

## Delivering Low Carbon Infrastructure



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## **Executive Summary**

The infrastructure industry is a vital part of the UK economy and the services it provides are essential for our modern society. Over £500 billion is planned to be invested in the construction of UK infrastructure between 2016 and 2030 and for each £1 billion of investment, UK GDP increases by £1.3 billion.

As well as planning significant investment in infrastructure, the UK is also planning large scale reductions in carbon emissions due to the threat from climate change. The UK has ratified the Paris Agreement which requires a net zero carbon economy within the second half of this century. UK legislation also includes the Climate Change Act, which requires an 80% reduction in the UK's carbon emissions by 2050, from a 1990 baseline.

The Infrastructure Carbon Review in 2013 showed that the infrastructure industry controls 16% of the UK's total carbon emissions and has influence over a further 37%. This total impact figure of 53% is set to grow to 90% by 2050, due to decarbonisation in other sectors.

Data from the Infrastructure Carbon Review indicates that the UK's infrastructure sector needs to reduce its total carbon emissions to 34  $MtCO_2e$ /year by 2050 from a baseline of 157  $MtCO_2e$ /year in 2010.

In response to requests from UK-GBC members for greater clarity on what the infrastructure industry is currently doing to address this need to decarbonise, UK-GBC has produced this report which explores:

- what carbon targets clients are currently setting;
- why clients are setting these targets; and
- the impact these targets are having.

Informed by detailed interviews with a selection of significant infrastructure clients and desktop research, the main findings are:

- There is no specific target for the infrastructure industry which organisations and projects can work towards.
- There is little similarity in ambition, duration and scope of the targets being set in the infrastructure industry.
- There is no single method used by all the surveyed clients to set their carbon targets.
- Regulators play a role in addressing carbon, however, they are not explicit in setting targets for carbon reductions and driving performance.

Based on the findings, UK-GBC is recommending the establishment of a whole life carbon target for the infrastructure industry based on climate science and from which organisations can derive commensurate targets. The monitoring of such a target, and the reporting of progress against it, will be crucial.



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## Foreword

Carbon is a key concern in infrastructure. Clients across all infrastructure sectors are taking action to reduce emissions, but we must ensure our actions go far enough to tackle the challenge that lies ahead. It is clear that the setting of an industry-wide carbon target for infrastructure, as recommended in this report, is essential. This will ensure we have a clear trajectory to a low-carbon future, in line with climate science.

Across our industry, we need to improve both transparency and collaboration in order to combat the threat presented by climate change. In achieving this, there is a role to be played, not just by clients, but by every part of the value chain – only by working together, with clear targets in place, can we hope to achieve the change we need. To enable this, clients need to recognise carbon as a key consideration ahead of the procurement stage on projects, embedding it into investment-level decisions as standard. Furthermore, there is a key role for Government and regulators to drive progress and encourage excellence.

The ICE Infrastructure Client Group recognises the leading work done to date by industry organisations in this area, and we are keen to see the setting of a target to continue the momentum established by this work.

This report provides an opportunity for our industry to take a lucid view on where we are with our commitments to decarbonise our assets and operations. Setting an industry-wide carbon target would be a positive step forward, and this group fully endorses further collaboration to achieve this.



Andy Middell

Andy Mitchell CBE Tideway CEO Chair, ICE Infrastructure Client Group Chair, Infrastructure Industry Innovation Platform (i3P)

#### **Clients interviewed for research**





## 1 Introduction



The scope of this report is limited to *economic infrastructure*, as defined in National Infrastructure Delivery Plan, 2016-2021, this includes transport, energy, communications, flood defence, water, waste and science and research<sup>[5]</sup> The infrastructure industry is a vital part of the UK economy and a driver of future growth. The services it provides are essential to today's society, in which more than 80% of the UK's population is living in towns and cities<sup>[1]</sup>. Over £500 billion<sup>[2]</sup> is planned to be invested in the construction of UK infrastructure between 2016 and 2030 and for each £1 billion of investment, UK GDP increases by £1.3 billion<sup>[3]</sup>.

As well as planning significant investment in infrastructure, the UK is also planning large scale reductions in greenhouse gas (carbon) emissions due to the threat from climate change. Since 2008 the UK has had a legally binding commitment to reduce carbon emissions by 80% by 2050 and, in 2016, the government ratified the Paris Agreement on Climate Change, which aims to limit global warming this century to 'well below 2°C'.

There is a need for the infrastructure sector to reduce carbon emissions from the operation, maintenance and decommissioning of infrastructure assets, as well as from the construction of new assets or modification of existing asset systems. Data from the Infrastructure Carbon Review (ICR) indicates that an 80% reduction in carbon emissions from the UK's infrastructure sector equates to emissions of 34 MtCO<sub>2</sub>e/year in 2050 from a baseline of 157 MtCO<sub>2</sub>e/year in 2010.<sup>[4]</sup>

The research detailed in this report was conducted in response to requests from UK-GBC members for greater clarity on what the infrastructure industry is currently doing to address this need to decarbonise.

Through detailed interviews, with a small but significant selection of infrastructure clients from different sectors, this report provides a snapshot of current activity to address carbon emissions. Specifically, it explores what carbon targets have been set by clients, and the impact these targets have had. The research focussed on client organisations as they are the fundamental driver to taking action: the supply chain will deliver performance improvements in response to clients' requirements.

