

CONSTRUCTION ENGINEERING MASTERS DISSERTATION ABSTRACT

Reducing embedded carbon during the construction phase of infrastructure projects

The construction industry contributes approximately 39% of all global carbon emissions, a third of which relate to the manufacturing of construction materials. The UK infrastructure carbon review (2013) predicts that the infrastructure sector could have influence over 90% of UK carbon emissions by 2050 due to the predicted decarbonisation of other sectors. Recent legislation and industry guidance such as the UK Government Climate Change Act and PAS2080 call upon the industry's value chain to minimise the carbon footprint of projects and contribute towards the UK's mandated target of net zero by 2050.

High Speed 2 (HS2) is one of the largest infrastructure projects in Europe and has mandated far reaching and aspirational targets for carbon reduction, not seen before in the construction industry. By adopting the strategies set out in PAS2080 and utilising the Life Cycle Assessment (LCA) methodologies detailed in BS EN ISO14040 and BS EN 15978, HS2 intends to reduce its embedded carbon footprint by 30% for enabling works contracts and 50% for both main works and stations contracts.

This study uses primary carbon LCA data from the HS2 Enabling Works North Contract (EWC-N), supported by interviews with industry experts and supply chain professionals to assess how key materials were tracked during the construction phase of the project and the consequences this had on the carbon footprint of the EWC-N project.

The findings of this study show that the majority of information required to track embedded carbon was recorded during construction. However, this was done retrospectively and not actively used to inform decisions to minimise the carbon footprint of projects on site. This, combined with a general underestimation during the design stages of the embedded carbon of temporary works elements, some contractor design elements and other ancillary design items, meant that an increase in carbon footprint was seen between detail design estimates and the as-built reports, instead of the predicted reduction.

Going forward, to actively track and inform carbon-based discussions during construction, simplification or rationalisation of data management platforms is needed to ensure all data is stored in a common data environment, suitably referenced and structured, to facilitate multiple uses for all disciplines. Precise data requirements need to be defined i.e., the exact data required, the format expected and the intervals of submission. To be successful, the measures must be supported by clear leadership, transparent facilitation of upskilling in the value chain and by providing appropriate incentivisation.

Paul Day
July 2023