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BEEN

Baltic **E**nergy **E**fficiency **N**etwork for the Building Stock

BEEN Project Results, Including Detailed Findings and Recommendations

Practical Manual

addressing the issue of
how to activate large-
scale energy-saving
refurbishment
measures for
prefabricated housing

Baltic Sea Region INTERREG III B

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BEEN
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for the Building Stock

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Preface

This summary of the BEEN project results is a supplementary document presented in the framework of the EU INTERREG III B project BEEN (Baltic Energy Efficiency Network for the Building Stock) final conference on 11 December 2007 in Berlin.

It expounds upon and explains the results and recommendations summarized in the BEEN-policy- paper in more detail and is directed at all parties interested in a summary of information on approaches to, problems and possibilities for increasing the initiative to refurbish prefabricated residential buildings in Central and Eastern European countries.

Heat energy saving measures are central to the refurbishment of prefabricated housing because thermal insulation is paramount to both heat energy savings and to repairing facade damage. The advantages of heat energy saving measures, particularly with respect to prefabricated housing, are undeniably evident:

- Reducing heat energy consumption by 40 to 50% in easily attained. This results in an average reduction in the primary energy requirement of 0.5 to 0.7 t SKE[1] per flat per year leading to a reduction of CO_2 emissions by on average 1.0 to 1.4 t per flat and year.
- A thermally insulated facade results in dry, warm exterior walls which halt initial weathering damage to the facade. Residents' experience more warmth and lower heating costs, in addition thermally insulated exterior walls are no longer risk mould or mildew growth.

In view of these advantages, the only question remaining is which energy-saving measures are optimal from a cost-benefit point of view and how to finance them.

This summary comprises six sections:

1. Potential savings of energy-saving measures
2. Scope for financing energy-saving measures with regard to housing costs and income
3. Privatization of prefabricated housing and the capacity for action of the relevant ownership types after privatization
4. Rules for reaching decisions about implementation of refurbishment measures
5. Cost-effectiveness of energy-saving measures under consideration
6. Experience with financing and funding of refurbishment measures

Each section ends with a summary of the findings reached in the BEEN Project, the obstacles located and the recommendations derived from it, in order to give impetus to large-scale refurbishment. Hence you can read at first the summaries and recommendations and turn back to details afterwards in case of nearer interest. To this purpose the pages with summaries and recommendations are colored.

Peter Wollschläger

[1] SKE = "Coal Unit" = reference unit for evaluating energy sources. One kilogram of coal is equivalent to c. 7 to 8 kWh. 1 liter of oil has a calorific value of 9.5 to 12.3 kWh; one square meter of natural gas has a calorific value of c. 9.0 kWh.

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1 Savings Potential of Energy-Saving Measures

1.1 Prefabricated housing stock and definition

Needless to say, the primary question in considering the refurbishment of prefabricated housing is the number of flats of this type in relation to total housing stock.

From a technical standpoint "prefabricated housing" refers to buildings whose load-bearing structure mainly comprises large precast concrete slabs.
In view of the practical focus of this handbook, which aims at triggering refurbishment initiatives for privatized, formerly state-owned housing stock, prefabricated housing is defined as follows:

- Multi-storey residential buildings erected between 1950 and 1990 with standardized construction methods under the direction of the state or cooperatives;
- Therefore, standardized residential buildings of masonry or block construction also fall under the category of prefabricated housing;
- Residential buildings constructed after 1990 are not included, because they are usually built to higher standards and thus do not require large-scale refurbishment. Smaller houses for one or two families have been excluded;
- When comparing data and refurbishment strategies for Germany, only East German housing stock is included because only the multi-storey residential buildings constructed between 1950 and 1990 in eastern Germany and eastern Berlin (the former GDR) are directly comparable to prefabricated housing stock in Central and Eastern European countries.

The following spreadsheet gives an overview of prefabricated housing stock in the EU countries participating in the BEEN project:

Country		Population in millions [2]	Total housing stock [2] (number of flats)	Of these in prefabricated housing [3]	Occupants per flat [4]
Estonia	**(EE)**	1.4	624,000	**406,570**	**2.24**
Latvia	**(LV)**	2.4	958,000	**416,460**	**2.51**
Lithuania	**(LT)**	3.5	1,295,000	**790,000**	**2.70**
Poland	**(PL)**	38.2	11,800,000	**5,200,600**	**3.24**
East-Germany (G)	**1990**	14.7	6,570,000	**2,150,000**	**2.24**
	2005		7,710,000		**1.91**
	Share in East Berlin			273,000	
Germany total		82.5	38,500,000		2.14

[2] *These figures are taken from generally available statistics with slight variations according to source.*

[3] These figures were provided by project partners in the context of the BEEN project, in connection with figures on privatization. The number of privatized flats plus the number of flats remaining in the hands of cooperatives basically constitutes the total of prefabricated flats addressed in this handbook. These figures are lower than the total number of flats which were built between 1950 and 1990 according to generally available statistics.

[4] These figures result from dividing the first and second columns. In statistical records, different values are also given: 2.4 for Estonia and Latvia, 3.0 for Poland.

The importance of prefabricated housing refurbishment is due to the fact that, in Central and Eastern European EU countries, more than half the population lives in prefabricated housing structures. Even in the eastern part of Berlin approximately half the population lived in large estates of prefabricated housing.

1.2 Basic types of prefabricated housing and main construction features

A large number of standard series residential buildings was developed and constructed in the regions these countries are located in. Three main types can be identified in relation to energy refurbishment need:

Type	Construction years	Construction features	Typical heating	Annual heat consumption kWh/m²
Type 1	1950 to approx. 1965	Masonry construction (bricks), modular construction (blocks)	Stove heating	approx. 150 to 180
Type 2	1962 to approx. 1980	Exterior walls constructed of one-storey, single-layer concrete slabs	Central heating (district heating), usually one-pipe system	approx. 140 to 170
Type 3	from 1975	One-storey, triple-layer concrete slabs (sandwich panels) with a thermal insulation core (approx. 5 cm)		approx. 100 to 140
New Buildings	from 1990	Usually individual constructions rather than prefabricated housing	Central heating (two-pipe system)	approx. 75 to 90

The following spreadsheet shows how common the three different types of prefabricated housing are in BEEN countries:

Type	Estonia	Latvia	Lithuania	Poland	East- Germany
Type 1 masonry construction and modular construction	35,0%	40,0%	35,0%	35,0%	33,0%
Type 2 exterior walls constructed of one-storey, single layer concrete slabs	**50,0%**	**50,0%**	**50,0%**	**50,0%**	30,0%
Type 3 triple-layer concrete slabs with a thermal insulation core	15,0%	10,0%	15,0%	15,0%	**37,0%**

Type 2, usually with district heating, is the most common type in the new EU countries. There are fewer Type 3 prefabricated buildings in the Central/Eastern European countries (unlike in Eastern Germany); this is advantageous for refurbishment because:

- Types 1 and 2 are usually structurally more stable. Thermally insulated facades can be mounted without structural fortification.
- Type 3 is clad with concrete facade slabs. In this case the structural stability of the anchors must be tested before mounting a thermally insulated facade.

On the other hand the exterior walls of type 3 buildings already have an inner layer with a higher insulation value (and are of more recent date), so additional facade insulation to increase energy efficiency is less urgently required.

1.3 Heat energy consumption: climate dependency

A building's heat energy need (e.g. Type 2 prefabricated housing) is determined by the climate of its location. Outdoor temperature patterns vary according to the regional climate and determine when heating is required to keep housing sufficiently warm.

The construction physics calculation for heat energy requirement expressed in the term heating degree day index (HDD index) summarizes the effects of climatic influences summarizes using the following formula:

HDD index = duration of typical heating period (in days) x average temperature difference between indoor and outdoor temperature in ° C.

National standards define which HDD index should be used to calculate building needs.

The actual heat consumption of a building, however, results from the actual HDD index, i.e. actual use of heating and actual room temperatures.

Thus, surveys among BEEN partners revealed differences in heating period duration and varying average room temperatures in winter. Therefore, longer heating periods with higher temperatures in a mild climate can result in the same heat consumption as shorter heating periods (with cooler room temperatures in the transitional seasons) in a colder climate:

- The long heating period in Germany is explained by the fact that heating is used outside the regular heating period (1 October to 30 April = 212 days), if the temperature at 22:00 is below 12° C (for prolonged periods);
- The shorter heating period in the Baltic States is explained (despite colder climates) by the fact that less heating is used in the transitional seasons (although residents often use individual supplementary heating in the form of electric heaters).

Climate-related figures during heating period[5]	**Estonia**	**Latvia**	**Lithuania**	**Poland**	**Germany**
Duration of heating period in days	210	206	197	225	252
Average outdoor temperature in ℃	- 1,00	- 0,40	0,20	2,30	4,90
Average room temperature in ℃	19,00	19,00	19,00	19,00	20,00
Heating-Degree-days-number (HDD-index)	**4.200**	**3.996**	**3.704**	**3.758**	**3.805**
Ratio of HDD-indexes	**110%**	**105%**	**97%**	**99%**	**100%**
Heat demand for an assumed identical prefabricated building type 2	171,08	162,79	150,86	153,06	155,00

There are no significant differences in the comparison of the BEEN countries. The influence of heating technology standards also plays a role just as existing climatic differences do:

- The average room temperature in Germany during the heating period is 20° C (lower at night, higher in daytime); residents can use thermostatic valves to regulate the temperature between 18 and 25° C according to their individual requirements. Heating costs are calculated according to metered consumption, thus encouraging residents to employ economical heating practices (for more details see 5.4).
- In Central and Eastern European countries (with the exception of Poland), one-pipe central heating systems without valves are common, meaning that residents can not

[5] Estimation in the frame of BEEN based on figures of the BEEN- partners; the fine tuning could not be finished during the project period

influence room temperature (except by opening windows). They have to accept heating as it arrives. One-pipe heating systems have the disadvantage of rendering it difficult to ensure even heat distribution to all flats. There are two possible courses of action:

- either the heating system is set high enough that even the coldest flat is receives enough heat (leading to overheating of other flats) or
- the heating system is set so that on average no one must suffer the cold; in practice, however, this causes flats in disadvantageous locations (on the edges or corners of the building) to lack heat in winter.

This means that implementing heat energy-saving measures which allow room temperatures to be regulated individually after refurbishment leads to heat energy savings. Flats which were previously too cold will now be warmer. This compensation effect reduces attainable savings accordingly.

1.4 U-values and potential heat energy consumption savings for prefabricated housing

When contemplating energy-saving measures, the difference between *heating demand* and *heating consumption* must be accounted for. Heating consumption is the actual heat energy consumption recorded by the heating system and invoiced to the customer. Heating demand, on the other hand, is a theoretical value calculated according to a standardized process and enabling an objective comparison of the quality of buildings from an energy standpoint.

In order for residents to formulate an opinion regarding implementing energy-saving measures, concrete practical information is needed on which measures are available and the savings on heating costs they would achieve.

Insulation layer thicknesses and U-values before and after refurbishment are often mentioned in discussions about refurbishment. It is, therefore, worthwhile to acquire basic knowing of energy savings calculations, especially given the fact that such background information relating to construction physics is easily comprehensible.

The characteristic energy value of structural members is the U-value (in W/m²K). The U-value states how much heat energy in watts (W) seeps through a one square meter surface area of the structural elements (per 1 ° C or 1 ° K temperature difference between internal and external air temperatures[6]).

Heat loss (transmission heat loss) through walls, ceilings and windows is calculated using the formula:

Heat loss (in Wh) = surface area of structural element area in m² x HDD index[7] x 24 x U-value of the structural element

The lower U-value a structural element has, the lower the heat loss. Therefore, reducing the U-value of structural elements by appropriate measures is decisive for the extent of possible energy savings.

The spreadsheet below illustrates which structural elements of typical Type 2 prefabricated housing concede the greatest heat loss, which heat energy-saving measures come into consideration and typical U-values before and after refurbishment.

[6] Temperature differences are given in ° K, where 1 ° K is identical in value to 1 ° C.
[7] See “heating day degree index” (HDD index) in Section 1.3; multiplied by 24 to calculate the length of a day in hours.

	Before refurbishment		After refurbishment			
Building components	Typical U-value in W/m²K	Heat energy loss in kWh/m² annually	Energy-saving measures	Typical U-value in W/m²K	Heat energy loss in kWh/m² annually	Savings
Exterior walls	1.30	82.00	8 cm outer insulation	0,35	22,08	73,1%
Windows (transmission)	3.40	41.00	New windows (double glazed)	1,30	15,68	61,8%
Windows (ventilation)	Heat loss through unsealed joints	41.00	Ventilating only when necessary		20,50	50,0%
Top-floor ceiling	1.00	8.00	10 cm of additional insulation	0,30	2,40	70,0%
Cellar ceiling	1.80	4.00	6 cm of insulation	0,50	1,11	72,2%
Heating pipes		4.00	Insulation		2,00	50,0%
Total heat-energy loss		**180.00**			**63,76**	**64,6%**
Heat gain (solar and internal)		- 25.00			- 25,00	
Heat demand		155.00			38,76	
Practicable reduction in heat consumption					**75,00**	**51,6%**

The spreadsheet purpose of the spreadsheet is to give an idea of the energetic weak points of prefabricated housing and the scale of possible improvements:

- Windows and exterior walls permit far and away the greatest heat energy loss. Window surface area in prefabricated housing is much smaller than that of the exterior walls (c. 25 to 30%), nonetheless windows allow almost as much heat loss as exterior walls. This is because, in addition to transmission heat loss, which is calculated in U-values, as for exterior walls, further heat loss is caused by opening windows to ventilate and, unintentionally, through poorly fitting windows and untight seals around windows.
- The advantages of installing well-sealed windows is improved U-values of the glazing and window frames and the elimination of unintentional ventilation heat loss through unsealed window joints. The heating requirement for warming the fresh air necessary for healthy living is, however, not eliminated (c. 20 m³ per person per hour). This consumes a share of c. 20 kWh of the total heating need per m² living space annually.
- The spreadsheet also shows that much lower U-values can be reached for exterior walls than for windows. Therefore, when replacing windows, it is particularly important to install thermally coated double-glazed windows with certified U-values ranging from 1.1 to 1.3 W/m²K. If windows with only simple double glazing are installed (without coating or special insulating gas filling), U-values of only 2.8 W/m²K are achieved; this would be nonsensical given the fact that coated double glazed windows are available in EU countries at practically the same cost.

The spreadsheet shows that transmission heat loss can easily be reduced by 60 to 70%. In practice, however, savings of “only” 45 to 55% are usually achieved. Why is this?

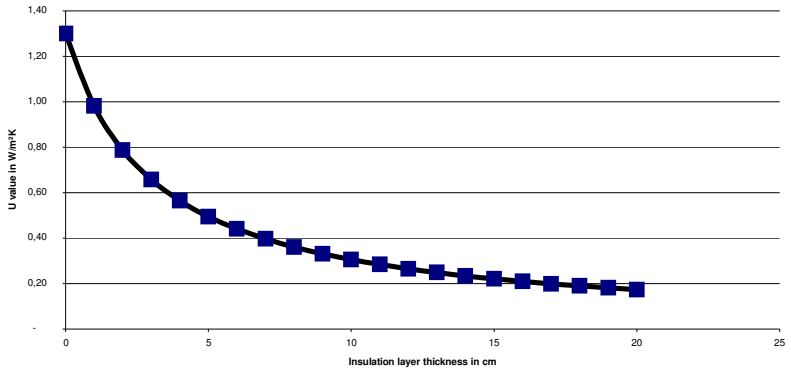
One reason is that in buildings which were previously underheated, residents must compensate for the lack of heat, which in turn impinges upon potential savings potential.
Another reason is that the savings calculated in theory are reduced in practice by thermal bridges in construction, which are hard to avoid. Thermal bridges[8] occur most frequently in the following areas:

- around loggias and balconies, which are almost impossible to encompass completely with thermal insulation without leaving gaps. The ideal solution would be loggias mounted on the exterior walls;
- around building foundations and roof edges;
- around window embrasures and window sills.

1.5 Insulation layer thickness

As the spreadsheet in 1.4 shows, thermal insulation of exterior walls achieves the greatest savings. This poses to the question of optimum insulation layer thickness from a cost-effectiveness point of view.
As the following spreadsheet and diagram illustrate, the U-values of exterior walls do not increase in a linear relationship to insulation layer thickness.

Thickness of insulation layer	U-value in W/m²K	Heat energy loss in kWh/m² per annum	Savings	Increase
Uninsulated exterior wall (Type 2 prefabricated housing)	1,30	82,00	–	–
1 cm	0,98	61,82	24,6%	24,6%
2 cm	0,79	49,83	39,2%	14,6%
4 cm	0,57	35,95	56,2%	16,9%
8 cm	0,35	22,08	73,1%	16,9%
12 cm	0,27	17,03	79,2%	6,2%
16 cm	0,21	13,25	83,8%	4,6%
20 cm	0,17	10,72	86,9%	3,1%



[8] Thermal bridges

The spreadsheet and diagram show that the first 8 cm of thermal insulation reduce heat need by 60 kWh/m² annually, but that doubling the insulation thickness only increases savings by a further 7 kWh/m² per year. Therefore insulation layers thicker than 8 to 10 cm are only sensible when they do not incur additional costs.
In practice, U-values below 0.4 W/m²K for walls only produce measurable additional savings when all thermal bridges in the construction have been eliminated, because thermal bridges have a more considerable impact when U-values are lower than 0.40 W/m²K. In addition, windows are an increasingly notable weak point because, unfortunately, it is impossible to obtain values below 1.10 W/m²K with double glazing.

Obtaining low energy standards for heat energy consumption below 30 to 50 kWh/m² per annum requires further, more expensive measures in the course of refurbishment:

- Triple-glazed windows (U-values: 0.90 to 1.10 W/m²K);
- A centrally regulated ventilation system with heat recovery system;
- Thermal solar panels to pre-heat heating water.

Even in Germany, to date projects like these only exist as individual pilot projects (so-called low-energy houses).

1.6 CO_2 emissions

In view of climate change and international agreements on greenhouse gas reduction, cutting CO_2 emissions is of particular interest when performing building refurbishment. Heating residential housing produces about 15 to 18% of all CO_2 emissions[9] in Germany.
In order to achieve the ambitious national and EU goals for CO_2 reduction, thermal insulation of all still uninsulated exterior walls, unless prevented by preservation order, is the key measure. Germany has made a great contribution to achieving this by almost completing energy-saving refurbishment of prefabricated housing in Eastern Germany.

The level of CO_2 reductions achievable by energy-saving refurbishment depends on the method of heat generation and the energy source used. In the new EU countries and in East Germany, large estates of prefabricated housing were usually heated by district heating.

The spreadsheet below gives an overview of the scale of CO_2 emissions in kg per kWh of heating (end energy consumption).

Heating provided by	Primary energy used				
	Oil	Anthracite	Charcoal	Natural Gas	Wood
District heating	0,36	0,44	0,44	0,27	0,39
District heating from plants with waste heat recovery systems	0,20	0,24	0,24	0,14	0,21
Locally generated heating	0,31	0,31	0,37	0,23	0,33
Electrically generated heating	0,84	1,03	1,02	0,62	0,90

[9] The literature mentions shares of up to 40% but this includes to the entire building stock (including commercial buildings) and total energy consumption (including hot water, cooking, lighting, air conditioning). The proportion of energy consumed to heat residential housing (c. 17%) can be calculated by comparing average energy consumption (c. 185 kWh/m² living area annually) for 38.5 million flats (with 3.3 billion m² living area) to the annual total primary energy consumption of c. 500 million t SKE (coal units) and an average end energy calorific value of 6.5 to 7 kWh per 1 kg SKE.

Energy-saving measures result in an annual CO_2 reduction of c. 1 t for a 54 m² flat in a Type 2 prefabricated building:

	BEFORE Refurbishment	AFTER Refurbishment	Savings
Typical heat energy consumption in kWh/m²a	155,00	75,00	80,00
Annual heat energy consumption in kWh	8.370,00	4.050,00	4.320,00
CO_2 emissions from district heating with combined heat and power generation in kg per kWh of district heating	0,24		
Annual CO_2 emissions per flat in kg	**2.008,80**	**972,00**	**1.036,80**

1.7 Energy savings on hot-water heating

This handbook concentrates on heat energy saving measures because heating consumes by far the largest proportion of energy in residential buildings (annual heat energy consumption for a 54 m² flat before refurbishment: c. 8,400 kWh).
Energy-saving measures in water heating are not dealt with specifically in this handbook. However, here are a few hints:

- The most efficient method of hot water heating is point-of-use heating with gas-powered water heaters without boilers (along with gas for cooking). The end energy consumption for point-of-use hot water heating is about 1,500 kWh for an average flat (c. 200 m³ of gas annually).
- However, gas-powered continuous-flow water heaters require exhaust chimneys, which are not usually present, so residential buildings with district heating have to provide hot water by district heating too (separate hot water circulation pipes). Central hot-water heating, however, results in considerable heat loss in pipe networks and storage boilers, so the cost of hot water can be one-third that of heating costs (up to 3,000 kWh for an average flat).
- While carrying out energy-saving measures, therefore, thermal insulation in the hot water distribution network should also be improved. In addition, the use of solar energy (thermal solar panels on the roof) is a useful supplement to central water heating.

1.8 Resume Section 1

1. Heating residential buildings requires a large amount of energy and the combustion process for heat generation causes high levels of CO_2 emissions. Heating an average flat in an unrefurbished prefabricated building requires about 1 to 1.5 t oil (= c. 1,000 to 1,500 m ^{3} natural gas) annually, depending on the effectiveness of heat generation and distribution.

2. Heat consumption in prefabricated buildings can be halved (resulting in consumption of about 70 to 80 kWh per m² living a year)[10] by implementing relatively cheap and simple measures. This leads to reduction in average annual CO_2 emissions to 1 to 1.4 t per flat.

3. By reducing energy consumption and CO_2 emissions, heat energy-saving measures have beneficial effects for energy resources and climate change; in addition, they are key to building refurbishment and sustaining the long-term value of prefabricated buildings:

    - Saving energy does not lead to restrictions; on the contrary, it results in increased warmth and comfort.

    - The key measure in energy saving, thermal insulation, protects concrete facades from weathering, makes repairs to the facade unnecessary and improves the appearance of unattractive concrete facades.

[10] Reduction of heat consumption to even lower levels (e.g. 35 to 45 kWh/m² area = low-energy standard, achievable cheaply for new buildings) is disproportionately expensive for existing buildings and is therefore not the subject of the BEEN project, where extensive implementation of the basic package of energy-saving measures already presents an ambitious goal (see 5.5.2).

2 Scope for Financing Refurbishment Measures with Respect to Housing costs and Household Income

2.1 Typical housing costs

However good the technical concepts and planned measures, actual implementation is dependent on what residents can afford and what scope for financing this allows.
The starting point for calculating the financial scope for implementation of refurbishment measures is housing costs paid by residents BEFORE refurbishment.