This report also explores external drivers for reducing carbon and the ways in which infrastructure clients are tackling climate change. This includes how the issue is embedded in the organisation, the use of procurement, and how the business case is being demonstrated. It is clear from the findings that infrastructure clients are experiencing numerous challenges and barriers to decarbonisation, and that each organisation is currently addressing these in different ways.

This report is not meant to be exhaustive and it is acknowledged that there will be activities taking place in the infrastructure industry that are not covered. However, it does present high-level trends and patterns and, based on these findings, presents recommended next steps to enable the industry to decarbonise in line with the UK's ambitions. It is hoped that this will help further collaboration and action within the industry.

# 2 Requirements for carbon reduction

This section sets out the high-level climate change objectives that apply to the UK and looks at the carbon impact of the infrastructure industry. This context highlights the role that the infrastructure industry, and consequently individual organisations and projects, need to play in reducing carbon.

#### 2.1 UK carbon reduction targets

The Paris Agreement, which was ratified by the UK in November 2016, aims to limit increases in global average temperature this century to "well below 2°C above pre-industrial levels", and to this end has set the goal of achieving<sup>16</sup> a 'net zero' carbon economy by the second half of this century.

The UK Climate Change Act 2008<sup>[7]</sup> (CCA) commits the Government to reducing the UK's carbon emissions by 80% by 2050, from 1990 levels.

The UK Government's Construction 2025<sup>[8]</sup> strategy, published in 2013, set a target of a 50% reduction in GHG emissions in the built environment, by 2025, from a 1990 baseline (in line with the fourth carbon budget).

The Green Construction Board's 2015 update to the Low Carbon Routemap for the Built Environment<sup>[9]</sup> indicates an increase in carbon emitted from the built environment between 2009 and 2012. To achieve the 2025 reduction target, the built environment needs to find a further 39% reduction in carbon emissions between 2013 and 2025.

Further detail on these requirements can be found in the Appendix.



#### 2.2 Infrastructure's impact

The Infrastructure Carbon Review (ICR)<sup>[4]</sup> of 2013 showed that the infrastructure industry controls 16% of the UK's total carbon emissions, comprising both capital carbon (CapCarb) and operational carbon (OpCarb). These are emissions arising from the construction, operation and maintenance of assets.

A further 37% of carbon emissions are related to the use of infrastructure assets, over which the industry can have some influence. See Figure 3.

#### Carbon terms used in the infrastructure industry<sup>[4]</sup>

- Carbon is used as shorthand for the carbon dioxide equivalent of all greenhouse gases. It is quantified as 'tonnes of carbon dioxide equivalent' (tCO<sub>2</sub>e).
- Capital carbon, or 'CapCarb', refers to emissions associated with the creation of an asset. Capital carbon is being adopted within the infrastructure sector because it accords with the concept of capital cost. (Going forward, the related term "embodied carbon" will continue to be used at a product-level, whereas capital carbon will have greater relevance at an asset-level).
- **Operational carbon, or 'OpCarb'**, describes emissions associated with the operation and maintenance of an asset. It is analogous to operational cost and is quantified in tCO<sub>2</sub>e/year.
- Whole life carbon, combines both capital and operational carbon and is analogous to whole life cost.
- **End-user carbon, or 'UseCarb'** describes emissions from the end-users of infrastructure assets. Although not directly controlled by infrastructure asset owners, UseCarb can be influenced.



#### Figure 3. Carbon emissions in the infrastructure sector (2010)<sup>[4]</sup>

Assuming an 80% reduction in UK emissions by 2050, the total impact of infrastructure is projected to increase from 53% of emissions in 2010, to over 80% of emissions in 2025 and 90% in 2050. The significance of CapCarb emissions will increase as the grid decarbonises and operational emissions decrease. See Figure 4.

The ICR put forward the case for low carbon solutions across economic infrastructure assets in all sectors. The purpose of the review was to make clear that reducing carbon also reduces costs. According to the ICR, if emerging best practice were driven across UK infrastructure, up to 4 MtCO<sub>2</sub>e/year of CapCarb and 20 MtCO<sub>2</sub>e/year of OpCarb could be saved by 2050, saving the UK £1.46 billion a year.



#### 2.3 Carbon targets for the infrastructure industry

Whilst the ICR includes recommendations and opportunities for carbon reduction, there is no specific target for the infrastructure industry that organisations and projects can work towards. The CCA's 80% reduction target by 2050 applies to emissions from the whole of the UK, and the Construction 2025 50% reduction target covers both infrastructure and buildings. It is therefore unclear as to whether the targets currently being set in the infrastructure industry are enough to meet the 80% reduction target by 2050; or the more stretching requirement for net zero emissions set out in the Paris Agreement.

Any carbon target for infrastructure must take account of society's future demands from infrastructure. If more infrastructure is required, there will be an associated increase in carbon emissions. The National Infrastructure Commission<sup>[10]</sup> has shown that infrastructure demand generally increases with rising incomes and falls with rising prices. As well as economic drivers, infrastructure demand may also be affected by the emergence of disruptive innovations such as ultra-low emission vehicles or micro-scale energy generation and storage, which have the potential to create a paradigm shift.



# 3 Infrastructure client carbon targets

This section contains findings from publicly available information and from interviews conducted with eleven client organisations. It provides insights into the carbon reduction targets that infrastructure clients and projects are currently setting.

#### 3.1 Current client targets

There is little similarity in the targets being set in the infrastructure sector, or even between asset types. Most clients are setting OpCarb targets; some are setting CapCarb or whole life carbon targets.

