

Raoul Rudloff, Yvonne Brandenburger, Svea Golinske, Kerstin Hornemann

## **Guideline for the implementation of the LCC in the planning phases and work processes of the architects and engineers**

Condensed report

### **Research program**

„Future building“

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**Grantee:** Ingenieur- und Sachverständigenbüro Dr. Rudloff [ISBR]  
Jahnstraße 3  
21614 Buxtehude

**Project management:** Dr.-Ing. Raoul Rudloff [ISBR]  
Prof. Yvonne Brandenburger [FH Erfurt]

**Further contributor:** Svea Golinske M.A. [ISBR]  
Kerstin Hornemann B.Sc. [FH Erfurt]

**Functional support:** Fabian Brodbeck, Fraunhofer Institut

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The operating costs had been scrutinized by the portfolio holders. This happened whilst the interest about the calculation of the lifecycle costs since the beginning of PPP projects and sustainability certification had been moved in the focus of builder-owners and planners. The economical view on immovable and the knowing about the proportion of production costs and operations costs engendered different processes to calculate the lifecycle costs. Many of those processes had been established through regular use in certification processes today. Some are even obligatory to use for some groups of portfolio holders, such as government buildings. In addition are perspectives of the surveyor tasks for valuation operations. These operations can be very different in their level of detail in terms of the perspective and the received data for the calculations.

A longlasting economical building planning isn't state of the art in the building industry yet. There are methods missing that can be implemented whilst the planning process and that are useable to calculate the costs until the operational phase. Furthermore it comes to a mistaking of "economical" and "cheap". This contradicts the lifecycle idea, because "cheap" is a short lasting perspective that ignores the intergral aspect which lasts long and beyond the building process only. Approaches including this aspect are findable in the certification systems such as BNB, DGNB and NaWoh. The actual standard outputs of planning actors are mostly only focussed on calculation of production costs. That mirrors the planning phases 1-3 in their level of detail in the costs structure (DIN 276) and factors of the operational and removal phase. Factors like maintenance are totally ignored in these perspectives.

Until now there is a method missing which continually updates the lifecycle costs and fits the planning process/ service phase and the detail level of the planning phase consistently. A method like this would help to analyse and clearly overview the lifecycle costs of a building in the planned different phases of its lifecycle. The correlation can be only orientated at the planning phase worked out by architects and engineers.

The objective of this research project is to develop a method based on existing approaches of certification systems for sustainable building and valuation operations (such as ImmoWertV). This method should enable an economical lifecycle costs calculation in early planning phases, starting with project development and lasting over the whole planning phase (according to HOAI) that can be implemented in the planning process. We developed a method that enables the possibility to update the lifecycle costs calculation until the building is set up continually on the base of the individual existing planning phase and planning detail level. After the set up of the building the method still enables the possibility to be further updated through the operation phase of the building regarding the existing costs structure. Base of this method are the necessarily provided input data. These need to be provided in a defined quality and stated points of time by expert planners and portfolio holders in the method. This method can start at any time of the planning phase, even in the

operation phase and it is independent of previous phases. The method is universally valid and properly for common use.

The guideline for the implementation of the LCC in the planning phases and work processes of the architects and engineers shows that there are tools for any service phase to start a lifecycle costs analysis. In the beginning the tools need less input data and can be seen overriding. In further service phases the methods are more concrete, possibly including calculated advertising prices (for production and usage (cleaning)) for the contractor, that can be put in the lifecycle analysis.

It had been shown how the results of single calculations can be implemented in a costs matrix to transfer them consistently to the next planning phase and further operation phase.

It had been pointed out how important the constellation of the single construction elements are to calculate the costs. An example are the sizes of windows, which have diverse influences on the lifecycle cost analysis (energy, cleaning, illumination etc.).

The result of the costs matrix shows how comprehensive a whole costs matrix can be. That's why a software based tool which automatizes the tools for the calculation is a good solution when we look at it from a long lasting perspective. The planner would have the possibility to use a program together. A further option for future plannings is to build a conjunction between this new software based tool with graphics programs of architects. In this point the modul- and process-model shows how a conjunction between construction- and area-related attributes can be set up with the planned construction.