Renovation of buildings is of benefit to the environment and the economy

Some Austrian experiences

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1 Our main findings

Europe would benefit from a generous renovation program for buildings

In almost all European countries a big share of their building stock has very low thermal standards. Preliminary estimates suggest that about half of the building stock in most European countries would tremendously benefit from a generous renovation program for their buildings. This holds in particular for countries like Austria, which suffered heavily from the damages in World War 2. The hectic post-war reconstruction activities produced buildings with very modest standards in particular as to the thermal quality.

Some evidence for all European countries

- About 40 % of final energy consumption is related to buildings.
- There are plenty of technologies available that make it possible to improve energy efficiency of buildings between factor 4 and factor 10.
- Innovative building technologies – “green buildings” – could become a landmark of EU’s ambitions for a resource efficient economy.
- A full-scale renovation by 2020 of one fifth and by 2050 of four fifth of the building stock is a prerequisite both for meeting the 2020 targets of the EU energy and climate package and for making possible the 80 % reduction of greenhouse gases suggested in the road map to a low carbon economy in 2050.
- The EU, therefore, should aim for a renovation rate of at least 2% of the building stock each year.

Renovation of buildings create multiple benefits

- Such a comprehensive renovation program multiples not only the thermal standards but raises convenience and market value of the buildings.
- The potential for improving the thermal quality and the rising energy prices make renovation activities highly cost-efficient since the saved energy costs are increasingly able to cover the investment costs.
- The macroeconomic impact of renovation programs is a high domestic value added with related impacts for additional employment.
- Due to the high multiplier effect of renovation activities the costs of public incentive schemes are typically overcompensated by additional tax revenues.

Some specific recommendations for Austrian renovation programs for buildings

- Currently only about 1 % of the Austrian building stock is renovated per year.
- This renovation rate should be raised to 3% in order to bring the total post-war building stock to low energy standards over the next 25 years.
- The companies in the renovation sector need credible signals for a higher renovation rate in order to induce expansions of renovation capacities.
- Although Austria has a rather generous support scheme for private buildings, it is recommended to design via the private financial institutions new long-term financing mechanisms for building activities.
- These innovative designs for financing should focus on contracting schemes tied to special long-term loans.

2 Buildings have a key role for meeting ambitious energy and climate targets

Energy demand and emissions related to buildings

For providing thermal services in buildings approximately 30% of total energy requirements are needed. Taking into account transformation and distribution losses, around 40% of energy requirements are related to the thermal quality of buildings and the supply chain of the required energy flows.

Although these numbers vary according to the geographical location in Europe and the age distribution of the building stock, experience with renovation activities all over Europe provides similar evidence:

- Improving the thermal quality of buildings has a high priority:
  Moving to low energy standards by a full-scale renovation results in energy savings between 60 % and 90 %.
- Using renewables for the remaining energy requirements:
  Only after a full-scale renovation a fuel-switch in the heating systems towards renewables is recommended.

An ambitious renovation program for buildings is a prerequisite for meeting ambitious energy and climate targets

Because of the high share of energy needed for providing thermal energy services in buildings, the milestones of EU energy and climate policy will be only met with a major effort for improving the thermal structure of the building stock. These could be the targets for speeding up the renovation rates:

- By 2020 one fifth and
- by 2050 four fifth of the building stock need to undergo a full-scale renovation.

Renovations of buildings generate high additional benefits

An often overlooked aspect of renovation activities are their ancillary benefits:

- the improvement of the convenience and the market value of the buildings
- the resilience against energy price hikes, and
- the direct value added and job effects in the construction sector and the induced multiplier effects for the whole economy.

In addition a focused renovation program will stimulate technologies for buildings that are energy self-sufficient and buildings that accumulate more energy than they need for themselves, the plus-energy buildings dubbed also as the power plants of the future. Austria can already demonstrate high competence with these technologies both in research and implementation. This competence opens competitive advantages in export markets which for some Austrian companies have already materialised.

3 Austrian experiences with renovation programs for buildings

The current renovation activities for buildings are not sufficient

Currently only about 1 % of the residential buildings undergo a renovation per year. This share is a little bit higher for multi-story buildings. Even with a 3 % rate it would take until 2035 to achieve a complete renovation of the post-war period building stock.