The setting of operational targets may be related to mandatory scope 1 and scope 2 emissions reporting. Consequently, it is relatively easy to set a reduction target.

Typically, absolute reduction targets from a baseline figure are being used, as opposed to carbon intensity targets.

#### **Scope definitions**

Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard<sup>[11]</sup>

- **Scope 1** emissions are direct emissions from sources owned or controlled by the reporting company, e.g. emissions from company owned or operated boilers or vehicles.
- **Scope 2** emissions are from the generation of purchased electricity (or other forms of imported energy or cooling).
- Scope 3 emissions are all the other indirect emissions which are related to the reporting company's activities, such as the embodied emissions of purchased goods and services, business travel in third-party owned vehicles.

Some clients are setting qualitative targets that focus on minimising carbon footprints and using tools to minimise carbon, for example collecting more accurate carbon data on all projects, in order to set targets in the future.

Of those clients interviewed, the majority have been setting carbon targets for more than five years, which suggests it is a well-established process. Further, most organisations are using their own datasets as baselines, which indicates a level of maturity in addressing their emissions. Figure 5 shows the scale and the timeframes of the operational, capital and whole life carbon targets that have been set by the surveyed clients, alongside other publicly available carbon targets from other clients and projects.

Most of the targets are set to be achieved by the year 2020. This 'cliff edge' shows that shortterm rather than long-term targets are being set, despite the requirement for an 80% reduction in UK emissions by 2050.



Figure 5. Publicly available client infrastructure carbon targets



For regulated industries, it is possible that the target horizon is linked to the investment period and therefore the targets are driven by commercial imperatives, rather than in-line with climate change projections. For example, the water industry's asset management period 6 runs from 2015-2020 and Network Rail's control period runs from 2014 to 2019.

Both Crossrail and Tideway are setting carbon targets against an absolute baseline figure. These clients are both 'pop-up' infrastructure projects in that they will not be operating the assets they are building. However, being a 'pop-up' client is not a barrier to considering operational (and whole life) impacts. Crossrail has expended considerable effort in addressing energy efficiency of the new assets such as through track design, energy saving features on rolling stock, and energy efficient lifts and escalators.

In the absence of an industry level target, and consequently derived targets for individual organisations and projects, it is unclear whether the current targets set by clients are commensurate with an 80% reduction by 2050.

#### 3.2 How clients have set targets

There is no single method used by all the surveyed clients to set their carbon targets. The methods used to derive carbon targets include:

#### Supply chain collaboration

Setting targets by collaborating with the supply chain enables the contractors to use their technical ability and take a more flexible approach to achieving the targets. An example of this is through the use of a principal contractors' 'Construction Environmental Management Plans' to identify potential carbon reductions and subsequently set a target that could be achieved collaboratively.

#### Comparing targets across the industry

Clients are informing their own targets by comparing targets set by industry peers, such as Anglian Water and National Grid.

#### **CEO-led targets**

Some organisational targets are being led from the top-down with CEOs and senior management teams setting aspirations such as achieving net zero emissions in the long term. Targets being driven from the top down can be powerful and provide a long-term vision for the business.

#### Setting in-line with Government targets

Other clients are simply setting carbon reduction targets in line with the Climate Change Act to make them meaningful for the organisation.

Despite awareness of the UK's commitments to tackling climate change, many infrastructure clients have not set their carbon targets in-line with climate science, leaving doubt as to whether these targets are sufficient to meet the 2050 target.



# 4 How industry is addressing carbon

This section summarises findings from interviews and details the opinions raised by the infrastructure clients. CEEQUAL data and information from the supply chain has been used to help give a broader picture. Together these have allowed us to 'take the temperature' on what action the infrastructure industry is taking to reduce carbon.



Crossrail Contringtion Station platform tunnels, delivered by BAM Ferrovial Kier joint venture (BFK) © Crossrail Ltd

#### 4.1 Organisational carbon management

For the majority of clients interviewed, carbon reductions are being driven by CEO/senior management leadership and implemented through organisational sustainability strategies.

Almost all the clients in the sample are regularly reporting carbon internally, either monthly or quarterly, at board level. Additionally, most are publicly reporting their progress as part of their corporate annual reporting.

In order to achieve their targets, many clients are using carbon 'hotspots' to identify areas that are responsible for a large proportion of emissions and thus represent the best opportunities to take action. These hotspots can be identified regardless of the carbon accounting methodology employed.

#### External drivers for organisations to reduce carbon

Given the many differences between the client organisations and projects in the research, there is no single external factor that is motivating them all to address carbon. The interviewed clients cited the following external drivers:

- investor influence;
- enhancing reputation;
- UK Government targets;
- UN Sustainable Development Goals; and
- the need to implement policy, if a public body.

Regulators play a role in addressing carbon, however, they are not explicit in setting targets for carbon reductions and driving performance. There is also no consistency between sectors.

#### Ofwat

In 2008 Ofwat asked each water company to report its OpCarb data. Since then Ofwat "monitor each company's greenhouse gas emissions annually in line with Government guidance". They state that "this has made sure that companies properly understand their emissions, and that we can monitor their progress in a consistent way". Ofwat expects "companies to understand and take responsibility for their own GHG emissions", as there are, "no statutory obligations on water companies to reduce their emissions."<sup>[12],[13]</sup>

#### ORR

The Office of Rail and Road has asked Network Rail to "measure and reduce the amount of carbon embedded in new infrastructure and to publish regular, accurate data on carbon emissions and energy efficiency for both traction (train-related) and off-track operations such as offices and stations."<sup>[14]</sup> However, there is no explicit target for Network Rail to meet.