The following spreadsheet lists the typical housing costs (per month and per flat) as indicated by the BEEN partner countries (as of the end of 2006):

	Estonia	Latvia	Lithuania	Poland	East Germany
Living space in m²	55,00	50,00	59,60	50,00	58,00
Operating costs excluding heat (water, waste disposal, etc.)	25,22 €	7,00 €	16,09 €	26,00 €	89,32 €
Administrative costs	–	5,00 €	0,70 €	10,00 €	25,00 €
Debt inherited from construction	–	–	–	–	29,00 €
Costs for crucial repairs	–	3,50 €	–	1,50 €	16,11 €
Reserve funds for extensive maintenance	14,10 €	–	–	14,37 €	32,22 €
Electricity for lighting and cooking gas	7,61 €	9,66 €	–	16,04 €	28,33 €
Heating costs	23,14 €	21,00 €	24,44 €	28,94 €	43,50 €
Hot water	6,60 €	6,00 €	11,92 €	12,50 €	13,34 €
Total typical housing costs	76,67 €	52,16 €	53,15 €	109,35 €	276,82 €

Figures for the new EU countries reflect typical costs for condominiums. In order to be able to make a direct comparison, the figures for Germany reflect the typical costs arising for a rental flat owned by housing companies, not including costs for financing refurbishment. In actuality, in addition to operating costs, an all-inclusive “net rent” intended to cover all expenditure on administration, debts, repairs and maintenance is charged for rental flats in Germany. This “net rent” is usually exceeds the actual costs for administration, debts, repairs and maintenance. It is assumed (for reasons of direct comparison with the BEEN countries) that the excess from the “net rent” is available for refurbishment measures and not siphoned off as profit.

The following spreadsheet shows the typical operating costs based on cost structures in Berlin (beyond heating and hot water):

Typical operating costs (excluding heat) in Germany in €/m² a month		
	in €/m² per month	in € monthly
Fresh water	0,23 €	13,34 €
Wastewater/drainage	0,32 €	18,56 €
Custodian, cleaning services	0,22 €	12,76 €
Waste disposal	0,21 €	12,18 €
Property tax	0,14 €	8,12 €
Lift	0,12 €	6,96 €
Garden upkeep, snow removal	0,09 €	5,22 €
Insurance	0,07 €	4,06 €
Building lighting	0,05 €	2,90 €
TV aerial, cable television	0,05 €	2,90 €
Street cleaning	0,04 €	2,32 €
	1,54 €	**89,32 €**

Water and waste water costs have come constitute the biggest expense behind heating and hot water:

- In Berlin one cubic meter of fresh water costs c. €2.00 and one cubic meter of waste water costs €3.00;
- Water consumption in Germany is c. 100 liters per person per day (c. 40 m³ per person per year)

2.2 Housing costs in relation to incomes

The next step in when planning financing for refurbishment measures is to consider how average housing costs relate to average household incomes. The BEEN partner countries (as of the end of 2006) provided the following figures[11] for average disposable household incomes (after tax and social insurance contributions).

	Estonia	Latvia	Lithuania	Poland	East Germany
Average household disposable income	450,00 €	350,00 €	366,00 €	530,00 €	1.700,00 €
Monthly housing costs	76,67 €	52,16 €	53,15 €	109,35 €	276,82 €
Current burden caused by housing costs	17,0 %	14,9 %	14,5 %	20,6 %	16,3 %
Reasonable burden for housing costs in % of income	25,0 %				
Reasonable monthly housing costs	112,50 €	87,50 €	91,50 €	132,50 €	425,00 €

Given the assumption that housing costs of up to around 25% of average household income are acceptable, a scope for refurbishment apportionments in the BEEN countries is present.

[11] In the meantime higher figures for average household incomes have been provided in the context of best-practice projects, which is plausible considering economic progress in the new EU countries. Therefore as far as scope for financing refurbishment measures is concerned it can be assumed that average household incomes in the new EU countries are somewhat higher than these figures indicate.

2.3 Scope for refurbishment measure apportionments

Assuming the housing costs and incomes indicated in 1.1 and 1.2, there is scope for financing refurbishment measures which would entail monthly apportionments of up to on average €25.00 per flat in the new EU countries. The equivalent scope for refurbishment apportionments in Eastern Germany is about €125.00 a month.

	Estonia	Latvia	Lithuania	Poland	East Germany
Reasonable monthly housing costs	112,50 €	87,50 €	91,50 €	132,50 €	425,00 €
Current housing costs	76,67 €	52,16 €	53,15 €	109,35 €	276,82 €
Reasonable housing costs minus housing costs to date	35,83 €	35,34 €	38,35 €	23,15 €	148,18 €
Reserves for increasing housing costs (foreseeable)	10,00 €	10,00 €	13,00 €	2,00 €	23,00 €
Income remaining for refurbishment measure apportionments	25,83 €	25,34 €	25,35 €	25,15 €	125,18 €

The high figure for Germany explains why extensive refurbishment measures could be financed in Eastern Germany. The low level of refurbishment activity in the new EU countries to date reveals that the increasing financial scope has been little used thus far.
Regardless of how this contribution is calculated, the question remains whether the presumed average refurbishment apportionment of €25.00 per flat actually proves reasonable in practice. At present, the results of BEEN seem to indicate that the assumption of a standard scope for refurbishment financing of €25.00 per flat in the new EU countries is sensible and necessary, particularly for the following reasons:

- It is necessary to assume this or some other amount in order to enable concrete discussions on subsequent considerations about financing and support programs.
- At this stage the €25.00 figure seems to be a very conservative estimate given that economic development in the new EU countries has led to a considerable rise in average incomes compared to the statistics provided in 1.2. However, it can be assumed that housing costs (see 1.1) are also rising accordingly. Overall, however, it is to be expected that a more exact up-to-date survey of data on housing costs and incomes would likely arrive at a somewhat higher monthly figure than €25.00 as a reasonable average refurbishment apportionment. For the purposes of this handbook, however, the assumption of this cautious estimate is entirely adequate.

2.4 To what extent do heating cost savings from energy-saving measures pay for themselves?

Energy-saving measures reduce energy consumption and thus reduce costs; ideal measures are those which save more than they cost,[12] because they are per se cost-effective.
If complex energy-saving measures as in 1.4 are able to reduce heat energy consumption by c. 50%, what savings on heating costs are achieved?

The following potential savings can be calculated for Type 1 and 2 prefabricated housing:

[12] Such measures do exist (e.g. thermal insulation of heating pipes or insulation of top-floor ceilings on buildings with accessible roofs).

	EE LV LT PL	East- Germany
Heat energy costs per kWh of district heating	0,03 €	0,06 €
Flat area in m²	54,00	58,00
Average annual heat energy consumption in kWh/m²a BEFORE refurbishment	155,00	155,00
Annual heat energy consumption in kWh for an average flat BEFORE refurbishment	8.370,00	8.990,00
Average annual heating costs BEFORE refurbishment	251,10 €	539,40 €
Monthly heating costs BEFORE refurbishment	20,93 €	44,95 €
Cost-saving potential from energy-saving measures	50,0 %	50,0 %
Average achievable annual heat savings in kWh per flat	4.185,00	4.495,00
Monthly heating cost savings per flat	**10,46 €**	**22,48 €**
Heat energy costs per kWh of district heating	125,52 €	269,76 €

Average potential savings on operating costs arising from energy-saving measures in Type 1 and 2 prefabricated housing (with a savings rate of 50%) in the new EU countries is at present c. €10.00 per flat per month. Savings on heating costs attainable in Germany are double this figure, because the energy price for 1 kWh of district heating is twice as high.
Between 2000 and 2006 the price for 1 kWh of district heating energy in the new EU countries remained fairly stable at €0.03 (or €0.06 per kWh in East Germany). Prices have gone on the increase since 2007; for example the price of district heating in Estonia rose from €0.03 to €0.04 per kWh on 1 August 2007.

Yet, since the pilot projects run from 2003 to 2007 have shown that actual savings between 40 and 50% were achieved, a safe amount of average achievable savings for an average flat which can be promised to residents is about €10.00 per month.

Of course, arguing on the basis of heating costs savings is only sensible for residents, if they actually bear the full costs of heating their building themselves. This is the case in participating BEEN countries, but is not usual in all countries. The following remarks should therefore be taken not of for such discussions involving other countries:

- Financial motivation to implement energy-saving measures only emerges when residents can be shown how much measures save on heating costs.
- The minimum prerequisite for achieving this is that heat energy consumption is metered for each building and that residents are only charged for the actual amount of heat energy consumed in their building. As a basic motivation it suffices if total heating costs for the building are divided up among according to flat size. Whether the total heat energy consumption measured for the building is also invoiced according to individual consumption in each flat is of less consequence (see 5.4). The decisive factor bearing upon residents' financial motivation to implement energy-saving measures is that measures implemented for their own building are metered and lead to lower heating costs as expected.

2.5 Extent of heating cost savings attained through various energy-saving measures

The following spreadsheet shows roughly the proportional savings effect achieved by each of the energy-saving measures under consideration for Type 1 and 2 prefabricated housing.[13]

Measure Group A **Thermal insulation of the building envelope**	**Features of the measure**	**Savings**
Insulation of exterior walls	Insulation layer from 8 to 12 cm (with $\lambda < 0.04$)	24 % bis 28 %
New windows (double-glazed)	U-value 1.3 W/m²K	23 % bis 26 %
Insulation of the top-floor ceiling	Insulation layer from 12 to 16 cm (with $\lambda < 0.04$)	4 % bis 5 %
Insulation of the cellar ceiling	Insulation layer from 4 to 8 cm (with $\lambda < 0.04$)	2 % bis 3 %
Insulating heating pipes not in flats		bis zu 2,5 %
Measure Group B **Accompanying measures**		
Modernization of the central heating control system (Modern control and regulatory equipment)	Savings, if building previously excessively heated	up to 10 %
Departmental shut-off valves	Evenly-distributed heating	
Radiator valves	Savings, if building previously excessively heated	(+/-) 15 %
Consumption metering devices and consumption-based billing	Incentive to save	up to 15 %
Heating pipe systems: conversion of one-pipe heating to two-pipe heating construction of bypass lines on radiators with one-pipe heating systems		
New radiators	Facilitated consumption metering	
Ventilation (window ventilation canals or vents; air ducts for enclosed toilets; fans on ventilation shafts)	Guarantees sufficient ventilation	
Total achievable savings		**50 % bis 55 %**

Summing the effects of the measures can normally mean heating cost savings of 45 to 55% for Type 1 and 2 prefabricated housing. Higher values can only be achieved if a building was consistently overheated in winter prior to refurbishment (as was often the case in East

[13] The cost-effectiveness of each measure from the cost-benefit standpoint is examined in more detail in Section 5.

Germany) and if the opposite was not the case; many flats were previously perpetually underheated in winter (as was the case for pilot projects in Broceni, Latvia). Another precondition for higher savings is that thermal bridges be eliminated at all costs.

A frequently asked question is whether modernizing the heating system alone does not in itself result in considerable heating cost savings. This is possible in isolated cases, but depends on the extent to which previous heat losses can be reduced through heating system modernization:

- If modernizing the heating system is combined with improving the thermal insulation of the installations and cellar pipes, this will save heat energy because previous heat loss has been reduced.
- If the modern control and regulating systems (combined with more efficient pipe systems) result in more equal heat delivery to the flats, thus providing previously overheated flats with a normal amount of heat, heat energy savings will also be reached.
- However, if modernizing the heating system mainly results in supplying previously cold flats with sufficient heat; heat energy consumption will actually increase.

The effect of installing thermostatic valves is similar. Thermostatic valves only achieve heat energy savings if rooms were previously overheated and the thermostatic valves are used to reach suitable temperatures as needed.

Therefore, the best and most balanced results are achieved by implementing the whole package of energy-saving measures. If only partial measures are implemented, they must be very carefully planned to avoid unpleasant surprises in practice (mould through new windows without wall insulation – see 5.6.3).

2.6 Overall scope of financing refurbishment measures

In order to develop realistic concepts for refurbishment measures, it is necessary to have a rough estimate of the financial scope which provides the framework for the concepts.
The financial scope for prefabricated housing can be deduced from sections 2.3 and 2.4 as follows:

	EE LV LT PL	**East- Germany**
Typical size of flat in m²	54,00	58,00
Reasonable apportionments for refurbishment measures (monthly per flat)	25,00 €	125,00 €
Scope for refinancing from heat energy-saving measures (monthly per flat)	10,00 €	20,00 €
Maximum total refurbishment apportionments (monthly per flat)	**35,00 €**	**145,00 €**
Burden after heating costs savings (monthly per flat)	25,00 €	125,00 €

When planning to finance refurbishment measures with loans to exploit the financing scope, what are the conditions that banks offer for refurbishment loans?

	EE LV LT PL	East Germany
Term in years	7 to 12 years	20 to 25 years
Interest	4.5 to 7 %	4.0 to 5.5 % (7.0 to 8.5 % in the 1990s)
Annuity (Sum of repayments and interest in %)	**16%**	**7.0 %** **(8.5% to 9 % in the 1990s)**

What refurbishment investments could be financed at these loan conditions?

	EE LV LT PL	East Germany
Refurbishment apportionment	€ 35.00	€ 145.00
Annuity (installments for interest and repayments in %)	16.0%	8.5%[14]
Possible refurbishment loan	**€ 2,625.00**	**€ 20,470.59**
What does the package of energy-saving measures as in the pilot project Ozolciema 46/3 in Riga[15] approximately cost?	€ 5,000 to 6,000 per flat	c. € 8,000 per flat

These figures allow the following conclusions:

- With these key financing data, it was easily possible to implement the full package of energy-saving measures in East Germany. In addition, there was sufficient financing scope to execute general refurbishment measures. Which refurbishment measures were implemented in addition to energy-saving measures in the course of complex refurbishments is shown in more detail in Section 7.

- Financing through banks has failed to offer sufficient financing for large-scale refurbishment in the new EU countries. Section 6 deals with current support programs which support refurbishment measure financing and how they can be best exploited.

The aim of the BEEN project was to find methods of financing which enable the full package of energy-saving measures to be implemented for all prefabricated residential housing in the new EU countries (at a cost of c. €5,000 per flat) (see the recommendations at the end of Section 6).

However, before finance optimization can be addressed, it is first necessary to consider more closely who the potential investors in refurbishment measures are and the rules the relevant ownership types adhere to when reaching refurbishment decisions.

[14] For comparison with the new EU countries, the loan conditions of the 1990s are given for eastern Germany, when the majority of refurbishment measures were implemented.
[15] The cost estimates for energy-saving measures listed here are dealt with in more detail in Section 5.

2.7 Resume Section 2

1. In all the BEEN countries, the heat energy costs actually incurred are recorded for each building and passed on in full to building residents. Because of this fact, residents are open to discussions on potential heating cost savings achieved through energy-saving measures.
2. Because of the similarity of all unrefurbished prefabricated housing in terms of energy consumption and based of current heat energy prices (€0.03 to 0.04 per kWh district heating), it can be assumed that implementing energy-saving measures in the new EU countries will achieve savings of €10.00 per flat per month.
3. Average household incomes in the new EU countries have gone up enough that, in addition to apportionment of the full operating costs, there is financial scope to allow refurbishment apportionments. The average acceptable refurbishment apportionment for financing large-scale refurbishment measures can be set at least €25.00 per flat per month at the present time.
4. Together with the refinancing scope from energy-saving measures (€10.00 per flat per month) a total financial scope of €35.00 per flat per month can be assumed. This means a total financial burden of €25.00 per flat per month for residents after heating cost savings have been deducted.
5. This financial scope for refurbishment measures will tend to rise in the course of continuing economic progress in the new EU countries and rising energy prices. For comparison: the financial scope for refurbishment apportionments in Eastern Germany is €145.00 per flat, which includes the refinancing scope of €20.00 per flat per month on average.
6. As regards exploiting the financing scope mentioned by financing refurbishment measures through loans, loan terms of only 8 to 12 years are usual in the new EU countries, (in Germany, by comparison, 20 to 25 years), which results in high credit annuities. At such short terms it is only possible to implement refurbishment measures of c. €2,500 per flat with the present level of financial scope. The cost-benefit effect this produces is obviously not sufficiently attractive to encourage the implementation of large-scale refurbishment measures. The aim of BEEN was to provide financing models (see Section 6) which would enable refurbishment investment at twice this level with the same apportionment.

3 Privatization of Prefabricated Housing and the Capacity for Action of Relevant Ownership Types after Privatization

The aim of the BEEN project is to jumpstart refurbishment (while emphasizing energy-saving measures) of standardized multi-storey residential buildings constructed by the state between 1950 and 1990 (see 1.1). An important fact is that formerly state-owned housing stock has been privatized in all BEEN countries. It is therefore essential to consider who the buyers were and the relevant post-privatization ownership types' capacity for action in implementing refurbishment measures when formulating refurbishment concepts.

3.1 Ownership structures of prefabricated housing before privatization

Ownership structures of prefabricated housing before privatization:[16]

	Estonia	Latvia	Lithuania	Poland	East- Germany
Year of reference	2004	2005	2001	1994	1990
Total number of flats in prefabricated housing	406.570	416.460	790.000	5.200.600	2.150.000
State-owned flats	374.792	357.000	650.000	2.030.600	1.450.000
Share in %	92,18%	85,72%	82,28%	39,05%	67,44%
Cooperative-owned flats (company-owned housing)	31.778	59.460	140.000	3.170.000	700.000
Share in %	7,82%	14,28%	17,72%	60,95%	32,56%

There were two types of ownership: state-owned and company-owned (cooperative) housing stock.
Apart from the state, cooperatives were also allowed to build multi-storey residential buildings between 1950 and 1990 (mainly to accommodate their workers).
The high levels of cooperative ownership in Poland and Germany are the result of the strong tradition of cooperative housing provision in both countries.

In principle, only the state-owned housing stock was available for privatization, because legally, cooperative ownership is already a type of private ownership.

3.2 Ownership structure after privatization

Formerly state-owned housing stock was privatized in all the BEEN countries:

- In Poland and the Baltic States, the formerly state-owned residential buildings were offered the then tenants for purchase. To date, privatization rates of over 90% have been reached in the Baltic States.

- The privatization concept in East Germany was completely different, due to the need to bring it into alignment with the West German legal system. All formerly state-owned

[16] See 1.1 for explanations of these figures. The proportion of cooperatives to state ownership was given by the BEEN partnership countries and were compiled on the basis of privatization statistics available in those countries.

housing stocks were transferred to communal housing companies. Not until after refurbishment were the flats offered to the residents for purchase (with little success).

- The cooperatives were preserved as a legal form, apart from in Lithuania. In eastern Germany, the proportion of cooperative ownership has even risen due to sales to cooperatives.

This spreadsheet depicts the ownership structure of prefabricated housing stock after privatization:

	Estonia	**Latvia**	**Lithuania**	**Poland**	**East- Germany**[17]
Reference year	2004	2005	2001	1994	2004
Total number of prefabricated flats	406.570	416.460	790.000	5.200.600	2.150.000
Type 1 Ownership (condominiums)	**374.792**	**357.000**	**790.000**	**2.030.600**	**100.000**
a. Owner-occupied	337.492	273.000	767.000	1.015.300	50.000
b. Unsold flats (still municipally owned)	37.300	84.000	23.000	1.015.300	–
c. Unsold flats (still owned by housing companies)	–	–	–	–	50.000
Rate of privatization	90,05%	76,47%	97,09%	50,00%	3,45%
Type 2 Ownership (cooperatives)	**31.778**	**59.460**	**–**	**3.170.000**	**800.000**
Type 3 Ownership (rental housing)	**few**	**few**	**few**	**–**	**1.250.000**
a. Municipally owned	social housing	social housing	social housing	–	–
b. Owned by private or municipal housing companies	–	–	–	–	1.250.000

The differences in privatization rates for former tenants are striking. They correlate closely with the prices the tenants have to pay for their flats.

[17] In the interest of providing an unambiguous comparative scale the estimated figures are lower than the total provable figure (2,150,000 housing units)

3.3 Prices of housing sold to residents upon privatization

The differences in privatization rates correlate with the purchase prices demanded from residents for their flats:

	Estonia	Latvia	Lithuania	Poland	East Germany
Asking price (un-refurbished flats)	Almost free (the price could be paid by privatization certificates / vouchers). Missing or free certificates were traded.			€ 250 (up to € 25) per m² living space	-
Asking price for refurbished flats	-	-	-	-	c. € 1,000 per m²
Old liabilities from the building's construction to be taken on	-	-	-	-	Up to € 75.00 per m² (included in residents' sales price)

- The privatization rate in the Baltic States is over 90% because it was virtually possible to purchase flats without expending personal capital.
- At 50%, the privatization rate in Poland is much lower, because the price (initially €250.00 per m²) had to be paid in cash.
- The privatization rate in eastern Germany is very low (only 3.5%) because only a few tenants are interested in paying €1,000 or more per m² for their flats after refurbishment.

3.4 Characteristics of ownership types

The following spreadsheet compares important characteristics of the three relevant post-privatization ownership types as a basis for further considerations:

Type 1 Ownership (condominiums)	
Legal status	Condominiums communities subject to civil law.
Feature 1 Owners	The privately-owned property (special property) of a particular flat is connected to a pro rata share of the shared property (common property).
Feature 2 Housing manager	The property owners must appoint a housing manager to manage the common property.
Feature 3 Utilization rights	Each owner-occupied flat is recorded on a separate folio in the land register (special property).
Feature 4 Cost bearing for flat usage	Each property owner must pay a share of the costs incurred to manage the common property. Occupants bear financial responsibility for their own special property.
Type 2 Ownership (cooperatives)	
Legal status	The cooperative is recognized as a legal person.
Feature 1	The cooperative's shareholders are members. Residents can become members of the cooperative by paying a contribution.
Feature 2	A cooperative board of directors is responsible for property management.
Feature 3	All residents (even those who are members of the cooperative) must enter into a leasing contract with the cooperative board in order to utilize the property.
Feature 4	Each resident must pay a pro rata apportionment (or rent) to cover the costs of the smooth management of cooperative property.
Type 3 Ownership (rental housing)	
Legal status	Undivided property.
Feature 1	The property is owned either by a private or a municipal housing company or a private person.
Feature 2	The owner manages the property or employs a housing manager.
Feature 3	Residents are required to sign a tenancy agreement in order to utilize the property.
Feature 4	Rents are calculated according to national letting regulations/specifications.

3.5 Significance of the three ownership types for getting refurbishment up and running

The significance of the three relevant post-privatization ownership types in the BEEN countries for getting refurbishment up and running is different according to the proportion of the housing stock they comprise.

	Estonia	Latvia	Lithuania	Poland	East- Germany
Type 1 Ownership (condominiums)	very high	very high	very high	very high	-
Type 2 Ownership (cooperatives**)**	low	low	-	high	high
Type 3 Ownership (rental housing)	-	-	-	-	very high

This leads to varying legal requirements and needs for action:

- The Baltic States and Poland require sound home ownership laws to enable condominium ownerships to take action effectively.
- Eastern Germany required sound rental laws to refurbish prefabricated housing, a process which is now almost complete.
- Poland and Germany require sound cooperative laws.
- **Condominiums communities (Type 1 Ownership) require the most support**
- Type 2 and 3 Ownership have centralized structures, which essentially allow them greater capacity to act.

3.6 The innovative idea of founding an HOA to increase condominiums communities' capacity for action

To increase condominiums communities' (Type 1 Ownership) capacity to act, the new EU countries have introduced a legal option to acquire legal person status for the management of their joint property. In the Baltic States, this occurs by officially founding a homeowners association (HOA); in Poland, condominiums communities attain this status when entered in a register.
A condominiums community with HOA (or a registered condominium ownership in Poland) is referred to below as Type 1A Ownership (or HOA).

