can be made more sustainable by modifying the mix or finding alternative ways of reinforcing it.

PAS 2080 will steer clients towards low carbon assets
PAS 2080 will provide much needed guidance on what good carbon management is, how to measure and monitor capital and operational carbon, and responsibilities across the value chain. Businesses which demonstrate they are 'PAS 2080-ready' will be more competitive as they will show asset managers they are able to reduce the carbon footprint of developments.

Use belief and belligerence to drive forward your carbon

Anglian Water

In 2008 Anglian Water embarked on a journey to cut the carbon emissions of new assets in half within seven years. Not only would this reduce our effect on the environment, we also knew that this would cut costs.

We understood what a challenge this would be. To make sure it happened, we announced our intention publicly and made our supply chain aware that they were crucial in helping us achieve it. At times progress was incredibly tough and a combination of belief and belligerence was crucial to our success.

We knew that 80% of capital carbon was in the concrete and steel of our assets. By establishing a baseline we knew what we were cutting against, while detailed models allowed us to value engineer our assets for both carbon and cost.

Tough targets stimulated innovation in asset design, with new materials and alternative construction techniques helping to drive down the carbon footprint.

We learned to question everything – and simple modifications such as installing pipework above ground instead of burying it reduced unnecessary emissions.

Seven years on we cut 54% of our capital carbon in 2015 together with average reductions in capex of 22%.

We also exceeded our targets in operational carbon. Although we set our carbon cutting goal very high, we achieved it and realised a healthier business as a result.

Key ways to drive down carbon in asset development:

Engage with suppliers
Pass your emissions targets on to your suppliers and enlist them in your carbon cutting journey. They will bring their own expertise to asset design and delivery.

Establish your baseline
If you can measure something, you can cut it. Having a baseline helps you to see what works and what doesn't.

Use modelling techniques
Carbon models allow you to optimise asset design, ensuring the emissions impact is as low as possible.

“Set ambitious targets. Show strong leadership. Get started.”

Chris Newsome
Asset management director, Anglian Water and Chairman, Green Construction Board Infrastructure Working Group

Innovate in materials
Investigate alternative materials which can reduce the carbon footprint of new assets. Changing the proportions of constituent materials such as aggregates makes a big difference across a whole project, and suppliers are always innovating with new products.

Innovate in processes
Do you really need to build? If so then innovate with building processes – use thinner components or build using offsite techniques.

Understand where the carbon is
When we modelled installation of a water main we realised that only 11% of the carbon was in the actual pipework – the rest was due to the excavation and reinstatement of the trench. If you want to cut carbon, you need to understand exactly where the emissions are.

Such ambitious targets require a change in mind-set from top to bottom of a business and its supply chain with the carbon agenda placed at the heart of its business strategy.

Strong leadership
Changing behaviours requires impetus from the top. I have the backing of fellow board members and our investors which empowered me to push ahead with ambitious targets.

Consistent messages
In the world of advertising they say people need to see a message 20 times for it to be effective. If you want to change business as usual, you need to remain consistent in your messages until others adapt to them.

Be clear about the things you can control
Progress will come from setting defined targets that you and your supply chain can tackle.

Make yourself publicly accountable
When Anglian Water embarked on its carbon cutting journey, we said publicly what we wanted to do. The added pressure of reporting progress publicly spurred us on our journey.

By striving to cut carbon emissions, Anglian Water has also benefited from a cut in capital costs for new assets.

"This new carbon management standard will be transformative."

Scott Steedman
Director of standards, BSI

Construction firms should use the opportunity of a PAS

The world's first carbon management standard for infrastructure

The BSI's new publicly accessible standard will support those who want to cut their carbon emissions while encouraging innovation in the design of new assets.

Disruptive change can be a good thing and used effectively, standards can play an important part in achieving it. For example, when the PAS 1192 series of standards on building information modelling (BIM) was introduced in 2013 it facilitated a step change in the UK industry uptake of BIM.

Now PAS 2080 – the world's first carbon management standard for infrastructure – is set to do the same for carbon, providing the guidance the sector needs to effectively manage greenhouse gas emissions while driving down cost.