### The Infrastructure Carbon Review (ICR) and PAS 2080

Almost all of the clients surveyed in our research have signed the Statement of Endorsement<sup>[15]</sup> of the ICR. Of the 60 signatories to the ICR, there are 20 clients with 35 other organisations from the supply chain. These signatories have committed their "organisations to releasing the value of lower carbon" through leadership, innovation and procurement. However, fewer than half of the clients surveyed are actively using the ICR's Carbon maturity matrix<sup>[4]</sup> to drive their performance.

PAS 2080: 2016 Carbon management in infrastructure<sup>[16]</sup> has been available for a year and just over half of the clients interviewed are actively engaged with it.

These organisations are either considering how to incorporate PAS 2080 or are undertaking a gap analysis to identify what is required to implement it.

The *Guidance Document for PAS 2080*<sup>[22]</sup> provides a framework for setting a baseline for carbon emissions and consequently setting a target. However, it is yet to be seen if this methodology will be adopted consistently across the industry.

#### ->

#### Client opinion – Opportunity

Increase the use of PAS 2080, especially to identify existing gaps and so drive change.

#### 4.2 Outcomes of target setting

Using carbon targets has driven performance in several ways, including:

#### **Reducing operational energy use**

For some clients, the targets have acted as a driver to alter specifications to drive down energy use.

### Proving the case that "reducing carbon reduces costs"

Other clients have used the targets to prove the case that reducing carbon reduces costs. For example, Crossrail has demonstrated over £2 million of savings were made from energy and fuel reductions during the construction phase.

#### Changing business practices

Clients have found that the targets have enabled the organisation to alter their business practices to more sustainable methods.

#### **Enhancing reputation**

Addressing carbon reduction has been used by some clients to enhance their commercial reputation and thus add value.

#### Supply chain collaboration

Many clients have used the lens of carbon reduction to enhance collaboration with their supply chain.

#### Client opinion – Challenge

The supply chain is fundamental to providing low carbon products and solutions, so early engagement is critical. The traditional construction process means that material suppliers are often the last to be engaged/ consulted.

#### 4.3 Assessment schemes

Worldwide there are a number of infrastructure certification schemes which address carbon emissions. In the UK, BREEAM Infrastructure operates alongside CEEQUAL (now under the common ownership of BRE). BREEAM Infrastructure will come together with CEEQUAL as a single scheme and the next version of both is due in 2018.

CEEQUAL is most commonly used by the clients that were interviewed. However, in these cases it has not necessarily been used as a driver for carbon reduction. Although not always a driver, the structure and process of using CEEQUAL has prompted action in areas which may have otherwise not been addressed and which have resulted in carbon reductions. CEEQUAL does not set carbon targets, but rewards projects that can demonstrate the consideration, specification and implementation of low carbon initiatives.

Some clients are using the Carbon Trust Standard for Carbon to drive emission reductions. BREEAM Infrastructure is also used for external recognition of sustainability achievements, rather than as a driver for carbon reduction.

#### **CEEQUAL** analysis\*

Data from Version 5 of the CEEQUAL scheme was interrogated to establish how projects have performed on delivering low carbon infrastructure between 2012-2016. 66 assessments were reviewed covering the transport, energy, flood defence, water and waste sectors. The value of the work covered by these assessments is over £4 billion.

The results from the "Physical Resources – Use & Management" section show that there has been an annual increase in the total number of questions scoring the maximum number of points available (see figure 6). This indicates that consideration, specification and implementation of low carbon initiatives are becoming more widespread amongst infrastructure projects.

All data provided to UK-GBC as part of this research and analysis has been anonymised and no references are made to individual CEEQUAL Assessments or projects.



Figure 6. CEEQUAL data shows that carbon is being increasingly addressed in the infrastructure industry.

Of the 66 assessments, the client was the main applicant in 30. In these cases it is likely that the CEEQUAL assessment is being driven by the client rather than the project team<sup>[17]</sup>. If this is the case, it may indicate that carbon is increasingly being addressed by clients.

Further analysis of the evidence and commentary from 28 'Whole Team Awards' was carried out. This was for completed projects that included all the carbon-related questions.

A large proportion of these assessments provided examples of Client, Designer and Constructor corporate policies, including for carbon emissions, improving energy efficiency and increasing resource efficiency. There are also several examples of project specific policies for the whole team. These policies contain a statement or commitment to reducing carbon emissions or improving energy/resource efficiency, but do not necessarily state any specific targets.

Measures to deliver low carbon infrastructure within the assessments tend to be either project-specific examples or organisational practices. Evidence from the CEEQUAL assessments suggests that the most common practices for reducing OpCarb include installation of LED lighting and low maintenance solutions. During construction low-carbon initiatives include energy efficient plant and employee behavioural training and/or campaigns.

In summary, the CEEQUAL assessments analysed indicate an increased awareness from the whole supply chain in delivering low carbon infrastructure since 2012.

There is further evidence to suggest that the industry is addressing carbon reduction with a series of commitments and targets, albeit with the majority of targets set at a corporate level.

