

# Civil engineering insights into the UK's 2050 greenhouse gas emissions net-zero target

## Overview - the scale of the challenge

With the passing of legislation in June 2019<sup>1</sup> the UK must now reach net-zero greenhouse gas (GHG) emissions by 2050. To achieve this, a step change is required to both reduce emissions and where this isn't possible to offset those that are harder to avoid producing. This is a huge challenge as the demography of the UK shifts and is made even more complex by the legacy of an economy that has been powered by fossil fuels for decades.

While the scale of the challenge is significant, the impact of doing nothing is even more severe. This is why ICE, alongside other civil engineering organisations, have declared a climate and biodiversity emergency.<sup>2</sup> This is in parallel to 64% of UK councils and six combined authorities who have also done so.<sup>3</sup>

As the UK aims for net-zero by 2050 the population is expected to grow to 75m people.<sup>4</sup> If current energy generation and consumption trends continue, alongside the mass use of unsustainable modes of transport, it will simply not be possible for the economy to both accommodate population growth and achieve the net-zero target.

This short insight paper explores the role of the infrastructure sector in contributing to the 2050 target, including the range of options for effecting change, alongside the steps being taken in other countries to deliver environmentally sustainable development. The paper serves as a pre-cursor to the recommendations that ICE will set out in its State of the Nation report on the policy interventions required to get to net-zero emissions. This report will be published in 2020 and further detail is included at the end of this paper.

## Performance of the UK economy to date

The net-zero emissions target was passed into law by Theresa May's former Conservative Government. It followed independent advice provided by the Committee on Climate Change (CCC) in its *Net Zero – The UK's*

---

<sup>1</sup> BEIS (2019) [UK becomes first major economy to pass net zero emissions law](#)

<sup>2</sup> [UK Civil Engineers Declare Climate & Biodiversity Emergency \(2019\)](#)

<sup>3</sup> Declare a climate emergency (2019) [List of councils who have declared a climate emergency](#)

<sup>4</sup> ICE (2016) [National Needs Assessment](#)

*contribution to stopping global warming*<sup>5</sup> report. The target replaces the previous goal for the UK to reduce GHG emissions by 80% based on 1990 levels. In short, it is a much more ambitious target.

With this in mind it is important to recognise that the UK was already falling short in meeting the original target. The most recent assessments conducted by the CCC highlighted that progress on both the fourth and fifth carbon budgets were behind plan; that is to reduce emissions by 2025 and 2030 by 51% and 57% respectively.<sup>6</sup> Further still, the CCC calculated that just one of 25 policy actions recommended to government in 2018 for achieving 80% emissions reductions had been delivered in full by July 2019.<sup>7</sup>

There are a number of questions for the infrastructure sector that stem from this analysis. Is the upgraded target realistic? How will the infrastructure sector need to change in order to help contribute to the delivery of the target? What pathways and policy options are there available to facilitate this?

## Carbon emissions and the infrastructure sector

Despite the importance of the infrastructure sector to the UK's economy there is no escaping the scale of the carbon footprint that it generates, both in terms of assets and their use. In 2018 the transport sector accounted for 33% of all carbon emissions (CO<sub>2</sub>), with the majority of these coming from road transport.<sup>8</sup> During the same year electricity from power stations contributed 18%, whilst the residential sector (mainly gas for heating) was also responsible for a similar proportion.<sup>9</sup>

In total that's approximately 69% of all CO<sub>2</sub> emissions. As with the limited progress outlined previously on the overall reductions in all economic GHG emissions it follows suit that there have been only negligible improvements in the infrastructure sector itself. For example, since 1990 there has been just a 3% reduction in CO<sub>2</sub> emissions from the transport sector based on 1990 levels.<sup>10</sup>

Clearly initiating and enacting the change necessary to reduce the impact of the infrastructure sector on the environment is increasingly important. Notwithstanding the cultural, behavioural and economic obstacles that impact the appetite for innovation in the built environment,<sup>11</sup> there are a range of potential options for placing the infrastructure sector on the pathway to net-zero emissions by 2050.

