MOTT MACDONALD

Output from the fifth Carbon Crunch seminar hosted by Mott MacDonald on 29 November 2017 at the Institution of Civil Engineers, London

Carbon Crunch: who needs reduction targets?

“Strategy involves considering and planning action on many different agendas. But ultimately, every agenda comes down to sustainability, whether it is of a personal career; a business; an industry; a country or a world – how do we ensure that it is sustainable?”

Guy Leonard

Targets were the theme of our fifth Carbon Crunch event. The UK government’s 2013 Infrastructure Carbon Review, of which we were lead author, set out how cutting carbon cuts cost, giving a strong business imperative to act. Since then, our annual events have heard how pioneering firms are pushing the agenda forward.

But much more work remains for the infrastructure sector to truly play its part in meeting the UK’s national targets to cut emissions by 80% against 1990 levels by 2050. Assets now in planning need to be designed and delivered to operate in a net zero emissions future.

The UK Green Building Council called for the creation of carbon reduction targets for the whole of the infrastructure sector in its report, ‘Delivering low carbon infrastructure’, published in summer 2017.

Such a goal would force us to ask where projects fit on the roadmap to zero emissions.

Targets provide assessment criteria that can be used to guide action, and could be effective in an industry already used to regulation. However, they would need to be seriously challenging, and some fear that targets ‘for everyone’ will be soft, so as not to leave the least able behind.

Self-motivation is more important. After all, sports teams do not need targets to motivate themselves to be the best. Huge achievements can be made by companies that challenge themselves in this way. Anglian Water is a prime example. By imposing what it describes as ‘big, hairy, audacious goals’ the company has created a carbon-cutting culture, spread it across its supply chain and delivered them.

Whether targets are self-selected or imposed on the industry, ambition is the key. To meet carbon reduction commitments and achieve a sustainable future for its residents and the world we live in, the infrastructure sector must embrace ambition.

Guy Leonard
Group strategy director, Mott MacDonald

“Leadership can drive change. If leaders aren’t talking about carbon, if they’re not asking what the solutions are and what the business is doing to decarbonise a project, then it will not be given the focus it requires.”

Alastair Mant

Delivering low carbon infrastructure

In terms of helping to meet the aim of the 2015 Paris Agreement to keep global temperature increases well below 2°C, the UK economy needs to achieve net zero carbon very soon after 2050. In 2017 we looked at whether the infrastructure industry had a roadmap to help get us there.

The role of infrastructure in reaching zero carbon is phenomenal. More than 50% of carbon emissions come directly or indirectly from infrastructure.

The proportion of emissions from infrastructure will increase as the energy system is decarbonised, accounting for 80% of the UK’s carbon footprint by 2025, and 90% by 2050.

Our research looked at what targets were being set by infrastructure client organisations now, and how they could help the UK achieve its 2050 goal. We found quite a range: just two were setting targets on a whole-life basis, while most covered only operational carbon.

