Life cycle considerations for infrastructure facilities

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Summary

This paper presents essential life time considerations for infrastructure facilities. The considerations are the basis for developing a scientific concept for life time harmonisation. This concept is introduced and the developed research procedure is explained. The terms infrastructure and infrastructure facilities are defined. A uniform life cycle model and the different life time types are described. Factors that govern the life times are analysed for the combination in a life time prognostication model. Examples are presented for road bridges.

Keywords: life cycle, life time, infrastructure, life time harmonisation

1. Introduction

In the planning of infrastructure facilities, the definition of design life time is a crucial item. Looking back on several decades of experience in running facilities (such as roads, tunnels, bridges, power plants and water works) the determination of an appropriate design life time has not been made easier, but has raised even more questions. In the past often life time meant “as long as possible”, which is not right any more for modern infrastructure. In order to have better answers for the appropriate design life, a certain level of harmonisation of the different time spans (economical, technical, functional, service) should be achieved and focused on as a common goal.

Life time considerations are especially important to assess design alternatives and design for durability and sustainability. Design for durability and sustainability means to reach a high and sustainable life cycle quality. Life cycle quality can be precised by the three main aspects cost efficiency, quality efficiency and time efficiency. Cost efficiency is governed by the life cycle costs. Quality efficiency is presented by a variety of quality aspects that have to be guaranteed, e.g. functionality, safety, reliability, convenience or ecological demands. Time efficiency is primarily specified by the availability of a facility [1, pp. 461–462] [2, pp. XIV–XVI].

For infrastructure facilities quality and time efficiency govern the life cycle quality. That means that for determined quality and time constraints cost efficiency has to be reached.

In order to argue about life time harmonisation, it is important to discuss the probable life cycle quality improvement. The harmonisation of life time spans will lead to more:

- quality efficiency, because of the possibility of designing the facility adequate to the life cycle requirements,
- time efficiency, because the compiling of rehabilitation packages reduces the percentage of unavailability due to many single shut downs and interruptions, A high level of availability is furthermore defined as a target criterion in the process of life time harmonisation.,
- cost efficiency, because of the potential to optimize and minimize the life cycle costs, especially the amount of maintenance costs.

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