MOTT MACDONALD

Delivering net-zero infrastructure: practical steps in a changing world

Output from the 2020 Carbon Crunch summit hosted by Mott MacDonald, 16th–19th November 2020

Forging the path to net-zero

This is the eighth Carbon Crunch summit we have hosted – the first to be held virtually – and amid a challenging set of circumstances this year, it's never felt more important.

We started Carbon Crunch in 2013 at the same time as the launch of the Infrastructure Carbon Review, and since then it's become the premier event in the calendar for the industry to focus on practical steps for infrastructure carbon reduction through sharing best practice.

So much needs to be done urgently – not just over the next 30 years – if we are to meet the UK government's commitment to reach net-zero by 2050. At Carbon Crunch 2020, we heard first-hand from infrastructure leaders, experts and stakeholders about how they are tackling current and future challenges and taking their organisations and sectors closer towards that goal.

2050

the UK government's deadline for reaching net-zero

Mark Crouch
Leader for carbon management, Mott MacDonald

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Mike Haigh
Executive chair,
Mott MacDonald

A critical time for the carbon emergency

This year's Carbon Crunch took place at a critical time for the climate emergency. While the world's attention has rightly been engaged by the COVID-19 pandemic, the imperative to reduce carbon emissions and address the mounting challenge of climate change has not gone away. In fact, the pandemic has further emphasised that we can't take our natural systems for granted, and that "business as usual" is simply not an option for us. In the coming months and years, we will clearly need to rebuild our economies, but we must do so in a way that gets us firmly on the path to net-zero.

COVID-19 has posed many challenges to Mott MacDonald, but this hasn't dampened our intent or slowed progress. Our company purpose, which we launched earlier this year, has three core pillars – social outcomes, excellence and digital – and our approach to net-zero exemplifies this purpose. We've been decarbonising our own business activities, recently becoming the first company of our class to be independently certified as carbon neutral. But we also know that the way we can have the largest impact is by collaboration: with our clients, and with the wider engineering sector.

That's why the UK infrastructure industry coalition that we convened in 2019 has such an important role to play. It's also why events such as Carbon Crunch are so valuable, and we are grateful to the speakers whose contributions you can read in this report for sharing their knowledge and experience.

COP26 in Glasgow is now less than a year away. It provides the industry with an opportunity to come together and seize the moment. What is clear to me is that net-zero needs to be an industry-wide mission, so over the next year, in the run-up to COP, we need to take industry collaboration to the next level.

The industry's progress on decarbonisation

Industry rallies behind drive for net-zero

There are encouraging signs that infrastructure organisations are rising to the challenge of net-zero, but progress on emissions reduction has still not been fast enough.

Chris Newsome OBE
Chair of the Infrastructure Working Group,
Green Constrution Board

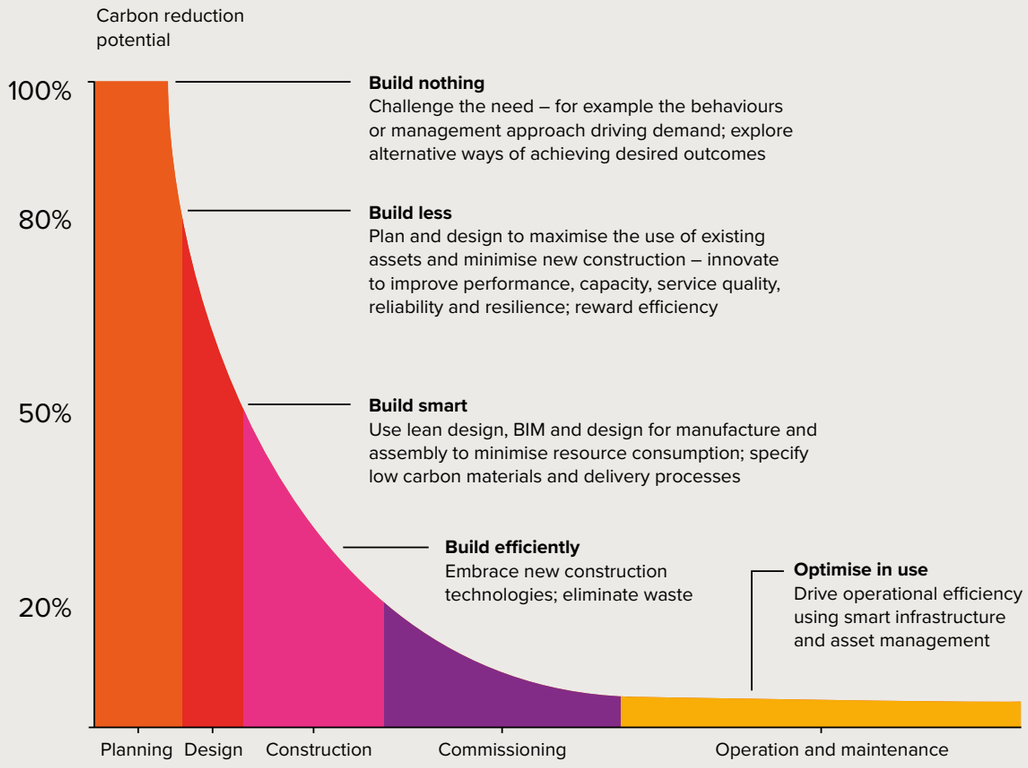
David Riley
Head of carbon neutrality,
Anglian Water

