



A probabilistic approach for handling uncertainty in infrastructure LCA

Oskar Larsson

Structural Engineering, Lund University, Lund, Sweden

Dániel Honfi

SP Technical Research Institute of Sweden, Göteborg, Sweden

Håkan Strippel

IVL Swedish Environmental Research Institute, Göteborg, Sweden

Contact: oskar.larsson@kstr.lth.se

Abstract

To demonstrate and support sustainability of large-scale infrastructure projects, life cycle assessment (LCA) has become a common tool used in the evaluation of environmental impact. However, LCA includes a number of phases, which are all associated with uncertainties. Decisions made without regard to these uncertainties may be suboptimal and/or misleading. The current paper discusses some important issues about how to deal with uncertainties in LCA. Two case studies are presented that shows the effect of including uncertainty in various parameters. The results show that a reduction in uncertainty due to manufacturing improvements can increase the reliability of the results significantly. It was also found that the uncertainty assumptions for parameters where data is not available have a large impact on the LCA-results.

Keywords: LCA, uncertainty, probabilistic analysis, data quality, investment decisions

1 Introduction

For decisions on investments concerning large infrastructures, several other aspects are taken into consideration than just looking at the expected construction costs and safety. Costs also related to operation, maintenance and demolition are often considered using a cradle-to-grave approach with Life Cycle Cost (LCC) methodology. Besides the costs of resources committed to different phases of the project, other consequences of the construction, maintenance and demolition processes are also considered,

such as environmental and social impacts.

Large infrastructure projects use resources intensively and contribute significantly to emissions of greenhouse gases (GHG) by using large amounts of fossil fuels, concrete, steel, bitumen etc. during construction. Another large part of the environmental impact from the infrastructure comes from the operation and utilization phases (mainly lightning, ventilation and fuel consumption) [1]. Environmental impacts of transport infrastructure are often assessed throughout the entire life cycle utilizing Life Cycle Assessment (LCA). A standardized framework for