#### 4.4 Procurement

There is no single procurement method used by all the clients in the sample, but most clients are considering carbon during the tendering process. This includes explicit references to the provision of data and the use of carbon reduction to facilitate innovation. Many infrastructure clients currently include consideration of carbon in the PQQ/ITT stage of the procurement process. Alongside this, many clients also hold supply chain workshops during the tender process to communicate their carbon targets.

Whilst weighting carbon questions in the tendering process is not ubiquitous, it seems that active consideration of carbon in the tender process is a norm. Sustainability or environmental experts are usually involved in the tender review process, although this suggests carbon is still viewed as a specialist topic rather than being incorporated into other professions.

Once contracts have been awarded, performance is monitored by all the clients albeit using methods that are appropriate for their individual organisations.

#### Client opinion – Challenge

Carbon reduction is viewed as a "bolt-on" and not business as usual. It is deemed the domain of specialists rather than as a common theme in all professions. Consequently, embedding a carbon reduction 'culture' in all parts of an organisation and addressing the resistance to change is challenging.

#### Incentives

Many clients use a 'pain/gain' mechanism with their supply chain to incentivise performance. This is so both the contractor and client financially benefit from the cost savings made as a result of carbon reductions.

Through the procurement process, clients are incentivising the supply chain to innovate to reduce carbon emissions on current projects, and thereby put themselves in good stead for winning future work.

Another mechanism employed is to use a fixed price contract with the Tier 1 contractors to reward performance i.e. contractors reap the benefits if they reduce carbon and therefore costs.

#### 4.5 The business case

Most of the infrastructure clients interviewed recognise there is a business case for carbon reduction, but are at different stages of maturity in terms of demonstrating it.

The business case can cover a range of environmental, social and economic aspects relating to the benefits of reducing carbon.

#### Client opinion – Challenge

There is a need for examples of cost reduction in advance of projects starting in order to provide a clear business case.

Cost is undoubtedly taken into account by clients when considering carbon reductions. The way in which this takes place is particular to the individual organisations. For example, some clients are linking carbon reductions and wider efficiencies in the business by including the supply chain in the target setting process. Other clients are using pilot projects and new reduction methods to 'prove' the case for carbon and cost reductions which will then enable carbon reduction to be used as a driver of value on future projects.

## 4.6 Opinions on delivering carbon reduction

The interviews finished with an open-ended discussion on the challenges and opportunities that the infrastructure industry is facing in addressing carbon. Many of the same points appeared as both challenges and opportunities, depending on the interviewees' perspective. The opinions voiced can be grouped into four themes:

#### 4.6.1 Demonstrating the value

- There is a need for examples of cost reduction in advance of projects starting to provide a clear business case.
- There is the potential that by focussing on CapCarb, rather than whole life performance, suboptimal outcomes may be achieved.
- Demonstrate the value that is created by going beyond 'compliance'.
- Share best practice as well as 'lessons learnt' more widely. In particular, there is a role for contractors to spread their expertise and experience across sectors.



Tunnel Boring Machine 'Phyllis', Crossrail Western Running Tunnels, delivered by BAM Ferrovial Kier joint venture (BFK) © Crossrail Ltd

#### 4.6.2 Collaboration

- The supply chain is fundamental to providing low carbon products and solutions, so early engagement is critical. The traditional construction process means that material suppliers are often the last to be engaged/consulted.
- By enabling the client and supply chain to work together, carbon reductions can be achieved by maximising technical abilities and integrating innovation efficiently.
- For those further down the supply chain, cost reduction through a fixed-cost contract is a perverse mechanism material suppliers don't want to sell less material.
- Innovation is best enabled through performance requirements rather than prescriptive requirements, yet not all projects are framed in this way.
- Despite there being common supply chains in different sectors, the lessons learnt are often not shared cross-sector.

#### 4.6.3 Actions to reduce carbon

- The infrastructure industry is typically 'risk averse' and there can be a divergence in engineering priorities and carbon reduction. This can make implementing innovations difficult and timeconsuming.
- There can be competing business priorities alongside carbon reduction. However, carbon can be used as a conduit for innovation that allows all priorities to be accommodated.
- Carbon reduction can be an enabler for innovation. However, implementing new ideas on a project may be difficult due to the timescales involved (especially if standard changes are required).
- There are not always appropriate resources allocated to projects to identify and implement carbon reduction opportunities.
- Develop and use industry benchmarking databases and tools, for example on cost savings and procurement. Using common tools should bring efficiencies for both clients and contractors.

- Increase the use of PAS 2080, especially to identify existing gaps and so drive change.
- Obtaining a baseline against which carbon reductions can be assessed is a hurdle for organisations to overcome. By having a baseline, reductions can be managed and performance monitored effectively.
- Integrate carbon information into BIM. This will make it much easier to track design changes and analyse improvements.
- Further embed sustainability into whole life asset management.

#### 4.6.4 Leading the change

- Carbon reduction is viewed as a "bolt-on" and not business as usual. It is deemed the domain of specialists rather than as a common theme in all professions. Consequently, embedding a carbon reduction 'culture' in all parts of an organisation and addressing the resistance to change is challenging.
- Regulatory drivers could help to accelerate change. However, there is a lack of strong direction from the UK Government and regulation to "enforce" carbon reductions. There is also a lack of consistency between sector regulators.
- Industry bodies can play a role in bringing consistency and coherence to the industry. This may give rise to better opportunities for the supply chain to respond to requirements in an innovative fashion.
- The industry should capitalise on the "pockets" of enthusiasm to drive cultural change.
- Defined leadership is needed internally to drive the culture change and get buy-in from employees to think about carbon reductions.
- There is a huge opportunity for coherent leadership and a common voice for the infrastructure sector to drive carbon reductions and lead the way.

