A low carbon bridge over the River Thames, London, UK

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Abstract

The construction industry must make a concerted effort to reduce its carbon footprint. This initiative for carbon reduction should supplement the social and economic benefits that infrastructure projects offer. A proposition project was initiated to design a pedestrian and cycle bridge over the River Thames in London with a carbon target of 250 $kgCO_2e/m^2$, whilst not compromising the functionality of the bridge. To this end, the Nine Elms to Pimlico site, in London, was chosen as our challenge. The project has shown that a low carbon bridge over the river is feasible, although achieving an upfront carbon of less than 250 $kgCO_2e/m^2$ proved to be too ambitious for this bridge with current design constraints. The need for unconventional materials, technologies and design processes has been identified. A reduction of 75% was achieved by redesigning the superstructure, to reach the targeted carbon further work is needed on the substructure and foundations.

Keywords: low carbon; bridge design; superstructure; long-span bridge; timber arch.

1 Introduction

Whether it is for replacement and improving resilience of existing bridges, or construction of new bridges to facilitate mobility and enhance people's lives, the demand for bridge design in the coming years is evident. In addressing the pressing Climate Emergency, the design of new bridges must prioritise greater material efficiency, functional effectiveness, and environmental harmony.

1.1 Setting a target

The carbon footprint associated with the construction of a bridge, or any civil engineering project, can be divided into different stages and modules, ranging from raw material supply to final recycle and recovery.

A proposed rating system for bridges, Structural Carbon Rating Scheme for Bridges (SCORBS), assigns ratings from 'A++' to 'G' based on the structural normalised upfront carbon for modules A1-A5, or 'Cradle to Practical Completion', as defined in *BS EN 17472:2022*, see Figure 1 [1].

This paper's objective is to demonstrate that a carbon focused design can be achieved without comprising quality but upon the assumption that the early decision for the necessity of a new bridge has already been made.

The key carbon metric used is normalised carbon, measured in kilograms of carbon equivalent per area ($kgCO_2e/m^2$). The carbon assessments

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