The characteristics of Type 1A Ownership:

Legal status	**Condominiums community subject to civil law managing common property as legal person.**
Feature 1	Similar to Type 1 with the exception that: Condominium owners in Poland must register their condominiums communities in order to attain legal person status. Condominium owners' share automatically makes them party to the legal person. In the Baltic States property owners have the option of founding a homeowners association (HOA) to manage common property.
Feature 2	The executive of the legal person (HOA) is the housing manager or it appoints a deputy.
Feature 3	The legal person's (HOA) assets consist exclusively of apportionments paid by condominiums owners. There is no central land register folio.
Feature 4	Condominium owners pay the legal person (HOA) their allotted cost apportionment.

Type 1A Ownership exhibits the following advantages over ownership under civil law (Type 1 Ownership):

	Type 1 Ownership (condominiums community exclusively subject to civil law)[18]	**Ownership Type 1A** (HOA managing common property as legal person)
External obligations (financial obligations of the condominiums community , e.g. from supply contracts (heating, water, waste disposal; repair work)	**Joint and Several Liability** As a co-proprietor, each property owner carries liability for the common obligations (joint and several liability). A creditor can lodge a claim against any property owner.	**Advantage: the HOA carries exclusive liability** The HOA is liable (legal person). The HOA's creditors are not able to lodge claims directly against individual property owners.
Internal obligations (payment of apportionments to the housing manager for district heating, water, waste disposal, repairs)	**Joint and Several Liability** Property owners are obliged to pay the housing manager their allotted share of the joint management costs (pro rata costs). In the case of non-payment by individual property owners, other property owners' apportionments rise accordingly (disbursement). The housing manager reclaims these sums from the defaulting property owners.	**Advantage: liability only pro rata** Property owners are liable only for their pro rata costs. The HOA bears the costs for any defaults. The HOA finances its obligations with pro rata apportionments paid by property owners. In view of the implications of bankruptcy, it is certainly in property owners' interest that the HOA be adequately solvent.
Efficacy of management resolutions	**Protracted decision-making process** All issues which do not expressly fall within the housing manager's executive powers require a majority vote from all property owners.	**Advantage: Expedited decision-making processes** All issues which do not require a majority vote from property owners can be decided upon more quickly with a HOA.

[18] This outlines the characteristics of an condominiums community under civil law, which is externally liable as joint owner. Under the amended German condominium ownership law (WEG) valid from 1 July 2007, condominiums communities have by law a partial legal responsibility for the joint property; so that in theory, each condominium owner is only externally liable for his pro rata share. This is largely equivalent to the legal status of an HOA in the new EU countries.

Credit worthiness	**Value of assets** The financial value amounts to the total value of the condominiums (land register folios). Creditors' claims against condominiums communities (housing managers) are covered by individual property owners' assets. They are jointly and severally liable, provided no legal limitation on liability applies.	**Disadvantage: the financial worth of the HOA is limited to its management assets** The HOA has no asset value, only management assets in the form of liquid reserves and apportionments which function as security for contracting parties. In order to take out loans for larger refurbishment measures, the HOA requires collateral securities (e.g. government guarantees).

In Germany, explicit legal person status for joint property does not exist at present. However, the amendment to German home ownership law which came into force on 1 July 2007 implies that partial legal responsibility for joint property can be attributed to condominiums communities. In practice this is of no consequence for the housing stock relevant to BEEN because refurbishment in eastern Germany is performed solely under rental law, nonetheless this amendment affects c. five million condominiums in West Germany and emphasizes the correctness of the HOA approach in the new EU countries.

3.7 An innovative idea from Poland: allowing the purchase of condominiums within cooperatives

In view of the fact that the largest proportion of prefabricated housing in Poland is owned by cooperatives (Type 2 Ownership), the question of why residents in cooperative flats should not too be able to purchase their flats, as residents of formerly state-owned, now privatized, flats, became increasingly common.
Since early 2006 it has been possible to purchase a flat as a condominium within a cooperative (referred to below as type 2A ownership) in Poland.

Characteristics of type 2A ownership (condominium ownership within a cooperative)	Like type 2 (cooperative) with the special characteristic that the manager for issues of the joint property is the cooperative (management). However, each owner receives his/her own land registry folio and has full ownership rights like type 1 owners.

Type 2A Ownership (condominium ownership within a cooperative) melds the advantages of Type 1 and 2 Ownership:

Criteria	Comparison with Type 1A Ownership (HOA)
External obligations (financial obligations of the condominiums community , e.g. from supply contracts for heating, water, waste disposal and repair work)	**As in Type 1A Ownership:** The cooperative is liable (legal person). The cooperative's creditors cannot lodge claims against property owners.
Internal obligations (payment of apportionments to the housing manager for district heating, water, waste disposal, repairs)	**As in Type 1A Ownership:** Liability only pro rata: property owners are liable solely for their allotted apportionments. The cooperative bears the costs of default payments.
Efficacy of management decisions	**Advantage over Type 1A Ownership:** Fast decision-making processes for all issues which fall within the jurisdiction of cooperative executive in accordance with the articles of association.
Credit worthiness	**Advantage over Type 1A Ownership:** The cooperative holds property assets (= building stock minus the value of the condominiums) and is creditworthy as a result of these property assets. In order to receive credits for refurbishment measures, the cooperative only requires additional guarantees when applicable.

According to information from Polish project partners, Type 2A Ownership is in great demand and 20% of cooperative housing stock already falls in this category. Condominium owners must, however, account for the possibility that the cooperatives will eliminate residential buildings with a high proportion of condominiums to transform them into independent condominiums communities, turning Type 2A Ownership into Type 1 or 1A.

3.8 Interspersed municipal flats

A further issue affecting condominiums communities' capacity to act (Type 1 Ownership) is how far privatization through sale to residents has progressed in terms of flats which have not yet been sold to residents and are still municipally owned and thus remain as "interspersed" municipal flats.

	Estonia	Latvia	Lithuania	Poland	East- Germany
Reference year	2000	2004	2001	2002	2005
No. of formerly state-owned flats	374.792	357.000	650.000	2.030.600	1.450.000
Flats sold to occupants to date	337.492	273.000	630.000	1.015.300	50.000
Rate of privatization	90,0%	76,5%	96,9%	50,0%	3,4%
Municipally owned flats (interspersed municipal flats)	**37.300**	**84.000**	**23.000**	**1.015.300**	**none**
%	**10,0%**	**23,5%**	**3,5%**	**50,0%**	**0,0%**

The proportion of municipally owned flats remaining is between 4 and 25% in the Baltic States and averages 50% in Poland.
Do the remaining municipally owned flats infringe upon condominiums communities' capacity to act?

What problems do remaining interspersed flats create for municipalities?			
	EE LV LT	**PL**	**East- Germany**
Problem 1: Municipalities must finance pro rata management costs (apportionments) from their budgets	Ja		-
Problem 2: Standard council rents do not cover costs	Ja	Costs (apportionments) are approx. twice as high as rents	-

What problems do remaining interspersed municipal flats create for condominiums communities?		
	EE LV LT PL	**East- Germany**
Problems?	None, only advantages	-
Advantage 1: The municipality carries joint liability	YES	-
Advantage 2: Financially, creditors can rely on municipalities as the strongest flat owners	YES	-
Advantage 3: Condominiums communities which include interspersed municipally-owned flats are more creditworthy (because the municipality carries joint liability)	YES	-
Potential Disadvantage: Municipalities block refurbishment decisions for budgetary reasons	no instances of this as yet	-

In terms of liability, it is more beneficial for condominiums communities when some municipally owned flats remain.
This is not the case from a municipal perspective. The apportionments due from the municipal purse for remaining (as yet unsold) flats are usually considerably higher than the rent which can be demanded, it is therefore in the municipalities' interest to liquidate the remaining interspersed flats as soon as possible. Transferring only the management of these flats to a private management company (without transferring ownership) does not affect the municipalities' ownership of the interspersed flats.

3.9 Do ownership types lack certain capacities for action?

Whatever the ownership structure, management of residential buildings must fulfill an array of functions which can be divided into three areas of competency:

Tasks for proper management of residential buildings (function areas)		**Importance**
Task 1	Concluding operating contracts (heating, water, sewage, waste disposal); billing and cost apportionments for the operating costs	very important
Task 2	Contracting, billing and payment for necessary repairs (e.g. burst pipes)	very important
Task 3	Contracting, billing and payment for major maintenance, modernization works and energy-saving measures	if financially viable

Areas 1 and 2 are essential to the proper management of a residential building. Area 3 is a desirable option, if sufficient financial resources are available; this is the main topic of the considerations that follow.
The prerequisite for desirable refurbishment measures is, however, that there are no obstacles to fulfilling the essential functions of Competency Areas 1 and 2.
What is the state of the capacity for action of the ownership types after privatization?

In Which types of ownership, the proper management tasks 1 and 2 are fulfilled?		
	fulfilled?	**Reason**
Type 1 Ownership (condominiums)	**?**	**Overview is not easy. Thus, analysis in details required.**
Type 1A Ownership (condominiums with HOA as legal person)	**?**	
Type 2 Ownership (cooperatives)	**Yes**	The executive board carries full responsibility and has capacity to act
Type 2A Ownership (condominiums in cooperatives)	**Yes**	
Type 3 Ownership (rental housing)	**Yes**	Property owners are unequivocally responsible or they can appoint a housing manager to act as their agent.

The capacity for action of Type 1 Ownership is not as easy to survey as that of Type 2 and 3 Ownership. The subsequent section considers this in more detail, because the capacity for action of Type 1 Ownership as far as basic functions 1 and 2 are concerned is a prerequisite for tackling large-scale refurbishment measures.

3.10 Can gaps occur in condominiums communities' capacity for action?

The question of an condominiums community's capacity for action is, for all intent and purpose, identical with the question of whether a housing manager capable of taking action is permanently available.

What gaps could arise in the proper management under condominiums communities?		
… in the issue of:	**Is there a housing manager responsible for the function areas 1 and 2 for the joint property?**	**Gap yes/no?**
Phase 1: BEFORE privatization	The housing manager appointed by the state is responsible (unified property)	No
Stage 2: legal transformation of rental housing into privately owned housing	The housing manager appointed by the state remains manager or appoints a third party. The manager appointed can be a private manager or a private management company (in which the municipality may have a share).	No
Stage 2: sale of the first flats to residents	Usually no change in management (or case 1 or case 2)	No
Case 1: setting up an HOA (legal person status for joint property)	The members of the HOA appoint a manager (member or third party or previous manager). The HOA takes on the contracts with public utility companies. Until this happens, the management functions 1 and 2 remain in the hands of the previous manager.	No
Case 2: condominium owners dismiss manager	The majority of the condominium owners (or the HOA) is dissatisfied with the previous manager and vote to dismiss him/her	**Yes, if** dismissal only without new appointment
Case 3: appointment of a manager by condominium owners	The majority of the condominium owners (or HOA) appoint a new manager by majority vote.	No
Case 4: the manager does not carry out functions 1 and 2	If majority votes in cases 2 or 3 do not occur, each condominium owner has the right to apply in court for the appointment of a different manager.	No
Case 5: the manager is inactive and the condominium owners are also inactive	Long-term lack of action by the manager would lead to utility companies turning off heat and water. At that point, case 4 occurs or the municipality realizes what is happening and appoints an emergency manager.	**Possible, temporary**

National housing property law sanctions capacity for action for basic management functions (operating costs and urgent repairs) for condominiums communities established after privatization. As a rule a responsible manager is always present. Temporary gaps can only occur when a manager is dismissed without a new one being appointed or when both manager and all condominium owners are temporarily inactive. In this case, however, an emergency manager can be appointed.

3.11 Resume Section 3

1. All three relevant post-privatization prefabricated housing ownership types, including condominiums communities, are sufficiently capable of action as regards basic housing management (contracts with utility companies and implementing necessary repairs) (see 3.9).
2. Good new innovative ideas have been developed in the new EU countries to improve condominiums communities' capacity for action by creating homeowners associations (HOA) (see 3.6).
3. A further innovative model for condominium ownership has existed since 2006 in Poland, where residents within a cooperative can buy their flats. This model combines the advantages to the resident of condominium ownership with the advantages of central management by the cooperative (see 3.7).
4. Lack of activity or a temporary vacancy in management for condominiums communities is equally possible in all BEEN countries. However, all BEEN countries provide the option to for each condominium owner to apply for a court-appointed emergency housing manager (see 3.9).
5. The fact that condominiums communities in the new EU countries are not motivated to implement desirable large-scale refurbishment measures does not justify the conclusion that condominiums are neglectful. No activity can be expected if the financial situation appears to allow no chance of implementing desirable improvements. Therefore an important aspect of the following discussions on how to activate large-scale refurbishment is to arrive at financing models which all condominiums communities can afford and which make it worthwhile to take action.
6. The fact that in Poland (unlike in the Baltic States) residents had to pay relatively large amounts of money (up to €250.00 per m^2) to buy their flats (see 3.3) may still turn out to be a serious financial obstacle to implementing large-scale refurbishment, because this money is no longer available for refurbishment.

4 Rules for Binding Decisions to Implement Refurbishment Measures

With regards to implementation of refurbishment measures owners generally decides on the type and scope of measures to be executed, since they also assume the financial risk. But what decision-making rules apply to the individual ownership types? How are residents involved?
This chapter is concerned with these decision-making processes, which are largely legally stipulated. It also takes a special look at condominium ownerships as the most important ownership type in getting larger-scale refurbishments up and running in the new EU countries.

4.1 Types of refurbishment measures

Building refurbishment measures can be divided up into two areas:

- Maintenance
  Maintenance (repair) involves measures to rectify construction deficiencies that have arisen due to wear and tear and weathering and are intended to restore the building to its original state.
- Modernizations (includes energy-saving measures) Modernizations are measures to improve the living standard, bringing it in line with contemporary standards; they are based on new building standards.

In practice, larger-scale renovation measures are commonly performed concomitantly with improvement measures when old building components are to be replaced by new ones. If a choice is available between various building materials, it is often more sensible to choose a higher quality construction because the benefits compensate for extra costs. When replacing rickety windows for instance, only new windows with modern thermal insulation glazing and a U-value below 1.5 W/mK should be used.

4.2 Legal obligations to implement refurbishment measures

4.2.1 Obligations to implement essential maintenance measures

An obligation to perform essential maintenance would at first appear self-evident, for it would appear obvious that the owner of a building would implement essential repairs in the interest of maintaining the building.

In practice, the implementation of maintenance measures depends on the financing options which are actually available.

- In Germany owners (and housing managers in condominiums communities) have had a compulsory responsibility to perform corrective maintenance for nearly 20 years. Therefore, condominiums communities exist in Germany for which the housing manager deals most minor of defects immediately and the building is always be in first-class condition. On the other hand however, apportionments for essential maintenance can be very high.
- Should owners or residents have less financial capital at their disposal, there is good reason to question the definition of the term “essential” maintenance. Necessity is dependent upon funds available. The only truly “essential” repairs are measures which keep the building functioning (see 3.9). Where major maintenance is merely desirable but not in reality acutely necessary, it can be put off until a later date. Whether postponing it is makes sound financial sense (since delaying repairs is generally more expensive than acting quickly) is ultimately a question of money. If there is less financial scope, it is only

logical for implementation of major maintenance to be considered just as inessential as desirable modernization measures.

- The standard for implementing major maintenance in the BEEN countries is therefore inextricably linked to financial resources. Whereas in Germany the executing major essential maintenance measures has been a clear obligation of every owner (or housing manager for condominiums communities) for around 20 years now, in the new EU countries implementation of major maintenance measures understandably depends in practice on financial possibilities. A tenant who pays €350 per month for their housing (as in Germany) expects (and gets) a higher standard of maintenance than a redisdent in an ownership complex in need of refurbishment in the new EU countries, where the average income of the occupants is only €350 per month.

4.2.2 Legal obligations to retrofit in order to implement specific energy-saving or other measures

The state possesses a particularly simple avenue to initiate implementation of specific refurbishment measures on existing building stock by legally stipulating the implementation of certain refurbishment measures (while providing reasonable transition periods). For constitutional reasons however, legal retrofitting obligations of this kind may only extend to measures which are cost-effective and whose implementation is of special public interest.

The current status of legal requirements for obligatory implementation of energy-saving measures is as follows:

	EE	LV	LT	PL	Germany
Insulation of accessible heating pipes that were previously uninsulated	–	–	–	–	Obligation to retrofit by 31.12.2005 (§ 9 of German regulations on energy conservation (EnEV))
Insulation of accessible top-floor ceilings	–	–	–	–	
Mandatory consumption-based billing for central heating					
Installation of thermostat valves	–	–	–	–	Obligation to retrofit by 31.12.95 (German regulations on heating costs)
Installation of consumption-based meters	–	–	–	–	
Mandatory consumption-based billing for central hot water					
Installation of consumption-based meters	–	–	–	–	Obligation to retrofit by 31.12.95 (German regulations on heating costs)

The economic efficiency of these measures is looked at in Chapter 5.

4.2.3 Obligations to install building components which comply with the latest energy standard when performing major renovation

When executing larger-scale refurbishments (even voluntarily) it should be understood that building components used for renovation comply with latest technical standards (such as windows with low U-values). To emphasize this principle, Article 6 of the “EU Directive 2002/91/EC on the energy performance of buildings” (EPBD) calls on all EU member states to introduce country-specific minimum requirements for the implementation of larger-scale renovations.

The current status[19] of requirements in the BEEN countries is elaborated in the following table:

National requirements for major renovations according to Art. 6 of the EPBD					
	Latvia	**Poland**	**Estonia**	**Lithuania**	**Germany**
Requirements for buildings less than 1,000 m²	No				Yes
Definition of "major renovation"	No definition to date			> 25 % of construction space is renovated	> 20 % of construction space is renovated
Requirements (max. U-values in W/m²K) for major renovations					
External walls	0.30	0.30 – 0.40	Definition in 2007	0.30	0.45 / 0.35
Windows	1.80	1.70 - 1.90		1.90	1.70
Glazing				1.90	1.50
Roof	0.20	0.25		0.25	0.30 / 0.25
Cellar ceiling	0.25			0.35	0.40 / 0.50

4.3 Decision rules for binding resolutions to implement refurbishment measures

4.3.1 Decision rules for condominiums communities (Type 1 and 1A Ownership)

Decision rules for implementation of construction measures for condominiums communities (type 1 and 1A ownership)					
Type of measure	**EE**	**LV**	**LT**	**PL**	**Germany**
Essential repairs (M1)	No owners' vote required (implementation is obligatory task of building management); residents are informed (notice), schedule is agreed with residents of housing that needs to be accessed				
Major maintenance	Majority vote (50% +1) of property owners or HOA members required				as M1
General modernizations					100 % agreement by all condominium owners required (as of 1.7.2007: 75%)
Energy-saving measures					
Constructional changes					
Legally-ordained constructional measures	as M1				

According to the German condominium ownership law (WEG), every condominium owner has a legal right to proper maintenance which preserves the value of their property. This

[19] As of 2006

means no majority resolution is required for the implementation of essential maintenance measures. In the new EU countries condominium owners or HOA members must agree through majority resolution (in the case of Type 1A Ownership) to major maintenance (for any non-essential repairs). On the other hand only a majority resolution is required in the new EU countries for modernizations, whereas in Germany, unanimous agreement (as of 1 July 2007: 75%) from all condominium owners affected is necessary to perform modernizations. Legally-stipulated energy-saving measures have proven very effective in Germany (see 4.2.2). Energy-saving measures prescribed by law must also be implemented by condominiums communities and do not require the unanimous vote (as of 1 July 2007: 75 %) of affected condominium owners which is otherwise applicable in Germany.

The following statements can be made about the practical significance of decisions rules:

- These decision rules are especially important in the Baltic States because since privatization this legal form has come to apply to over 90% of prefabricated residences.
- Though the proportion of Type 1 Ownership is only 40% in Poland, condominiums communities are equally important there because all building stock formerly owned by the state was privatized as Type 1 Ownership.
- In contrast, these rules were irrelevant for the refurbishment of prefabricated housing in eastern Germany, as this was only done with Type 2 and 3 Ownership. These decision rules are, however, relevant for the some five million condominiums in western Germany with respect to the implementation of energy-saving measures. To achieve this very aim, the majority vote has been lowered to 75 % as of 1 July 2007.

4.3.2 Decision rules for cooperatives (Type 2 and 2A Ownership)

Inasmuch as prefabricated residences are concerned, the cooperative ownership type is most important in Poland and Germany where it accounts for 60% and 43% of prefabricated housing stock respectively. In Latvia and Estonia, the proportion of cooperatives is only around 10% of prefabricated housing stock. Lithuania has no cooperatives.

Great discrepancies in the structure of cooperatives are evident between Germany and the new EU countries. While housing cooperatives in Germany are based on rental law, cooperatives in the new EU countries must focus on covering costs (business plans with apportionments), just as condominiums communities. The cooperative board concludes decisions on imposing apportionments. A supervisory board chosen by the members of the cooperative ensures that the board only implements refurbishment concepts that, with respect to apportionments, are within the financial means of the occupants (cooperative members). Cooperative members can call a plenary meeting at which they can effect a different decision by majority resolution.

According to bylaws, the board alone has the capacity as legal person to decide about financing refurbishment measures (whether to use credit or pay in cash once reserves have been gathered). In Poland however, the board requires a majority resolution at a member meeting to take out a credit secured by land registry. Cooperatives in the new EU countries, finance refurbishment measures on the basis of monthly costs apportionments which are calculated by the board (and approved by the supervisory board) to cover the costs of refurbishment measures (with credit financing, interest rates and amortization).

Cooperative residents (and members) in Germany pay for the use of housing as stipulated in rental housing regulations. Accordingly, rules on tenant participation (see 4.3.3 – rental housing type ownership) apply to residents when implementing refurbishment measures.

4.3.3 Decision rules for rental housing (Type 3 Ownership)

Type 3 Ownership (rental housing) is virtually irrelevant when it comes to refurbishing prefabricated housing in the new EU countries.

- Very few prefabricated buildings exist as rental housing and those that do are social housing owned by municipal authorities with very low municipal rents.
- Municipal authorities can implement the refurbishments necessary on their own. Their actions are restricted only by budget limitations.
- As regards interspersed municipal housing which remains within condominiums communities (those not yet sold to the tenants), municipal authorities must comply with the decision rules for rental housing (see 4.3.1) and enjoy no special rights.

Decision rules for rental housing were, however, of great significance for the implementation of refurbishment measures in eastern Germany. All refurbishments to prefabricated housing in eastern Germany were carried out with Type 3 Ownership "rental housing" (see 3.2) since the bylaws governing cooperatives in Germany are based on rental law.

Decisions about implementing refurbishment measures on rental housing in Germany are made according to the following rules:

- Maintenance measures (conservation measures) must be tolerated by tenants without restrictions. However, no conflicts arise with tenants on this matter as increases in rent are not permitted for maintenance measures. The agreed rent includes costs due to the owner for orderly maintenance.20
- The owner alone makes decisions regarding the implementation of modernization and energy-saving measures (except legally-stipulated measures – see 4.2.2).

However, although the owner alone decides about the type, scope and financing of refurbishment measures in Germany, they must involve tenants in measures which go beyond essential maintenance measures (modernizations) and which will lead to increases in rent. The process for tenant participation comprises three elements:

- They must be informed in writing about the type, scope and timescale of the intended measures;
- Written calculations must be provided on proposed rent increases;
- Tenants can undertake checks with regards to their legal obligation to accept such increases.