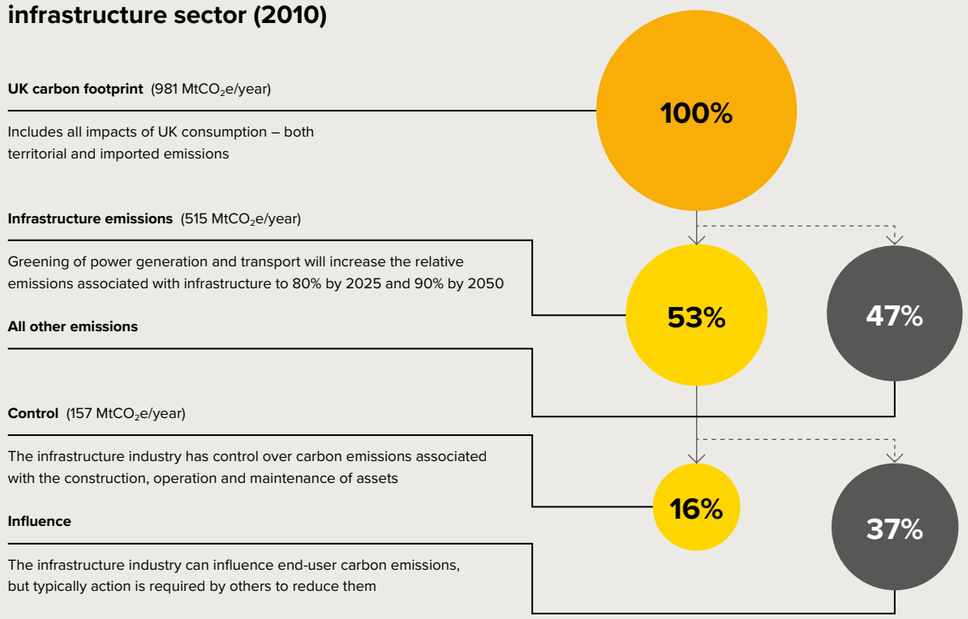
Leaders drive change. If leaders aren’t talking about carbon, if they’re not asking what the solutions are and what the business is doing to decarbonise a project, then it will not be given the focus it requires.

Our report recommends setting a whole-life carbon target for the sector, based on climate science. From this, all organisations can derive commensurate targets.

We’re convinced that some form of stretching industry target is required to get to net zero after 2050. That’s because on current progress the infrastructure industry is not set to get there.

Alastair Mant
Head of industry engagement, UK Green Building Council

Carbon emissions in the infrastructure sector (2010)



Source: Green Construction Board

“Every piece of material delivered to a construction site is typically moved four times before it is used. Every house built in the UK generates 7t of waste to landfill.”

Keith Waller

A sustainable route to high-performing infrastructure

Productivity and sustainability are inextricably linked. There is a gap between how we boost productivity, and how being more efficient can produce a more sustainable outcome.

Inefficiency is widespread. Every piece of material delivered to a construction site is typically moved four times before it is used. Every house built in the UK generates 7t of materials to landfill. What that actually means is that we deliver 7t of waste to site, we move it around four times, and then we drive it to landfill.

A key aim of the Infrastructure and Project Authority is to deliver high-performance infrastructure. Our definition includes not just cost, quality and time, but also user experience and sustainability.

The UK is spending £60bn a year between 2016/17 and 2020/21 on infrastructure. We need to take a whole-life, whole-system approach, not just a capital cost approach to how we measure performance. It would mean sustainability and social benefits, such as skills, would also be considered.

The 2017 budget committed government departments responsible for transport, health, education, justice and defence to presume in favour of offsite construction. This is an attempt to join up the government estate to deliver a more sustainable and more productive outcome.

The infrastructure sector needs to build a better evidence base on the benefits, not just the cost, of projects, and do this for the whole life of the asset. Big data and technology should be harnessed to improve productivity and sustainability.

Better performance data on existing assets might reduce the need to deliver new ones.

Ultimately, high-performing infrastructure is also sustainable.

Keith Waller
Senior advisor, Infrastructure and Project Authority

Infrastructure Carbon Review

Every organisation involved in delivering infrastructure must play its part in reducing carbon.

Cutting carbon cuts cost

That was the overriding message of the UK government's Infrastructure Carbon Review (ICR), published in 2013. It concluded that pursuing a low-carbon agenda drives innovation. Leading companies and their supply chains have already cut capital or embodied carbon by 40% and reduced average capital costs by 25%.

Carbon reduction in infrastructure

The government's Green Construction Board commissioned us to produce the ICR, which was a milestone report setting out the opportunities to cut carbon and cost in infrastructure. Our team interviewed more than 100 leading infrastructure companies on the most effective strategies and actions to achieve low-carbon solutions. We made 10 recommendations to drive low-carbon outcomes in infrastructure businesses.