Getting started

PAS 2080 provides guidance on how to initiate and embed low carbon efficiency.

Driving innovation

The focus on carbon will stimulate new ways of thinking about infrastructure creation and management.

Establishing a common language

PAS 2080 paves the way for a consistent approach to methods, measurements and reporting which makes it easier to talk about carbon and cost right across the supply chain.

Non regulatory

PAS 2080 is a voluntary standard. This allows businesses to find their own way to best practice, minimising the need for regulations. Clients can specify PAS 2080 as they choose.

Complementing existing standards

PAS 2080 complements the existing suite of codes focusing on carbon management (including PAS 2050 for products, PAS 2060 for processes, and PAS 2070 for cities).

Prospects for a global standard

In its role as the UK national standards body, BSI provides the infrastructure for UK industry experts to work on international, European and national standards within a process that meets the UK obligations under the WTO principles of full stakeholder engagement, open public consultation and consensus.

Given the UK's dependence on international trade, around 95% of BSI's work is international, helping UK experts to shape what global or European best practice looks like (such as the Eurocodes). Given its provenance as a BSI document, PAS 2080 could in time become the global standard as an ISO on carbon management. Being PAS 2080-compliant will give firms an 'early mover advantage' in global markets.

Until now, businesses have had to steer their own carbon cutting agendas, using the example of leading clients who have cut costs by cutting carbon.

This new BSI PAS 2080 standard will provide much needed guidance to help all asset owners make the most of carbon management. For most, complying with PAS 2080 will lead to a complete rethink of 'business as usual'. But as always, it will be businesses at the vanguard of change which reap the rewards.

“Become an intelligent client.”

Nirmal Kotecha
Director of capital programmes and procurement, UK Power Networks

An intelligent client has a good understanding of its assets and value chain

UK Power Networks

UK Power Networks believes the first step in cutting carbon involves becoming an ‘intelligent client’ which truly understands its assets.

Clients work in different operating and regulatory environments meeting diverse customer needs. They have different priorities and starting positions as far as effective carbon management is concerned.

The priority for UK Power Networks has thus far been to support the UK’s transition to a low carbon economy and to reduce distribution losses. In the creation of new assets, the strategy has been to reduce waste/inefficiency (cost) across the asset creation process which invariably also reduces carbon. Other clients have led with carbon reduction as the driver which has also led to cost efficiencies.

The characteristics of an intelligent client:

Evidence of strong leadership
Leadership from the very top is essential to drive the change agenda for whatever outcome.

Understands assets
This means knowing the asset condition, its baseline carbon footprint and the impact of interventions on both the cost and carbon footprint of the asset base.

Identification of ‘waste’
Understanding its value chain allows an intelligent client to target improvements that can be converted into a cash and carbon currency.

PAS 2080 sets out many essential actions across the value chain to provide a framework which allows the intelligent client to put these into effect.

Uses smart procurement
For major infrastructure clients, mimicking a production line model and moving away from a drip-fed allocation of work to a long and visible pipeline is a key enabler to minimise waste.

This combined with the use of commercial models that drive the right behaviours with the supply chain and incentivise ‘no build’, ‘less build’ and ‘smart build’ innovative solutions is a proven strategy for reducing cost and carbon.

Make carbon reduction a key programme outcome
Setting ambitious carbon reduction targets sets the leadership tone and aligns everyone to one cause.

Reducing distribution losses and waste is key to UK Power Networks as it supports the country’s transition to a low carbon economy.

“Assess your carbon baseline to pave the way for reductions.”

Matthew Webb
Senior energy and carbon strategy manager, Transport for London

Calculating the carbon impact of a project

Transport for London

With London’s population growing steadily and expected to hit 10M by 2030, TfL has to rapidly expand capacity on the city’s transport network to keep up. The next 10 years alone will see more than 160 new trains added, 279km of track renewed and 104 station projects.

This work has to be delivered with minimum carbon emissions and cost – ensuring the customers who use and pay for our services get the best value for money.