Maria Manidaki
Technical lead for net-zero,
Mott MacDonald

Seven years ago, the Infrastructure Carbon Review (ICR) made the case that cutting carbon cuts cost and unlocks innovation. Since then, more than 70 organisations from the infrastructure value chain have made commitments to reduce carbon, but also to consider the impact of whole-life carbon. The message presented in the ICR – one of leadership and innovation – is still as valid today, if not more so. In 2019, the Green Construction Board Infrastructure Working Group initiated a project to assess the current state of carbon reduction in infrastructure since the publication of the ICR. More than 20 organisations across the infrastructure value chain were approached to share good practices achieved under the main enablers of the ICR – leadership and governance; collaboration and culture; commercial solutions; innovation and standards and baselines and metrics.

"If you're not considering carbon reduction at the earliest planning stage you are missing the biggest opportunity. Client leadership is critical: demanding change and passing the challenge down is not enough, clients should work with their value chain to structure change."

Chris Newsome OBE
Chair of the Infrastructure Working Group,
Green Constrution Board



Firstly, the good news. In terms of leadership and governance, ambition has been raised across the value chain, with clients, consultants and contractors having set individual net-zero targets. We've seen some excellent collaborative work and new industry platforms being set up, such as the Net Zero Infrastructure Industry Coalition, the Institution of Civil Engineers' Carbon Project, the innovation platform i3P, the Green Construction Board's Low Carbon Concrete Group (LCCG), and others. Meanwhile, tier one suppliers, contractors and consultants are collaborating better across projects and programmes of work, following PAS2080 principles.

Many asset owners have a better understanding of where the carbon is in their capital programmes and some great quantification tools for managing carbon have been launched. There is evidence that the messages of the ICR have been spreading across the globe, with organisations from New Zealand to Abu Dhabi trying to follow the principles of PAS2080 and bringing the supply chain with them.

However, although emissions are going down across most infrastructure sectors, the rate of progress has not been fast enough for the UK to meet its 2050 net-zero target. Transport emissions are rising, while capital carbon has been increasing in all sectors. The latter is mainly due to the increasing need for delivering new infrastructure as well as replacing or refurbishing old assets. The decarbonisation of the electricity grid means that capital carbon now makes up a higher proportion of whole-life emissions.

"Although emissions are going down in all infrastructure sectors, the rate of progress has not been fast enough."

Maria Manidaki
Technical lead for net-zero, Mott MacDonald

There is still a long way to go to meet the national UK net-zero target. We need to move away from operating in silos and manage our infrastructure as part of a wider system; leadership needs to be stronger in all parts of the value chain, with asset owners still being the lever. Carbon reduction should be better incentivised with more innovative commercial solutions being adopted to help drive the right behaviours. The principles of PAS2080 should become business as usual, while more innovative options, including nature-based solutions with greater co-benefits, should be accelerated.

