Konstruktives Gestalten und Baukonstruktion

TECHNISCHE UNIVERSITÄT DARMSTADT

Master Thesis – Ibrahim Busher, Hajjar

A Comparative Study Between Theory and Practice in Building Retrofit: A Case Study in Hessen

Research Importance and Scopes

- SDGs goals (10,11,12) and SUD program at the TU.
- Rising global energy prices and GHGs emissions. are crucial drivers for energy-efficient solutions.
- Building sector contrubutes with 40%.
- Buildings are responsible for 29% of CO2 equivalent.
- Buildings retrofitting shows high savings potential.
- Energy Consumption (heating). Residential sector – family houses, in Germany, Hesse, Darmstadt

Research Questions

- The status of energy-saving strategies and used instruments for retrofitting residential buildings in Germany → **Programs and instruments.**
- The differences between the retrofit scenarios of a case study and their sustainable developed → **Nummerical Findings.**
- Gaps between the theoretical and practical aspects of residential retrofitting projects. Useful tools be further developed to overcome potential problems → **Discussion**
- The recommendations and potential proposals to increase the working efficiency in the retrofitting field of residential projects → **Proposal approach, Developed tool**

Research Methodology

Step 1. Data collection - Tool 1
- Actual instruments and conditions of retrofitting market.
- Based on several criteria (building age, structure type, size and data availabilitty)
- specify current measures, sizes, dimenstions and other relevant facts.
- prepere specifications tables.

Step 2. Data proccising - Tool 2,3,4
- Two case studies from resedential sector.
- Illustration of renovation roadbump scenarios
- Overview on the scenarios for further development.
- Technical scenarios application

Step 3. Data processing - Tool 2,4
- Intepration of most sustainable scenrio.

Step 4. Feedback and comparisson - 5,6
- Potential issues on practice
- Findings of numerical analysis
- Developed Tools

Step 5. Finalization - Tool 1, 5, 6
- Recommendations
- Conclusion
- Potential future work

Used Tools
- Tool 1: Excel - Graphics, Area determinmation of projects
- Tool 2: BKI Energieplanner - For building's simulation
- Tool 3: U-Wert-Rechner from UBakus
- Tool 4: LEA Hessen: Solar-Kataster - Energetic Potential areas
- Tool 5: Site observation
- Tool 6: Interviews.

1. Building Retrtofit
- Decrese Energy (88.5%).
- Less CO2 Emessions.

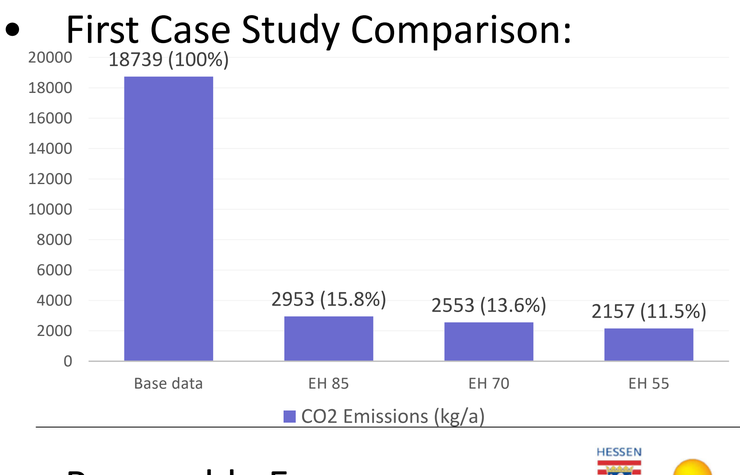
2. Retrofit measures:
- Walls, Basement. ceiling, Roof insulation
- Windows replacement.

