Chapter 11
Economic Analysis for Green Residential and Non-Residential Building Envelopes

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ABSTRACT

Renovating buildings is more useful than ever. Due to future rising energy prices, energy costs in poorly insulated buildings are an important component of operating costs. Another important point is the rapidly growing emissions from the combustion of fossil energy sources. Good insulation in buildings reduces the amount of primary energy and thus, less greenhouse gases are emitted. The renovation potential is high. A large part of the properties consumes more energy than would actually be necessary. Common construction without thermal insulation is responsible for this. It is advisable to invest in renovation, also, in thermal insulation. This will benefit you in two ways. The ancillary (additional) costs will be reduced massively, the living comfort increases and by today’s state subsidies in many countries they will make a contribution to the investment costs.

INTRODUCTION

The aim of the chapter is to analyze the economic and ecological aspects of building renovations.

First, the energy flows that are explained in a building over a period of time. Afterwards it will be shown how the energy distributions on buildings can look like in the future. Here, Life Cycle Assessment is explained briefly and explains what is meant by grey energy.

Then, the economic basics of building renovation are presented. Based on the thermal quality of building elements, two buildings are calculated and simulated in two case studies.

In the next chapter ecological and environmental considerations for green building envelopes, the entire lifecycle of a building is considered. In doing so, a calculation is shown which the environmental authority in Switzerland uses for a life cycle observation of building elements.

SCOPE GENERAL CONSIDERATIONS

Renovating buildings is more useful than ever. The primary energy costs of the last 25 years worldwide are rising continuously. For the energy requirements of buildings depending on the energy requirement for heating and cooling, this means a continuous increase in energy costs. In central and northern Europe, as well as North America and Canada, the heating energy requirement is higher compared to the southern regions, where the demand for cooling energy is correspondingly higher.

The energy (heating and cooling) costs in poorly insulated buildings are an important component of operating costs. Around 30-35 percent of primary energy consumption is accounted for by buildings throughout Europe. And there is an enormous savings potential on energy usage and greenhouse gases savings through higher efficiency through better insulated building envelope in Europe (DENA, 2019).

What can the strategic decisions look like when renovating a building?

Depending on the condition of the building and its interactions, where the property is located, different strategic decisions can be made.

In the building structure analysis, the individual building and plant components are compared with the period of use, the amount of energy consumption, the structural condition of the building envelope, the room layout and the size of the apartments and the standard of the apartments. All these aspects make up a picture of the building structure.

Market Potential

Decisive influence on the choice of modernization strategy also has the general conditions and development opportunities of a property. In addition to the assessment of attractiveness in terms of location, view, development, supply and so on continue to give building regulations information about use and expansion options. Figure 1 shows a matrix between market potential and the possible building structure.

**Figure 1. Modernisation strategy renovation matrix**

*source: Own contribution*