A crucial step in this process is establishing the carbon baseline. We used the rail industry standard RSSB Carbon Tool to calculate the capital carbon impact of redevelopment plans for Camden Town Station, which includes construction of a completely new station building, escalators and lifts as well as new cross-passages between platforms. Looking at a 60 year lifecycle, we projected 37M t of capital and operational carbon.

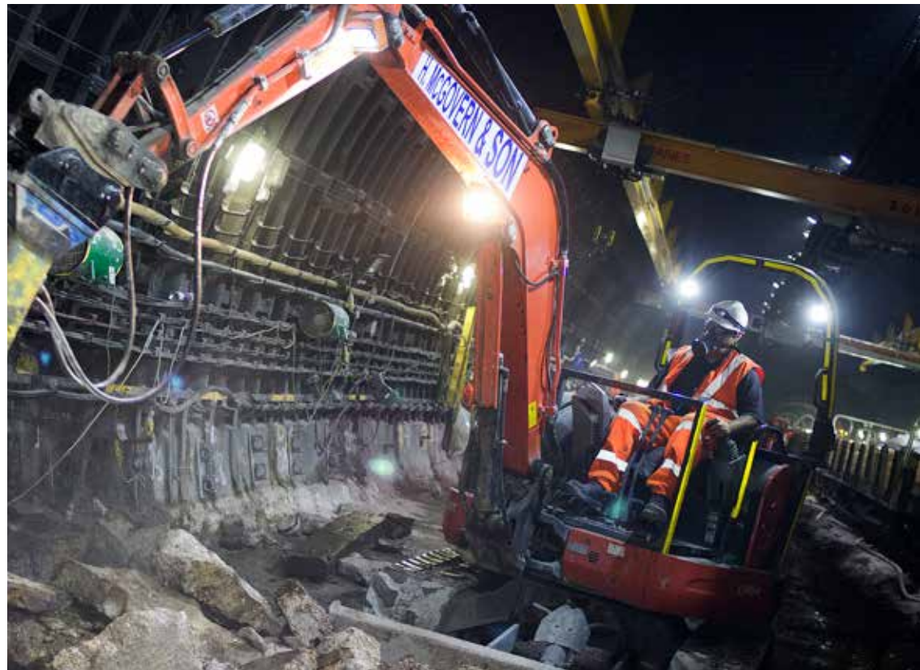
Developing this baseline brought a number of benefits:

Know what you are cutting against
By establishing a baseline we can now measure our progress and evaluate the success of carbon cutting interventions.

Identify where the carbon emissions come from
If you know where the carbon is, you know where to make cuts. We calculated that more than a quarter of the redevelopment’s carbon footprint was locked in sprayed and in situ concrete, and are now looking at lower carbon concrete mixes, alternatives to sprayed concrete lining techniques, and altering tunnel layouts.

Compare different solutions
You can optimise development work by calculating the carbon baseline of varying interventions and design innovations.

As we focus our efforts on cutting our carbon footprint, we welcome the introduction of PAS 2080, a standard which provides a blueprint for effective carbon management. The bottom line benefits of driving down carbon have repeatedly been shown. But the work starts by establishing an accurate carbon baseline to cut against.



Establishing a carbon baseline for projects enabled TfL to identify where the carbon was – and where changes to design would make the biggest impact.

Infrastructure managers don’t need to go it alone

Tarmac

Suppliers can help infrastructure owners and managers cut carbon. Consulting with the supply chain early in the process allows us to provide alternative products and solutions.

Too many asset owners feel they need to steer their carbon-cutting journey themselves: out of more than 15,000 customers, only a handful make a point of asking how we can provide lower carbon solutions.

We can calculate the carbon footprint of all our products – taking into account constituent materials, the energy that goes into the manufacturing process and delivery to site. This is done using PAS 2050 methodology, the specification for assessing the greenhouse gas emissions of goods and services, so our calculations will integrate seamlessly with your own carbon management using PAS 2080. We also consider the whole-life performance of our products as well as carbon and cost comparisons of our solutions.

Bespoke solutions are also possible. Our products often reflect common industry specifications, but is there an opportunity to change the design and the specification? Working with you early in the process will give us an opportunity to find new ways of achieving outcomes through design, processes and materials innovations.

