Innovation in early planning and design for energy efficient retrofitting

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Passivhus Norden 2013
Many Swedish/European apartment buildings are from the post war era.

- They are 40-60 year old today.
- Extensive renovation needed.
- Wet areas, pipes, electricity, ventilation, windows, balconies, facades…
Renovation barriers

- Financial hinders, large investment costs
- Operation and maintenance costs increase due to old materials/installations
- Can lead to socio-economic segregation
- Often isolated renovation measures based on short-term strategies
- May hinder future renovations
Renovation opportunitets

- See the life cycle profitability!
- Energy and operation savings helps funding the investment cost
- More attractive building and surroundings
- Social benefits for the tenants
- Added rentable area
- Possible rental increase
- Replication potential

Voiron - During renovation
Foto: E2ReBuild
Objectives

- Create innovative decision criteria for energy efficient renovation (energy goal of 30-50 kWh/m²/year delivered energy for heating, hot water and ventilation)
- Identify successful renovation strategies
- Evaluate and spread the on-going work with the Retrofit Advisor - a new easy-to-use decision tool for property owners in early stage
Method

- Evaluation of the seven demonstration buildings
- Questionnaires sent to demonstration leaders
  - Location, construction, before energy use, ownership structure, costs
- Before facts, before energy (energy bills)
- Demo facts, demo energy (calculation results)
- Socio-architectural benefits for tenants

Evaluation and national adaption of The Retrofit Advisor
Evaluation of renovation measures

Envelope improvements

- Prefabricated façade elements (4)
- Additional external insulation in façade (2)
- New windows (5)
- Additional insulation in roof (7)
- Additional insulation in floor (5)
- Improved air tightness (5)

Foto: Frank Lattke
Evaluation of renovation measures

Heating and ventilation improvements

- District/central heating (2)
- Improved heating supply system (4)
- Heat pump (air-water) (1)
- Mechanical return air (1)
- Mechanical return/supply air with heat exchanger (3)
- Window supply (trickle vents) (1)

Foto: Stephen Burke
Evaluation of renovation measures

**Renewable energy**
- Solar thermal energy (4)
- Heat pump (air-to-water) (1)

**Additional improvements**
- New wet areas/kitchens (3)
- Added rental space (3)

Foto: Chiel Boonstra  Foto: E2ReBuild
Evaluation of energy use

Delivered energy before and after renovation
kWh/m², year

Before energy  After energy (calculated)

Augsburg  Halmstad  Roosendaal  London  Voiron

Project goal: 30-50 kWh/m², year

2013-10-17  Kajsa Flodberg, NCC Construction Sverige AB
Early stage decision

- Actual state/repair
- Partial renovation/repair
- Comprehensive renovation
- New construction
The Retrofit Advisor

- Excel-based online tool for building owners
- Empa 2007, beta version 2011, final version 2014
- Ecological data from Ecoinvent
- Investment and operation costs
- Social aspects
Step by step

1. General "before data"
2. Financial key figures
3. Desired renovation level
4. Social aspects questionnaire
5. Potential energy savings are given
6. Final total evaluation
Total evaluation

Financial aspects: important

Environmental aspects: less important

Social aspects: relatively important

Total evaluation (a high number of points is advantageous)
Discussion

- Further development of the Retrofit Advisor
- Innovative and thorough programme
- The Retrofit Advisor as an easy-to-use decision tool?
- How reliable is a Life Cycle Analysis?
- Does the building owner care about social aspects or is it all about the money?