## Options for change

The CCC's net-zero report sets out a number of scenarios for each of the core infrastructure networks (and associated sectors) for achieving the 2050 target.<sup>12</sup>

<sup>5</sup> CCC (2019) [Net Zero – The UK's contribution to stopping global warming](#)

<sup>6</sup> CCC (2019) [Summary Report: 2019 Progress Report to Parliament](#)

<sup>7</sup> Ibid

<sup>8</sup> BEIS (2019) [2018 UK Greenhouse Gas Emissions, Provisional Figures](#)

<sup>9</sup> Ibid

<sup>10</sup> Ibid

<sup>11</sup> ICE (2018) [Improving approaches to risk in the built environment sector](#)

<sup>12</sup> CCC (2019) [Net Zero – The UK's contribution to stopping global warming](#)

During the 2020's these include:

- **Electricity:** largely decarbonise supply via the increased roll-out of renewables and the phasing-out of coal. Major transmission and distribution upgrades to be completed in order to enable this.
- **Road transport:** to expand the electric vehicles (EVs) market, including the deployment of 12,000 rapid EV charging points on the strategic road network.
- **Buildings:** increase efficiency and the rollout of heat pumps. In total 1.5m homes to be supplied by low-carbon heat networks.
- **Infrastructure:** demonstrate carbon capture and storage (CCS) and create industrial CCS clusters.

During the 2030's and 2040's these include:

- **Electricity:** decarbonisation of an expanded electricity system using hydrogen and the deployment of bioenergy with CCS.
- **Road transport:** car and van fleets to generate zero-emissions, with 800 refuelling stations for heavy goods vehicles (HGV).
- **Buildings:** expanded heat networks and possible switching of the gas grid to hydrogen. Approximately 29m homes having undergone energy efficiency retrofitting and being supplied with low carbon heat.
- **Infrastructure:** roll-out of infrastructure for hydrogen and electric HGVs, plus more CCS infrastructure that by 2050 will remove 75-175MtCO from the atmosphere per year.

Whilst these scenarios are based on robust analysis, the CCC do acknowledge that it is almost impossible to predict the exact technologies and behaviours that are required to achieve net-zero GHG emissions by 2050. It is also important to recognise the complexity of deploying new technologies and embedding the necessary behaviour change that each of these scenarios requires; in most cases 'ready to go' solutions are not yet in place.

For example, in road transport the [current] poor provision of charging infrastructure is consistently cited as holding back mass deployment of EVs.<sup>13</sup> Likewise, the infrastructure scenario is predicated on the rollout of carbon capture and storage technologies, but the cost of deployment and the lack of commercial examples from around the world to draw insight from are both barriers within a UK context.<sup>14</sup>

A range of cost, planning, technical and political challenges will need to be overcome in order to realise each of these scenarios. However, what is certain is that achieving each of the key milestones detailed will require

<sup>13</sup> Business, Energy and Industrial Strategy Committee (2018) [Electric vehicles: driving the transition](#)

<sup>14</sup> Parliamentary Office of Science and Technology (2018) [Carbon Capture and Usage](#)

strategic policy interventions right across the infrastructure sector and as importantly the support of the general public.

## Public sentiment

A range of opinion polls have been conducted to explore the British perception of climate change.

An Ipsos Mori poll recently found that public concern around climate change has reached record levels, with 85% of British adults now expressing concern, which is up from the 82% a similar poll recorded in 2005.<sup>15</sup> Taken in isolation this suggests that climate change is very much a primary concern for the British public.

However, in a separate poll conducted by YouGov the degree of concern that exists in Britain – across a number of measures – lags that of many other economies. Indeed, YouGov found that in India (71%), Spain (69%) and Italy (66%) there is greater agreement than in Britain (51%) that ‘the climate is changing, and human activity is mainly responsible’.<sup>16</sup> The same poll also found that European countries and the USA are less likely to think that climate change will create catastrophic damage to humankind.

Comparing different polls is not a perfect science but doing so is necessary in order to demonstrate the variation in public sentiment that exists in relation to climate change. After all there is little doubt that mitigating climate change and adapting to its impacts is an endeavour that the entire UK (and global) population will be required to share in.

That said, in relation to the 2050 net-zero target it is perhaps telling that a majority (55%) of British adults believe that the target should be achieved before the legislated deadline of 2050.<sup>17</sup>

## International comparators

Presently 15 countries have adopted net-zero emissions targets, with the majority covering all GHG emissions as opposed to just CO<sub>2</sub>.<sup>18</sup> Many of the Scandinavian countries have earlier targets than the UK e.g. Norway (2030), Finland (2035) and Sweden (2045). Bhutan’s economy is already operating at net-zero and the country has set itself a target to maintain this indefinitely.<sup>19</sup>

Whilst these targets are more ambitious than the UK’s it is necessary to consider the historical and marked differences that exist in these economies in relation to their demographics, energy consumption trends and political commitment to environmental sustainability. Put simply, whilst it is imperative that the UK works towards a net-zero GHG emissions target, the date of that target must be realistic and practical in order to be realised.