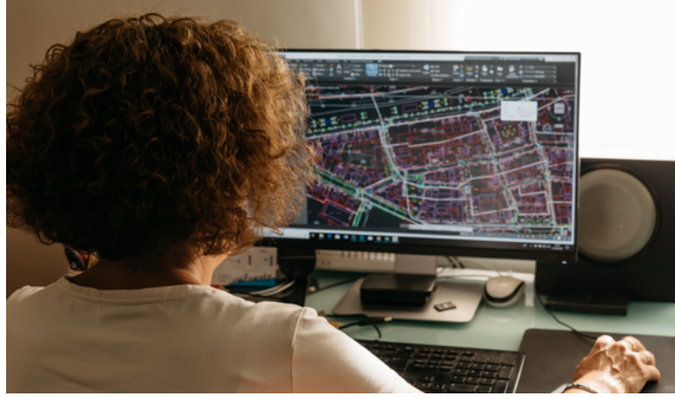
"At Anglian Water we don't just pass on the carbon reduction challenge to our supply chain. We are part of that supply chain, in terms of coming up with low carbon solutions."

David Riley
Head of carbon neutrality,
Anglian Water

In our snap poll at Carbon Crunch,

90%

agreed that digital twins are an essential enabler for achieving net-zero



You can't get to net-zero without digital twins

Net-zero is a cross-sector issue. We cannot continue to take a siloed approach to tackling carbon emissions.

Digital twins can tell the story of what will happen if we do nothing about carbon reduction. Equally, they show what will happen when we take actions, and how those actions are interdependent within the overall system of systems, helping us take a system-level approach to tackling climate change.

When data is shared across all sectors, it's possible to take the system level view of the demand for infrastructure and see how services can be supplied with the lowest levels of carbon possible.

For example, the energy and water sectors don't currently communicate with each other enough when making long term plans. Sharing data between the two sectors via connected digital twins could enable better planning with respect to scarce resources. There are many overlaps between the sectors which the companies and the regulators are just starting to understand.

The National Digital Twin Programme at the Centre for Digital Built Britain seeks to develop an ecosystem of connected digital twins which can enable us to see how we can reduce capital, and operational and user carbon. We can then use these insights to inform our decisions and actions.

At city-level, you can think about digital twins of cities with small scale digital twin pilots that can be scaled up to regional, national and even international scale. It would be possible to use a city-level digital twin to make a local net-zero action plan.

Government, industry and academia are working together in the National Digital Twin Programme to enable cross-sector data sharing to take us on the path to net-zero. This collaboration is essential – efforts cannot be driven just by government, industry, or by scientists. There must be a high degree of collaboration across disciplines and organisations to take the whole system to net-zero.

It is crucial to get everyone involved in this. Connected digital twins are the enablers of the right kind of decision making that we need to get to net-zero. We can't get there without them.

Sarah Hayes
Change lead, Centre for Digital Built Britain

Strategies for reaching net-zero

Since national net-zero legislation was announced in the UK, many organisations have set their own targets for reaching net-zero and have begun to develop strategies and roadmaps to get there.

These include some common features – reductions in capital and operational carbon, the use of renewable energy, demand management strategies, and natural carbon sequestration and offsetting measures. But each sector has its own set of individual challenges, which is why a more co-ordinated approach at sector level and a better understanding of cross-sectoral interdependencies will be key to not only unlock the right solutions but ensure that the most cost-effective way of reaching net-zero at a national level is adopted.

Leadership and a co-ordinated approach at different levels of the infrastructure value chain, from government and regulators to asset owners and the wider supply chain, are of vital importance.

There are several key questions to ask when developing a roadmap, including the scope, transparency and cost effectiveness of any organisational targets; the importance of data; how best to engage the workforce, stakeholders and the supply chain in the plans; and the extent to which we can rely on unproven technologies, carbon removal options and policy enablers to help us get to net-zero.

Maria Manidaki
Technical lead for net-zero,
Mott MacDonald

A routemap that tells a powerful story

The water industry made a commitment last year that it would get to net-zero operational emissions by 2030.

The water sector can generate

80%

of its own energy needs through renewables by 2030

As the association representing all the water companies in the UK, we commissioned Ricardo and Mott MacDonald to help us build a routemap to enable that journey. We wanted a credible, data-led approach that could help us get to net-zero. The routemap needed to draw out at sector level the main opportunities and inform the individual plans of the companies within the water industry.

Our consultants drew on sector-level data from the water industry carbon accounting workbook to establish a 'business as usual' trajectory, and then they were able to look at the decarbonisation interventions that are available to the industry and assess their benefit in terms of carbon abatement. We looked at opportunities to directly reduce our emissions first, before turning to renewables, followed by offsetting as the last resort.

Within our routemap, we now have three main scenarios, or pathways, that illustrate how the sector could get to net-zero by 2030. Direct interventions identified in the pathways include electrification of our fleet, and programmes for water and energy efficiency.