Austria already provides a fairly generous support program for residential buildings amounting to about one percent of GDP per year. For at least two reasons, this program obviously creates only limited incentives for renovation activities. One is the emphasis on supporting new buildings, the other the increased use of these funds for activities not linked to construction activities at all.

New financial incentives from the Federal Government of Austria for renovating buildings

In addition to awareness activities for renovation of buildings the Federal Government, therefore, in 2009 launched a support program targeted to improving the thermal quality of buildings.

These are some design features of this program:

- Incentives are given to private residential buildings for thermal improvements.
- The required thermal standards after the renovation are 75 kWh/m^{2}a for single family buildings and 35 kWh/m^{2}a for multi-family buildings.
- For the investments which qualify for the program, a 20 % subsidy is provided which is capped at € 5,000.

Evaluating the impacts of the 2009 renovation program of the Federal Government

From an evaluation of this program these experiences have emerged:

- A high leverage effect of the support scheme.
  € 61 m of subsidies induced € 485 m of investments.
- A widespread impact.
  Almost half of a percent of the residential buildings benefitted from these activities with an estimated reduction of 0.7 % of energy for heating per year.

Some key indicators which result from this renovation program could be compared with other countries. For example for saving under the program presented per year one Peta-joule of energy for heating in Austria

- € 51 m subsidies are needed,
- € 404 m investments are induced, and
- 28,000 tons of CO_2 are saved per year.

4 The economics of renovating buildings

Differentiating between investment costs and user costs

There is a lot of confusion about the evaluation of the economic impacts of renovation activities. A clue for escaping these confusions is differentiating between investment costs and user costs which are synonymous to rental and leasing costs.

We demonstrate this by looking at Table 1 which exhibits examples of renovation projects for Austria. We list at prices for 2008 for single-family and multi-family buildings for 2008 and 2020 actual and expected investment costs, the changes in energy flows from the renovations and energy prices. Given the assumed depreciation period of 40 years and an interest rate of 2.5 % we obtain the annual user costs which can be compared with the yields from saved energy flows. It turns out that even under the assumption of constant energy prices the saved energy costs contribute substantially to covering the investment costs and may even fully finance the investment if energy costs continue rising as expected.

Table 1: Investment costs and user costs for renovating buildings to low energy standards (LES)

Renovating buildings		Single-family residential		Multy-family residential		Public non-residential	
Unit activity	1 m2	2008	2020	2008	2020	2008	2020
Investments							
Depreciation period	years	40.0	40.0	40.0	40.0	40.0	40.0
Interest rate	% p.a.	2.5	2.5	2.5	2.5	2.5	2.5
Investment price	€/m2	710.0	539.6	390.0	296.0	680.0	516.8
User cost of investment	€/m2 p.a.	35.5	27.0	19.5	14.8	34.0	25.8
Operating							
Energy flow before renov.	kWh p.a.	291.0	253.0	160.0	136.0	187.0	145.0
Change energy flow	kWh p.a.	-249.0	-209.0	-116.8	-94.1	-152.9	-110.9
Change	*in %*	*85.6*	*82.6*	*73.0*	*69.2*	*81.8*	*76.5*
Energy price (mix)	€/MWh	82.0	82.0	82.0	82.0	82.0	82.0
Change of energy cost	€/m2 p.a.	-20.4	-17.1	-9.6	-7.7	-12.5	-9.1
Net cost of activity	€/m2 p.a.	15.1	9.8	9.9	7.1	21.5	16.7

Source: EnergyTransition (2010)

Macroeconomic impacts of renovation activities for buildings

For evaluating the macroeconomic impact of renovation activities we consult the input-output table. Not surprisingly we discover the high value added and the high induced economic activities due to the low import content as indicated in Table 2.

For Austria the impact of € 100 million investments into renovations of buildings is € 126 million value added and full-time equivalent employment for 1,202 persons.

Table 2: Macroeconomic impacts of renovation activities for buildings

Renovating buildings		€ 100 m Investments
Value added	€ m	126
direct	€ m	90
induced	€ m	36
Employment	Persons	1,202
direct	Persons	881
induced	Persons	321

Source: EnergyTransition (2010)

References

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