---

<sup>15</sup> Ipsos Mori (2019) [Concern about climate change reaches record levels with half now 'very concerned'](#)

<sup>16</sup> YouGov (2019) [International poll: most expect to feel impact of climate change, many think it will make us extinct](#)

<sup>17</sup> Ipsos Mori (2019) [Concern about climate change reaches record levels with half now 'very concerned'](#)

<sup>18</sup> World Resources Institute (2019) [What Does "Net-Zero Emissions" Mean? 6 Common Questions, Answered](#)

<sup>19</sup> Ibid

These challenges are arguably even more prevalent in larger countries like the US, China and India; all of which do not have a net-zero GHG emissions target in place. It is therefore of little surprise that the World Resources Institute estimates that those economies with targets in place produce only 5% of total global GHG emissions.<sup>20</sup>

## Next steps for the Institution of Civil Engineers (ICE)

The UK net-zero GHG emissions target is legally binding and places a significance onus on all of the UK's key economic sectors to adapt delivery models and business practices accordingly in order that it is met. This includes the infrastructure sector. At a high-level this paper has set out the current state of play within the sector, the associated challenges and a broad range of policy options for addressing these.

To inform policy development, the ICE has made a commitment that its annual State of the Nation report for 2020 will focus on identifying specific interventions to ensure that the UK's infrastructure sector makes a positive contribution to the net-zero GHG emissions target.

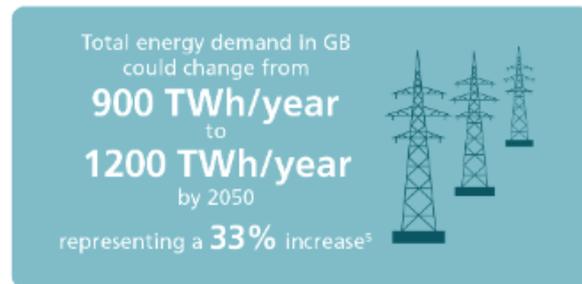
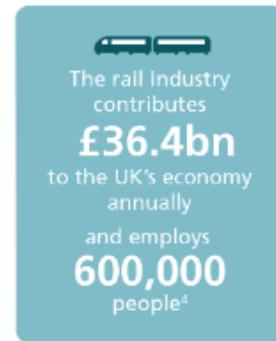
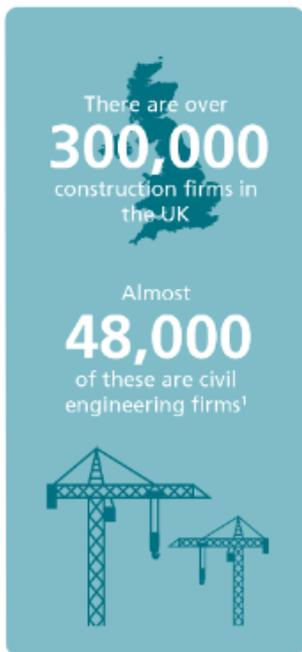
A research programme of focus groups, workshops and interviews with experts in the field will be initiated early next year in order to achieve this. If you would like to participate in this work, please see the contact details overleaf.

---

<sup>20</sup> Ibid

## GB AND UK HEADLINES

From roads to railways and bridges to power stations, high-performing infrastructure is vital for economic growth and thriving communities.



1. ONS (2018) Construction statistics annual: Number 19, 2018 edition  
4. Oxford Economics (2018) The Economic Contribution of UK Rail

2. ONS (2018) Output in the construction industry  
5. ICE (2016) National Needs Assessment

3. ONS (2018) Gross Value Added (GVA)

## About ICE

Established in 1818 and with over 93,000 members worldwide, the Institution of Civil Engineers exists to deliver insights on infrastructure for societal benefit, using the professional engineering knowledge of our global membership.

For more information please contact:

**Ben Goodwin**, Lead Policy Manager, ICE

Email: [policy@ice.org.uk](mailto:policy@ice.org.uk)