There's a significant challenge around process emissions, since a quarter of the water industry's emissions are methane and NOX coming from the treatment of wastewater, and the pathway for that element starts with monitoring and research to understand what drives those emissions, which will inform the measures we are able to take later on.

On renewables, we think the sector can generate up to 80% of its own energy needs by 2030 through solar generation, wind generation and the use of biogas. Biogas is used to generate electricity within the sector via CHP, but over time, it can be used to create biomethane to put to other uses, including supporting the decarbonisation of other sectors such as industrial heat.

The routemap is now out there, and it tells quite a powerful story that allows us to communicate with stakeholders about the challenges we face, share best practice, and signal our plans to other sectors and the supply chain. It draws out the opportunities to decarbonise an entire sector well ahead of the government's 2050 deadline; we will need to deliver at pace over the next ten years.

Samuel Larsen
Programme lead, Water UK

Formulating a glide path to net-zero

At the Environment Agency we are addressing carbon emissions under three headings – capital carbon, operational carbon and user carbon – and we have workstreams, projects and pilot initiatives in each area.

Sally Sudworth
Net-zero carbon programme manager, infrastructure, Environment Agency

46%

of the Environment Agency's emissions come from construction

The result of these pieces of work over the next 12–18 months will inform a more detailed glide path down to net-zero carbon by 2030, which is our commitment.

Almost half (46%) of our emissions come from construction; in the future the look and feel of our capital investment programme is going to need to be quite different from how it is today.

We will still be building where needed to deliver on our outcome measures, such as protecting properties from flooding and habitat creation, but we'll need to work differently, in a far more efficient and low-carbon way. And as much as possible we'll need to work with nature, not against it, with solutions that tackle flooding at a catchment level.

On operational carbon, we have been managing this since 2006 and have built up useful data that we are using actively to help us manage our business. Our pumping activities are a particular focus.

We have analysed our top 100 hotspots, and have research and development underway that is helping us analyse and optimise our performance at each of those sites. We're also running a pilot with colleagues who are involved in maintenance activities on each of our assets to see how carbon planning and management can be brought to the fore in our maintenance activities.

The long game is to ensure we have a whole-life approach to managing our assets, and take every opportunity to minimise carbon emissions, with offsetting as the last resort.

Addressing the challenge of tailpipe emissions

While other sectors of the economy have decreased their carbon emissions quite substantially, surface transport has remained fairly steady – emitting about 124 megatonnes of CO_2 equivalent per year – about a third of this from the Highways England network.

Ivan Le Fevre
Head of environment,
Highways England

That's a very large carbon footprint, and so the actions we take can be very significant in terms of the overall UK story.

The vast majority of those emissions come from the tailpipe of the vehicles travelling on England's strategic road network; our construction and network management activities, and our own corporate carbon, are by comparison very much smaller.

But while we have very good direct control over those latter components, we are very much in the influence space when it comes to road users. In developing a plan to move us forward, we recognised the importance of getting our board and our executive engaged.

So, we started out with a 'plan for a plan', presenting them with the range of options, the possible scope and risks of the plan and seeking their buy-in.

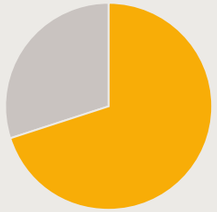
Our board and executive agreed that the scope of our plan should include user carbon; although our levers are limited for controlling it, and government clearly has the biggest role to play, we really need to internalise what the government actions in the forthcoming Transport Decarbonisation Plan might mean for Highways England and how we support them.

There are three stages to what we are doing: scoping (forecasting emissions and identifying the issues to address), build (identifying actions and the effects they will have) and refining (consulting with suppliers, stakeholders and staff on the plan). It's important that we are led by the data. It's also crucial for us that this is Highways England's plan, owned by our staff, and that it really impacts on our culture.

As much as anything, this is a corporate transformation plan to make us into a low-carbon company. We need to work out how we train and motivate staff to think about carbon in their everyday decision-making.

