



## Life Cycle Management of Infrastructures: towards an integrated approach of design, construction and maintenance

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### Summary

This paper presents principles of life cycle optimization from an engineering point of view. The optimization is reached through interaction between the disciplines of design, construction and maintenance. Process aspects, tools and criteria are discussed with focus on the reliability of these aspects.

**Keywords:** Integrated design, life cycle management, RAMS analysis, Systems Engineering, construction, maintenance, design process

### 1 Introduction

Infrastructures are built to serve human society: they should fulfil their intended purpose in an effective, reliable way and be safe for a defined service life.

Traditionally, the subsequent phases of realization are split: first design, followed by construction of the scheme and finally the operational phase of inspection, maintenance and repair. Due to this approach sub-optimizations have frequently been observed.

Triggered by privatization in many countries in Europe, infrastructural schemes are more often than before developed, executed and maintained by private companies. The successful company gets the project awarded through a tender procedure. To be successful a most competitive proposal must be developed which, at the same time, will comply with all relevant requirements. These objectives can only be achieved if life cycle costs are optimized and integrated design procedures are followed. Design engineers should not limit their horizon to design aspects only but need to consider the through-life cycle on a holistic basis. This means that a strong interaction with the other disciplines involved is essential: apart from the other design disciplines, a close interaction with cost estimation, work preparation, procurement, construction and maintenance is essential. To perform in such environment, design engineers should understand the process they are in and the interactions that should be managed but also need tools and criteria to make their contribution to the overall process. And that is where the gap often appears in practice.