

The Real Price – Holistic Cost-Efficiency Considerations in Design and Construction of Infrastructure Projects

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Summary

The present paper focuses on holistic sustainability evaluations for infrastructure measures and the related engineering structures. Following a brief overview on the current state of development of rating concepts both in the building and infrastructure sector, general options for assessing the overall sustainability are discussed and some major infrastructure-specific characteristics regarding the holistic performance are explained. Since indirect (external) effects often play an important role in the assessment of infrastructure measures, the respective influence on the overall performance and the interrelation between direct and indirect costs are exemplarily discussed by means of three examples (road infrastructure). Hereby, it is shown that the indirect costs easily may reach a level being in the range of the construction costs of the entire project and that an initial additional investment during construction in high-quality structural members and components is being typically paid off by a reduced maintenance effort, even if the external effects are not included.

Keywords: Sustainability, holistic assessment, environmental performance, infrastructure, structures, maintenance costs, durability, robustness, external effects, indirect costs.

1. Introduction

In recent years people have become more and more aware of the fact that it is a general necessity to have a focus on sustainability and energy efficiency and to minimise emissions such as CO₂ when designing and constructing buildings and engineering structures. While there are already numerous research activities and concepts available in the building sector, only minor attention has been paid on the investigation of infrastructure projects and the related structures (e.g. bridges and tunnels). Accordingly, “real prices“ are not known to date and hence in case of infrastructure measures the decisions, e.g. on the optimum solution, are not being based on holistic (i.e. complete) input data. So far, projects mostly are awarded on the basis of minimum construction costs rather than on the background of live-cycle costs or holistic assessments. The only exceptions where at least medium term behaviour and maintenance costs are partly taken into account are PPP projects.

In order to evaluate real prices for infrastructure projects, to derive holistic value measures and thus provide an approach of genuine price comparison a co-operation between engineers from different disciplines and economists is required. By using selected case studies as an example, fatal consequences are identified with respect to economic and ecological aspects. In accordance with the “incorrect” value measures that are usually applied today, these aspects lead to an orientation towards pure construction costs and therefore generate a demand for innovation that is aligned in a completely erroneous direction. This involves comparative life-cycle examinations of individual projects including a CO₂ equivalence balance, carried out and evaluated in terms of real economics. Here, particularly in the case of construction projects associated with existing infrastructure, it is very important to include so-called “external effects” (e.g. traffic congestion, including the environmental burden resulting from these indirect effects).