Construction Leadership Council

construction.enquiries@beis.gov.uk

27.04.2022

Carbon rating system could help rapidly reduce emissions from concrete, says industry taskforce

- Carbon rating system would help benchmark the industry and improve data
- Experts believe carbon intensity of concrete could be more than halved by 2035
- Concrete industry could become a 'carbon sink' by 2040s

A group of experts from across the construction industry has proposed a standardised carbon rating system that would make it easier for clients and designers to choose low-carbon options. This is just one of many recommendations set out in the *Low Carbon Concrete Routemap* which is published today.

The report is the result of a collaboration between the Green Construction Board and the Institution of Civil Engineers (ICE). It brings together experts from across the industry including the Concrete Centre, Mott MacDonald, CEMEX and many others.

As well as making recommendations, the report sets out three decarbonisation routes to 2050 based on what action the industry takes and how fast carbon sequestration in concrete advances. Even under the most modest route, emissions are expected to fall from 10 million tonnes $CO2_e$ in 2022 to 5 million tonnes in 2035. Under the most optimistic scenario, the concrete industry could become a carbon sink – absorbing more greenhouse gases than it emits – in the 2040s.

The report also predicts this will lead to major cost savings, ranging from £2.5 billion to £10.5 billion by 2050, depending on how quickly the industry decarbonises.

The recommendations for clients, designers, contractors and suppliers include:

- An industry-wide rating system to disclose the carbon embedded in different concrete mixtures, similar to the energy efficiency ratings for homes
- Options for reducing the cement content, especially by using limestone and calcined clays as fly ash and blast furnace slag become less available
- Design approaches that use less concrete or lower-carbon concrete, such as using voids, coffers, non-structural fill and smaller spans between columns
- Giving concrete suppliers maximum time and flexibility to choose a mix that meets the requirements with the minimum carbon
- Updating technical standards to reflect the priority of reducing carbon and the latest materials and techniques

Andrew Mullholland, chair of the Low Carbon Concrete Group and co-author of the report, said: "The next 10-15 years are critical in driving the carbon out of concrete. There are steps we can all take immediately to minimise the quantity of concrete we use and the carbon intensity of production, and this change should be driven by clients. This will require motivation and substantial effort from across the industry."

Andy Mitchell, Co-chair of the Construction Leadership Council, said: "This report pulls together a wealth of practical advice and best practice from across the industry. But more importantly, it charts a route forward to net zero which must increasingly be the guiding principle of every construction project. I call on peers across the industry to read this report and take up its recommendations as soon as possible."

Many of the recommendations in the report are already being deployed. For example, the main flood gate in the Environment Agency's Boston Barrier used low-carbon concrete, which saved more than 1,300 tonnes of $CO2_e$. It also raised a control room above the flood level which avoided the need for deep piled foundations and saved a further 360 tonnes $CO2_e$.

Concrete is a major source of carbon, accounting for 1.5% of all emissions in the UK and 8% globally. This is largely due to the production of cement, which involves heating limestone and clay to very high temperatures and a chemical reaction that produces greenhouse gases. Every year we use approximately 11.7 million tonnes of cement in the UK, equivalent to the weight of more than 100 aircraft carriers.

An informal survey of 178 industry professionals found that education and a tendency of industry standards to recommend more traditional concrete blends and practices were major barriers to decarbonisation. More than half of respondents said that they struggled to find data on the carbon embodied concrete products – something that the rating system could help to address.

The report also sees a major role for carbon sequestration – both techniques of locking carbon dioxide into concrete and of capturing the carbon that arises from the production of cement. But it says these techniques are not yet commercially viable and calls for large-scale industry and government support for research and trials. Sequestration should be seen as an end-of-pipe solution once other opportunities to cut carbon have been taken.

A new UK Concrete Decarbonisation Taskforce, convened by the ICE, will oversee the delivery of the *Low Carbon Concrete Routemap*. This group will update the report each year and monitor progress across the industry.

Mark Hansford, Director of Engineering Knowledge at ICE, said: "We have the solutions and a clear route forward. The UK Concrete Decarbonisation Taskforce has a vital role to play in unlocking funding and working across the industry and government so that we can drive a step change in the decarbonisation of concrete."

Ends

Notes to editors:
Download a copy of the *Low Carbon Concrete Routemap* here. To arrange an interview, contact Kai Tabacek: kai.tabacek@ice.org.uk / 07818 939 701.

Images of the rating system proposed in the report and the Boston Barrier available on request.
The Low Carbon Concrete Group was established by the Green Construction Board in January 2020 to demonstrate how the UK Government's net zero target could be achieved for concrete used in construction. The UK Industrial Decarbonisation Strategy (March 2021) sets targets for UK Industry of a two-thirds reduction in emissions by 2035 and 90% reduction by 2050 (both from 2018 levels).

The report makes the following projections to 2050 based on three potential routes. Route 1 would involve optimising current practice and technology including using materials like limestone, calcined clay, and volcanic ash to replace cement. Route 2 would do all of the above and also adopt alkali-activated cementitious materials. Route 3 would do all of the above and adopt carbon sequestration within concrete.

	Annual carbon emissions ($MtCO2_e$/year) in 2022	Annual carbon emissions ($MtCO2_e$/year) in 2030	Annual carbon emissions ($MtCO2_e$/year) in 2035	Annual carbon emissions ($MtCO2_e$/year) in 2050
Route 1	10	6.3	5.0	4.2
Route 2	10	6.2	4.7	2.5
Route 3 (amount avoided through sequestering carbon in concrete)	10 (0)	5.6 (0.4)	3.6 (-1.1)	-3.6 (negative) (-7.1)

The rating system proposed in the report will be specific to the strength class of the grade of concrete used and the carbon categoriroutemapes will be based on the variety of concretes on the market at a given time. These classifications will need to be adjusted as the carbon in concrete is reduced over time.

The Boston Barrier Tidal Flood Defence Scheme is a £100m project built as a Mott MacDonald and BAM Nuttall Joint venture for the Environment Agency. It will reduce the risk of flooding to over 14,000 properties in the town of Boston, Lincolnshire once completed. The primary flood gate in the tidal Haven became operational in December 2020 and was deployed for the first time in November 2021 protecting 13,700 homes. Many of the low-carbon innovations will be repeated in the final phase of the scheme when the project moves into the Port of Boston wet dock entrance. More details available on request.

The USS Gerald R Ford, the largest aircraft carrier in the world, weighs 100,000 tonnes, according to Whatthingsweigh.com. We used 11.7 million tonnes of cement each year in the UK in 2018 according to the European Ready Mixed Concrete Organization – Ready-Mixed Concrete Industry Statistics 2018 (table 2a).

About the Green Construction Board
The Green Construction Board was created by the Construction Leadership Council in 2011 to advise on the regulatory, policy and technical framework required to overcome key barriers to the delivery of a zero carbon and zero waste built environment.

About the Institution of Civil Engineers
Founded in 1818, the Institution of Civil Engineers (ICE) is a UK-based international organisation with more than 92,000 members, ranging from students to professionally qualified civil engineers. As an educational and qualifying body, with charitable status under UK law, we support our members throughout their careers, and help society to have trust and confidence in infrastructure professionals. Under our Royal Charter, ICE has become recognised worldwide for its excellence as a centre of learning, a public voice for the profession and a leading source of expertise in infrastructure and engineering policy.

Ends