Tenants must accept modernization measures which upgrade flats to meet current qualitative norms (§ 554 of German Civil Code (BGB)). The tenant may refuse modernizations which go beyond if the rental increase will lead to unreasonable personal hardship.

The owner can demand a rental increase of 0.917% (= 11% annually) of the costs for modernization measures (including energy-saving measures). Any costs saved on acutely necessary maintenance (i.e. replacement of a rickety window with a new one with thermal insulation glazing) must be deducted when calculating the apportionment.

Rent (including increases for modernization purposes) may not significantly exceed the typical rent for comparable housing in the area. Typical local rent (without operating costs) for refurbished housing in Berlin is between €4.50 and €5.50 per m².

The following table shows an example of a rental increase after modernization:

[20] Only at the start of the 1990s, when rents in eastern Germany were still relatively low, could certain rent increases be demanded for specific renovation measures to provide owners with an incentive to implement such measures.

Example rental increase after modernization			
Size of residential flat in m²			58.00
	Construction costs	in € per m² monthly	in € per month
Rent (without operating costs) BEFORE modernization		3.50	203.00
Operating costs for heating + hot water		0.98	56.84
Other operating costs		1.54	89.32
Total rent		**6.02**	**349.16 €**

Share of costs for modernization measures	8,000.00 €		
minus expenses saved on acutely necessary repairs (e.g. rickety windows)	- 1,000.00 €		
Apportionment amount for modernizations	7,000.00 €		
Monthly rental increase (11 % annually)			
0.9167%		€1.11	€64.17

Rent (without operating costs) AFTER modernization		4.61	267.17 €
Operating costs for heating + hot water		0.64	36.84
Other operating costs		1.54	89.32
Total rent (with all operating costs)		**6.78**	**393.33 €**

4.4 Decision rules for financing of refurbishment measures for condominiums communities (Type 1 and 1A Ownership)

Whereas decision rules for financing refurbishment measures are easily understood for Type 2 and 3 Ownership (cooperatives and rental housing) due to their central organizational structures, decision rules for financing refurbishments are extremely complex. Because of their importance for getting larger-scale refurbishments up and running in the new EU countries, these will be dealt with in detail in the following sections.

4.4.1 Decision rules for establishing reserves

<table>
<tr><td colspan="6">Decision rules for monthly reserve payments (for financing construction measures) with condominiums communities (types 1 and 1A ownership)</td></tr>
<tr><td>Type of measure</td><td>Estonia</td><td>Latvia</td><td>Lithuania</td><td>Poland</td><td>Germany</td></tr>
<tr><td>Essential repairs (M1)</td><td colspan="5">No vote by property owners required (demanding sufficient maintenance reserves is an obligatory task of the housing manager)</td></tr>
<tr><td>Major renovations</td><td colspan="4" rowspan="4">Establishing reserves for financing of measures requires a majority vote (50% +1) at the meeting of condominium owners or HOA members</td><td>Establishing sufficient reserves is an obligatory task of the housing manager</td></tr>
<tr><td>General modernizations</td><td colspan="1" rowspan="3">Unanimous agreement among owners affected required for financing. As of 1 July 2007, 75% majority resolution suffices.</td></tr>
<tr><td>Energy-saving measures</td></tr>
<tr><td>Structural modifications</td></tr>
<tr><td>Legally-stipulated construction measures</td><td colspan="5">As longer time periods apply for these measures, increased reserves (as for M1) can be established and fixed in due time</td></tr>
</table>

The most transparent basis for financing refurbishment measures is the gathering of reserves (monthly apportionments to establish reserves).
Building sufficient reserves for payment of essential maintenance (M 1) is the housing manager's undisputed compulsory responsibility in all BEEN countries. This also functions successfully in practice. In Germany it is also the duty of the housing manager to gather reserves for any envisaged larger-scale essential maintenance. Condominium owners or (with type 1A ownership) HOA members must approve binding monthly apportionments to gather reserves for major maintenance through majority resolution (from larger-scale maintenance to major modernizations) in the new EU countries. This represents a greater hurdle for financial decisions on maintenance measure financing in these countries than for rental housing in Germany. On the other hand, the hurdle for financing decisions for modernizations (including energy-saving measures) in the new EU countries is no higher (50 % + 1) while in Germany until recently unanimous agreement (as of 1 July 2007: 75 %) of all affected occupants was required for modernizations (and hence to finance contributions for modernizations). Energy-saving measures stipulated by law are therefore of considerable significance for condominiums communities in Germany since legally prescribed energy-saving measures also apply to condominiums communities (see 4.2.2).

4.4.2 Decision rules for covering the costs of resolved measures when reserves are inadequate

<table>
<tr><td colspan="6">Decision rules for one-off apportionments for financing construction measures already decided upon when reserves do not suffice (Types 1 and 1A Ownership)</td></tr>
<tr><th>Type of measure</th><th>Estonia</th><th>Latvia</th><th>Lithuania</th><th>Poland</th><th>Germany</th></tr>
<tr><td>Essential repairs (M1)</td><td colspan="5">No vote by condominium owners required (each must pay the reserve if reserves are insufficient)</td></tr>
<tr><td>Major renovations</td><td colspan="4" rowspan="4">If costs are outstanding from majority resolutions to implement measures which cannot be covered by reserves, each condominium owner has to pay an apportionment for the remaining costs</td><td>Obligation to pay apportionment for remaining costs</td></tr>
<tr><td>General modernizations</td><td rowspan="3">For measures already agreed (with 100% or 75% agreement as of 1 July 2007), each condominium owner must pay their share of the costs</td></tr>
<tr><td>Energy-saving measures</td></tr>
<tr><td>structural modifications</td></tr>
<tr><td>Legally-stipulated construction measures</td><td colspan="5">If reserves are insufficient, each condominium owner is obliged to pay their allotted apportionment to cover the remaining costs</td></tr>
</table>

Rules for one-off costs apportionments appear at first simpler and less problematic than those for establishing reserves: All condominium owners have to pay their allotted apportionments for refurbishment measures decided by majority resolution (see 4.3.1).

However, this apparent simplicity is deceptive. One-off cost apportionments are only unproblematic when resolutions on regular monthly apportionments have been concluded by majority decision (see 4.4.1) and remaining costs for refurbishment measures exist from which cannot be covered in full by the reserves agreed upon.

4.4.3 Decision rules for taking out a loan (without land registry security)

<table>
<tr><td colspan="6">Decision rules applied to for condominiums communities (Types 1 and 1A Ownership) when seeking a loan (without land registry security) to finance construction measures</td></tr>
<tr><th>Type of measure</th><th>Estonia</th><th>Latvia</th><th>Lithuania</th><th>Poland</th><th>Germany</th></tr>
<tr><td>Essential repairs (M1)</td><td colspan="5">Financing M1 measures with credits is not common</td></tr>
<tr><td>Major renovations</td><td colspan="3" rowspan="4">To take out a loan, a majority vote (50% +1) is required; at the same time the majority vote decides the amount by which present installments reserve (for payment of credit rates) is to be increased</td><td colspan="2">Only permitted as temporary emergency financing solution by the housing manager when condominium owners fail to pay their apportionments</td></tr>
<tr><td>General modernizations</td><td colspan="2" rowspan="3">Only where agreement by all condominium owners affected exists (100% or 75% agreement as of 1 July 2007); all condominium owners have the right to finance their allotted costs on their own (cash or private loan)</td></tr>
<tr><td>Energy-saving measures</td></tr>
<tr><td>Structural modifications</td></tr>
<tr><td>Legally-stipulated construction measures</td><td colspan="3">Where reserves do not suffice, apportionments (no credit)</td></tr>
</table>

In the new EU countries a majority may decide to assume a refurbishment credit can if no land registry security is required.[21] Yet it is not uncommon in the new EU countries for the housing manager to test the ability of the condominiums community to pay by initially demanding monthly apportionment payments equal to the credit rate required before resolving to take out a refurbishment loan (as was the case with the BEEN best practice project in Tallinn). Taking out a refurbishment credit is only responsible (with respect to the actual overall liability[22] pertaining to condominiums communities) when apportionments can be raised safely. Banks that are prepared to hand out a credit to condominiums communities will also demand proof of ability to pay from the condominiums community . A 50% + 1 decision alone is not adequate for a bank.

4.4.4 Taking out a loan with land registry security

The situation is the same in all BEEN countries with regards to the theoretical possibility of assuming a joint refurbishment credit with land registry security: no condominium owner can be forced to secure a shared refurbishment credit in their land registry folio against their will. Apart from this, it is doubtful whether the bank providing the credit would even be prepared to accept this due to the differences in credit worthiness of individual condominium owners. A loan for refurbishment credit with land registry security only works where individual owners wish to finance their allotted cost contributions using credit. Majority resolutions to finance refurbishment measures through credit with land registry security are therefore not possible in the case of condominiums communities.

4.4.5 Obligations for condominium owners to accept measures they have voted against or are not in agreement with

<table>
<tr><td colspan="6">Decision rules for toleration by minorities (not in agreement or actively against a measure) for condominium owners (types 1 and 1A ownership)</td></tr>
<tr><th>Type of measure</th><th>Estonia</th><th>Latvia</th><th>Lithuania</th><th>Poland</th><th>Germany</th></tr>
<tr><td>Essential repairs (M1)</td><td colspan="5">To be tolerated without limitation</td></tr>
<tr><td>Major maintenance</td><td colspan="3" rowspan="4">After successful majority resolution (50 % +1): minority must tolerate</td><td colspan="2">To be tolerated without limitation</td></tr>
<tr><td>General modernizations</td><td colspan="2" rowspan="3">No obligation to tolerate (consensus by all affected condominium owners required); as of 1.7.07: toleration after 75% majority resolution</td></tr>
<tr><td>Energy-saving measures</td></tr>
<tr><td>Constructional changes</td></tr>
<tr><td>Legally-ordained constructional measures</td><td colspan="5">To be tolerated without limitation</td></tr>
</table>

[21] Due to the amendment to condominium ownership law (WEG) which came into force on 1 July 2007 in Germany, it also appears possible for a 75% majority to decide to take out a joint credit, providing this is not secured by land registry. Condominium owners who express a wish to pay their shares of the costs in cash will, however, be able to do so.

[22] Even if the liability of each condominium owner is limited externally to their flat share in a HOA (and the same applies in Germany as of 1 July 2007), it is in the basic interest of all condominiums communities to meet their external obligations in the full to outside parties in order to prevent the implementation of complex but also very costly enforcement measures.

Given a valid majority resolution to implement and finance refurbishment measures (see 4.4.1 to 4.4.4), condominium owners who are actively or passively against measures must accept their implementation regardless.
According to decision rules in Germany, essential renovation must, in any case, be accepted without objection. Legally-stipulated retrofitting measures to save energy (see 4.2.2) must be tolerated without restriction, as is the case for essential maintenance.

4.5 Differentiation between individual ownership and common property with joint refurbishment measures

In the previous sections, decisions about implementing refurbishment measures in buildings with the legal form of condominiums (Type 1 and 1A Ownership) applied to refurbishment measures for the common property. Every condominium owner is, however, responsible for the property in the confines of their condominiums.

This principle is common to all national home ownership laws.

When examining all possible refurbishment measures on a building more closely, we see that, practically, all measures concern communal property. Individual ownership actually includes only those areas which bear on the appearance and comfort inside the home. Everything that concerns operation and stock of other homes too is, in questionable cases, common property, even where the realm of use is within the individual property.

Differentiation between the principles of individual ownership and common property		
Type of property	Explanations	Examples
Individual ownership	Individual property in the form of a self-contained flat	e. g. standard of fittings in bathroom and kitchen
Common property	Common property is everything required for the safe existence and usage of all homes in a building (structural safety, protection against bad weather and joint supply of heating, water, waste water etc)	e.g. all bearing walls and ceilings; the roof, facades, risers, stairwells
Differentiation between individual ownership and common property	Everything which affects the operation and stock of other homes is common property in cases of doubt even if it is located within the individual property.	e.g. all bearing walls in a home; risers (electrics, water, waste water, heating pipes); the windows, entrance door

In practice, considerable complications may arise due to the distinction between common and individual ownership. Most problems with overlapping occur when residents make changes to windows, entrance doors and loggia of their own accord.

Problematic resident initiatives which overlap the areas of individual and common ownership		
Types of common resident refurbishments		**Way in which individual ownership overlaps with common property**
New windows	Rickety, draughty windows are replaced by new ones by resident on own initiative; result: Non-uniform look for facade and windows with poor U-values	Windows are actually a matter of common property due to their exterior design and thermal insulation (plus protection against bad weather)
New entrance doors for flats	For safety reasons, anti-burglary entrance doors are installed by resident acting on own initiative; Result: non-uniform appearance of entrance doors in stairwell	Uniform look and security of entrance doors to the stairwell is actually a matter of common property
Safety grill on loggia	For safety reasons, lattices are attached on loggia on lower floors of house by residents acting on own initiative: Result: a highly non-uniform, unseemly facade	External appearance of loggia facade is actually a matter of common property

Some complications which occur in practice are:

- Despite the merely requiring a majority vote, in practice relatively little refurbishment was carried out to common property, so many condominium owners resorted to personal action on issues concerning the grey area between individual ownership and common property. Residents have themselves installed new windows and secured entrance doors to flats and loggia against burglary. In doing so, concerns of common property (especially with respect to uniform external appearance) were often disregarded by residents who took independent action.
- Yet, in the 1990s who could have or desired to forbid these resident initiatives? In a situation where nothing in the way of refurbishment is being done, who would wish to add insult to injury by denying a resident the right to improve their home of their own accord? Now however, after 2006, the time has come to set clear practice-orientated rules for these popular self-help measures which take both the interests of the community and the interests of the individual owners into account, even in the new EU countries.

4.6 Vote counting for condominiums communities majority resolutions

The following question arises when condominiums communities decide via majority resolutions: How are condominium owners votes actually counted and weighted?
This question appears simple at first, but on closer inspection reveals itself as a complex issue. Although only one answer is possible, in practice there are three ways to count votes:

- One vote per flat (model A);
- Votes weighted according to share of common property (model B);
- Each condominium owner: only one vote (model C).

The presence of the three ways of counting votes in the BEEN countries:

Weighting of votes in case of home ownership					
	EE	**LV**	**LT**	**PL**	**Germany**
Model A: Each condominium has one vote	**Yes**	**Yes**	**Yes**	**-**	**-**
Model B: Each condominium has a vote with weighting by fraction of common property (= the more flats or living space the more the votes weight)	**-**	**-**	**-**	**Yes**	**-**
Model C: Each condominium owner (regardless of how many homes they own or how large their home is) has only one vote	**-**	**-**	**-**	**Yes,** if > 20% want this	**Yes**

In Germany each condominium owner, regardless of how many homes they own or how large their homes are, has one vote only to prevent dominance by owners who hold large portions of the property[23].
In the Baltic countries each home is granted one vote. This has as yet posed no problems because only municipal authorities have been able to hold large amounts of property because of their as yet unsold homes.

[23] Another model can be agreed upon during the founding procedure or later by majority vote

4.7 Resume and recommendations, Section 4

4.7.1 Resume and recommendations relevant to Art. 6 of EPBD

Art. 6 of the EPBD is a very good approach on the part of the EU to force EU countries to introduce requirements to bring building components in line with the energy standard for new buildings when performing major renovations (4.2.3).

The present ruling and the way its application have not to date pursued the actual goal (see 4.2.3) sufficiently in practice, however, and therefore require optimization along the following lines:

Recommendation 1:
The scope of Art. 6 of the EPBD should be extended to apply to smaller residential buildings (not only to those exceeding 1,000 m² of living space)

- National legal systems are at liberty to stipulate requirements regardless of building size (as in Germany), but often only the minimum EU regulations are enforced.
- The threshold size of 1,000 m² is however less relevant to prefabricated housing because multi-storey prefabricated houses are generally larger residential spaces.

Recommendation 1a:
The scope of Art. 6 of the EPBD should be extended to cover "minor" (not just major) renovations to residential buildings, in particular window replacement in living spaces; otherwise refurbishment in incremental steps, as is common in the new EU countries, may thwart the objective of continual improving a building's energy standard.

- Here too, national legislators are free to stipulate requirements for minor refurbishments but, even in Germany, major renovations are generally defined as those that affect more than 20% of the involved parts.
- As far as practical refurbishment issues are concerned, particular care must be taken to ensure that every window replaced in residential spaces conforms to new buildings requirements. This is particularly important since, in the new EU countries, it is common for residents to replace windows of their own accord and, with no express requirements in place, to install windows with poor energy standard, compromising the energy standard of the building in the long-term.

Recommendation 1b:
National energy requirements for window replacement should be simple and practice-orientated and avoid abstract references to complex regulations for new buildings. There is no sensible reason to allow the installation of new windows with U-values higher than 1.3 W/m²K.

- National implementation rules for Art. 6 of EPBD use the range of U-values for new buildings for refurbishment too, although this is not objectively justified, thus permitting poorer windows than is reasonable from a cost-efficiency perspective.
- This is a matter for concern because the flexibility allowed to plan new buildings has no bearing whatsoever on refurbishment activity. The building exists in its previous state. If windows are replaced, it should clearly be stipulated by law that windows with thermal insulation glazing (U-value < 1.3 W/m²K) must be installed. Anything else results in unnecessary heat consumption for many years to come since windows have a very long service life.

Recommendation 1c:
National energy requirements for thermal insulation of facades should be simple enough to ease compliance in practice. Instead of U-value ranges for new buildings, practice-orientated regulations should be introduced which guarantee new thermal insulation on facades possesses a minimum thickness (e.g. at least 8 cm) and stipulate specific practical steps to prevent thermal bridges.

- As with windows, requirements for thermal insulation facades are not sufficiently practice-orientated. Since the building already exists at the time of refurbishments (and as such awaits thermal insulation only), it cannot be considered good practice to stipulate high, abstract U-values. Instead, a minimum thickness should be specified for insulation material (with practice-orientated thermal conductivity values) which is sensible from a cost-effectiveness point of view.
- An insulation material thickness of 8 cm for prefabricated buildings of Type 1 and 2 results in U-values of 0.35 W/m²K. This is a fully sufficient value (see 1.5). More important than attaining even better U-values for outside walls is planning the execution of the design in such a way as to avoid thermal bridges and stipulate requirements to achieve this.

4.7.2 Resume and recommendations regarding the possibility of legally-stipulated energy-saving measures

In Germany, legally stipulating the implementation of certain energy-saving measures (with a transitional period) is a tried and tested approach (see 4.2.2.).

Recommendation 2:
The legal instrument which provides for compulsory retrofitting measures should be introduced in the new EU countries too, initially, however, only for: • **retroactive insulation of accessible heating and hot-water pipes not contained in living spaces** • **and supplemental insulation of accessible top-floor ceilings.**

- These energy-saving measures are already economically viable in the new EU countries (see 5.3).
- The introduction of consumption-based billing for central heating (and installation of the required equipment) exhibits a more complex cost-efficiency relationship (see 5.4. for details).
- This presupposes of course that individual heat consumption is measured for each building, as is standard practice in the new EU countries. Where this is not the case, retrofitting must be performed. The first step in consumption-based billing is of course that the heating consumption of each building is measured individually and only this supply is charged to the flats in a building.

4.7.3 Resume of the existing statutory decision rules for binding resolutions on refurbishment in condominiums communities

The approach to binding refurbishment decisions in the new countries with a majority resolution (50% + 1) designed to present as little of an obstacle as possible is a good one. It alone has yet to spur widespread larger-scale refurbishment resolutions for reasons of financing (see 4.4 and 6), yet it does guarantee that no obstacle exists with respect to agreement quotas.
A similar barrier was recently removed with effect from 1 July 2007 thanks to an amendment to the German condominium ownership law (WEG). The unanimous consensus previously required for modernizations (including energy-saving measures) was reduced to 75% in Germany.

A proper approach to refurbishment practice in the new EU countries is that the majority resolution also applies to larger-scale maintenance (which exceed the scope of necessary repairs). A different approach, as the one obliging housing managers to deal with essential maintenance in Germany (without requiring tenant agreement), is in practice only feasible where buildings are in a fundamentally sound state of repair.

4.7.4 Resume and recommendations on self-help activities to windows and flat doors

Due to the fact that thus far few larger-scale refurbishments have taken place in the new EU countries, many residents performed refurbishment measures which represent an overlap between the areas of common ownership and own-initiative refurbishments (particularly for windows, entrance doors, burglary protection) (see 4.5).

Recommendation 3:
Self-help activities by condominium owners to install new windows, new entrance doors to flats and lattices on loggia should be expressly regulated in a practice-oriented manner in national home ownership law.

Practice-orientated regulation might for instance entail:

- When it has been decided that certain building components (as yet unrenovated) are to be replaced by new ones in the foreseeable future and a uniform planning has been made, communal refurbishment must have precedence over individual activities.
- If communal refurbishment is not to be expected in the foreseeable future, condominium owners cannot be prevented from replacing these components of their own accord, providing the outward appearance corresponds to the existing external appearance of the building. For this, the housing manager must approve a resident's plans. If such action is done, new windows should have a U-value < 1.30 W/m²K since heat losses via windows affect all condominium owners (via apportionment for heating costs).

5 The Cost-Effectiveness of Energy-Saving Measures

5.1 Which energy-saving measures are worth considering?

For measures to save heating costs, it is necessary to make a distinction between two groups of measures:

- Measures Group A: Energy-saving measures (thermal insulation measures) which reduce heat loss
- Measures Group B: Essential accompanying measures for heating systems which enable realization of potential savings from measures in Group A (with measures from Group A alone homes would be very warm but no energy would be saved!)

Possible heat conservation measures	Function and purpose of measures
A. En- Measures Group A	
A.1a Insulation of gables	Reduction of heat loss from building envelope
A.1a Insulation of longitdinal walls	
A.2 Insulation of top-floor ceiling	
A.3 Insulation of cellar ceiling	
A.4 Insulation of heating pipes	Avoidance of unnecessary heat loss from pipes
A.5 NEW windows	1. Reduction of heat loss via window panes and frames
	2. Avoidance of unnecessary heat loss (due to unwanted draughts through poorly-insulated windows)
A.5.1 Ventilation slats in windows	Guarantee of sufficient basic ventilation (ca. 20m² fresh air per person per hour) for hygienic fresh air and (measures A.5.3 and A.5.4) to avoid pollution of odors in house
A.5.1 Air supply valves in windows	
A.5.3 Air extractor fans for roof	
A.5.4 Air flaps in shaft	

Measures A.5.1 to 5.4 are “accompanying measures” which are nonetheless imperative for windows; they are essential to guarantee basic ventilation in homes since new windows close without admitting any air (in contrast to rickety and draughty old windows)

B. Measures Group B (accompanying measures)	
B.1 Modernization of heating system	Requirements-based supply of heating water to flats (according to reduced heating requirements after thermal insulation)
B.1.1 Heating pipe shut-off valves	For flawless regulation of hot water flow into risers and to allow the option of shut-off for repairs.
B.2 Modernizations to heating pipes and radiators	For flawless regulation of heating needed in flats
B.2.1 Alternative 1: Retaining 1-pipe heating[24]	economical heating variants (main problem: thermostat valves can easily become blocked by rust particles with old pipes)
B.2.1a (thermostat) valves	Individual requirements-based regulation of room warmth; thermostat valve (unlike simple valves) keep the heating level constant automatically
B.2.1.b By-pass radiators single pipe	Prerequisite for installation of radiator valves with single-pipe heating
B.20.2 Alternative 2: Conversion to 2-pipe heating	Technically the better variant
B.20.2a (thermostat) valves	as B.2.1a
B.2.2b Second riser	One riser each for supply and drainage of heating water for more constant heat supply
B.2.2c Connection of radiators to forward and return flow risers	

B.3 Consumption meters on radiators	Measuring of flat consumption (and consumption-based billing) to discourage overheating of flats
B.3.1 Replacement of unsuitable radiators	Where existing radiators are unsuitable for attaching energy meters
B.3.2 Measuring of consumption and billing	
B0.3.1 Alternative of own investment	Own investment and own reading/billing by resident
B0.30.2 Alternative of leasing	Passing on of equipment investment and billing to energy provider

B.4 Renovation of stairwell	Integral part of successful refurbishment

With a view to financing, the focus here is on the classic energy-saving measures. Section 8 deals more closely with further energy-saving measures aimed at attaining low-energy standards.

