An Update on Carbon Footprint of Bridges

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Abstract

Transport infrastructure accounts for a significant proportion of the worlds carbon dioxide emissions. Bridges and viaducts use a significant amount of steel and cement, these two industries alone amount to about 16% of total worlds carbon emissions. The carbon footprint of bridges and viaducts has been studied and documented. This paper summarises the published data and adds some additional data from the Arcadis bridges database and other sources. Plots of carbon with crossing length and bridge area are given. New datasets of bridge carbon with time, with span and carbon in substructures are introduced to note progress towards net zero and to address issues noted in the original research. The paper summarises the key conclusions of previous research and gives 4 key recommendations towards net zero along with key performance indicators of good bridge designs considering carbon footprint.

Keywords: bridges; carbon emissions; climate change; bridge carbon KPI; net zero; sustainability.

1 Introduction

Transport infrastructure accounts for a significant proportion of the worlds carbon dioxide emissions. Bridges and viaducts use a significant amount of steel and cement, these two industries alone amount to about 16% of total worlds carbon emissions.

The carbon footprint of bridges and viaducts has been studied and documented in this paper.

The materials used in bridge construction account for nearly 80% of the total carbon footprint of the bridge. Steel and cement account for over 75% of overall embodied carbon generated by bridge construction material. Bridges relatively have high intensity of carbon when compared with roads or railway per kilometre [1] and a good design can help reduce carbon footprint of a bridge.

The original database [2] comprised 174 bridges. For this paper the database was updated with additional new data comprising 12 new bridges from Arcadis Bridges Database and 13 fixed links from published data on fixed links by Mullins et. al [3]. The author further added carbon data for some long span bridges. The final database for this paper comprises 200 bridges.

The data was analysed, grouping loading type footbridges, highway, and railway bridges. Most structures by number are from the UK, but most of the larger bridges are international. The data has been reviewed for completeness consistency and accuracy to give reasonable assurance as to the integrity of the data; some data was discarded.

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