Evaluating the life cycle environmental impact of short span bridges

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Abstract

Bridge infrastructure consumes large amount of energy and raw materials, leading to considerable environmental burdens. The traditional infrastructure construction prioritizes its technical and economic viability. In recent years, the society devotes an ever-increased attention to the environmental impact of the construction sector. Life cycle assessment (LCA) is a systematic method for assessing the environmental impact of products and systems, but its application in bridges is scarce. In Swede, most of the bridges are short spans and the type of concrete slab-frame bridge (CFB) accounts for a large share. Soil steel composite bridge (SSCB) is a functional equivalent solution for CFB. In order to mitigate the environmental burdens of short span bridges, this paper performed a comparative LCA study between these two types of bridge. The results indicate that the initial material consumption is critical through the whole life cycle. The case of SSCB shows preferable environmental performance over CFB in most of the examined indicators.

Keywords: concrete slab frame bridge; soil steel composite bridge; soil steel flexible culverts; LCA; CO_2 emission; sustainable construction; life cycle assessment; global warming; climate change

1 Introduction

Bridges are vital infrastructures in a country's economic development, and responsible for considerable environmental burdens due to their long life spans. According to Swedish Transport Administration [1], there are more than 24574 bridges in Sweden and most of them are short spans [2]. Among these, the concrete slab frame bridge (CFB) is a common solution. However, due to the challenge from the environmental degradation, designers are concerned to seek a new solution thus mitigate the environmental impact. Soil steel composite bridge (SSCB) is a technical solution functionally equivalent to the CFB. Earlier studies [3, 4] showed SSCB is

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