Renewal of post-war housing
- policies and practice

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GBP Network, 30th March 2004, CSTB - Paris

Research motivation

• New housing production in the EU accounts for 1.9 billion units per year that is 1% of the total building stock.
• Dwellings to be built will constitute 5-10% of the total housing stock in Kyoto period 2008-2012.
• In the Netherlands, 3.6 Mton CO2 reduction possible in the existing housing with an average 2,300 € investment per dwelling.
• Making adequate policies requires awareness of practical potential and barriers.
Demolition or renovation?

Research questions

• What is the energy saving potential of post-war housing?
• What are the required expenditures and the expected receipts?
• Will policy developments make energy efficient renovation more attractive in the near future?
• What kind of policy instruments are required to support energy efficient renovation of post-war housing stock?
Goal and scope of the study

1. Case study
   - The Netherlands
   - Feasibility of energy saving measures
   - Energy Performance Advice (EPA)
   - Net Present Value test (NPV)
   - Policy developments

2. Policy implications
   - Regulatory, fiscal and communicative instruments
   - Focus on energy

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Case study

- Hoogvliet, Rotterdam
- Built in 1959
- 76% social rental
- +60m² dwellings
- Uninsulated
- Energy use is dominated by natural gas
- Natural ventilation
Renovation solutions

• Based on the National Package for Sustainable Management.
• Life-cycle target 30 years, 15 years for installations.
• Reference level (current situation, standard maintenance) is compared to standard renovation and to four sustainable renovation solutions:
  • Solution 1: insulation,
  • Solution 2: insulation and HR++ windows,
  • Solution 3: thermal envelope and new installations,
  • Solution 4: thermal envelope, new installations and solar boiler.

Case study results

<table>
<thead>
<tr>
<th></th>
<th>REFERENCE</th>
<th>STANDARD</th>
<th>SOLUTION 1</th>
<th>SOLUTION 2</th>
<th>SOLUTION 3</th>
<th>SOLUTION 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy index</td>
<td>1,13</td>
<td>1,03</td>
<td>0,86</td>
<td>0,78</td>
<td>0,74</td>
<td>0,66</td>
</tr>
<tr>
<td>CO₂ reduction (kg)</td>
<td>-</td>
<td>12,156</td>
<td>31,641</td>
<td>40,327</td>
<td>39,562</td>
<td>48,177</td>
</tr>
<tr>
<td>Expenditure * (€)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>108,179</td>
<td>168,235</td>
<td>322,404</td>
</tr>
<tr>
<td>Energy costs ** (€/year)</td>
<td>18,301</td>
<td>18,141</td>
<td>12,619</td>
<td>11,219</td>
<td>13,882</td>
<td>11,564</td>
</tr>
<tr>
<td>Payback time (years)</td>
<td>-</td>
<td>-</td>
<td>30</td>
<td>45</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

* excluding VAT and subsidies, ** Gas price € 0.367, electricity 0.128 (incl. REB)
Case study results

- Insulation and new windows can reduce the annual gas use with 44% resulting at annual €7,000 saving (€270 per average dwelling) in energy costs.
- Adding new installations can save 79% in gas use and cut energy bills with €6,700.
- Compared to insulation, new installations increase the investment costs with 48%, while the energy savings add with 19% and the CO₂ reduction with 2%.
- Only insulation (solution 1) can be paid back over 30 years.

Zero option

<table>
<thead>
<tr>
<th></th>
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<th>SOLUTION 3</th>
<th>SOLUTION 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO₂ reduction (kg)</td>
<td>-</td>
<td>-62%</td>
<td>-70%</td>
<td>-69%</td>
<td>-75%</td>
</tr>
<tr>
<td>Receipts in total energy costs (€/year)</td>
<td>-</td>
<td>5,522</td>
<td>6,922</td>
<td>4,259</td>
<td>6,577</td>
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</table>

Compared to a standard renovation, renovation solution 2 saves 38% more in annual energy costs, and results at 70% more CO₂ reduction.
Life-cycle cost (LCC) over 30 years

Policy developments

- Impact:
  - The Kyoto Protocol
  - The EC Energy Certificate
  - Taxes and increases in energy prices:
    - +30% gradual increase in 2012 (without Kyoto)
    - +60% gradual increase in 2012 (with Kyoto)
- Less impact:
  - Building regulations
  - Subsidies
  - Voluntary initiatives at national, regional and municipal levels
LCC of standard and renovation solution 2 with current energy price and +30% increase

<table>
<thead>
<tr>
<th>Time (years)</th>
<th>Cumulative LCC</th>
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<tr>
<td>0</td>
<td>€0</td>
</tr>
<tr>
<td>10</td>
<td>€100,000</td>
</tr>
<tr>
<td>13</td>
<td>€130,000</td>
</tr>
<tr>
<td>16</td>
<td>€160,000</td>
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<tr>
<td>19</td>
<td>€190,000</td>
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<td>22</td>
<td>€220,000</td>
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<tr>
<td>25</td>
<td>€250,000</td>
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<td>28</td>
<td>€280,000</td>
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</tbody>
</table>

NPV in 30 years with different energy price scenarios

- Current price
- +30% increase in 2012
- +60% increase in 2012

<table>
<thead>
<tr>
<th>Solution</th>
<th>Current price</th>
<th>+30% increase in 2012</th>
<th>+60% increase in 2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard</td>
<td>163,473</td>
<td>157,957</td>
<td>163,473</td>
</tr>
<tr>
<td>Solution 1</td>
<td>157,957</td>
<td>152,607</td>
<td>157,957</td>
</tr>
<tr>
<td>Solution 2</td>
<td>141,433</td>
<td>136,087</td>
<td>141,433</td>
</tr>
<tr>
<td>Solution 3</td>
<td>125,913</td>
<td>120,567</td>
<td>125,913</td>
</tr>
<tr>
<td>Solution 4</td>
<td>110,393</td>
<td>104,963</td>
<td>110,393</td>
</tr>
</tbody>
</table>
Policy implications: taxes

• Taxes are important in shortening the payback times of environmental investments if the rate is set high enough.
• Increased waste prices can support renovation and Landfill Tax can reduce the final disposal of C&D waste (UK, NL).
• Reduced VAT rate can be applied on renovations or sustainable products and materials (UK).
• Experience from the Netherlands shows that energy tax requires information dissemination to be effective.
• Inequality problem is emphasised in post-war housing.

Other fiscal instruments

• Researches show a free-rider effect in subsidies (NL).
• Preferential credit conditions for sustainable buildings (F, G, UK).
• Specialized funds for sustainable construction (G, NL, UK).
• Added density allocations (CH).
• Trade of CO2 certificates (G, UK).
• Energy consumption as a factor in the allowed rents.
• Fiscal instruments should be backed up by legal means.
Regulations

- Building regulations are required to stimulate also non-forerunners, but few countries have mandatory regulations for the existing housing (G, UK).
- Experience shows that labelling and rating should be used with sanctions (DEN).
- Regulations does not encourage exceeding the standard level.
- Too much standardisation can lead to suboptimalisation, renewal requires flexibility and regional policies.
- Question of control.

Conclusions

- Case study presents great energy saving and CO₂ reduction potential.
- NPV ≤ 0 makes energy investments unattractive for developers.
- Dilemma of investment and profit.
- Despite policy developments energy investments will remain expensive.
Policies

- Whos willing to take the investment if the receipts are smaller than the expenditure?
- How to value the environment and CO₂ reductions?
- How to deal with more abstract measures like the extension of the functional life-cycle?
- Revolution of renewable energy sources?