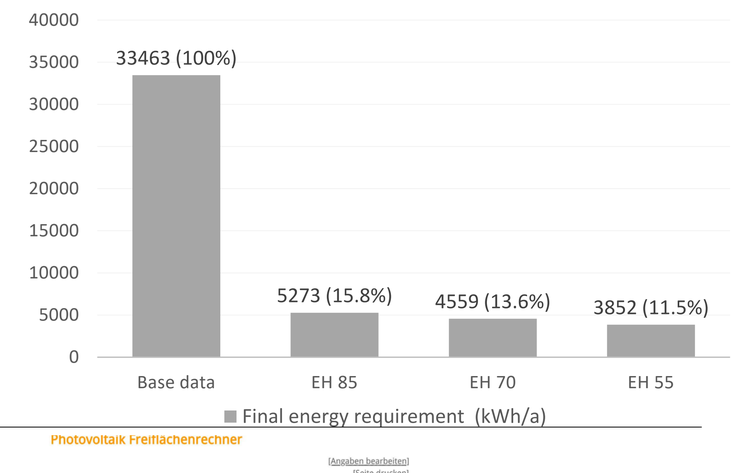
3. The Comparison of
- CO2 Emission.
- Required Energy.

4. The tool function
- Stakeholders' collaboration.
- Coordination of construction management.
- Consruction and quality management evaluate the procedure, operation and monitoring.

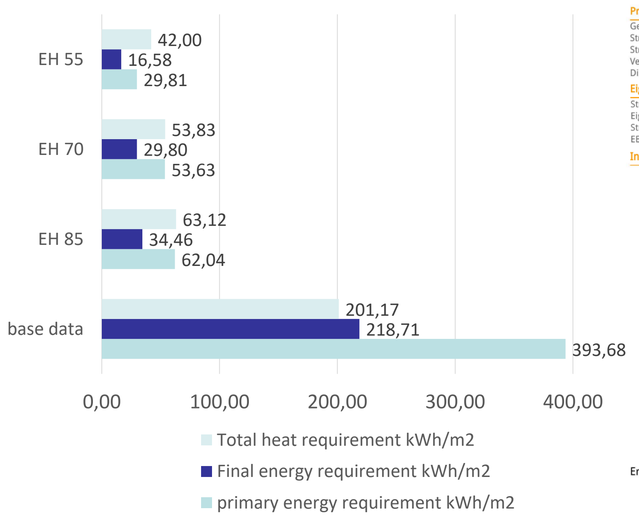
Main Findings

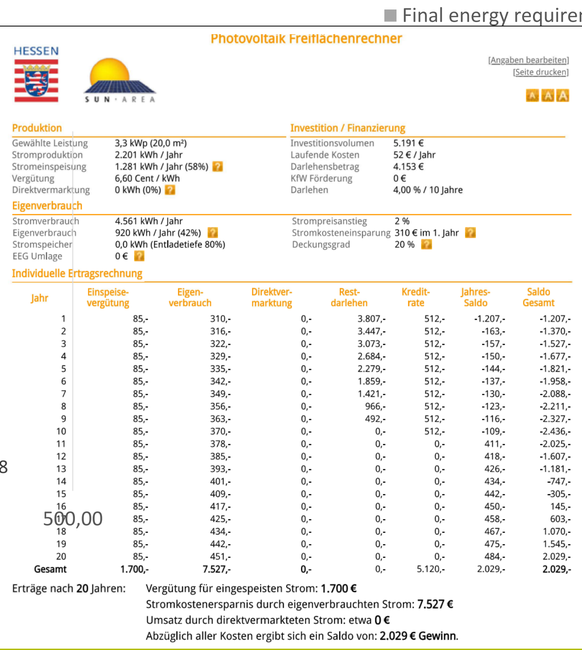
- First Case Study Comparison:

