



## A Broadened Approach to the Environmental Assessment in Bridge Design

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### Abstract

The construction industry must cut its carbon footprint significantly and therefore needs to widen its performance indicators like safety, reliability, availability, and economy by environmental aspects. There are numerous challenges to an objective comparison of bridge design alternatives based on environmental considerations. In addition to the considerable uncertainties in the Global Warming Potential of construction materials the question of setting adequate boundaries for the environmental assessment must be addressed. The aim of the present case study of a typical overpass above a motorway is to illustrate the importance of the interaction between the structural design choices, such as the placement of an intermediate support, and their consequences for traffic. An objective environmental evaluation of bridge design choices must consider both aspects. The importance of such a broadened approach shall be highlighted in the present study.

**Keywords:** bridges; environmental assessment; global warming potential; uncertainties; traffic simulation; life cycle analysis.

### 1 Introduction

The Austrian Institute of Technology (AIT) strives to be a leading research and technology organisation at the highest international level for infrastructures, with the vision to successfully address the grand challenges and transformations and thus drive the transformation towards a sustainable and future-proof world. The construction industry is responsible for approximately 50-60% of the global resource consumption and with a share of 53 % it is also the main source of worldwide greenhouse gas emissions, with 12 % contributed by infrastructural constructions such as bridges [1]. Therefore, it is one of the central goals of AIT's Unit for Transportation Infrastructure Technologies to guide the construction industry towards a design

and planning process, which incorporates in addition to traditional performance indicators such as safety, reliability, availability, and economy also the hitherto not always duly considered environmental aspects.

Despite the fact, that the standardization of Environmental Product Declarations (EPDs) in the EN 15804 [2] contributed significantly to more objective assessment procedures for environmental impact, still significant challenges remain to be solved. In a previous study, focusing on the Global Warming Potential (GWP) of the main construction materials used in bridge design, we already observed, that the differences between EPDs can be significant [3]. Choosing one single value to represent the environmental impact of a material may therefore be misleading, especially since due to the procurement procedures typically