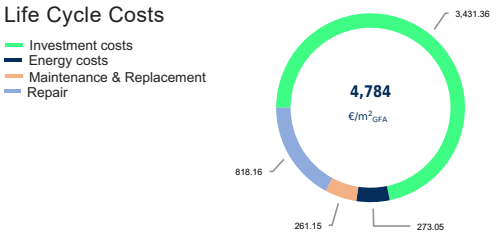
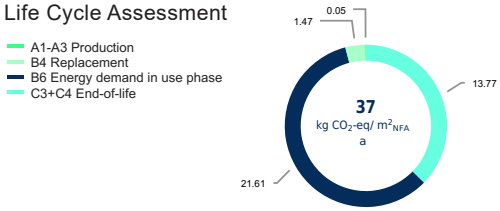
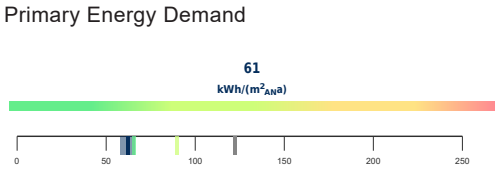
EMANUEL JOHANSSON

CHEAPER BUT BETTER

- An investigation of the interrelation between building costs, life cycle costs, energy use, climate footprint and architectural qualities, of a small rental villa in Sweden







BUILDING DESIGN FOR SUSTAINABILITY

Supervisor: Walter Unterrainer
Examiner: Liane Thuvander
MT´21

Economy in architecture is not primarily building costs, but resource optimization and life cycle costs (LCC). The building industry argue that high costs is hindering quality housing, even though construction prices in Sweden is among the highest in Europe. Economic incentives are missing to build more climate neutral. Life Cycle Assessments (LCA) can help architects identify the largest optimization opportunities for both cost and climate early in the design.

The Swedish building sector causes 20% of the nation's CO2 emissions. The lifecycle of buildings is central to climate change, yet knowledge of LCA remain scarce in most architecture and construction companies. However, interest is increasing as LCAs will become a requirement in 2022.

Moreover, 240 out of 290 municipalities have a shortage of housing and many cannot afford new productions. The issue of high prices has caused a debate on how to build cheaper housing for everyone. A precarious path if lower quality means higher operational costs over the building's lifetime.

Architects have a reputation, often justified, of not caring about costs. Sustainable goals present at the start of projects get lost along the line, as economic calculations do not add up. The widespread neglection of economy teaching in Swedish architecture education is not helping.

The aim was to challenge the perspective of economy and demonstrate how to build cheaper, but better. I re-designed an existing rental villa from 2020 in Viskafors, and investigated the interrelation between building costs, life cycle costs, energy use, climate footprint and the improvement of architectural qualities, such as space, proportion, functionality, and materiality. This was performed through interviews, literature, design experiments and calculations.

According to the chosen parameters and price estimations, large optimization potentials were found. The result of re-designing and improving the building volume (e.g., orientation, roof, and plan layout) and selected materials (e.g., window and foundation), reduced lifecycle cost by 5,4%, energy by 18%, and CO2 emissions by 31%. Replacing the technical equipment further increased total savings up to 10%, 33% and 55%. The result is a summary of plus and minus values, combining selected experiments into one final design proposal.

Keywords:
#economy #LCA #LCC #lifecycle #resource optimization #sustainable housing