5.2 Outlay for energy-saving measures

To be able to arrive at conclusions on the economic viability of possible energy-saving measures, it is important to consider the costs of measures. Costs for two type 2 (single-slab prefabricated housing) refurbishment projects from the range of energy-saving measures are summarized in the table below for purposes of comparison. These are:

[24] According to information from NAPE (PL), this alternative does not exist in Poland as central heating in Poland was always built as dual-pipe heating. For this reason, measure B2 is a matter of installing thermostat valves only in Poland. This is also a reason why energy-saving measures are cheaper in Poland than in other countries.

- Ozolciema 46/3 pilot project in Riga, Latvia (2001)
- Comparable project in Berlin, Landsberger Allee 68 – 72 (1995)

Outlay for energy-saving measures	Germany	Latvia
Size of flat in m²	58.00	54.00
A. Insulation of building envelope		
A.1a Insulation of gables	€448.45	€313.91
A.1a Insulation of longitdinal walls	€2,035.96	€1,308.83
A.2 Insulation of top-floor ceiling[25]	€134.02	€116.15
A.3 Insulation of cellar ceiling	€491.40	€312.71
A.4 Insulation of heating pipes	€58.00	€ 35.10
A.5 NEW windows	€2,223.55	€1,819.27
A.5.1 Ventilation slats in windows	€ -	€ -
A.5.1 Air supply valves in windows	€20.30	€18.90
A.5.3 Air extractor fans for roof	€203.00	€129.60
A.5.4 Air flaps in shaft	€49.30	€37.80

B. Accompanying measures		
B.1 Modernization of heating system	€696.00	€486.00
B.1.1 Heating pipes shut-off valves	€40.60	€29.70
B.2.1 Retain 1-pipe heating		
B.2.1a Thermostat valves, single-pipe	*€101.50*	*€94.50*
B.2.1.b Bypass radiators, single pipe	*€301.60*	*€189.00*
B.2.2 Conversion to 2-pipe heating		
B.2.2a Thermostat valves dual pipe	€101.50	€94.50
B.2.2b Risers dual pipe	€493.00	€270.00
B.2.2c Connection of radiators dual pipe	€101.50	€64.80
B.3 Consumption meters		
B.3.1 Replacement of unsuitable radiators	€870.00	€594.00
B.3.2.1 Alternative of own investment	*€ 58.00*	*€48.60*
B.3.2.2 Leasing	€ -	€ -
B.4 Renovation of stairwell	€406.00	€189.00

Total costs WITH conversion to dual-pipe heating	**€8,372.59**	**€5,820.28**
Total costs for retaining single-pipe heating	€8,079.69	€5,674.48

Cost differences can be explained thusly:

- Prices for high quality building materials (e.g. insulation material, thermostat valves) are now relatively standardized throughout the EU since they come from suppliers that supply to the global market.
- Price differences are essentially a matter of varying wage costs for work with building materials on-site by construction companies active regionally.

The following is a comparative breakdown of wage and material costs:

[25] These costs relate to a "cold roof" (i.e. above the top-floor ceiling is an accessible but unheated floor for equipment which makes it possible to put in insulation material on top floor ceiling without cost or hassle. If there is a "warm roof" (sandwich roof), additional insulation is generally only economically viable when the roof sealing is due to be replaced.

	Germany (D)		Latvia (LV)		Costs
	Costs	**Proportions**	**Costs**	**Proportions**	**LV vs. D**
Material costs	€3,767	45%	€3,767	64.7%	100.0%
Personnel costs	€3,767	45%	€1,801	31.0%	47.8%
Technical processing	€837	10%	€251	4.3%	30.0%
Construction costs	**€8,372**		**€5,820**		**69.5%**

These cost levels have been confirmed in projects by the German-Latvian energy conservation pilot program and the Estonian pilot project conducted as part of the EU BEEN project.

5.3 Cost-effectiveness of energy-saving measures

5.3.1 Cost-effectiveness versus amortization periods in terms of housing economics

To determine the cost-effectiveness of energy-saving measures, it is necessary to make a proper comparison of investment costs and the reductions in operating costs (savings on heating costs) that can be achieved through investment. There are two common methods for this (indicators):

- Indicator 1: cost-effectiveness housing economics terms
- Indicator 2: Amortization period

Determining cost-effectiveness on the basis of the amortization period of a measure would at first appear to be the correct method. It is merely a matter of working out how long it will be until investment outlay is covered by the savings on heating costs. This method assumes, however, that money is available to make the initial investment in cash.
In the housing sector it is, however, usual to (pre)finance long-term refurbishment measures with loans because it would be uneconomical to wait so long to begin an available investment until the money has actually been stockpiled. For economic viability in terms of housing economics, it is therefore only the amount of the annual burden from interest and amortization that are compared with the savings on heating costs attained each year. Providing this is a factor below 1.00, a measure will be cost-effective since the savings are more than the running costs to finance the credit.

In the following sections, the cost-effectiveness of possible energy-saving measures is therefore determined mainly on the basis of the cost-effectiveness factor in housing economics terms, though amortization periods are also compared.

5.3.2 Cost-effectiveness of energy-saving measures in terms of housing economics (measures and costs as 5.2)

For energy-saving measures in each of the projects compared in Section 5.2., the cost-effectiveness as regards housing economics can be calculated as follows for an average home; the savings on heating costs in the wake of the measures are directly compared with credit apportionments resulting from credit financing (with typical conditions for the country – see 2.6).

	Germany	Latvia	Germany	Latvia		
Heating costs per kWh	€0.06	€0.03				
Annual heating costs BEFORE refurbishment	**€553.17**	**€271.54**				
Credit burden (sum of annual interest and amortization in %)			7.0%	15.0%		
Savings and cost apportionments from the measures (in € per flat annually)						
	Germany	**Latvia**	**Germany**	**Latvia**	**Germany**	**Latvia**
	Heating costs savings		Credit apportionments		Apportionment after saving	
A.1a Insulation of gables	€27.47	€13.12	€31.39	€47.09	€3,92	€33,97
A.1a Insulation of longitdinal walls	€95.81	€45.68	€142.52	€196.33	€46.71	€150.64
A.2 Insulation of top-floor ceiling	€23.85	€11.54	€9.38	€17.42	- € 14.47	€5.88
A.3 Insulation of cellar ceiling	€11.08	€5.87	€34.40	46.91 €	€ 23.32	€41.04
A.4 Insulation of heating pipes	€9.13	€4.84	€4.06	5.27 €	- € 5.07	€0.43
A.5 NEW windows	€131.38	€65.58	€155.65	272.89 €	€24.27	€207.31
B. Accompanying measures	€ -	€ -	€222.98	€289.58	€222.98	€289.58
Annual total	**€298.71**	**€146.63**	**€600.38**	**€875.47**	**€301.66**	**€728.84**
Monthly total	**€24.89**	**€12.22**	**€50.03**	**€72.96**	**€25.14**	**€ 60.74**
Saving on heating costs in %	54.0%	54.0%				

In both countries, the result in terms of housing economics is unfortunately not positive. The package of energy-saving measures does not pay for itself through savings on heating costs alone.

Though investment costs in Germany are around 30% higher, the apportionment to the occupants in significantly lower (€25.11 compared to €60.74 monthly). This is due to the following:

- In Latvia (as in the other new EU countries) annual credit rates for standard refurbishment credits are twice as high as in Germany (due to differences in the usual loan periods of credits: 8 to 12 years compared to 20 to 25 in Germany).
- Heating costs in Germany are twice as high[26] (approx. €0.06 as opposed to €0.03 per kWh of district heating) and thus the savings on heating costs possible due to energy-saving measures are twice as high.

The around 30% lower building costs in the new EU countries can reduce this doubling effect only by a ratio of 1:2.4.

[26] While prices for district heating in the years 2000 to 2006 were fairly steady, a rising trend can be discerned from 2007 onwards: District heating costs in Latvia rose on 1 August 2007 from €0.03 to €0.04 per kWh (see BEEN best practice project in Tallinn).

5.3.3 Economic efficiency rankings of energy-saving measures

Once concrete figures are available on the economic efficiency of energy-saving measures, this knowledge can be generalized and a ranking list for energy-saving measures drawn up. A relative ranking of this type is particularly helpful when all the desired measures cannot be implemented at once for financial reasons and it is necessary to develop a refurbishment concept in stages (see also 5.6 for this). In such cases it is good to have a ranking list that shows which energy-saving measure are the most efficient from costs-benefit point of view.
In the following ranking, the costs and saving effects from 5.2 and 5.3.2 have been placed in relation. The ranking table shows the following:

- The column “cost-effectiveness factor in terms of housing economics” shows the relation in which the financing costs of a measure (= annual interest and amortization rates for a refurbishment credit) stand compared to heating costs savings attained. If the factor is larger than 1, refurbishment apportionments are larger than savings by this factor. If the factor is less than 1, the measure is immediately cost-effective and finances itself with savings.
- The amortization periods column contains the figure for how many years it will take before the total heating costs savings reach the amount of outlay for the measure.
- Both columns (economic efficiency factor and amortization periods) together give both statistical values (for the case heat costs increase = zero) and the values for assuming a yearly heating costs saving of 5%, or 10% for Latvia, (= dynamic values). Economic efficiency values are of course better when looked at dynamically.
- The last column shows the results: Efficiency rankings of energy-saving measures. The table shows that, regardless of which method is used to determine the cost-effectiveness, the ranking order with both methods is the same. As such, amortization periods can be used for relative rating calculations. It remains the case, however, that amortization periods have no value (at least not directly) for economic-efficiency in terms of housing economics.

Relative cost-effectiveness of energy efficiency measures (EEM)					
Germany	**Economic-efficiency factor in terms of housing economics**		**Amortization periods of EEM in years**		**Efficiency ranking**
En-costs increase in %		5.0%		5.0%	
Energy-saving measures	*static*	*dynamic*	*static*	*dynamic*	
A.1a Insulation of gables	1.05	0.82	14.97	11.36	***3***
A.1a Insulation of longitudinal walls	1.36	1.06	19.49	14.21	***5***
A.2 Insulation of top floor ceiling	0.36	0.28	5.15	5.15	***1***
A.3 Insulation of cellar ceiling	2.85	2.26	40.67	28.11	***6***
A.4 Insulation of heating pipes	0.41	0.32	5.82	5.65	***2***
A.5 NEW windows	1.09	0.85	15.52	11.76	***4***
B. Accompanying measures					
Total	**1.84**	**1.45**	**24.81**	**18.61**	

Latvia	**economic efficiency factor in terms of housing economics**		**Amortization periods of EEM in years**		**Efficiency ranking**
En-costs increase in %		10.0%		10.0%	
Energy-saving measures	*static*	*dynamic*	*static*	*dynamic*	
A.1a Insulation of gables	3.75	1.98	24.97	12.16	***3***
A.1a Insulation of longitudinal walls	4.48	2.37	29.90	13.90	***5***
A.2 Insulation of top floor ceiling	1.57	0.85	10.50	7.05	***2***
A.3 Insulation of cellar ceiling	8.34	5.23	55.60	26.82	***6***
A.4 Insulation of heating pipes	1.14	0.71	7.57	6.45	***1***
A.5 NEW windows	4.34	2.41	28.95	14.11	***4***
B. Accompanying measures					
Total	**6.23**	**3.57**	**40.38**	**20.64**	

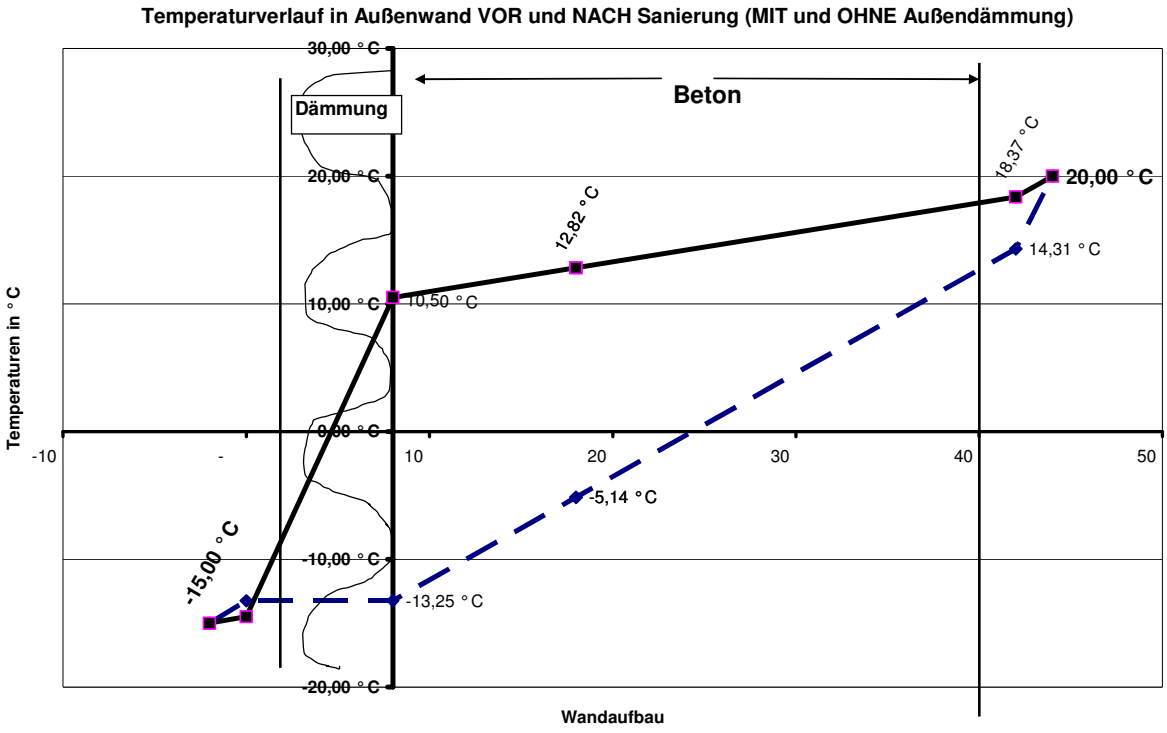
Comparison of the relative economic values shows, in particular, the following:

- In Germany, some measures (insulation of top-floor ceiling, heating pipes insulation) are already immediately cost-effective. For this reason, implementing these measures is also stipulated by law (see 4.2.2)
- Whereas conditions in Germany (energy price level, financing conditions) mean primary energy-saving measures are at the outset close to cost-effectiveness in terms of housing economics, Latvia (and the other BEEN countries) is still far away from this state. For this reason, targeted financing support is required in the new EU countries (see section 6).
- However, the table also shows that economic efficiency of the individual energy-saving measures cannot merely be looked at in isolation but that necessary accompanying measures (for the heating system) also need to be considered. The economic efficiency of a package of measures overall (in this case the complete measures package as with the Ozolciema 46/3 pilot project in Riga (see 5.2)) is determined considerably by the scope of accompanying measures required to actually enable savings through the realization of heat insulation measures.

5.3.4 Quality-of-life benefits in addition to heating cost savings gained through energy-saving measures

Even if the whole package of energy-saving measures is not in itself immediately cost-effective in Germany, as with the Ozolciema 46/3 pilot project in Riga (see 5.2), this does not mean implementation is entirely uneconomical. For overall cost-effectiveness is **not only** calculated using savings won on heating costs.
Heat insulation of the building is, however, more than the key measure for saving heating energy; it also rectifies a multitude of general construction faults on prefabricated housing:

- A thermal insulation facade **saves on maintenance measures** to rectify damage to concrete surfaces and joints. Further exacerbation of damages is halted before reaching the protective thermal insulation layer.
- The walls are not exposed to fluctuations in temperature due to the thermal insulation, or to the humidity of the outside air. Dampness present in the walls dries. Rusting of reinforcing steel that has commenced is stopped.
- A thermal insulation facade automatically eliminates the problem of mould buildup on exterior walls and in the corners of rooms in prefabricated housing. This happens because frost no longer permeates the walls (remaining in the external insulation). In this way the temperature of the walls increases so that virtually no dew can be formed on exterior walls and the **danger of mould formation** is removed.
- The “cold-radiation” effect which emanates from uninsulated walls in winter is eradicated. Due to an externally-applied layer of insulation, the frost remains in the external insulation layer even in the coldest of winters. The room side of the external walls is almost room temperature and therefore seems pleasantly warm, even in the coldest of winters. Due to the **elimination of “cold-radiation” effect in winter,** room temperatures of 20 ° C are perceived as pleasantly warm. The lack of a cold-radiation effect therefore brings an additional saving possibility on heating costs of around 7% for residents who heat economically.
- The effect of thermal insulation keeps the walls at virtually room temperature all year around; it is **climate-compensating**. In the transition periods (spring, autumn), it is not necessary to heat as much because the heat stored in the walls works like heating. In **summer, thermal insulation works like an air conditioning system**. Thermal insulation prevents walls being heated up by solar radiation. The walls have a cooling effect if air is circulated intelligently (opening windows at night, closing windows and blinds in the daytime to block solar radiation) in the summer months.



5.4 Cost-effectiveness of consumption-based billing of heating costs

5.4.1 The three steps in consumption-based billing

Most people associate only heat consumption meters in homes with consumption-based billing for heating costs and a bill which reflects the amount consumed.
On closer inspection, however, this consumption-based bill is merely the third step in cost-adjusted billing of heating costs. It is only because the first two steps have long since been standard in the BEEN countries (though not in all countries in eastern Europe) that they are taken for granted and their significance underestimated.

The three steps of consumption-based billing of costs for district heating are:

Consumption-based billing **step 1**: Introduction of **cost-covering apportionment of heating costs** (and all operating costs – no more subsidies for operating costs).[27] For heating costs, this means: Each household must pay a monthly advanced payment for heating costs. At the end of the heating period, a bill for the actual heating costs and a calculation of the share for each home is made according to the proportion of living space. Depending on the result of the bill, at the end of the heating period there is either a back payment or a refund for each household.

Consumption-based billing **step 2**: **Disconnection of district heating network from heat distribution in buildings. Point of separation is the heat transfer point in the building (building's connection station). Each building receives a heating meter.** Each house pays only the amount of heat meter in-house. The district heating company can no longer apportion its costs as lump sums (costs for overall primary energy consumed including more or less poor efficiency rate of heat generation systems, heating losses in pipeline network)

[27] Residents in East Germany (GDR) for example paid low flat-rate housing costs for heating (and also for other housing costs) which did not cover outlay until 1990. This provided no incentive to be economical with heating or water.

but instead needs to develop a rate based on each 1 kWh for effective energy supplied to the building.[28]

The consumption-based bill for step 2 has the following two purposes:

- Purpose 1 (incentive to save primary energy with district heating provider)
  By revealing the effective energy costs per kWh at the building transition point, there is an incentive for the district energy provider to improve the efficiency rate of heat generation systems and to reduce heat losses in the distribution network (by better heat insulation of pipes). By comparing the effective energy supplied (now measured) to the building with the primary energy it consumed itself, the district heating provider can work out how much their own energy losses are (efficiency rate of systems, losses via distribution pipelines). If the district heating provider's price is not competitive, they can reckon with condominium owners turning to another provider (offers for local heating supply) or even that they might construct a local heating system themselves. Step 2 of the heating reform has led district heating companies to reduce their primary energy consumption using energy efficiency measures (improvement of efficiency rate for heat generation, insulation of distribution pipelines) for supply of housing developments by up to 50%!
- Purpose 2 (incentive to occupants to implement energy-saving measures in their buildings)
  If each building only has to pay the actual heating consumed (according to a uniform price per KWh), which is measured at the building transfer point, this provides an incentive for the building inhabitants to implement energy-saving measures. If heating energy requirements are halved using thermal insulation measures, the benefit of energy-saving measures goes entirely to the refurbished house alone. Without calculation of heating consumption for each house by a heating meter, it would not have been possible to determine the effect of actual energy-saving measures on the house itself.

Consumption-based billing **step 3**: **Installation of consumption-measuring devices** on each radiator and **billing according to the consumption measured** instead of the old heating cost apportionments according to the size of the living space finally occurs as the third step.

To correctly gauge the importance of the three reform steps for heating costs billing, it is important to clarify what they can contribute to primary energy savings for the economy:

- Step 1 is a prerequisite for Step 2, which is the most effective: The district heating provider reduces the previous primary energy consumption by up to 50%. This really is true: Energy-saving measures by district heating providers themselves (to improve efficiency rate of heat generation systems and thermal insulation of distribution networks) can alone lead to just half of the previous primary energy being consumed to maintain the same heating supply for housing developments.
- If building owners already undertake energy-saving measures in the building on their own (as with the pilot project Ozolciema 46/3 in Riga – see 5.1 and 5.2), effective energy consumption for heating is halved again. Both effects together result in a reduction of the previous primary energy consumption (before Steps 1 and 2) by up to 75%.
- By contrast, step 3 (conversion of flat-rate heating cost apportionment to consumption-based heating costs billing) brings an additional saving effect of only around 10 % to 15 %29 on effective energy consumption for heating. When calculated on the original economic primary energy consumption (in contrast Steps 1 and 2 bring reap savings of

[28] This does not rule out a flat rate connection tariff being charged in addition to the consumption price to cover basic costs.

[29] The literature which accompanied the legal introduction of consumption-based billing in Germany in the 1990s assumed a saving effect of around this size (10 to 15%). This number is plausible if one considers that a room temperature that is 1 °C lower brings in a heating cost saving of around 6%.

up to 75%), step 3 thus brings only an additional primary energy saving effect to the economy of 2.5 to 3.75%.

But step 3 for heating cost billing (conversion from flat rate m² apportionment to consumption-based billing) brings this additional savings effect only if overheating of homes is possible due to residents' behavior. In this respect, step 3 assumes the following:

- Radiators must be fitted with valves with which occupants can control room heat individually (within a range). If individual control of room warmth is not possible (e.g. because there are no valves on the radiators), consumption-based billing makes no sense.
- The same is true if the heating system does not provide sufficient heat in winter. Consumption-based billing in homes (step 3) only makes sense where the occupants can overheat their homes using individual valve settings (meaning increased room temperatures of 23 to 26 ° C are possible).