These focus on: leadership, communication and culture, metrics and governance, commercial solutions, innovation and standards. Through our work as lead authors of the ICR we identified that if emerging best practice was driven across the infrastructure sector, it could save up to 4Mt of capital carbon and 20Mt of operational carbon each year. This would annually benefit the UK economy by up to £1.5bn.

Real savings

There are now more than 60 signatories to the ICR. They include asset owners, developers, consultants, regulators and construction product suppliers. All have pledged to make carbon reduction an integral part of infrastructure construction in the UK. Collectively, they have implemented more than 150 commitments. A follow-up study found that 16 low-carbon exemplar projects saved a total of 300,000t of CO_2e and £140M.

This opportunity is not limited to the UK. Leading companies across the globe are setting the trend by rethinking projects from the start. They have realised that reducing carbon is not just about building new assets in a more intelligent way, it's also about demanding better performance from what you already have.

4Mt
capital carbon savings

20Mt
operational carbon savings

£1.5bn
economic benefit

Crossrail 2 – a carbon smart railway

Designing and operating a ‘carbon smart’ railway is a priority for Crossrail 2. It is important to us because we recognise the significant benefits of reducing carbon, which include saving money and improving air quality.

To make Crossrail 2 carbon smart, we’ve been proactive at an early stage and have developed a forecast carbon footprint for the construction and operation of the scheme.

The carbon model shows that the majority of our carbon footprint over a 120-year period will be in embodied materials in our stations and connecting infrastructure.

Now we know where the carbon is, we need to develop the solutions to reduce it.

As the majority of carbon will be in our materials, we will be having a strong focus on reducing materials that we use and using low carbon alternatives where we absolutely need to build.

We’ll also be looking into how we can use clean energy across the route, including the potential for incorporating innovations from groundwater cooling to solar powered railway sleepers.

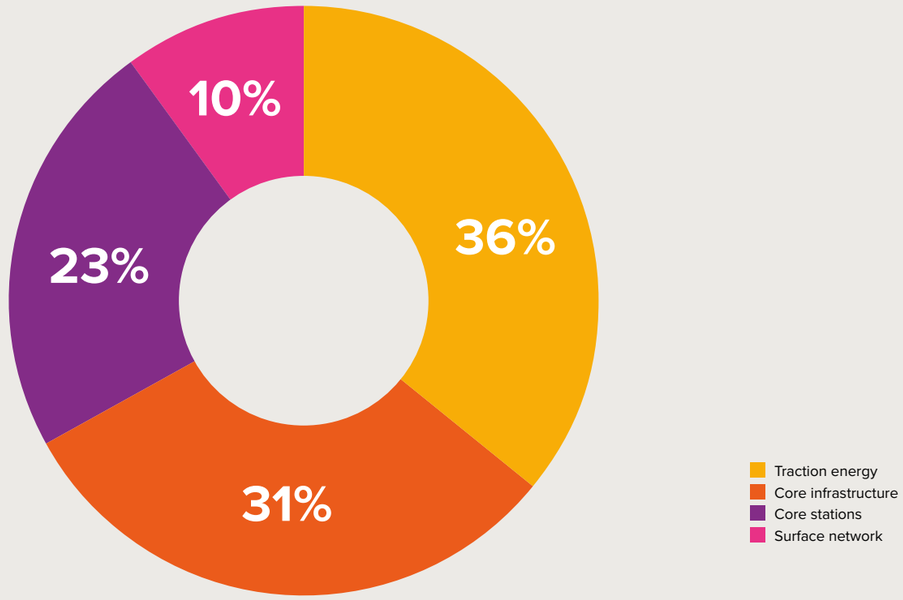
Innovation will be important, although we recognise the importance of targets for driving behaviour. We are exploring how we can use them in a meaningful way on the project, and how we can have a science-based approach to setting them.

Daniel Watson
Sustainability lead, Crossrail 2

“We recognise the importance of carbon reduction targets for driving behaviour.”