# 5 Next steps for delivering low carbon infrastructure

In order to deliver low carbon infrastructure the UK-GBC recommendation is to establish a whole life carbon target for the infrastructure industry based on climate science from which organisations can derive commensurate targets. The monitoring of such a target, and the reporting of progress against it, will be crucial.

It is acknowledged that this is no easy thing to do. However, existing academic and industry expertise provides knowledge to inform how a target could be set and the measures and mechanisms that could be used to achieve it.

#### 5.1 Reasons for setting an industry target

PAS 2080 provides a common and consistent approach for measuring carbon in infrastructure for the whole asset lifecycle. However, the scope of carbon targets being set in the infrastructure industry varies in type, duration and ambition. What is even more pressing is that it is not known whether the targets enable the infrastructure industry to play its role in reaching the 80% reduction required by 2050.

To be able to effectively answer this question, the infrastructure industry as a whole would benefit from having a dedicated whole life carbon target from which commensurate targets for individual organisations and projects can be derived. This target needs to be in line with climate science to ensure the required goal of an 80% reduction by 2050 is met, and that the longer-term objective of net zero emissions shortly thereafter as set out in the Paris Agreement is achieved. Setting a target for the sector is another way in which the infrastructure industry can show its leadership.

Transparent and open targets will provide clarity and consistency for those working in the sector, both on client and supply sides. By their nature, these targets will be long-term and thus can help with setting long-term business strategies. In using carbon as a lens to look at the way infrastructure assets are operated, maintained, upgraded and built, other benefits can be realised which include reducing costs, facilitating innovation and achieving efficiencies in delivery and material use.

A common target should further engender collaboration, as all the stakeholders will know what their target is. Clients that are open to innovation, coupled with a supply chain that is empowered to provide low-carbon solutions, pave the way for transformation. The Tier 1 of the supply chain is reasonably common across infrastructure sectors; thus a common purpose should enable the benefits of cross-sector learning to be realised by clients. There is also an opportunity to include a whole life carbon target in the procurement process to reinforce this. If an asset-based approach can be used, it may help to bring consistency across clients.



### 5.2 Considerations for developing an industry target

The target should accommodate future infrastructure development arising from both societal demands and climate change adaptation requirements. New assets and existing assets need to be made more resilient to cope with the demands of climate change. Consequently, there is an inherent conflict between climate change mitigation and adaptation.

Any target must be whole life to reflect the overall impact of that infrastructure and to reconcile capital investments that reduce OpCarb or UseCarb later on. Within this the concepts of control and influence identified in the ICR and PAS 2080 are important.

It is important to recognise that complete mitigation of all Scope 1, 2 and 3 emissions from infrastructure construction, operation and maintenance this century is not feasible. Consequently, within any net zero emissions scenario, a portion of the UK's remaining national carbon budget must be allocated accordingly.

Further unique considerations when setting a target for the infrastructure industry, include:

- · the diverse nature of the industry's output;
- the poor representation of the industry in global pathway analyses;
- the longevity of the assets produced by the industry;
- the high level of long-term emissions associated with the use of assets after 2050 and depicting the long-term role of the industry in a net zero UK;
- a requirement to address Scope 3 emissions; and
- the projected level of industry output and delivering reductions in absolute emissions (not just carbon intensity).



#### 5.3 Methods for setting an industry target

There are a number of potential methods that could be used to set an industry target. UK-GBC is not advocating the use of any particular methodology but has summarised two of them which may be of use.

#### Science-Based Targets initiative (SBTi)\*

One of the methodologies available for corporate science-based target setting is the Sectoral Decarbonization Approach (SDA), developed by the Science-Based Targets initiative (SBTi) with support from Ecofys. This methodology uses the International Energy Agency 2°C Scenario to allocate carbon budgets to specific sectors, creating sector-specific decarbonization pathways that are in line with science. The method considers inherent differences among sectors, such as mitigation potential and projected growth and can be used by a wide range of sectors. However, there is still the need to develop pathways for sectors that are not currently covered as well as to disaggregate existing pathways into more nuanced ones.

The construction sector is currently included under the less disaggregated pathway "Other Industry" sector. Interested stakeholders can engage with the SBTi to contribute to the expansion of the SDA method by following the Sector Development Framework. Companies and other stakeholders in the infrastructure industry could use this framework to develop a pathway specific to their sector, or to disaggregate the covered sectors into more specific sub-sectors when ultimately seeking recognition by the SBTi. Approved sector pathways must ensure scientific rigor and consistency with the climate models used by the initiative.

The steps to participate in the SDA expansion process include:

- 1. Express interest to the SBTi and test the intended approach to obtain early feedback;
- 2. Develop the sector pathway (including stakeholder consultation and feedback incorporation);
- 3. Submit the pathway to the SBTi for review and approval.