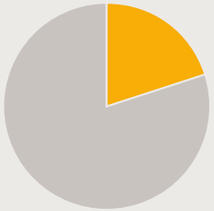
Survey findings

Participants in this year's Carbon Crunch took part in a series of snap polls which gave a taste of the actions their organisations had taken on the path to net-zero:



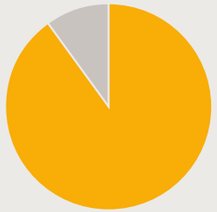
70% said that their organisation or sector had a net-zero target

50% said that it had a widely communicated plan or strategy



20% said that it had mature solutions in place to achieve the plan

In a separate poll on the decarbonisation of heat and transport:



90% of respondents agreed that decarbonising transport would require mass uptake of both electric and hydrogen vehicles

The majority **(75%)** also believed that both electrification and hydrogen would need to be adopted for the decarbonisation of heat...

...although a minority **(15%)** believed it could be achieved predominantly through the uptake of hydrogen

Decarbonising heat and transport

Heat and transport are sectors that are particularly challenging to decarbonise.

Each will require the rapid development and roll-out of key technologies, and behaviour change from the public. With all credible net-zero scenarios pointing to increased electrification and hydrogen uptake in both sectors, the energy infrastructure associated with heat and transport will also become more intrinsically linked. Delivering the necessary heat and transport infrastructure in the timescales required will clearly require greater systemic thinking.

Craig Lucas
Energy transformation leader, Mott MacDonald

Seeking sustainability in a system of systems

Cities are complicated places, and they have many different systems operating in them.

Think about a typical city, such as Leeds: it has systems for food distribution, water distribution, energy, transport, housing, waste management, education, and many more. The city itself is a system of systems.

Managing those systems is a multi-stakeholder activity; very few of them are within the purview of just one organisation. From our perspective as a city council, many of them are in fact run by private sector partners. But it's also true that when any of those systems fail, or when they clash with one another, this tends to impose costs on the public sector. So within local government, perhaps we need to see our role as systems integrators – making sure that those systems are running in an optimal manner – rather than just providing services within them.

That certainly implies a shift in the skills and competencies that people will need if we are to manage, oversee and connect those systems at a city level.

With the Net Zero Infrastructure Industry Coalition we have been exploring the way systems thinking can be applied to both heat and transport. We have considered how some system aspects, such as big infrastructure, are better managed at national level, but many are better managed at local level. For those that are better managed locally, we then asked some key questions: what powers would we need to be able to integrate this system effectively? And since these systems are multi-stakeholder, what partnerships and permissions would we need?

One of the key tools that can help us is in optimising systems is data. Publishing data on the performance of systems helps us to see how they interact with each other, and to understand our local context and the factors that drive it. Our approach to heat, for example, will be very different in Leeds than it might be more rural area.

Climate change is a classic example of system failure. If we want our cities to operate sustainably, then we need to have all of those systems operating within environmental limits. City-wide approaches to sustainable systems can play a vital role in getting to net-zero on a national basis, especially in those hard-to-decarbonise sectors such as heat and transport.

Tom Knowland
Head of sustainable energy and climate change, Leeds City Council

A 30-year challenge for transport

Glenn Lyons
Mott MacDonald professor of future mobility, UWE Bristol

Decarbonising transport will amount to nothing less than a regime transition for the transport sector.

In 30 years, we need to reach full or near-full adoption of zero emissions vehicles – for cars, light vans, buses, coaches and heavy goods vehicles – as well as for rail, shipping and aviation. An awful lot needs to change in a short space of time. Declaring a climate emergency was the easy bit. Responding to the emergency is not.

We don't just need technically workable solutions to be proven: we need them to be widely available, and for all vehicles, not just new vehicles, to be replaced in the next 30 years. The following four considerations are part of the challenge we face.

90%

of domestic transport carbon emissions in the UK are caused by road transport

4000

zero emission buses will be introduced over the next five years

2035

National Express aims for its entire coach fleet to be zero emissions by 2035

Four considerations of the challenge we face:

1.

Velocity of change

We cannot run over time and over carbon budget on this one. Speed is of the essence, yet there are different solutions available, including battery-electric vehicles and hydrogen-powered vehicles. Each need infrastructure systems to be developed, but all the actors involved need clarity on which solutions to invest in, to what extent and where. Rushing in the wrong direction or ambling in the right direction will not get us to our destination on time.

2.

Ambiguity of goalposts

Does decarbonising transport include international travel? Does it include only tailpipe emissions or are emissions from producing, maintaining and disposing of vehicles, and from building and maintaining infrastructure, included? Are emissions from energy generation and distribution included? Does transport have to be completely decarbonised or are there concessions available for transport provided that a net-zero economy overall is achieved? Ambiguity does not serve us well, and may act as an excuse for inertia and indecision that we can ill afford.