Daniel Watson

Our baseline footprint



> **“Carbon targets are either too long term or too short term. Who cares about 2050? It’s hard to bring it to life if most of the board won’t be around then. And who knows what technology will be developed over that timescale?”**
>
> Adam Crossley

Playing our part towards carbon neutrality

Skanska has been working on decarbonisation for the best part of a decade, driven by the leadership of our former chief executive, Mike Putnam. The business recently broadened this to cover wider sustainability issues, such as the UN Sustainable Development Goals. But we need to do this without losing our focus on carbon.

Infrastructure companies typically provide a project response when asked to explain what they are doing on carbon. Imagine if you asked a business how they’re doing on safety or how they’re doing on profit and their response was project specific: “This project is really safe” or “that project is really profitable.” That’s what the industry does with carbon. At Skanska, we want more systematic thinking, so we’re not just rolling out the flagship projects.

We looked across the industry and found that carbon targets are either too long term or too short term. Who cares about 2050? It’s hard to bring it to life if most of the board won’t be around then. And who knows what technology will be developed over that timescale?

Meanwhile, short-term targets, such as a 5% reduction year on year, are rarely stretching and probably achievable by tweaking a few things. The only way to drive ambition is through a mid-term target of between 10 and 15 years.

We also discovered that the scope of the challenge had changed.

Everyone in Skanska understands the business wants to be green. The challenge is now technical and financial. Our people say: “OK, I understand the message. What do I do next?”

We have created a roadmap to highlight six key areas: measurement and target setting; carbon estimation and design; emissions from plant, offices and transport; supplier innovation; financial and commercial solutions to help clients overcome cost barriers; and better information at handover to enable efficient use of the completed asset.

Each business unit can decide which area(s) to prioritise according to what is most relevant.

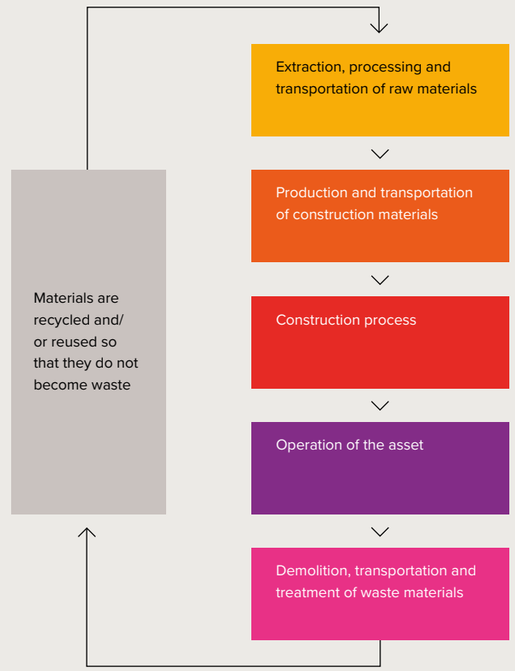
The facilities management team might focus on the fleet and buildings, while civil engineers might choose to prioritise emissions from materials.

The roadmap sets clear, technical guidance for the next 10 years, but allows each part of the business to set its own target.

It’s that kind of intelligence that I hope we can use for an infrastructure-wide carbon target.

Adam Crossley
Director of environment, Skanska UK

Construction carbon cycle



“Building information modelling is a big opportunity for making efficiencies and reducing carbon, and we are using it to eliminate waste in our asset design.”

Sally Sudworth

Winning hearts and minds

My main carbon reduction challenge at the agency is to win the hearts and minds of the 11,000 people who work for us and all our suppliers. The latter are particularly important.

We’ve set challenging targets for carbon reduction – but it’s important that everyone involved in chasing them understands why, and how. So we’ve taken care to contextulaise our requirements, and we’ve described the roles and processes for achieving them. We’ve also developed a carbon modelling tool, ERIC, to assist.

Building information modelling is a big opportunity for making efficiencies and carbon reduction. We are leading the way in using this to help eliminate waste in our asset design.

Our contractors from Tarmac, Jackson Construction and the David Ball Group proposed using cem-free concrete in a recent repair of flood defence walls in Woodbridge, Suffolk.