By engaging in the development of more nuanced pathways for their sector, and promoting the use of the SDA methodology across the UK infrastructure industry to set science-based targets, companies are ensuring they are playing their part in the global effort to limit global warming to 2°C.<sup>[18]</sup> The SBTi targets predominantly focus on Scope 1 and Scope 2 emissions, although Scope 3 emissions are included where significant (>40% of total emissions). Guidance from SBTi states that, "Scope 3 targets generally need not be science-based, but should be ambitious and clearly demonstrate how the company is addressing the main sources of GHG emissions within their value chain in line with current best practices."<sup>[19]</sup>

Given the significance of Scope 3 emissions for UK infrastructure, any approach that failed to address these in line with a 2°C scenario would clearly be inconsistent with national and global mitigation goals. Therefore, if the desire is to generate a target trajectory that is consistent with national commitments, valid for the period over which infrastructure assets will operate, and which recognises the unique significance of Scope 3 emissions within the sector, then an adapted or alternative approach will be required.

#### 5.3.1 A new approach

An alternative approach would begin with an estimate of potential carbon sinks and projections for the deployment of 'negative emissions technologies' under a time frame consistent with net zero emissions, for the whole of the UK's emissions.

This would provide a ceiling figure for remaining UK annual emissions under a sustainable net zero scenario. The remaining annual emissions budget would then be allocated amongst hard-to-mitigate industries through a cross-industry dialogue based upon the maximum mitigation potential within each industry. The portion allocated to infrastructure would then be translated into a long-term reduction trajectory that is consistent with stabilising global temperature increases.

Developing such an approach would require four things:

- 1. Deeper understanding of the scope for deployment of additional carbon sinks
- 2. Foresight on negative emission technologies
- 3. Concerted effort to establish a cross-industry dialogue
- 4. A means of subdividing the industry target between organisations (which could be adapted from the approaches advocated under the SBTi).

\* Information provided by SBTi.

#### 5.4 Delivering the target

Having a clear carbon target is just the start. Meeting the target will be a considerable challenge.

Once there is an infrastructure industry carbon target, performance needs to be monitored and progress reported. One way for this to be implemented is to identify an independent and impartial owner which is recognised by industry. This owner can play a vital role in helping industry to help itself by raising awareness, educating professionals, developing the knowledge/evidence base, developing tools and techniques, and facilitating collaboration. There is precedent in the delivery of the Level 2 BIM requirement by the BIM Task Group and the role of WRAP in delivering the Halving Waste to Landfill Commitment.

#### Client opinion – Opportunity

There is a huge opportunity for coherent leadership and a common voice for the infrastructure sector to drive carbon reductions and 'lead the way'.

### Role of certification schemes in addressing carbon

Certification schemes exist that can be applied to all types of civil engineering projects. Within the UK, these include BREEAM Infrastructure and CEEQUAL, both of which include a range of sustainability factors that influence carbon. For example, better use of materials, reduction in waste and improved operational efficiencies will have an impact on carbon performance.

Certification can apply to construction, operation and end of life phases and can also provide a focus for continuous improvement.

Certification to a rating scheme is more than achieving regulatory minima and is indicative of how much a project has exceeded the basic regulatory sustainability requirements.

There is much for the industry to do without individual organisations trying to 'go it alone'. The activity needs to be transparent and open to enable all organisations and individuals to understand what they need to do. There are numerous sector organisations already active, and their collective reach needs to be harnessed and co-ordinated. For example:

- The National Infrastructure Commission has sustainability as a cross-cutting theme and, in creating the national infrastructure assessment, "will analyse whether the existing approach to infrastructure is compatible with the UK's carbon [...] commitments and consider if different or further action is needed."<sup>[20]</sup>
- The Institution of Civil Engineers' Infrastructure Client Group looks at infrastructure carbon under its 'Whole life planning and cost control' theme.
- The Green Construction Board's Infrastructure Working Group has been instrumental in significant work, including the Infrastructure Carbon Review and the development of PAS 2080.
- The Supply Chain Sustainability School has over 10,000 members from the infrastructure industry and is delivering a programme to increase awareness of the carbon agenda and upskill the industry.
- The Construction Climate Challenge is beginning to gain traction in promoting the carbon agenda and has recently funded infrastructure research. The IMPRES<sup>[21]</sup> project aims to contribute to a more efficient implementation of policies and goals for reducing climate impact from the infrastructure sector. The CITT<sup>[21]</sup> project is developing a tool for construction companies to identify and reduce carbon in the construction supply chain.

#### Client opinion – Opportunity

Industry bodies can play a role in bringing consistency and coherence to the industry.

Given the current evidence, which indicates that the fourth carbon budget will be missed<sup>[22]</sup>, coupled with the stretching requirement of the Paris Agreement, there is a role for Government in setting out a carbon reduction trajectory for the infrastructure industry. An example of such an intervention could be to indicate a carbon budget for each line item in the National Infrastructure and Construction Pipeline. Furthermore, in terms of meeting the Paris Agreement requirements, it would be beneficial for the infrastructure industry to actively engage in depicting a net zero emissions future. This is because the industry will fundamentally determine the viability of such an objective, and will ultimately play a key role in delivering it.

#### $\rightarrow$

#### Client opinion – Opportunity

Regulatory drivers could help to accelerate change.

Sustainability needs to be embedded into organisations as business as usual in much the same way that has happened with health and safety. Using carbon as a lens to explore what can be done brings many benefits including cost, programme and design which lead to more sustainable outcomes.

#### Main recommendation

The UK-GBC is calling for the establishment of a whole life carbon target for the infrastructure industry, based on climate science, and from which organisations can derive commensurate targets. The monitoring of such a target, and the reporting of progress against it, will be crucial.