3.

Political will

Political will is going to be crucial to addressing velocity successfully. An appetite is needed for making decisions that are unavoidably difficult, because they disrupt business as usual. Decisions will need to be taken promptly and supported over the longer term as their consequences play out. This will be made easier if public and business attitudes are favourable. An ongoing programme of widespread communication and education is called for to help bring and keep the public and businesses onside with the change that's required. It needs to move from debate over whether change is acceptable to change being seen as inevitable.

4.

Behaviour change

One could be forgiven for thinking that the technology fix of tailpipe emissions means that more politically sensitive matters of behaviour change can be avoided. Yet even technology fixes call for considerable behaviour change – from public and private sector organisations responsible for bringing solutions to market and scaling those solutions, and from consumers in terms of the take-up of those solutions. We're now trying like never before as a sector to address the decarbonisation agenda, yet put bluntly, trying hard does not necessarily mean we are trying hard enough. We are now in a marathon of sprints. Being possible or plausible that we can decarbonise transport is not enough. Therein optimism bias and complacency lie. We need decarbonisation of transport to be probable, if not certain.

A heroic infrastructure build

The scale of infrastructure required to decarbonise heat over the next three decades is daunting.

Looking at how much fixed energy infrastructure is required for the transition we need to make, even a reasonable scenario that has a mix of electrification, hydrogen and heat networks will have a heroic infrastructure build requirement.

Heat networks
So far, over the past few decades we've built around 1800km of heat network in the UK. In a scenario with approximately 20% of demand met by heat networks, we may need to build about 1000km per year every year every year until 2050.

Gas and hydrogen networks
We would need around 5000km per year every year until 2050 – consisting of replacement, repurposing and new build – to bridge the gap between supply and demand. In the past one hundred years, only in ten individual years have we built more than 5000km of gas network.

Electricity
We may need approximately 13,000km of network reinforcement or build per year every year until 2050. 4000km of that will need to be underground, which will be especially demanding when accounting for demands for similar skillsets from underground networks. Actionable and effective infrastructure plans will be needed at a local level that meet local needs.

In order to create an efficiently running whole energy system, these plans need to fit within regional infrastructure frameworks that contribute towards a whole-system design to minimise investment and operational costs. It's going to be a challenge, but with a multi-scale systems approach, we can enable the accelerated deployment of the infrastructure we need for a net-zero energy system.

Alex Buckman
Practice manager,
Energy Systems Catapult

Making the sums add up for decarbonised heat

25-30%

increased efficiency by having heat pumps that generate heat and cooling

There is a growing interest in retrofitting heat pumps to campus-type buildings.

Our clients are typically in the health and education sectors and have campus-type estates with complex infrastructure, high energy intensity and burgeoning energy costs. Hospitals, for example, have traditionally generated steam for sterilisation, laundry and catering, but the need for that steam is much reduced with the outsourcing of those services in the NHS. It's a big challenge to decarbonise the heat on those sites on a retrofit basis, especially as these are all live environments which need to keep going while work is going on. We are predominantly using heat pump technology, which can be combined with other measures to reduce energy, carbon and heat demand.

Our client briefs have changed substantially. Previously, we would typically put in CHPs and other technologies that deliver a good cost saving, but not necessarily a good carbon saving. By contrast, heat pumps are low-carbon but the economics on them at the moment are not good, so we need to do everything we can to make them as efficient as possible. If we can have heat pumps that generate not only heat but also cooling, this increases efficiency by 25-30%.

Retrofitting heat recovery coils, to recover heat out of exhaust air, can also help, while installing on-site solar PV is very useful for satisfying as much of the electricity demand of those heat pumps as possible.

Stuart Bowman
Development director,
Breathe Energy

The supply chain and net-zero

To get to net-zero, infrastructure owners and their supply chains will need to work together to take effective action to cut carbon through innovations and improvements to products, solutions, and ways of working.

This is especially the case when it comes to driving down the capital carbon associated with new infrastructure: concrete alone is responsible for huge amounts of embodied carbon. Unless the industry comes together collectively to make rapid progress on low-carbon alternative materials, the infrastructure pipeline that is planned for the coming decades will quickly swallow a significant proportion of our national carbon budget. The development and acceptance of new standards, at both industry and client level, may play a vital role in driving change.