This has a CO_2 value of 52kg/m^3, compared with 158kg/m^3 from conventional concrete mixes, reducing the carbon footprint of the project by 67%.

When people claim carbon reduction targets of 40-50% are too difficult to achieve, we have an example of where it’s been done already, and it wasn’t hard.

Sally Sudworth
Sustainability lead, Environment Agency

The why

16 of the 17 hottest years since 2000

Paris Climate Change Agreement

The what

Construction carbon
Reduce by 40%

Operational carbon
Reduce by 45%

The who

Anyone who operates, maintains or builds assets

Anyone who writes business cases or buys materials or services

The how

Get suppliers to use ERIC carbon tool
Carbon analysis in all business cases

Be a carbon manager

What’s the whole-life impact of your asset?

“The Wimbledon asset replacement was the first project where we included in the tender a weighting of 5% specifically for carbon.”

Alison Fulford

A carbon reduction story from the client and contractor

Our first project to embed carbon reduction at every stage of the design and build was an extension to our Wimbledon substation. We started by developing our own early-stage design in-house, asking our engineers to reduce carbon. We used their output as our benchmark, so any reductions identified by the contractors would be additional.

23% carbon saving = **£3M** cost saving

This was the first project where we included in the tender a weighting of 5% specifically for carbon. Laing O’Rourke demonstrated that it could reduce carbon by 23% through its choice of materials and equipment, and by following lean design principles.

We set up a working group to ensure that commitments made in the contract were met. We worked as one team with a shared goal of reducing carbon, rather than the traditional relationship of client and contractor on opposite sides.

Wimbledon has given us a story to tell. It can be easy to become so wrapped up in meeting targets that you forget to communicate. This case study has given us a great platform to engage engineers internally about practicalities on the ground, senior management about cost savings, and procurement teams about a successful tender process.

Alison Fulford
Carbon advisor, National Grid

The required carbon qualification on the Wimbledon substation involved scrutiny of every detail, which conventionally are not available until well into a project. We overcame that by deriving details from our building information model (BIM) and have developed a way of manipulating the data in the model to identify ways of understanding carbon.

Our process involved exporting data, adding in carbon, quantifying it, visualising it, and reviewing it to understand what had changed. We are repeating the process over the seven years of the project, focusing on the carbon hotspots of in situ and precast concrete and steel.

This process enabled us to calculate carbon emissions in hours rather than weeks. We could visualise what had changed and use our findings to justify the choices we took.

Using digital engineering enabled us to look early at issues and identify where we could improve further on our estimated 23% carbon saving.

Thomas Whiting
Senior digital engineer, Laing O’Rourke

No reduction, no work

Clients and contractors seeking cost efficiencies should demand low carbon solutions from their suppliers.

The UK's most progressive infrastructure clients and their supply chains have tackled carbon emissions at both project and programme level. For example, at programme scale by 2015 Anglian Water had driven down capital and operational carbon against a 2010 baseline. It is on track to hit capital and operational reduction targets by 60% and 40% by 2020, reducing average capital costs of assets by 22% in the process.

Carbon emissions are a proxy for consumption of materials and energy. Therefore, reduced carbon correlates with reduced cost. Clients and contractors seeking cost efficiencies should demand low carbon solutions from suppliers.

A focus on cutting carbon forces consultants, contractors, asset managers and owners to challenge traditional technical management and commercial solutions. Instead of squeezing supply chain margins, savings are achieved by coming up with new ways to design, build and operate infrastructure.

Carbon should consistently be in the 'top 10' items for board meeting agendas, because those boards produce the policy-based framework within which strategic decisions about carbon can sit. However, the ability to lead is not exclusive to those at the top of an organisation, nor to those at the higher end of the value chain.

Leadership can come from anywhere, and if organisations are going to create the kind of culture shift we need where carbon is concerned, they must encourage leadership from their junior staff and from their suppliers, because leadership flows up as well as down.