## Acknowledgements

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#### **Client organisations**

Connect Plus M25 Crossrail Environment Agency Heathrow Airport London Underground National Grid Network Rail Transport for London Tideway Thames Water Transport Scotland



# Appendix

This appendix supplements section 3, providing further detail on the climate change objectives that apply in the UK.

#### **Climate Change Act**

The Climate Change Act 2008<sup>[7]</sup> (CCA) commits the Government to reducing the UK's greenhouse gas (GHG) emissions by 80%, from 1990 levels, by 2050.

As part of the CCA, the Government is required to set legally binding 'carbon budgets'. The first five carbon budgets are in current legislation and will run up to 2032 (See figure A1).

Budget	Carbon budget level/MtCO <sub>2</sub> e	Reduction below 1990 levels
1st carbon budget (2008 to 2012)	3,018	23%
2nd carbon budget (2013 to 2017)	2,782	29%
3rd carbon budget (2018 to 2022)	2,544	35% by 2020
4th carbon budget (2023 to 2027)	1,950	50% by 2025
5th carbon budget (2028 to 2032)	1,765	57% by 2030

#### Figure A1. UK Carbon budgets up to 2032<sup>[22]</sup>

The first carbon budget was met and the UK is currently on course to better the second and third budgets. However, the UK is not on track to meet the fourth carbon budget (2023-2027)<sup>[22]</sup>. The Government's "Clean Growth Plan" is imminent and will set out how the Government intends to meet the fifth carbon budget.

#### **Construction 2025**

Construction 2025<sup>[8]</sup> is the Government's industrial strategy<sup>[23]</sup> to transform the UK construction industry and drive a low carbon economy. The strategy has a clear vision for the industry, which includes people, technology, growth, leadership and sustainability.

The strategy sets a target of a 50% reduction in GHG emissions in the built environment by 2025, from a 1990 baseline (in line with the fourth carbon budget). The strategy sets out an ambition for the construction industry to deliver "low carbon assets more quickly and at a lower cost underpinned by strong, integrated supply chains and productive long term relationships"<sup>[8]</sup>.

#### Low Carbon Routemap for the Built Environment

In 2013 the Green Construction Board (GCB) developed the Low Carbon Routemap. The scope of the Routemap covers: operational carbon in buildings, operational carbon in infrastructure (OpCarb) and capital carbon (CapCarb).

A baseline emissions profile was developed showing that the built environment was responsible for almost 210 MtCO<sub>2</sub>e of emissions in 1990 and just over 190 MtCO<sub>2</sub>e in 2010. A model of the trajectory of carbon emissions for the built environment was developed for 2010 to 2050.

In 2015, the GCB provided an update to the Routemap<sup>[9]</sup>. This update indicates an increase in built environment emitted carbon and a widening of the gap to the 2025 50% reduction ambition (see Figure A2). To achieve the 2025 reduction target, the built environment needs to reduce carbon emissions by a further 39% against the 1990 baseline. Within the period 2009-2012, it is worth noting that the infrastructure sector had a 2% decrease in emissions.



#### Figure A2. GHG emissions in the built environment<sup>[9]</sup>

The Routemap provides a "snapshot" of past trends rather than an effective way of monitoring current performance. The infrastructure industry, and individual organisations, cannot use the Routemap to establish whether their efforts are on track to meet the targets.

#### COP 21 and the implications for infrastructure

The Paris Agreement has been ratified by the UK Government and entered into force in November 2016<sup>[24]</sup>. The agreement sets out an action plan to put the world on track to hold the increase in global average temperature to "well below 2°C above pre-industrial levels" and to "pursue efforts to limit the temperature increase to 1.5°C"<sup>[25]</sup>.

In addition, the Paris Agreement sets the goal of achieving<sup>[6]</sup> 'net zero' emissions. This is in recognition of the fact that net GHG emissions will need to fall to zero to stabilise global temperature.

The immense scale of the challenge involved in delivering the Paris Agreement's goals is frequently understated. Global ambitions for emissions reduction now go beyond the levels of commitment set out in the Climate Change Act<sup>[26]</sup>. A net zero goal requires both deeper mitigation than the currently targeted 80% reduction by 2050 and substantial deployment of negative emissions technologies.

Given the longevity of infrastructure assets, most assets being designed today will still be operational in the period by which the UK must achieve net zero emissions. Any remaining emissions beyond a net zero target date are likely to be offset with expensive negative emissions technologies<sup>[27]</sup>. Therefore, the most cost-effective path for the UK will involve deeper and more immediate mitigation in infrastructure design and delivery.

Any targets set by the infrastructure industry in the coming years should be compatible with both the national carbon budgets and with the long-term net zero emissions objective set out in the Paris Agreement. It would be beneficial for the infrastructure industry to actively engage in depicting a net zero emissions future, as it will fundamentally determine the viability of such an objective, and will ultimately be responsible for delivering it.



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- **16.** This publicly available specification (PAS) provides a common framework for all infrastructure sectors and value chain members on how to manage whole life carbon when delivering infrastructure assets and programmes of work.
- **17.** Unfortunately, this does not provide an indication of who the main driving force is for the CEEQUAL assessment. This is because some designers and/or contractors are contracted to apply for the CEEQUAL assessment and it is not possible to obtain this information, unless a contract document has been provided as part of the evidence.
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- 27. The three negative emissions technologies with the largest potential deployment have current cost estimates of  $40-600/tCO_2$  as reported in Committee on Climate Change (2016) UK Climate Action Following the Paris Agreement.