The saving effect triggered by Step 3 consists in residents being given an incentive not to constantly set the radiator valves at the highest level since those that do this (due to consumption-based billing) have to pay more heating costs than if they heat economically.

5.4.2 Current status of consumption-based billing of heating costs

Steps 1 and 2 for energy-saving consumption-based billing of heating costs have been realized in all BEEN countries.

In Germany, step 3 (consumption-based billing of heating costs) is also enforced by law. In eastern Germany a transitional period for this existed up to 31 December 1995 (see 4.2.2).

One problem with consumption-based billing of heating costs is that equipment required for this (acquisition, installation, maintenance and reading of consumption meters) costs money. Annual costs for consumption-based billing are between €30 and €60 per home and have to be paid annually in addition to heating costs.
But, even if extra charges for measuring consumption are not insignificant and largely cancel out the additional saving effects (through being economical) again, the method nevertheless enjoys widespread acceptance among residents since consumption-based billing (Step 3) corresponds to a sense of justice of being rewarded for being sparing and not having to pay for energy wasted by others.
Legal regulations also exist in Germany whereby consumption-based billing can be contracted out to energy providers so that annual billing costs (including provision and maintenance of consumption meters on a leasing basis) can be billed together with heating costs.

In the new EU countries, consumption-based billing has until now been a voluntary energy-saving measure within the building which is as much in the owner's power to decide as other energy-saving measures (see 4.3).

5.4.3 When is consumption-based billing economical?

First it should be stated that consumption-based billing of heating costs is not an energy-saving measure in itself. The type of billing of heating costs becomes an energy-saving measure if the type of billing leads to heating costs being saved overall. Experiences in Germany show that flats with consumption-based billing save on average around 10 to 15% on heating costs compared to those whose heating costs are billed according to m².

Nevertheless, consumption-based billing of heating costs is not a good idea in every case. Consumption-based billing (Step 3 of heating costs billing) is only sensible if three prerequisites are met:

Prerequisites for consumption-based billing (step 3):			
		Consumption-based billing: sensible or not...	
	Technical solution	sensible	not sensible
Prerequisite 1:	Adjustable valves (ideally thermostat valves) on every radiator	Essential prerequisite	not sensible WITHOUT
Prerequisite 2:	Heating system must provide higher room temperatures (20 to 25° C) than just minimum temperatures	As incentive to heat economically and according to need	If overheating is not possible by setting valves
Prerequisite 3:	Extra costs for equipment, reading and billing should not be higher than savings (around 10 to 15%) attained due to consumption-based billing (and the resulting behavior triggered)	... If additional costs for consumption-based billing are below 10% of heating costs	... If additional costs for consumption-based billing are below 15% of heating costs
	With annual heating costs after refurbishment of …	.. this would be…	.. this would be…
e.g. Latvia	€240	< €24.00	>€ 36.00
e.g. Germany	€480	< €48.00	> €72.00

The table shows the following:

- Billing of heating costs according to consumption is only sensible if all radiators are fitted with controllable radiator valves (ideally automatic thermostat valves). Residents must have the opportunity to set room temperatures according to individual needs. Without adjustable radiator valves, saving or generous heating is not possible as the heat must be taken as it is supplied form the heating system.
- The heating system must be set in such a way with regards to forward flow temperatures, that all occupants have the opportunity to set room temperatures within a minimum range (between 18 and 24 °C). If residents are unable to overheat their homes consumption-based billing brings no saving effects and is then not worthwhile because the heating system delivers only minimum temperatures.
- Furthermore, heating costs billing only makes sense if additional costs for the devices for measuring consumption are not higher than savings. This will be the interest of the residents at least. In economic terms, it is always a good idea if the additional 10 to 15% saving on effective energy can be realized, even if it maybe brings no benefit for residents (in relation to heating costs including billing costs).

For consumption-based billing, it is essential that suitable devices for measuring consumption are installed.

Alternatives for fitting equipment for consumption-based billing			
		Consumption-based billing: sensible or not...	
	Technical solution	sensible	not sensible
Alternative 1	Circular manifold for each flat with heat measuring device	With new buildings	Too expensive for refurbishments
Alternative 2	**Consumption-detection meters on each radiator**	Low-price solution for refurbishments	
Alternative 2a	Own investment and own billing		Generally not advantageous
Alternative 2b	"Leasing" of consumption-based billing (contract with energy provider)	.....generally not more expensive than own investment (use competitiveness of providers!)	
Cost range Alternative 2		€30.00 to €60.00	

Retrofitting of homes with exact measuring devices for gauging actual thermal consumption of individual homes is expensive. The equipment required for this is generally only fitted in new buildings.

With existing houses, consumption detection devices which record how warm the radiators were set in the course of the heating period (“heating cost distributor”) are attached to radiators for measuring individual heat consumption. The result is read as a figure on a scale. The figure read says nothing about the actual heating cost consumption. Only when all figures read have been added together is it possible to work out the amount of heating for a flat.

Measuring the individual heating consumption using the relatively low-price heating costs distributor assumes radiators are technically suitable for attaching these devices. With fine-ribbed radiators, this is not the case and often new radiators need to be installed for consumption-based billing.

To expound on the considerations above, the following table examines three frequently-occurring cases under the aspect of whether and how sensible consumption-based billing is:

Example cases for whether or not consumption-based billing is sensible			
		Consumption-based billing: sensible or not...	
	Technical solution	sensible	not sensible
Case 1:	**Not refurbished, radiators have no valves**		X
Case 1a	Heating costs €480 per flat annually (G)		X
Case 1b	Heating costs €240 per flat annually (LV)		X
Case 2:	**As 1 but controllable valves and increase in forward flow temperatures (so that individual overheating is possible)**	Consumption-based billing brings a saving of 10% to 15% on heating costs. This is…	
	..for e.g. heating costs 600 € per flat annually (G)	60 to 90 € per flat annually (through consumption-based billing)	
	…for e.g. heating costs 300 € per flat annually (LV)	30 to 45 € per flat annually (through consumption-based billing)	
Case 3:	**Energy-saving measures like Ozolciema 46/3**	Consumption-based billing brings a saving of 10% to 15% on heating costs…	
Case 3a	… for heating costs 240 € per flat annually (D)	24 to 36 € per flat annually (through consumption-based billing)	
Case 3b	..for e.g. heating costs 120 € per flat annually (LV)	12 to 18 € per flat annually (through consumption-based billing)	

Case 1 confirms that measuring home consumption and billing according to this amount is out of the question if residents have no facility for regulating heating warmth individually.
Case 2 illustrates that heating cost billing by consumption reaps the greatest savings in houses WITHOUT thermal insulation if the radiators are already fitted with radiator valves and the heating system provides sufficient forward flow temperatures. If these prerequisites do not exist however, it does not make sense to install only these fittings in an unrefurbished house (i.e. only radiator valves and boosting of forward-flow temperatures on the heating system). A partial refurbishment of this type would not be practical as, all told, it would increase heating energy consumption. The aim of energy refurbishment is, however, to reduce heating energy consumption while at the same time increasing living comfort. This can only be achieved with a sensible package of energy-saving measures (including insulation of external walls and quality windows) as described in Case 3. The disadvantage of this case is that, due to the measures, the heating warmth consumption is halved so that the additional saving effect due to consumption-based billing falls accordingly. Unfortunately, even for Germany, this is nearing economic inefficiency. At least this is the case if one goes by the average savings achieved.

The advantages and disadvantages and the situation for those interested in consumption-based billing become somewhat more complex if one takes into account the factors dependent upon the physical location of flats within a house.

5.4.4 Dealing with the inequalities in consumption-based billing due to flat location in the building

If the advantages and disadvantages of consumption-based billing were only those outlined in 5.4.3, it would not be difficult to make decisions.

The decision is made more difficult, however, by the fact that heat losses in homes, which amount overall to the heat consumption of the house, are not the same for all flats (even if they are the same size) at the same room temperatures. Heat losses in an actual flat depend on the amount and surface area of the surrounding buildings constituents bordering its external perimeter. A flat situated in the middle of the house (with other flats underneath,

above and below) has less heat losses (and thus less heat consumption) than a corner flat below a roof.

Heat losses and thus heat consumption therefore demonstrate the following differences depending on their position in the building:

Differences in physical heat consumption depending on location of flats in building			
	Average heat consumption	100%	100%
	Differentiation by location	BEFORE refurbishment	AFTER refurbishment
Inside flats	Built-in (only two longitudinal walls as external walls)	80% to 90%	approx. 90%
Flats on edges	Located at a gable wall, under the roof or above the cellar (i.e. compared to an inside flat **one additional external wall**)	Up to 120%	approx. 110%
Corner flats	Located on corner of building (i.e. compared to inside flat **two additional external surfaces**)	Up to 180%	approx. 130%

This means that actual heat energy consumption in a corner flat (with the same size and room temperature) can be as much as twice as high as that of a flat protected by the building.
With heating costs billing by living space (m^2), both flats have to pay the same amount of heating costs. With billing by consumption, differences in heating requirements contingent on physical factors become noticeable.

Is it just if, due to heating cost billing, one household pays twice as much heating costs as the other? How do we register economical and less economical heating?

Effects of consumption-based billing on location of flats within a house BEFORE and AFTER energy efficient measures						
Start data		56.00	m²		€0.06	per kWh
	BEFORE refurbishment			**AFTER refurbishment**		
		160.00	kWh/m²a		80.00	kWh/m²a
Average figures for average residential unit for heating WITHOUT consumption-based billing (i.e. heating costs billing by m²)						
		in kWh/flat a	*in € per month*		*in kWh/flat a*	*in € per month*
Heating energy consumption and costs	100%	**8,960**	€44.80		4,480	22.40 €
Figures for average flat for behavior WITH consumption-based billing						
Saving effect of consumption-based billing	**15%**	*in kWh/flat a*	*in € per month*		*in kWh/flat a*	*in € per month*
Heating energy consumption and costs		**7,616**	€38.08		3,808	19.04 €

Heating energy requirements by position of flat in house for average occupant behavior						
Inside flat	85%	6,474	€32.37	90%	3,427	16.18 €
Edge flat	115%	8,758	€43.79	110%	4,189	21.90 €
Corner flat	150%	11,424	€57.12	130%	4,950	28.56 €

Spectrum of economical and wasteful heating by location of flats in house						
Very sparing heating	88%	18 °C				
Wasteful heating	124%	24 °C				
A. Sparing		*in kWh/flat a*	*in € per month*		*in kWh/flat a*	*in € per month*
Inside flat	88%	**5,697**	€28.48		**3,016**	15.08 €
Edge flat	88%	**7,707**	€38.54		**3,686**	18.43 €
Corner flat	88%	**10,053**	€50.27		**4,356**	**21.78 €**
B. Wasteful						
Inside flat	124%	**8,027**	€40.14		**4,250**	**21.25 €**
Edge flat	124%	10,860	€54.30		5,194	25.97 €
Corner flat	124%	**14,166**	€70.83		**6,138**	30.69 €

Effects of introducing a flat-rate apportionment key proportion						50.0%
A. Sparing		*in kWh/flat a*	*in € per month*		*in kWh/flat a*	*in € per month*
Inside flat	88%	**6,656**	€ 33.28		**3,412**	17.06 €
Edge flat	88%	**7,662**	€ 38.31		**3,747**	18.74 €
Corner flat	88%	**8,835**	€ 44.17		**4,082**	**20.41 €**
B. Wasteful						
Inside flat	124%	**7,822**	€ 39.11		**4,029**	**20.14 €**
Edge flat	124%	**9,238**	€ 46.19		**4,501**	22.51 €
Corner flat	124%	**10,891**	€54.45		**4,973**	24.87 €

The table includes the breadth of heating cost consumption with sparing and generous individual heating and clearly shows the following:

- Internal flats clearly profit from consumption-based billing. The losers are corner flats. Even if they are sparing, they must pay more in heating costs than households that waste heating in an inside flat.
- Upon introduction of consumption-based billing, solutions must therefore be found which can compensate, at least partly, for this injustice. The approach that exists to this in Germany is that at least 30%, at most 50% of heating costs have to be apportioned according to the size of the flat (m² key). The last block of the table shows how this ruling equals out the injustices between corner flats and inside flats. The best result for consumption-based billing is AFTER implementation of energy-saving measures. Thermal insulation of gable walls, the roof ceiling and cellar ceiling leads to heat losses being disproportionately reduced via these outside surfaces (up to 75%) and thus the serious effect of heat losses via external walls and roof is reduced. The results show that the occupant of a corner flat also has more chance with consumption-based billing not to pay more than with flat-rate billing.

It should be noted that the advantages of internally located flats are in practice even greater than shown in the table:

- The low heating need of inside flats can mean vertical heating pipes (with heating valve turned off) alone sufficiently heat the flat.
- Those who wish to can also save a lot by allowing the warm walls of the neighboring flat to heat their flat if a temperature gap exists (“heat theft”).

This is, however, the usual situation:

- Occupants of internal flats profit from consumption-based billing. With multi-storey buildings, most flats (and thus the majority in votes – see 4.3) are located within.
- Flats on the edge are on average neutral and benefit little from consumption-based billing when heated sparingly.
- The losers of consumption-based billing are occupants of corner flats. These are in the minority and have a right to not be treated unjustly when it comes to apportionments.
- The state also has an interest in consumption-based billing because, in economic terms, consumption-based billing leads to a reduction in effective energy consumption of around 10 to 15%.

5.5 Other possible energy-saving measures

5.5.1 Energy certificate and energy audits according to Art. 7 of EPBD

In the wake of rising energy prices and international efforts to reduce CO_2 emissions, the energy standard of a building is becoming increasingly significant to a building’s value. Since estimation of the energy standard requires specialist knowledge, Art. 7 of the EPBD forces EU member countries to introduce **energy certificates** on energy standards for buildings. Using the information in the energy certificate, potential buyers and tenants can take into account the value of the standard in the purchase or rental price accordingly (as with a refrigerator with energy classes from A to D).
At the same time, it creates an incentive for owners to implement energy-saving measures to be able to advertise good values for a sale or rental.
According to Art. 7, Paragraph 2 of the EPBD, “Recommendations for low-cost improvement of overall energy efficiency” (**energy audits**) should also be enclosed with the energy certificate.

As part of WP 1 (see report ....), it was established that the BEEN countries will have fulfilled their obligations for national implementation of Art. 7 EPBD by the end of 2007. In the context

of BEEN, it was, however, not possible to work out how this implementation looked in comparison to other countries.

It was only possible to establish the following:
For Germany
In Germany the legal requirement to implement Art. 7 of EPBD enters force on 1 October 2007, while transitional periods for the application of certain regulations apply until 2009. Intensive discussions about the methods of calculations took place prior to this. It costs money to put together an energy certificate and the cheaper variant is an energy certificate based on actual heat energy consumption in previous heating periods. An energy certificate based on a theoretical energy requirements calculation according to a standard method is significantly more expensive.
The result was the freedom to choose between both methods for housing stock.

For Poland, Lithuania, Latvia, Estonia:
As part of the findings on existing financing programs (see Section 6) and as part of WP 5 (BEEN best practice projects) it could be established that, in practice, much value is placed on drawing up energy audits. For this reason it appears that, with regards to the implementation of Art. 7 of EPBD in the new EU countries, the focus was on implementation of the last clause of Art. 7 Paragraph 2 of the EPBD.
In principle, this is a good approach since the need for action in implementing these energy-saving measures is obvious. But precisely because the need to act is urgent, one has to ask whether the effort and costs so far expended on a huge number of energy audits is really necessary, since nearly all audits lead to the same conclusions and recommendations.
In this respect, it is urgent to think about a simplified, practice-orientated way to implement Art. 7 of the EPBD for prefabricated housing in the new EU countries, particularly with respect to the following:

- For unrefurbished prefabricated housing, there is no obligation to confer energy certificates as the energy requirement for existing prefabricated housing can be assessed generally (see 1.2).
- Recommendations for carrying out energy-saving measures based on standardized recommendations (as worked out as part of BEEN – see 5.3). If a prefab does not yet have a thermal insulation facade for instance, the key measure for energy saving is thermal insulation. No energy audits are required for this recommendation. It is better to save the money and use investment it instead.
- Single-case energy certificates are not feasible for prefabricated housing until after energy-saving measures have been implemented so that the optimal energy standard the building has attained through refurbishment can be displayed.

5.5.2 Low-energy standard

The energy-saving measures dealt with in 5.1 to 5.4 are “classic” energy-saving measures. They increase the energy standard of prefabricated housing from 155 kWh/m² per annum (and up to 180) to a heating consumption of around 70 to 80 kWh/m² per annum.

Of course it is possible to contemplate more ambitious targets. Buildings with a low-energy standard only have a heating energy consumption of 40 to 50 kWh/m² per annum. With new buildings, it is a good idea to plan a low-energy standard of this type from the outset since the extra costs for new buildings are relatively low.

it is however generally more expensive to attain a low-energy standard for existing buildings through later refurbishment measures. To demonstrate that it is technically possible, several pilot-projects have been realized in Germany. To reach a low-energy standard, the following measures are also required in addition to the classic package of energy-saving measures.

- installation of triple-glazed windows,
- insulation between 16 and 20-cm thick (instead of 8 to 10 cm),
- increased design effort to remove cold bridges,
- controlled ventilation of flats by air supply (from additional air channels) preheated via waste heat recovery,
- preheating of heating water and domestic water using thermal solar heating system.30

The problem with additional energy-saving measures to attain a low-energy standard is the additional investment costs in relation to the potential additional saving on heating costs. While reduction of the heating energy requirement from 155 kWh/m² per annum to 75 kWh/m² per annum (i.e. a reduction of 80 kWh/m² per annum) costs around €5,000 per residential flat in the new EU countries (in Germany around €8,000), further reduction of heating energy requirement requires an additional, disproportionate expenditure:

- Thus controlled ventilation with preheating brings a further saving effect of only up to around 10 kWh/m² per annum (see also 1.4), but is also associated with poorer air quality due to ventilation through air channels.
- Doubling the thickness of the insulation layer from 8 to 16 cm also brings only further reduction in heating losses of around 7 kWh/m²a while the first 8 cm effects a reduction of around 40 kWh/m² per annum.
- Triple-glazed windows bring only a further improvement of around 5 kWh/m²a while the installation of air-tight double-glazing with thermal insulation glazing brings a saving of around 30 kWh/m² per annum.

Bearing in mind that occupants of prefabricated housing in the new EU countries can currently only afford refurbishment measures of around €2,500 per flat, implementation of the classic package of energy-saving measures (at around €5,000 per flat) appears a demanding enough target for getting refurbishments broadly up and running.

5.5.3 Renewable energies

In terms of use of renewable energies, the following are worth considering for housing stock:

- heat recovery systems (e.g. for using heat from waste air and waste water),
- thermal solar systems (for preheating heating water and domestic hot water),
- photovoltaic systems,
- local heat generation with combined heat and power.

Of the renewable energy techniques, the most economical for refurbishments are thermal solar systems. These are technically only possible with local heat supply but not with district heating supply. It is a similar case with combined heat and power. This can only be considered if energy prices for district heating supply are so high that local heat supply (and thus disconnection from district heating) is more economical.

Photovoltaic systems bring no energy savings to individual buildings. Since the power gained (approx. 600 kWh annually for a $1kW_p$ system) cannot generally be used directly in the building if generated, it is usual to feed the electrical power gained entirely into the power network of the energy provider. Owners of photovoltaic systems receive compensation[31] from the energy provider for each kWh of current fed. The same can be said for the economic efficiency of photovoltaic systems as was said about the low-energy standard:

- While the classic package of energy-saving measures costs around €5,000 per flat (in Germany around €8,000 per flat) and saves 4,200 kWh of heating energy annually (see

[30] This is not possible with district heating supply. It would only work with district heating if hot water preparation were operated locally and district heat were only used for heating.

[31] According to the German Renewable Energies Law (EEG) energy provider companies in Germany are obliged to pay a fee which is largely to cover costs and allocated to the national power grid.

2.4), a photovoltaic system with investment costs of approx. €5,000 (approx. 1kW$_p$) annually and returns only around 600 kWh.[32]

Bearing in mind that the occupants of prefabricated housing in the new EU countries can currently afford only around €2,500 per flat, it therefore makes sense for the BEEN project to first attempt to implement the classical package of energy-saving measures.

[32] For average solar radiation north of 53 degrees latitude.

5.6 Resume and recommendations, Section 5

5.6.1 Resume and recommendations on the state of the "heating reform" (consumption-based billing)

It is positive to note that in all BEEN countries, the first two levels of consumption-based billing for district heating (see 5.4.1) have been implemented. These are:

- Cost-covering apportionment of heating costs (and all other operating costs) to occupants (no reductions by area for operating costs);[33]
- Measuring of district heating consumption for each building (in the district heating transfer station);
- Billing of building heating costs based on a heating costs price for the effective energy used.

The third step in consumption-based billing has so far only been implemented in Germany:

- Apportionment of heating costs within building by consumption instead of apportionment by size of flat (see 5.4.2).

In the new EU countries, decisions about type of heating cost billing within a house are in power of the condominiums communities (or the owner) as are modernization measures. The result is that to date consumption-based billing remains the exception.

Recommendation 4:
Initially, introducing billing by consumption (rather than by flat size) should remain voluntary in the new EU countries. In cases where condominiums communities decide in favor of consumption-based billing, the minimum requirements (e.g. minimum share of flat-rate apportionment, minimum equipment requirements) should be legally controlled to prevent gross injustices through majority resolutions (corner flats, heat theft).

- Enforcing consumption-based billing legally as in Germany would be, in the current situation of heating energy prices, unaccountable because the extra costs for consumption-based billing would (especially for little flats) regularly exceed the savings that can be expected (see 5.4.3).
- In cases where condominiums communities (and other ownership types) do decide on consumption-based billing, minimum requirements should be stipulated, for otherwise occupants of flats with an interior location, which profit from consumption-based billing and in prefabricated housing generally form the majority, might make billing resolutions which disregard the interests of "edge and corner flats" unjustly.

[33] At least there is no evidence that heating costs are still generally subsidized. The still relatively low heating energy prices in the new EU countries (0.03 € per kWh district heating, in Estonia from 1.8.2007 rising to 0.04 € per kWh) may be due to lower purchasing prices and lower service costs for district heating providers.

5.6.2 Resume of the optimal package of energy-saving measures

Consensus exists between the partners of the BEEN project that the classic package of energy-saving measures such as for the pilot project Ozolciema 46/3 in Riga (see 5.1 to 5.3) is the ideal to be strived for from a cost-benefit perspective. In this respect, the aim is to find a financing and support concept (see Section 6) which gives all condominiums communities the ability to afford the full package of energy-saving measures (at a cost of around €5,000 per flat).

The best practice projects (BPP) implemented as part of BEEN in Tallinn (Estonia) and Piaseczno (Poland)[34] and the projects of the Latvian-German pilot program[35] from 2003 to 2005 have shown that a costs framework of approx. €5,000 for the "classic" package of measures is realistic. BPP costs in Tallinn were €6,500 more expensive per flat but added costs were caused by increased costs for repairs to balconies and for insulation of the flat flat roof.

5.6.3 Resume and recommendations on refurbishment in stages where implementing the entire package (see 5.6.1) at once is not feasible.

Since implementation of the entire package of energy-saving measures is the exception in the new EU countries and many condominiums communities will have reservations even if financing terms are improved (according to Section 6), the question remains as to whether the package of energy-saving measures can then be implemented step-by-step and in what way.