Leveraging leadership from both ends of the spectrum is essential to making carbon reduction a core organisational value.

What people believe about carbon determines what they do about carbon – people need to see and know that carbon is of central importance.

Carbon reduction must take its place within organisations in a similar way to ethics and health and safety, because, like those values, carbon reduction makes business sense. It needs to become common policy with the message that companies will not win work unless they reduce carbon, and that they will be rewarded if they do.

Mark Enzer
Infrastructure Carbon Review lead author and group technical director, Mott MacDonald

Carbon cutting keys – leadership, innovation and procurement

The mindset and behaviours, and the skills, strategies and governance required to drive down carbon are the same as those needed to run a tight and successful business.

Companies who have presented at our five annual Carbon Crunch events all operate in very different environments and are on different low carbon journeys. But their headline messages are shared:

1.

Provide bold leadership
All have challenged the status quo, using the low carbon agenda to shake up thinking within their own organisations and in their supply chains. They have set goals and demanded that everyone pulls out the stops to achieve them. Failure isn't an option.

2.

Set yourself up for innovation
Delivering projects is not about the process, it's about the outcomes. Specify the services that need to be supplied by new or improved infrastructure, and the performance it needs to achieve. But design, construction and supply are all up for grabs.

3.

Flex muscle through procurement
Procurement departments have a central role in advancing low carbon, low cost solutions – they must be challenged to write carbon into tender and contract documents. This is where risk is allocated, innovation encouraged and performance incentivised. Simply, if carbon isn't in the contract, motivating and enforcing performance is difficult if not impossible.

PAS 2080 – a game-changer in carbon management

PAS 2080, the world's first carbon management standard for infrastructure, was launched in 2016. It was co-written by our experts and provides guidance on managing greenhouse gas emissions and cutting costs. It is a voluntary standard, which means businesses can specify it in the way that works best for them, and can increase their maturity in carbon management, no matter what stage they are at.

It provides a consistent approach to methods, measurement and reporting for companies across the supply chain.

As well as our extensive experience in helping clients to manage and minimise their carbon, we were the first major consultancy to be independently certified to PAS 2080. This combination means we are well placed to support your journey to accreditation.

What is PAS 2080?

All carbon emissions

PAS 2080 addresses whole-life carbon, in other words, capital and operational GHG emissions that can be directly controlled by asset owners. It also draws attention to the importance of user carbon where owners have some influence.

Supply chain engagement

There are already many standards on how to quantify carbon, but PAS 2080 is different. It provides a way of managing carbon by focusing on the behaviour of companies in your supply chain. Requirements are set out for asset owners, managers, designers, constructors and product and material suppliers. PAS 2080 shows how these can be integrated in organisations to realise the benefits of carbon reduction in delivering infrastructure.

No red tape

PAS 2080 has been created to enable, not restrict. It enables companies in the supply chain to clearly understand what is expected of them, no matter what their level of experience. It allows carbon management to be integrated with other developments in the infrastructure sector, such as BIM and information management.

Managing carbon: three aspects

Behavioural

PAS 2080 provides support on setting ambitious targets, establishing baselines and reporting performance transparently and at the right time to influence decisions. Tough targets will stimulate innovation in asset design, with new materials and alternative construction techniques.

Technical

Technical solutions to reducing carbon in infrastructure refer to innovative use of a material or technology. There are lots of lower carbon, lower cost options available. Examples include using novel construction techniques, LED lighting and substituting building materials, such as using 95% recycled aluminium, which has an embodied carbon footprint five times lower than that of virgin material. Continuing to do things in the same way will only get the same results.

Set an outcome-based specification when procuring a project, not a product- or process-based specification. That enables suppliers to bring new thinking. Incentivise innovation in procurement and commercial arrangements, and challenge your suppliers to compete against each other to find the lowest whole-life carbon and cost solutions.