Just one example of this is our work with Costain on the M6 Heysham Link for Lancashire County Council, a long awaited 4.8km dual carriageway. Through value engineering, we cut 200,000t of aggregate and 9000cu m of concrete from the job. We also used innovative products such as low temperature asphalt. Altogether the carbon footprint of the original design was cut by 21%.

Here are key ways you can collaborate with suppliers to maximise the benefits:

“Engage with suppliers to cut embodied and whole-life carbon.”

Andrew Swain
Senior manager, sustainability, Tarmac

Engage early
The opportunity to cut carbon decreases dramatically as you move through the phases of a construction project.

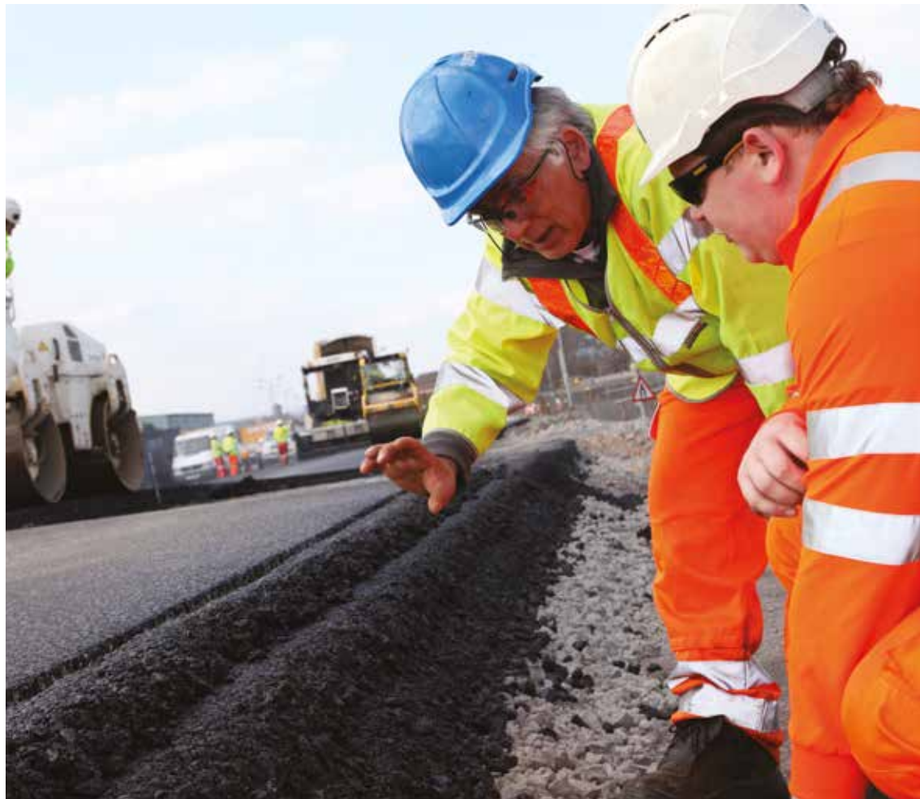
Consider whole-life and end-life performance
Up to 80% of the carbon emissions of an asset take place during operation, so it is important to consider the whole-life implications of product and materials choices. And take decommissioning into account too – will building components end up in landfill, or can they be easily recycled or refurbished?

Be flexible
Interrogate design requirements to see if there are ways to further cut carbon. For example, concrete – which is often misrepresented for having a high carbon footprint – can be used in low carbon solutions by reviewing the design requirements or adapting the mix.

Embrace new ideas
New technology and products are always entering the market. Have an open mind on how these can help to reduce the carbon footprint of your assets.

Choose your suppliers carefully
Many suppliers operate in the market. Work with those which provide sustainable solutions and best help you achieve your goals.

By innovating in products and processes, Tarmac has brought major cost and carbon savings to clients willing to engage early and be flexible in asset design and delivery.



“PAS 2080 could be a game changer in carbon management.”

