

CONSTRUCTION ENGINEERING MASTERS DISSERTATION ABSTRACT

Unexploited embodied carbon in a net-zero built environment: exploring the potential of embodied carbon of existing buildings using the Delphi method

The buildings sector is responsible for greater annual carbon emissions than any other sector. Embodied carbon, from construction and maintenance activities, can represent two-thirds or more of an individual building's whole life emissions. Despite this embodied carbon is unregulated in nearly all jurisdictions. Until technology exists to remove carbon from the atmosphere, drastic reductions in carbon emissions, including embodied carbon emissions, will be required to achieve net-zero by 2050 in line with global targets. Many believe that the most effective way to reduce embodied carbon from the built environment is to reuse existing buildings, however environmental factors such as embodied carbon do not often factor into reuse decisions. This is primarily due to embodied carbon being regarded as a construction stage emission, partly because typically, no carbon is physically 'embodied' within the building.

This research seeks to address this, exploring a new concept of unexploited embodied carbon, which attempts to link projects embodied carbon across the building's lifecycle. The research follows the Delphi method, which uses a panel of experts and multiple rounds of surveys to form a consensus. This method is particularly suited to studying topics of great complexity with little empirical evidence, such as this new and previously untested concept. The panels responses following each round of surveys were used to develop the concept of unexploited embodied carbon to a position where consensus was broadly achieved, resulting in a developed concept of unexploited embodied carbon, which presents a link between embodied carbon and the physical life of a building. Unexploited embodied carbon would make building owners accountable for their buildings embodied carbon and would ensure that embodied carbon featured in future decision making. With further research to develop the concept further, unexploited embodied carbon could lead to a bias in favour of retention of existing buildings, resulting in a significant reduction in embodied carbon emissions. Through implementation of taxation within a robust embodied carbon regulatory environment, unexploited embodied carbon might also provide a deterrent to demolishing existing buildings.

Craig Donachy
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