The value of accreditation

PAS 2080 recommends that all members of a supply chain, from clients to suppliers, gain certification from an accredited body to verify and validate their carbon management process and results. Accreditation will help you reassure your board, shareholders, investors, insurers and regulators that carbon is being effectively managed and targets are being achieved. The World Resources Institute reported in 2015 that at least 40 countries had or were developing mandatory emissions reporting programmes, so it is likely that disclosure will be increasingly demanded across the infrastructure sector. Accreditation to PAS 2080 will demonstrate your commitment to carbon reduction to staff and suppliers.

Leading lights in carbon reduction

Previous Carbon Crunch documents have included valuable case studies from major companies on how they have reduced carbon in their infrastructure assets. A selection is summarised below. To read more click on the links.

2013

Click to view

Anglian Water: using leadership to realise capital and operational efficiencies
Following a mandate from water regulator Ofwat to report embodied and operational carbon, Anglian Water set itself a goal to halve capital carbon in newly built assets and reduce operational carbon emissions by 10% in real terms by 2015, from a 2010 baseline. It's been so successful that targets were raised to 60% and 40% for 2020.

Highways Agency: supporting innovation and challenging standards
The Department for Transport challenged the Highways Agency to reduce emissions by 25% by 2015, against a 2009-10 baseline. The agency cultivated strong relationships and trust with its suppliers to improve the outcome of its projects. It provided suppliers with tools to measure and record greenhouse gas emissions, incentivise them to actively manage and reduce emissions, and encourage them to innovate in the construction methods and materials they used.

2014

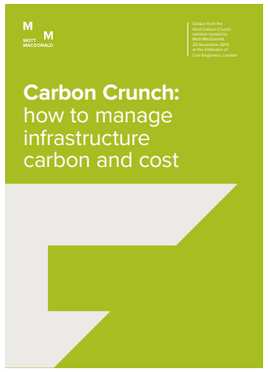
Click to view

National Grid: tapping supply chain innovation
Energy network operator National Grid has set itself a target to cut GHG emissions by 45% by 2020 and 80% by 2050, compared with 1990 levels. It is also aiming for 80% of its top 250 suppliers to report GHG by 2020, and a 10% cut in the capital carbon intensity of its schemes. The company has a sustainability steering group which provides governance for carbon reduction and oversees accounting for sustainability.

Heathrow Airport: procurement is the catalyst for reduction
Heathrow Airport has a target to reduce carbon emissions by 34% and ground-based NO_x levels by 5%. Its Responsible Heathrow 2020 plan is a three-pillar approach to supporting national economies and local communities, looking after its passengers and people, and reducing environmental impacts.

2015

Click to view



Transport for London: assess your carbon baseline to pave the way for reductions
TfL has the challenge of rapidly expanding capacity on the city's transport network to keep up with the capital's growing population. In the next 10 years, it will add more than 160 new trains, renew 279km of track and undertake 104 station projects. All of this needs to be delivered with minimum cost and carbon, to ensure value for money for customers.

Tarmac: engage with suppliers to cut embodied and whole-life carbon
Tarmac can calculate the carbon footprint of all its products, including constituent materials, the energy that goes into the manufacturing process and delivery to site. It uses PAS 2050 methodology, the specification for assessing the GHGs of goods and services, so calculations will integrate with carbon management in PAS 2080.

2016

Click to view

Yorkshire Water: make carbon a catalyst for change
Yorkshire Water is putting carbon reduction at the heart of its plans for the next investment period which starts in 2019. It will target whole-life emissions as well as capital carbon, to truly reduce the impact of its assets. During the current investment period, it made six carbon commitments, including to measure and monitor carbon emissions to inform operational and investment decisions.

Costain: embed carbon reduction across your business
Costain restructured its processes right from the planning, estimating and design phases and developed an in-house software tool to ensure that carbon was connected with delivery processes and to allow environment teams to be involved earlier on.

Learn how to start your journey by reading our low carbon masterclasses document.

Opening opportunities with connected thinking.

For more information contact davide.stronati@mottmac.com

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