Refurbishment in stages is only sensible as a second option if a decision about implementing the entire package of energy-saving measures cannot be reached.

On decisions about refurbishment concepts in stages, there are two aspects that need to be observed:

- Firstly, the refurbishment concept should be based on a ranking of cost-effectiveness for measures that come into consideration.
- Secondly, it must be borne in mind that not all combinations of measures are sensible and certain combinations are even damaging.

[34] The costs of the BPP in Piaseczno (153 units) are currently calculated at €2,810 per unit A cost-saving feature in Poland is that, since all heating systems are built as dual-pipe heating systems, there are no costs for bypass sections.

[35] Average costs for refurbishment of the 466 units in the program in total were €3,420 per unit.

Recommendation 5:

When implementing refurbishment in stages (if no resolution to implement the entire package of measures can be reached) the following order should be observed for cost-effectiveness of the energy-saving measures under consideration:

1. **Heat insulation of heating pipes where these are accessible and do not lead through flats.**
2. **Additional heat insulation of the top-floor ceiling where accessible (additional heat insulation of a flat roof (sandwich roof) only in conjunction with necessary roof isolation renewal).**
3. **Heat insulation of gable walls (without or with few windows).**
4. **Heat insulation of plain longitudinal walls (without loggia or balconies).**
5. **New windows (plain longitudinal walls).**
6. **Heat insulation of longitudinal walls with loggia or balconies.**
7. **New windows (loggia and balcony side).**
8. **Heat insulation of cellar roof.**
9. **Valves on radiators – if so, ideally thermostat valves from start.**

All these heat insulation measures are only sensible if the heating system is adaptable to the reduction in heating requirement due to thermal insulation measures or where the heating system is modernized accordingly.

Differentiation between longitudinal walls with and without loggia/balconies is sensible for the following reasons:

- Windows in the loggia sections are usually in a better state because they are better protected from the weather by the loggia above.
- Plain longitudinal walls are usually exposed to the weather (north side) while loggia and balconies are directed towards the sun (south). Plain longitudinal walls therefore require more protection against weathering (draught-proof windows, heat insulation) than the loggia sides.

- In addition, costs for new windows and heat insulation for plain longitudinal walls are less than the corresponding costs for loggia walls (more complex due to loggia doors and adjustment of heat insulation to loggia and balcony constructions).

Valves on radiators to save energy are also not absolutely necessary. They do however increase heating comfort. Controllable radiator valves can have two effects:

- They lead to an increase in heating consumption if, up to now, occupants have generally felt their flats were not sufficiently warm in winter.
- They can lead to a reduction in heating water consumption if until now the building was mainly overheated.

Thermostat valves are better than simple valves because they keep the temperature constant. They close the heating water flow automatically when the desired room temperature is reached. As a result solar heat gains (solar radiation) can be used most efficiently.

Recommendation 5a:

As regards implementing refurbishment measures in steps, it should be noted that new windows lead to an increase in air humidity in residential spaces due to the fact that they are extremely airtight. This leads to formation of mould and can make flats uninhabitable. To avoid the formation of mould on walls due to installation of new windows, heat insulation of the exterior wall is required. It is only possible to do without heat insulation with refurbishment in stages if only some windows are being replaced and sufficient air exchange is maintained.

5.6.4 Resume and recommendations for implementing Art. 7 of EPBD (energy certificates and energy audits)

Art. 7 of EPBD is basically an ideal approach with the issuance of **energy certificates** and the recommendations contained in them on implementing energy-saving measures (**energy audits**) to provide incentives to attain a good energy standard (see 5.5.1). Based on the practical concerns of energy refurbishment of prefabricated housing, EU regulations in Art. 7 of EPBD have, however, led, in the new EU countries, to implementation activities which have in some cases been hardly sensible. For this, much is spent on creating energy audits without sufficiently taking into account that the initial situation and need for refurbishment on prefabricated housing allows simpler and more cost-effective implementation of the specifications in Art. 7 of EPBD.

Recommendation 6:
Art. 7 of EPBD should make it absolutely clear that reference can be made to building type surveys for standardized building constructions which exhibit energy standards (before refurbishment) and refurbishment needs which can be generalized (in the sense of Art. 7 Paragraph 1 Clause 3 of EPBD).

Recommendation 6a:
According to Art. 7 EPBD, it should be clarified in national regulations that building-based energy certificates be issued only after implementation of large-scale energy-saving measures.

Energy certificates based on the building itself can only make statements that are of interest (proof of the energy standard attained) when the building has been refurbished. If a building has not yet been refurbished, the same uniform assessments can be made for the individual building types. Nationwide single-case energy certificates (as in Germany) are sensible if the majority of the building is at least partly refurbished and the differences in energy standard can no longer be discerned easily.

Recommendation 6b:
Instead of a large number of uniform new energy audits, previous knowledge gained about the need for refurbishment in the new EU countries for relevant prefabricated building types is better summarized in handbooks.

For there is no building segment as easy to understand with regards to need for energy-saving refurbishments as prefabricated residencies:

- The building state of prefabricated housing is similar to a building that is not yet complete. It is if it were waiting to be completed with a thermal insulation façade. For this reason any somehow packable exterior walls should be fitted with heat insulation (a minimum thickness of 8 cm). The more surfaces that can be insulated (and not in conflict with historic conservation concerns as with stucco facades of old buildings), the better.
- The same applies for windows. Old, rickety windows need to be equipped with new draughtproof windows with thermal protective glazing. With regards to effectiveness, fortunately not too many rickety windows have been replaced by poor quality new ones on residents' own initiatives.

Recommendation 6c:
For tendering and awarding of energy-saving measures, owners should get descriptions of standardized refurbishment measures. Since the description texts in the tender documents are binding for their execution, the quality of the measure description essentially defines the quality of the work performed.

Since, with energy-saving measures, the same measures are involved time and time again, it is fitting to use tried and tested standardized texts for the measure descriptions. These are particularly useful for less experienced condominiums communities, housing managers and architects and avoid quality specifications being omitted which are necessary for binding definition of good construction quality. A thermal insulation compound facade free of cracks, for instance, can only be obtained if it is stated in the measure description that angular material strips are to be stuck over the corners of the windows.

6 Support programs for Refurbishment Measures

6.1 Type and extent of governmental support programs in BEEN countries

6.1.1 Overview of existing support programs

Support programs for refurbishment measures now exist in all BEEN countries. What do these support programs look like? What refurbishment measures are being initiated? Which ownership types are being reached?

The following table provides an overview of the support programs (as of 2006):

	Latvia	**Poland**	**Lithuania**	**Estonia**	**Eastern Germany**
Main support programs (Prog 1)	**Loan program**	**Thermo-refurbishment program**	**Refurbishment program**	**Renovation program**	**KfW program**
Supplementary support programs (Prog 2)	Energy-saving pilot program		Supplementary urban programs		Supplementary state support
Measures funded	All measures (Prog 2: only energy-saving measures)	Energy-saving measures based on energy-audit	Energy-saving measures	All measures	All necessary measures; focus from 2000:energy-saving measures
Start of programs	Since 2001 (Prog 2: 2003 to 2005)	Since 1998	Since 1996	Since 2003	Since 1993 (Prog 2 in Berlin: till 2001)
Type of support Prog 1	State guarantees as bank security for loans	18 to 2% subsidy depending on scale of heating cost saving calculated	15 to 30% subsidy of investment costs (depending on scale of heating cost saving)	10% subsidy and required guarantees for loan	Reduced-rate interest on loans (10 years 2% interest reduction)
Type of support Prog 2	Loans with reduced interest (interest 1st year 4.3% to 9.1% in 11th year)				Additional interest subsidies for larger-scale refurbishment Guarantees for loans

- In Poland, Lithuania and Estonia support is being provided with subsidies between 10% and 30%.
- In Poland, the support concentrates on energy-saving measures. The scale of subsidies depends on the cost-savings ratio of the measures.
- In Latvia, a loan program has been in place since 2001 (without interest reduction).
- In Latvia between 2003 and 2005, as part of a German-Latvian collaboration and with the participation of the KfW and the German Ministry for the Environment, a pilot loan support program was run for implementing energy-saving measures modeled on the pilot project Ozolciema 46/3.

The table explains the state for the support programs associated with BEEN in 2006. The whole breadth of possible support approaches is shown in the table for convenience. For further discussion in the context of BEEN, it is not necessary to add the numerous current support schemes in Germany but rather only to show how the principles for support in eastern Germany in the 1990s were worked out when the vast majority of refurbishment measures were implemented. Even the envisaged change in support to a 20% subsidy in Latvia from 2008 reveals nothing new but is technically the same as the existing support program in Lithuania.

6.1.2 Scope of Support Programs and Resulting Refurbishment Investments

The following table provides an overview of the volume of support for the support programs and the refurbishment investment attained through these programs:

Support program volumes and resulting refurbishment investments					
	Latvia	**Poland**	**Lithuania**	**Estonia**	**Eastern Germany**
Main support programs (Pro 1)	**Loan program**	**Thermo-refurbishment program**	**Refurbishment program**	**Renovation program**	**KfW program**
Supplementary support programs (Pro 2)	Energy-saving pilot program		Supplementary urban programs		Supplementary state support
Loan	Pro 1: €1.6 m				
Loan with interest rate reductions	Pro 2: €1.6 m				Pro 1: €20,000 m
Construction costs subsidies		€41.5 mill.	€6.0 mill.	€3 mill.	
Interest reduction subsidies					Pro 2 (Berlin): €500 m
Time span for program indicated volumes	since 2001 (Pro 2: 2002 to 2005)	1999 to 30.6.2005	1996 to 2004	2003 to 2005	1993 to 2001
Number of residential flats supported	Pro 1: 2,000 flats (Pro 2: 466 flats	150.000	35.700	68.000	Pro 1: 1,350,000 flats Pro 2 (Berlin): 60.000

Refurbishment investment achieved					
Pro 1	€ 1.6 m	€ 250 m	€20 m	€30 m	€19,000 m
Pro 2	€ 1.6 m				€1,740 m
Average refurbishment investment per flat					
Pro 1	€800.00	€1,730.00	€560.00	€442.00	€14,500.00
Pro 2	€3,435.00	-			€29,000.00
Average support (value of support) per flat					
Pro 1	€ -	€332.00	€168.00	€44,20	€2,900.00
Pro 2	€1,120.00	-			€8,300.00

It is very positive to note that, in Poland and Lithuania, support programs were set up aimed at energy-saving measures and the amount of support depends on the scale of heating cost savings attained.
Only in Poland however (average €1,730.00 per flat with average 40% savings on heating costs) were notable large-scale energy-saving investments achieved for a large number of

flats (approx. 150,000). The relatively low construction costs to date in relation to the considerable 40% savings rate mentioned[36] for heating costs is astonishing. Since 2006, however, significant price rises have taken place in Poland. In the support year 2006 for instance the average construction costs during the thermo-refurbishment program were €2,000 per flat. With the Polish BEEN-best-practice project in Piaseczno, construction costs of €2,800 per flat were accounted.

The support program in Estonia (10% subsidies) and the main support program in Latvia (loan) do not distinguish between energy-saving and general refurbishment measures. The support programs in Latvia did not trigger any larger-scale refurbishment measures. Larger-scale refurbishment measures were implemented in Latvia only as part of the German-Latvian energy saving pilot program (average €3,435 per flat) and with the Berlin-Riga pilot project Ozolciema 46/3 (€6,500 per flat).

In eastern Germany however, practically the entire basic refurbishment of prefabricated housing was financed using KfW credits (with a loan volume of more than €20 billion) with overall average refurbishment investments of around €20,000 per flat.

6.1.3 Overall refurbishment need relative to support programs

If estimates for the overall refurbishment needs are placed side-by-side with refurbishment investments achieved, the following picture emerges:

Refurbishment Need Relative to Support Programs So Far					
	Latvia	**Poland**	**Lithuania**	**Estonia**	**Eastern Germany**
Number of flats in multi-storey buildings built 1950 to 1990	416,460	5,200,600	790,000	406,570	2,150,000
Assumed average refurbishment requirement per flat	€8,000.00	€8,000.00	€8,000.00	€8,000.00	€20.000.00[37]
Overall refurbishment requirement in millions of €	**3,332**	**41,605**	**6,320**	**3,253**	**43,000**
Investments achieved so far with the support programs in millions of €	3	250	20	30	30,000[38]
Refurbishment need covered by support programs so far	**0.10%**	**0.60%**	**0.32%**	**0.92%**	**69.77%**

Support programs in the new EU countries are so far small in relation to the need for refurbishment, even this is cautiously estimated at €8.000 per flat. Only in Poland have

[36] Figures from Polish BEEN partner Nape.

[37] €20.000 per housing unit is a figure from the early 1990s for refurbishing prefabricated buildings in eastern Berlin.

[38] Higher figure (estimate) than in 6.1.2 as the other eastern German states like Berlin had (in addition to federal support) additional state support programs. The refurbishment investments for the prefabricated housing in Eastern Germany would actually be more than €30 billion if one were to take into account that in the eastern part of Berlin alone (273,000 units) the average refurbishment investment is €20,000 per unit

refurbishment measures been carried out for a larger number of flats (150,000) so far, which in relation to the housing stock (5.5 million flats) is also just a start.

By contrast, the refurbishment of prefabricated housing in eastern Germany is essentially completed. In the eastern part of Berlin alone, a total of €5.5 billion were invested in the refurbishment of 273,000 prefabricated flats:

- 60% were comprehensively refurbished;
- 15% partly refurbished;
- Average refurbishment investments were around €20,000 per flat;
- An average of €8,000 per flat was invested in energy-saving measures;
- An average of €1,000 per flat was spent on improving the environment around each flat;
- Around 11,000 per flat was spent on complex refurbishment (see Section 7) for general refurbishment measures.

6.1.4 The possibility of co-financing using EU structural funds

In the wake of the EU expansion, the question has been a discussed for several years as to whether the new EU countries might receive support from EU structural funds for the maintenance and modernization of their housing stock. For, in the support periods up to 2006, EU structural funds could only be used for investments in the public infrastructure. Housing stock was considered to be private property and did therefore not qualify for support.

According to criteria for the new EU support period 2007 to 2013, the new EU countries may use a certain portion of their structural funds (up to 3%) to co-finance national programs to support refurbishment measures (energy-saving measures or general renovation measures). This means spending for the national support programs can be refinanced by up to 85% using EU funds. The question is, however, what focuses will the new EU countries use as part of their operational programs and what share of the available EU structural funds will they want to use for refurbishment of their housing stock.

The inquired state[39] is as follows:
In the context of BEEN the partner countries (Estonia, Latvia, Lithuania and Poland) use the EU-Funds within their Operational Programmes together with national money for supporting energy efficiency refurbishment in the housing sector. But they don't exhaust the scope of 3 % of their structural funds. Results differ between 0,5 to 2,22 % for all energy efficiency activities, included the two main groups:

- renovation of multi-family residential buildings and
- delivery of modern social housing of good quality through renovation and change of use of exiting buildings owned by public authorities or non-profit operators.

Countries	**Using the EU Funds (ERDF) in the period 2007-2013**		**possible maximum percentage at the ERDF (in %)**
	%	**€**	
Estonia[40]	[0,5]	87,2 Mio.	3,00
Lithuania	2,22	58,9 Mio.	3,00
Latvia	1,13	29,9 Mio.	3,00
Poland[41]	1,47	243,1 Mio.	3,00

[39] Inquired and summarized by BEEN- partner PP 04 (Schleswig-Holstein, Mr. Schulz) in cooperation with the national BEEN- partners

[40] Information CEE bankwatch network, Friends of the Earth Europe: Channelling EU funds into efficient and renewable energy, briefing paper, 2006. (share is not from the Estonian Government)

6.1.5 Implementation of energy-saving measures through contracting

Standard implementation of energy-saving measures is as follows:

- An owner association decides to implement energy-saving measures.
- According to the decision about financing (share of own funds, loans or support) a credit is taken out (e.g. €5,000 per flat).
- After completion, the measures become property of the building.
- The housing manager allocates the costs to the individual condominium owners as part of the annual business plans (e.g. €30 each month per flat).
- The condominium owners profit from the energy-saving measures implemented by lower heating costs (e.g. due to 50% reduction in heating costs, reduction of monthly heating costs by €14 per flat).
- Though the result is an additional monthly debit (in the example: €16 per flat), the condominium owners had voted for the implementation anyway as the general building advantages of refurbishment measures (increased heating comfort, new facade, increase in value) are worth this remaining net additional debit. Besides, the savings on heating costs will rise (in relation to unrefurbished houses) when the heating energy prices rise.

The basic idea of contracting, as an alternative to normal investment, is the following:

- An investor (e.g. a building firm) turns up and makes an offer to the condominiums community to implement the entire package of energy-saving measures at its own expense.
- The condominiums community no longer needs to concern itself with financing.
- The investor demands only a contract in which the condominiums community is obliged to pay the investor (contractor) a certain monthly amount for its services (e.g. €15 over 20 years).

Contracting therefore assumes that investors see the opportunity to implement energy-saving measures more cheaply and at more favorable financing terms than condominiums communities themselves could implement. If an investor were to make a contracting offer as described above, the owners' association would no doubt accept the offer. A monthly payment of €15 is less than the €30 which the condominiums community would have to come up with if it were to finance the venture itself. The offer would even match the ideal whereby debts after refurbishment can be virtually covered in full by savings on heating costs (monthly contracting rate of €15), initial heating cost savings €12 initially are rising in proportion with the rise in energy costs).

In practice there have been no contracting offers of this type for the entire package of energy-saving measures. This is essentially because no company has that amount of own capital to realize financing significantly more favorably than the usual market conditions.

So far contracting has only been used for residential buildings (unlike with public buildings[42] like schools, administrative buildings) in subareas for individual energy-saving measures.

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[41] This is allocation of ERDF funds for residential housing only, summed for all 16 Polish regions. The total ERDF allocation for Polish regions is 16 555 614 188 €

[42] For public buildings, however, energy contracting has been a great success as part of facility management, though it is restricted to energy-efficient running of buildings (for which there is more scope for central development than with residential buildings, including for lighting), and does not extend to implementation of heat insulation and new windows – these would be just as difficult to finance for the contractor as with residential buildings. This is because, with public buildings (due to conservation protection etc), there is less scope in this context than with residential buildings. In Berlin 5,000 municipal buildings are contracted out for energy-saving running of the facility. The energy-saving measures carried out by the contractor financed themselves from energy savings achieved from the building pool they run.

The most widespread use of contracting is with consumption-based billing (see 5.4.2) in the form of a leasing model:

- As an alternative to residents investing in consumption meters themselves, energy providers take on the installation, maintenance, care and updating of devices as well as the reading and billing.
- The leasing rates agreed by the energy providers in contracting (€30 to €60 per unit per year) are not higher than the outlay which would occur with an own investment.
- Contracting in this area comes about as the owner does not need to bother with the devices, meter reading and billing.
- The price is agreeable to the contractor because they can cost more favorably when looking after many thousand flats (for procurement and billing) than an owner can for a project.

Contracting is however being employed increasingly in Germany to construct and operate local heating systems as an alternative to district heating and separate heating stations:

- Contracting offers by regional energy providers rely on the fact that heating and hot water can now be provided more cheaply with decentralized hot water systems (for one or more buildings) than district energy provider companies are capable of doing (using systems with power and heat cogeneration, heat recovery, thermal solar systems).
- If therefore district heating providers can offer district heating at a rate of €0.07 per kWh, it may be that energy providers can offer to an owner association to build at their own expense a local heating system and supply the heating for €0.05 per kWh.
- In practice, problems only exist with how security of supply and the price advantage can be guaranteed in the long-term in the contracting agreement.

6.2 What sort of refurbishment investments were initiated by the support programs?

To be able to discuss where the strengths and weaknesses of the support programs lie to date, it is sensible to take a look at the financing structure of typical support cases reached by the support programs.

Typical support cases in the main support programs (shown for a typical average flat) are as follows:

	Latvia	**Poland**	**Lithuania**	**Estonia**	**Eastern Germany**
Main support programs (Pro 1)	**Loan program**	**Thermo-refurbishment program**	**Refurbishment program**	**Renovation program**	**KfW program**
Typical refurbishment sum per flat	€800.00	€1,730.00 €	€560.00	€442.00	€14,500.00
Financing					
Own funds	-	€398.00	€56.00	€44.20	-
Subsidy	-	€332.00	€168.00	€44.20	-
Financing bank loan	€800.00	-	-	-	€14,500.00
Bank load required	-	€1,000.00	€336.00	€353.60	-
Value of support					
Subsidies	-	€332.00	€168.00	€44.20	-

	Latvia	Poland	Lithuania	Estonia	Eastern Germany
Value of interest reductions	-	-	-	-	€2,900.00
Apportionments from credits					
Typical running period of credits	8 to 12 years				20 to 30 years
Typical interest	Currently 4.5% to 6%				1990s: 7% to 8%
Typical credit annuity	15.00%				9.3% (1990s); (today: 7.0%)
Credit annuity after interest reduction	15.00%				7.30%
Refurbishment apportionments per flat monthly	€10.00	€12.50	€4.20	€4.42	€88.21
Refinancing using typically implemented energy-saving measures					
Heating costs per flat monthly before	€20.00	€20.00	€20.00	€20.00	€40.00
Saving due to energy-saving measures	10.00%	40.00%	20.00%	10.00%	50.00%
Heating costs saved per flat monthly	€2.00	€8.00	€4.00	€2.00	€20.00
Monthly refurbishment apportionments (after reduction of heating cost saving)					
	€8.00	€4.50	€0.20	€2.42	€68.21

These case studies show in particular that:

- Up to now no large-scale refurbishments have been initiated in the new EU countries which make use of the financial scope as in 2.6 (refurbishment apportionments of around €25 per flat monthly after deducting heating cost savings). This means that the support conditions seem to offer little incentive to exploit the existing financial scope by larger-scale refurbishment measures.
- It is astonishing that the average for refurbishment measures in the Lithuanian support program is so low despite subsidies of up to 30% being guaranteed, while with the BEEN best practice project (BPP) in Tallinn support subsidies of 24.8% were enough to trigger a refurbishment investment of €6,500 per flat. The reason for this, when analyzed more closely with the BPP in Tallinn, is that even with subsidies from 25% to 30% the net involvement and debit from the loan financing are so high that to date only financially very strong condominiums communities (as was the case with the BPP in Tallinn) are able to afford the implementation of larger-scale refurbishment measures.
- The Polish thermo-refurbishment program is an exception here. Since costs for energy-saving measures were to date astonishingly low and, with refurbishment investments of €1,730 per flat, it was possible to attain flat heating costs savings of 40%,[43] while the cost level in the Baltic countries was, by comparison, twice as high, this led to a very attractive cost-benefit ratio in the Polish thermo-refurbishment program. It is therefore possible with the Polish thermo refurbishment program to speak of larger-scale refurbishment

[43] Information from Polish BEEN partner Nape.

measures having been got up and running successfully, even if (due to the astonishingly low level of costs so far), this results in refurbishment apportionments of €12.50 per flat monthly (before deduction of heating cost savings). In the wake of the cost increases recorded (2006: average €2,000 per flat; BEEN- best-practice project in Piaseczno approx. €2,800 per flat) this low ratio will get somewhat worse but by comparison it will still be significantly lower than in the Baltic countries (BEEN- best-practice project in Tallinn: approx. €5,000 per flat for energy-saving measures).