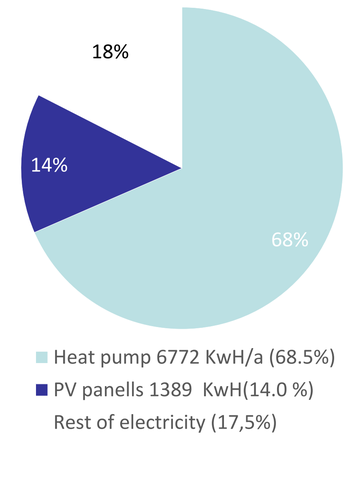




- Renewable Energy

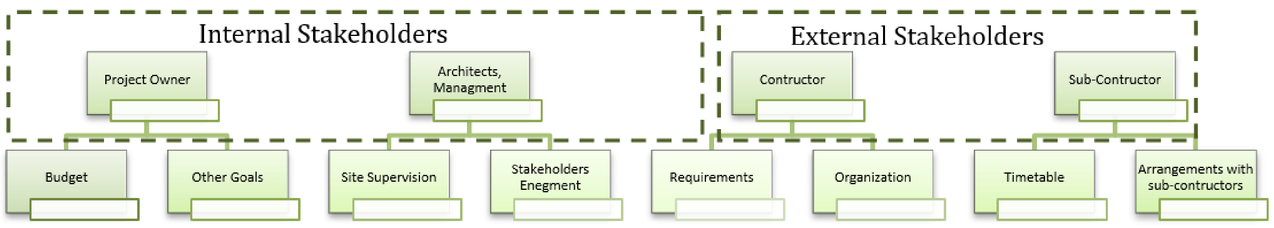






Proposal

- Proposal of Project Management: Coordination Tool



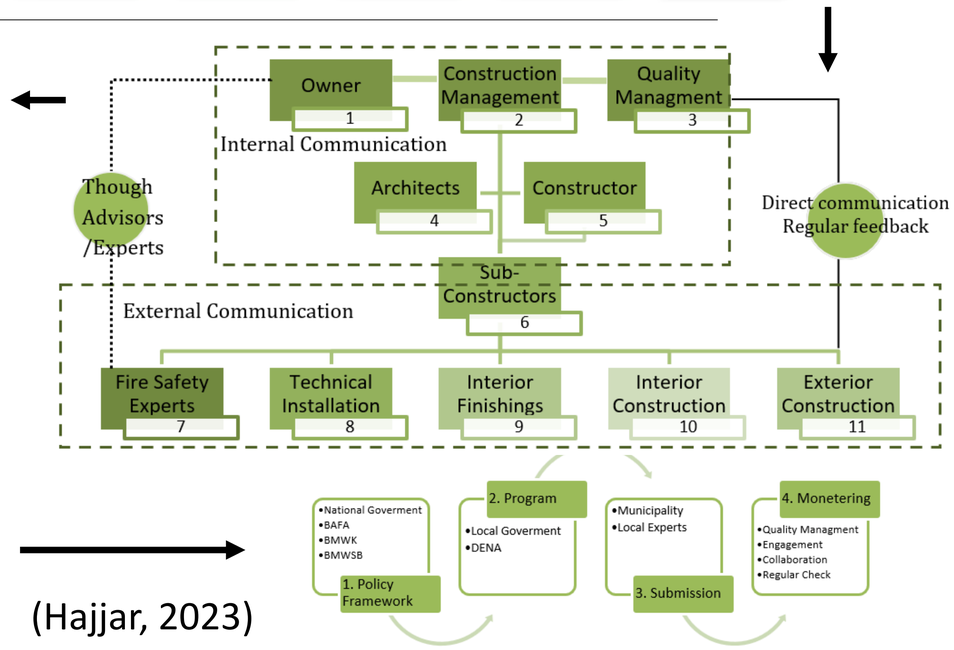
Step 1 Stakholders: 1,2,4
- Application to Architects, Building Managment.
- Authorization from Managment to Construction.
- Preperation and submission of Timetable and Drawings.
- Extracting the Expected expenses and Permition.

Step 2 Stakholders: 2,5
- Authorization from Building Managment to Constructor and Quality Managment

Step 3 Stakholders: 5,6
- Authorization from a contructor to other subcontructors

Step 4 Stakholders: 2, 5, 6 (7, 8, 9, 10, 11)
- Execution from Subcontructors
- Progress Monitoring and Stages Supervision

Step 5 Stakholders: 1, 2, 3, 5
- Finishings and Quality Manamgement
- Prject Operation
- Project Monitoring



(Hajjar, 2023)