Mark Edwards
Principal carbon management consultant, Mott MacDonald

We need top-down management of carbon, not just bottom-up

It's very difficult to answer the question of how much of our carbon budget is actually left.

In our role as a member of the Net Zero Infrastructure Industry Coalition, we have been looking at the potential embodied carbon of the infrastructure pipeline through to 2050, as published by the infrastructure projects authority (IPA) in 2018. This includes investment worth £534bn – although it's worth noting that there will be more infrastructure on top of the IPA pipeline, such as the recent announcement of a £12bn investment in green energy.

In March 2020 the Chancellor also announced government investment in Britain's roads, railways, broadband, housing and research, stating over the next five years the public sector will invest more than half a trillion pounds.

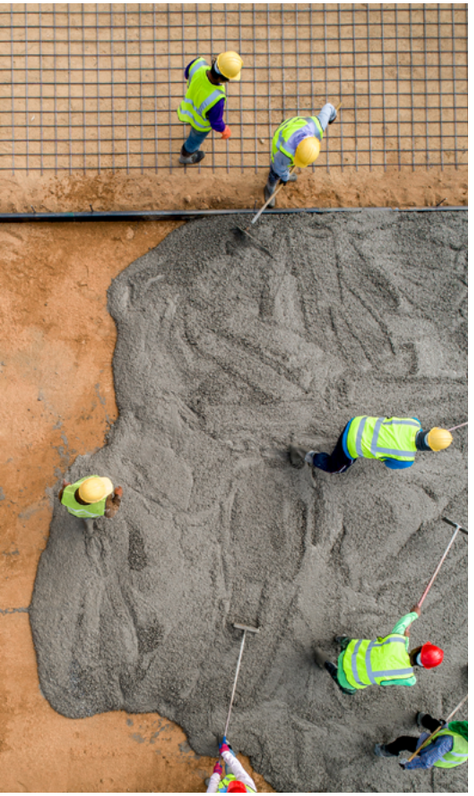
We don't know what the average carbon intensity of that combined investment will be, but if we applied a figure of around 200 tonnes of carbon dioxide per million pounds of revenue – which is a figure I am comfortable with, as it is a figure for Skanska's own work and is based on several years' worth of project data – and apply it to the Committee on Climate Change's fifth budgetary period (2028–32) then it is the equivalent of 10% of that whole UK economy carbon budget. Of course, that intensity continues to fall as we deliver our own Net Zero Carbon Strategy, however it would still have a huge embodied carbon impact.

This kind of top-down analysis cannot be very accurate at the moment: only 9% of the projects in the pipeline have actual data on carbon available. We can make a reasonable estimation of carbon data for 66% of projects, but that still leaves 25% of projects – which includes some significant areas of spend such as nuclear decommissioning – where it is simply not possible. We don't know enough about how those schemes are being developed, and therefore how much capital carbon they are locking in now.

As an industry, if we take a bottom-up approach, we know where the carbon is on the majority of the infrastructure projects – and we are able to do something about it, based on the technology and the alternatives available. Technologies such as electric plant and electric transport exist and are growing in maturity. We can substitute alternative fuels, and we can make decisions about the concrete and cement we use and how much of our steel is being recycled.

We are all able to make informed decisions at a project level – but what we don't know, as an industry, is how that adds up when you are thinking about the broader infrastructure sector. Until the data is there at a national level to be able to manage carbon strategically in sectoral budgets and drive down intensity, it's very difficult to answer the question about how much of our carbon budget is actually left. We need to be able to answer this question much better than we currently can.

Chris Hayes
Sustainability operations director, Skanska



A route map for low-carbon concrete

The Green Construction Board's Low Carbon Concrete Group (LCCG) was established in January 2020, bringing together more than 18 organisations to create a route map to assist clients and the wider construction sector in reducing the carbon impact of construction activities.

The LCCG route map covers six strands of activity: technical, engagement, compliance and standards, operational, complementary design materials and working practices, and ownership of the route map. It enables assessing bodies, low-carbon concrete developers and end users to map products against technology readiness levels (TRL). It looks at small, medium or large projects that demonstrate applicable uses of low carbon concrete, defined as "any concrete with CO_2e lower than that of concrete of the same strength class and which is generally available in the UK."

It assesses what level of manufacturer's information is needed at each readiness level, the properties and the test results that are required, the availability of independent guidance, and external approvals. The development of this route map is speeding up, starting with the publication of the first draft in January 2021. Testing the route map has already started and the results will feed into the final version expected mid-2021.