Maria Manidaki
Sustainability and carbon leader, Mott MacDonald
and technical author for PAS 2080 and guidance document

The PAS 2080 standard will provide all the guidance

Where to start in managing the carbon footprint of your assets

PAS 2080 provides a common language and framework to manage carbon across all sectors of the infrastructure industry. It will enable all members of the value chain to make carbon management a central part of their strategies when delivering infrastructure projects and programmes of work.

Key features of PAS 2080:

GHG emissions
The PAS focuses strictly on GHG management and does not address wider environmental or sustainability issues such as resilience, adaptation or climate change.

Consistency in GHG emissions management
There are already many standards which detail how to quantify carbon. PAS 2080 references these but differs in providing a framework for managing carbon by focusing on value chain member behaviours when delivering projects and programmes of work – delivering reductions and attendant benefits.

Infrastructure
The buildings sector is relatively well served. PAS 2080 focuses on carbon management in infrastructure.

Requirements for the value chain
PAS 2080 sets out requirements for asset owners/managers, designers, constructors and product/material suppliers and how these need to be fully integrated to realise low carbon benefits in infrastructure delivery.

Focus on all emissions
PAS 2080 is about the GHG emissions that can be controlled by asset owners/managers: mostly capital and operational carbon. But it also draws attention to the importance of user carbon where asset owners/managers still have a degree of influence.

Leadership
The right governance creates a culture where everybody challenges the status quo to deliver innovation and reduce carbon. This PAS and associated guidance document provides support on setting targets and how ambitious they should be, establishing baselines and how to report performance transparently and at the right stages in infrastructure delivery to influence decisions.

No red tape
The PAS has been created to enable, not restrict. While there are some very defined guidelines in PAS 2080, it enables value chain members with varying maturities in carbon management to clearly understand what is expected of them to improve collaboration and innovation, and to realise carbon and cost benefits. It is compatible with BSI standards for BIM and information management to aid integration of carbon management with other developments in the industry. And it promotes early, strong engagement with suppliers.

"The first BIM-enabled carbon calculator will help clients cut costs and spearhead innovation."

Terry Ellis and **Kim Hampton**
Principal environmental scientist, Mott MacDonald
Principal sustainability and carbon specialist, Mott MacDonald

The Carbon Portal will become a key enabler

Calculator to directly measure capital and operational carbon

The Carbon Portal is the first carbon calculator to directly measure the capital and operational carbon footprint of BIM-designed assets. It has been developed by Mott MacDonald using the infrastructure industry's most comprehensive carbon data.

Key aspects of the Carbon Portal include:

Focus on assets, not materials
Quantity surveyors are already able to add up the tonnage of individual materials and calculate carbon accordingly. However, innovation comes from engineers, and by providing carbon calculations for BIM objects and entire assets the Carbon Portal provides essential information at the planning and design stages where savings can be made.

Rapid calculations
Carbon assessment undertaken by specialist teams using an Excel spreadsheet can take hours or even days. Using the Carbon Portal reduces this to as little as 30 seconds.

Enables optioneering
Users are able to quickly calculate the capital and operational carbon footprint of competing designs, and to see the impact of design modifications across the entire project.

Ease of use
The Carbon Portal is based on a 'drag and drop' system which is intuitive to all software users. BIM data can be easily imported, with users adjusting for quantity to provide immediate calculations.

Cross-sectoral
The tool works for water, transport and power assets, and will be progressively expanded to cover further sectors.

Can be used internationally
The Carbon Portal is populated with UK data that already supports optioneering in all markets. Datasets are being continually refined and tailored to our key regions worldwide.

Carbon is a proxy for cost, and using carbon as a performance metric encourages creative design and construction solutions. The Carbon Portal can play an important role in showing the value of innovation. Although unable to replace strong leadership or engineering talent, it will become a key enabler allowing alternative designs to be easily tested, compared and value engineered.

As the importance of carbon management gains ground, we expect carbon to become fully embedded alongside scheduling and cost details as the sixth dimension of BIM, with automated carbon assessments informing the design process. This will take time, but will be driven by the many benefits clients are already enjoying by cutting carbon.

Opening opportunities with connected thinking.

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