Clare Price
Sector lead – built environment, British Standards Institution

In our snap poll at Carbon Crunch 2020, we asked what policy interventions were needed to make progress on reducing capital carbon.

Responses included:

"Infrastructure should be given a carbon budget envelope to work within and it should be reduced year on year."

"More testing, more certifications to offer reassurance and satisfy insurers."

"More incentives for supply chain companies to provide low-carbon choices, and bans and restrictions on high-carbon ones."

The building blocks that will help us towards net-zero

Concrete production contributes about 8% of the world's CO_2 emissions. It is essential to find better alternatives to concrete, and other high-impact construction materials, if we are to meet our net-zero target before 2050.

Jane Anderson
Board member,
Alliance for Sustainable Building Products (ASBP)

Members of the Alliance for Sustainable Building Products (ASBP) – an organisation with an aim to increase the sustainability of products and achieve a low-carbon built environment – are working with alternative, natural materials such as aerogel & lime, jute, mycelium, sisal, hempcrete and limecrete. In the UK, one of the barriers to using these materials is getting permission for use by insurance bodies who are not familiar with them, even when they have been used effectively in other countries.

Another issue is that some of these low-carbon materials we have today are not proven to be low-carbon beyond the manufacturer's claim. There is a role for everybody to look at these products and ask for Environmental Product Declarations – verified data – to demonstrate exactly why and how products are low-carbon. There needs to be more openness and transparency around this.

Concrete Innovations

- **Geopolymer cements:** alkali activated slag, fly ash or pozzolan concrete, eg EcoPact, Vertua, CEMfree, LoCem, Earth Friendly Concrete, Gement
- **Carbon cured concrete:** absorbs CO_2 to cure the concrete eg Solidia, Carboncure
- **OCO M-LS and Carbon8:** carbon cured industrial wastes producing carbon negative aggregate
- **SmartCrusher:** Dutch technology to break concrete waste back down into usable cement and aggregate

This is the future

Wherever you are on your net-zero journey, Mott MacDonald has the expertise, tools and know-how to support you along the way. Here are some resources that can help.

We believe in leading by example

To help others, we must have our own house in order. We are the first company in our class to be externally certified carbon neutral globally. With our clients and partners, we are committed to making a positive difference. Because we care.

- **Our vision for a carbon neutral future**
- **10 steps to become carbon neutral**
- **Setting a net-zero carbon routemap**
- **How carbon offset projects do more than compensate for emissions**
- **How we can help you cut carbon**

Podcasts

'Empowering ethical engineering' – the impact engineers can have for the good of society and the environment is incredible.

'Crunch time for net-zero' – practical steps towards the UK's 2050 target.

'Unleash the hydrogen potential' – why the lightest element has a key role to play as a transition fuel, an energy vector and a means of storing renewable energy.

'Acting on climate change' – for anyone who still needs convincing.

Food for thought

Craig Lucas, director for energy transformation, argues the case for **pricing carbon** into the UK's infrastructure decisions.

Ben Carlisle, global practice leader for DfMA and **Mark Edwards**, principal carbon management consultant, look at one of the biggest carbon hotspots in construction: **waste**.

Bethan Hutchinson, graduate carbon management consultant, explains how **PAS2080** and the Moata Carbon Portal can help deliver resilience and sustainability

Mike Haigh, executive chair, lays out our collaboration with Water UK in developing the world's first **sector strategy** for achieving net-zero carbon emissions.

Business efficiency should be reason enough to embark on decarbonisation. But climate change provides an increasingly powerful impetus. Read how we can **help you cut carbon**, every step of the way.

Eight years of crunching carbon

The reports from all our previous Carbon Crunch events can be found on our **website**.

- **2013** – New strategies for cutting the cost of infrastructure, introducing the Infrastructure Carbon Review
- **2014** – Shining a searchlight on leadership, innovation and procurement
- **2015** – How to manage infrastructure carbon: introducing PAS 2080, the international standard for managing infrastructure carbon
- **2016** – The route to zero carbon: why the highest level of ambition opens opportunity for innovation and reward
- **2017** – Who needs reduction targets? Strategies for accelerating carbon and cost savings
- **2018** – Achieving net-zero: the investor angle
- **2019** – Delivering net-zero infrastructure – practical steps

Opening opportunities
with connected thinking.

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