The calculation method for the amount of financing (subsidy) has made a considerable contribution to this extremely low cost-benefit ratio of the Polish refurbishment program:

- The subsidy is 25% based on construction costs minus own capital contribution (of a minimum of 20%) i.e. a maximum 20% of building costs.
- It needs to be mathematically proven (with an energy audit) that the credit burden in the tenth year is not higher than the saving on heating costs that can be achieved. If this is not guaranteed, the own share is increased by the amount which reaches this target. In the result, the own capital required (of at least 20%) increases to 23% on average. The subsidy is thereby reduced accordingly (from maximum 20% based on construction costs).
- This – by no means simple – system for measuring support clearly generates an interest in implementing measures packages with the best possible ratio between costs and savings. This target was also achieved with the support results so far (=average construction costs of €1,730 with average 40% heating costs saving).[44]
- One weak point with this support program may be the not inconsiderable amount of own capital however, so that it can be assumed that this support offer has only reached, besides cooperatives[45] more financially strong condominium ownerships so far.

[44] Information from BEEN partner Nape.

[45] According to information from BEEN partner Nape, the program was made use of equally by cooperatives (Ownership Type 2) and condominiums communities (Ownership Type 1).

Typical support cases in the German-Latvian energy saving pilot program and in the Berlin support program to support a large number of refurbishment measures (shown for a typical average flat) are as follows:

	Latvia	**Eastern Germany**
Supplementary support programs (Pro 2)	**Energy-saving pilot program**	**Combination of KfW and supplementary Berlin support program**
Typical refurbishment sum per flat	€3,435.00 €	€29,000.00
Financing		
Own funds	€ -	€ -
Subsidy	€ -	€ -
Interest-reduced loan	€3,435.00	€14,500.00 €
Bank load required	€ -	€14,500.00 €
Value of support		
Subsidies	€ -	€ -
Value of interest reductions	€ -	€2,900.00
Supplementary interest subsidies	€1,120.00	€8,300.00
Apportionments from credits		
Typical running period of credits	20 years	25 years
Typical interest	9.10%	7.50%
Typical credit annuity (1 year)	14.10%	9.3% (1990s)
Credit annuity after interest reduction	9.40%	6.23%
Costs per flat monthly	26.91 €	150.58 €
Refinancing using typically implemented energy-saving measures		
Heating costs per flat monthly BEFORE	20.00 €	40.00 €
Saving due to energy-saving measures	42.50%	50.00%
Heating costs saved per flat monthly	8.50 €	20.00 €
Monthly refurbishment apportionments (after reduction of heating cost saving)	18.41 €	130.58 €

Case studies for projects typically-implemented in the support programs exhibit the following special features:

- In the German-Latvian energy-saving pilot program, energy-saving measures with average investment costs of €3,435 per flat were performed on 466 flats. Program conditions were aimed at the implementation of the full package of measures as with the pilot program Ozolciema 46/3, with refurbishment apportionments of up to €25 per flat monthly as in 2.6. The surprising experience with this program was however as follows: Although overall a program volume (loan amount) of €5.0 million was available and initially declarations of interest were made for more than 130 projects, only €1.6 million was made use of by the applicants for seven buildings within the three-year period of the program. Reasons for this and conclusions which can be drawn from this are discussed below (see 6.6.2).
- In eastern Germany, support was aimed at prefabricated housing with greater need for refurbishment from the outset (complex renovation measures). These targets associated with the support were to a great extent achieved. The refurbishment apportionments calculated after support (=rental costs, since in Germany the legal category of rental houses alone were refurbished – see section 3 and 4) did not have to be demanded as

rental increases to the full amount. As shown in 4.3.3, rental increases may only be demanded for modernization measures in Germany. Rent is thus composed of the (locally) agreed rent to date, which already contains scope for refurbishment financing and modernization subsidies for modernizations. If a refurbishment apportionment of €150 per month is calculated, then this would in practice means a modernization apportionment of up to €100 per flat and €50 could be financed from the previous rent. For a typical overall rent of 425 after refurbishment (see 2.2), this would mean that the rent before refurbishment was already €325 and the rent increased after refurbishment by €100 to €425 per flat per month.

6.3 **The importance of loan financing**

If the financing structure for the projects supported in the support programs thus far are considered according to the proportions of subsidy, own capital and loan, the following picture emerges:

Proportion of loans in context of support programs to date					
	Latvia	**Poland**	**Lithuania**	**Estonia**	**Eastern Germany**
	Loan program	Thermo-refurbishment program	Refurbishment program	Renovation program	KfW program
Minimum own funds	–	20 to 25% (average 23.0%); (depending on scale of heating cost saving)	10%	10%	–
Support subsidy	–	average 19.2% (= 25% on investment costs minus own funds required)	15% to 30% (depending on scale of heating costs saving)	10%	–
Loan from support program	100%				100%
Loan to be procured on the capital market		57.8% (average)	60 to 75%	80%	for loan requirement above €250 per m²
Loan sums in framework of support programs in millions of €	3.2	144.5	14.0	24.0	20,740.0
Proportion of loans in refurbishment financing	100.0%	57.8%	60 to 75.0%	80.0%	100.0%

This overview shows that the main components of financing, even with subsidy support programs, are always loans (58& to 80%).
For this reason subsidy programs also assume that loan offers exist for main financing and can be used in practice.

Obviously the procurement of loans can be no more taken for granted than the guarantee of subsidies. What problems exist with the financing of refurbishments with loans? What needs to be observed?

6.4 The need to safeguard refurbishment loans

6.4.1 Security provision practices for loans in support programs to date

Loans offered for refurbishment measures by banks come from money that money holders make available to the capital market or banks temporarily for interest.
The most important factor in guaranteeing loans is therefore to make sure that the recipient of the loan pays the agreed credit rates (interest and amortization) on time and in full. In the case of delayed payment, it must be guaranteed that the outstanding payment amount is paid back immediately.
Obvious prerequisites for the handing out of refurbishment credits are:

- The refurbishment project must be economically viable (incoming and outgoing costs are covered).
- The loan recipient must possess sufficient credit worthiness. Sufficient credit worthiness means that the loan recipient has fulfilled his financial obligations and nothing to the contrary is known.

The following table shows how loans for the previous support programs were secured:

Type of loan security					
	Latvia	**Poland**	**Lithuania**	**Estonia**	**Eastern Germany**
Mortgage (land charge) with entry in land register	–	–	–	–	24,000.00 m. €
State guarantees up to .. (available)	3.20 m. €	–	14.00 m €	24.00 m €	As supplementary guarantee with high credits
Institution responsible for guarantees	LHZB Bank	–	HLI	Kredex	State subsidy banks (in Berlin: IBB)
Special private guarantee system	–	144.50 m €	–	–	–
Institution	–	BGK Bank	–	–	–

Size of risk coverage by guarantees and fees for this					
	Latvia	**Poland**	**Lithuania**	**Estonia**	**Eastern Germany**
Guarantee covers cancellation costs up to ...	Loans up to €300,000	Loans up to €500,000 for 5 years; loans up to €65,000 for 10 years	100%	Up to 75%	100%
Charges for guarantees	Contained as margin in interest	1st year: 1%; years 2-5: 2%	5.18% - 6.84% (depending on agreement vote of occupants)	1.2% – 1.7% annually on guaranteed loan	One-off 2% of loan amount guaranteed

In Germany the following applies to loan securities:

- In Germany the banks (whether subsidy banks or commercial banks) only hand out refurbishment loans with sufficient land registry assurance (mostly entry of a land charge), which allows the bank the right to obtain the rest of the loan back by enforcement if the debtor defaults on their obligations.
- Banks vary between their safe lending value (approx. 50 & of transaction value) and the additional risk-bearing lending value (1b area).
- Refurbishment credits that fall into the 1b area are mostly only handed out if a state guarantee is also taken on. Guarantees for loans in the 1b area in eastern Germany are taken on in individual cases providing there is a public interest in implementing larger-scale refurbishment measures and the economic viability of the project can be proven. The debtor must also possess sufficient credit worthiness.
- A land registry guarantee not only serves the interests of the bank, which can secure the repayment of the credit as a result, but also the interests of the person taking out the credit in two respects:
  - The interest for a loan secured by land charge is lower as the bank does not need to add any risk margins onto the interest.
  - Secondly, the bank can offer longer validity periods due to greater security.

The new EU countries, the practice for guaranteeing loans is completely different:

- Land registry security of refurbishment credits is entirely unknown to date.
- This is understandable and unavoidable with condominiums communities (Type 1 and 1A Ownership), as discussed in 4.4.4 and 6.4.2. This practice is not so understandable with cooperatives for which a land charge entry would be possible quite easily.
- But even with refurbishment loans for condominiums communities, the banks have to date not placed great value on security (land registry entry or state guarantees) as the BEEN best practice project (BPP) in Tallinn shows with a credit amount of €268,432 (€4,473 per flat). Guarantee programs already in place in Lithuania and Estonia show that the new EU countries are aware of the problems with land charge guarantee with condominiums communities even if they are currently used seldom at present.
- The generous practice of banks to date of handing out refurbishment loans in the new EU countries may have the following reasons:
  - The refurbishment loans requested have so far been relatively low in their overall amount and when converted to the amount of credit per flat and no notable cancellations have been recorded to date in this business sector.
  - In addition, the banks in these credit areas were imaginative enough to secure themselves sufficiently as is the practice. The loans handed out in the Polish thermo-refurbishment program were done so in such a way (and similarly in the Baltic countries) that condominiums communities first have to prove that they have fulfilled all their payment obligations to date. Secondly, reserves must be saved up. Thirdly, they must obligate themselves to paying 130% of the planned credit rates onto the credit account until a sufficient repayment reserve has been built up for the bank.

6.4.2 Options for Securing Refurbishment loans by Land Registry

Even if, in the context of the current support programs in the new EU countries, the question of securing by land registry or guarantees has not until now played any part, this will not stay so with respect to broadly getting larger-scale refurbishments up and running in the future.
For this reason, as a prerequisite for further considerations on how to optimize the support programs, it is important to first work out more systematically which options exist for land registry securing of refurbishment credits and where additional state guarantees are required. Where land registry securing is possible, there is no reason to offer state guarantees. Where land registry securities are not possible for larger-scale refurbishments offered in the public interest however, the implementation of larger-scale refurbishments can only be achieved if state guarantees are taken out for refurbishment credits.

A land registry security assumes that land register folios of value exist which can be used as a deposit for the credit and in which liabilities of credit can be entered as encumbrance.

Which land register folios exist for the three ownership types relevant after privatization of prefabricated housing (see 3.2.)?

	Home ownership		**Cooperatives**		**Rental housing**
	Type 1 (purely civil law)	Type 1A (with legal person)	Type 2 (normal cooperative)	Type 2A (condominiums within a cooperative)	Type 3 (rental housing)
Existing land registry folios					
Central land register (folio)	-	-	Yes	Yes	Yes
Land register folio for each flat	Yes	Yes	-	-	-
Land register folio for each flat sold	-	-	-	Yes	-
Value of property is (of value for land registry entry) lies...					
With the undivided central land register	-	-	Yes	Yes but reduced by the value of the flats sold	Yes
With the land register folios of flats	Yes	Yes	-	Yes, with flats sold	-

For this reason the following can be ascertained for the possibility of security of communal refurbishment credits by land registry:

- With cooperatives (Type 2 Ownership) and rental housing (Type 3 Ownership) central land registry folios doubtless exist in which the obligations from a refurbishment loan can be secured by corresponding entries.
- With condominiums communities (Type 1 and 1A Ownership) there are no central land register entries in any of the BEEN partner countries for rights and obligations from communal ownership. Land registry folios exist for each condominium only.

In this way the option also theoretically exists for condominiums communities to secure a communal refurbishment credit by land register entry by splitting up the overall credit and

entering this in parts in each land register. This cannot be realized in practice, however, for the following reasons (see 4.4.4):

- Land registry entry in each property land registry folio causes disproportionately high credit service costs.
- In formal terms, splitting up entry of a joint refurbishment credit means a separate credit contract for each condominium. This assumes that bank and condominium owners are prepared to sign a credit contract of this type voluntarily. Even if the condominium owner were prepared to do this, the bank would only offer credit if an individual condominium owner has sufficient credit worthiness and the land register folio still shows lending leeway.

For these reasons, a better way to secure joint refurbishment credit must be found for the getting up and running of larger-scale refurbishment for condominiums communities, which overcomes these obstacles in a practice-oriented fashion.

6.4.3 The lending value of prefabricated housing

Securing by land registry assumes, as well as the formal option of security (see 6.4.2) sufficient financial value of the land registry folios. For the case that a debtor does not meet their credit obligations, a bank will use enforced auctioning and will guarantee that the profit from the enforced sale at least covers repayment of the remaining loan amount.

In this respect, with land registry security, there is always a question as to how much the property value is of the land registry folio used as deposit for the credit by land register entry.

In the BEEN countries, the following prices[46] are paid for prefabricated housing:

Typical prices for multi-storey prefabricated buildings (built 1950 to 1990)					
	Latvia	**Poland**	**Lithuania**	**Estonia**	**Eastern Germany**
Market prices in € per m² (if not otherwise noted, prices are for unrefurbished houses)					
Ownership Type 1 and 1A (condominium)	approx. €300 per m²	up to €600 per m²	up to €700 per m²	approx. €300 per m²	Refurbished: approx. €1,000 per m²
Type 2 Ownership (cooperatives)	No market for the purchase of entire building ensembles				up to €250 per m² (refurbished: up to €600 per m²)
Type 2A (condominiums within a cooperative)	-	up to 600 per m²	-	-	-
Type 3 (rental housing)	-				up to €250 per m² (refurbished: up to €600 per m²)
Principles for the determining of loan value					
Safe loan value	No experience				Up to 50% of market value (1a-area)
Risk loan value	No experience				over 50% of market value (1b-area)

[46] As of 2006

The table shows that prices paid in the new EU countries for unrefurbished flats are surprisingly high, which is due to the fact that practically no low-cost rental property available is on the market and the only alternative is freely-financed new buildings.
The high transaction values for prefabricated housing have the side effect however that they offer sufficiently high deposit values for refurbishment credits even if only 50% of the transaction value is added to the secure lending value.

6.5 Income-depending support for low-income households

To this point considerations have focused on the average financing scope for refurbishment measures and average reasonable refurbishment apportionments (see 2.6).
Simple majority resolutions (see 4.4) are no use however if a large minority are against it because they cannot afford the monthly apportionments deemed to be average for refurbishment measures due to a below average income. Among others, the banks want to know how the condominium ownership intends to come up with the credit rate shares for the occupants who have not agreed to the proposal.

What concepts exist so that households with below-average incomes are not forced to move out because they are not able to afford the refurbishment measure decided on by the majority?

With income-based support for housing costs, a distinction is made between:

- percentage-based subsidies for housing costs where the scale of the subsidy is dependent on income (**housing allowance**)
- the taking over of all housing costs by the state as **help with subsistence (social security)**

6.5.1 Payment of refurbishment apportionments in the context of public support for living expenses (welfare)

A feature of welfare (subsistence support) is that a household is currently not in a position to pay for housing costs and the state takes over the housing costs in full to ensure a reasonable living standard.

With this it must initially be stated that in all BEEN countries support for subsistence (welfare) exists for persons and households who cannot afford a flat from their own means. Where necessary, refurbishment apportionments are taken over by the municipal authorities for these households or they might move into lower-cost public housing stock.

The proportion of such households living in housing stock to be refurbished is however low as households of this type have generally not become owners of their homes but have remained tenants (= homes not sold to date which continue to be in the ownership of the municipal authorities – see 3.8).

Assistance through Living-expense Allowance for Low-income Households (< 30% on Average)					
	Latvia	**Poland**	**Lithuania**	**Estonia**	**Germany**
Can housing costs (including operating costs) be reimbursed in full as part of assistance for living expenses?	Yes	Yes	Yes	Yes	Yes
Are refurbishment apportionments reimbursed?	Yes	Yes	Yes	Yes	Yes
Does the entitlement also apply to condominium owners?	Yes	Yes	Yes	Yes	Yes
Does a calculable legal claim exist?	**No. Payments depend on budget of municipal authority**				**Yes**

If housing costs have been taken on so far, refurbishment apportionments are also taken on as a matter of principle. In fact there is no real reason for welfare benefits recipients to decline potential refurbishment measures when they are put to a vote.

In practice, however, this is only the case in Germany. In the new EU states a calculable legal claim for the reimbursement of housing costs which is also calculable from the outset is not yet in place. Whether housing costs are taken on depends on municipal budgets.
However, there is no legal right in Germany to housing costs being taken on without limitations. If housing costs are too high after refurbishment, the municipal authorities can demand the household moves to a lower cost flat.

6.5.2 Income-depending subsidies for refurbishment apportionments as part of housing cost allowances

A characteristic of housing benefit is that a household, depending on income, is in a position to pay for a part of the housing expenses itself but not all of it.

The largest group of occupants who vote against refurbishment resolutions put to a vote are households with an income just below the average income going down to the welfare limit border. Households just before retirement age or threatened by unemployment also belong in this category.

In a comparison of BEEN countries, the following applies for subsidies to refurbishment apportionments as part of housing costs reimbursement:

Housing cost allowances (percentage subsidies) on refurbishment apportionments for low-income households (< 90% on average)					
	Latvia	**Poland**	**Lithuania**	**Estonia**	**Germany**
Do income-based subsidies (for housing costs) exist for households with low incomes?	No	Yes	Yes	No	Yes
Are percentage-based subsidies (housing costs) also paid for operating costs (heating, hot water)?	-	Yes	Yes	-	No
Are percentage-based subsidies (for housing costs) also paid for refurbishment apportionments?	-	Yes	No	-	Yes
Does the entitlement also apply to condominium owners?	-	Yes	Yes	-	Yes
Does a legal claim exist, which is calculable from the outset?	-	Yes	No. Depends on budget	-	Yes
Are there upper limits for housing costs?	-	Yes	Yes	-	Yes
Measuring principle for housing costs allowances	-	Income-dependent up to 50% of housing costs	-	-	Income-dependent up to 90% of housing costs

In Lithuania housing cost allowances are only paid for heating and hot water. Support for energy-saving measures is therefore expressly linked with the expectation that the need for housing costs will be reduced due to low heating costs after refurbishment.

In Germany housing cost allowances are only paid for pure housing costs, excluding operating costs. Those entitled to housing costs must pay operating costs in full themselves however.

In Germany and Poland housing cost allowances are also paid for refurbishment apportionments. Anyone can calculate how much their housing cost allowance will increase in the event of a given refurbishment apportionment with the support of housing cost allowance charts. If low-income households can calculate that they do not have to pay the refurbishment contribution in full but that, for example, half of it will be covered by an increased housing cost allowance, they have no financial grounds for voting against refurbishment.

In all countries in which income-based reimbursement of housing costs exists, housing costs are paid not only to tenants but also to condominium owners with low incomes who use the flat for their own use.

A subsidy for refurbishment apportionments (with legal claim) which is income-based and calculable at the outset is therefore particularly important because for the banks providing the finance, a resolution with a slight majority (50 % + 1) is not enough. The banks want to know how the condominium ownership intends to come up with the planned credit rates on time if so many occupants have not agreed to the proposal.

Generally, the banks therefore demand a minimum approving majority of 75%.
This is also the main reason why most of those initially interested in a total of 130 projects in the German-Latvian energy-saving pilot program failed.

6.6 Resume and recommendations, Section 6

6.6.1 Resume and recommendations on measures for which support is to be provided (support targets)

It is positive to note that support programs for refurbishment measures now exist in all BEEN countries:

- In Lithuania and Poland, support programs concentrate on energy-saving measures.
- In Poland the amount of support expressly depends on the cost-savings ratio of the energy-saving measures.
- In Estonia and Latvia, all refurbishment measures qualify for support on principle. Only the German-Latvian energy efficiency program (2003 to 2005) concentrated on energy-saving measures according to the model of the pilot project Ozolciema 46/3.
- Complex refurbishment measures were funded in eastern Germany in the 1990s which included energy-saving measures.

Recommendation 7:

Support programs in the new EU countries should have the aim of implementing the classic package of energy-saving measures (see 5.6.2), namely:

- **Thermal insulation of the building envelope;**
- **New windows with thermal insulation glazing;**
- **Modernization of the central heating system.**

To broadly enable refurbishments to get up and running, the type and scale of support must be purposefully designed so that financially weaker condominiums communities (Ownership Type 1 and 1A) can afford the implementation of this package of measures (see recommendations 8 to 10).

Due to the currently prevailing financial scope in the new EU countries (see 2.6) investments for the range of prefabricated housing stock greater than around €5,000 per flat cannot initially be realized, even with optimized approaches to support (see recommendations that follow). This financial scope is used most effectively from a cost-benefit perspective if the classic package of energy-saving measures is concentrated on. For thermal insulation of the building envelope is not only the key measure for saving on heating energy, but also at the same time the key measure for increasing the value of the housing and maintaining the house (see 5.6.2).

Recommendation 7a:

If the entire package of classic energy-saving measures is implemented, general refurbishment measures should also be included in the support. Measure in stages (see 5.6.3) or random combinations of general refurbishment measures need not be supported. Support should concentrate on particularly sensible packages of measures, which achieve effects that are clearly in the public interest and would clearly not be achievable without support.

- Support programs should include general refurbishment requirements which are sensible to finish off a building (e.g. refurbishment of concrete on loggia, balconies, entrance areas, renovation of stairwells).
- Under no circumstances should random combinations of measures be supported. The target of the support should always be to support particularly sensible combinations of measures which it would otherwise not be possible to finance without support.

- Refurbishment in stages, even if the stages concept appears sensible (see 5.6.3) should not be supported if support offers exist for larger, particularly sensible packages of measures.
- No reason exists either, to insulate anything less than all exterior walls except “triple-layer concrete prefabricated housing” which already has an interior level of insulation. Apart from this the naked, unattractive facades of prefabricated housing Types 1 and 2 urgently require completion by protection against the elements and a facelift.
- Concentrating support on measures packages also has the advantage that single-case based energy audits are only needed if a building has certain peculiarities (e.g. with prefabricated housing Type 3 or where a local heat generation system exists) (see also Recommendations 6 to 6b).

6.6.2 Resume and recommendations on type and amount of support to be provided

With regards to the type and scale of existing support program, the following can be stated:

- In Poland, Lithuania and Estonia support is being provided with subsidies between 10% and 30%. The small 10% subsidy program in Estonia has the best turnover (total subsidies 2003 to 2005 only €3 million).
- The Polish thermo-refurbishment program has had the greatest successes (with regards to scope of energy-saving measures, number of flats refurbished, ratio of subsidies used to heating costs savings attained). The low level of construction costs so far is particularly astonishing (currently approx. €2,000 to €2,800 per flat) with which savings on heating costs of 40% have so far been achieved.
- In Germany the refurbishment of prefabricated housing was essentially financed with favorable interest credits from the state subsidy bank KfW (credit sum approx. €20 billion).
- In Latvia, support has also been provided to date with loans from the Latvian Mortgage Bank (LHZB), though with less success and only with an overall credit amount of €3.2 m in total in the years 2001 to 2005. Latvia therefore intends to change the support to subsidies (20%).

What conclusion can be made from these findings for considerations on the optimization of the type and scale of the support?
Firstly:

- Poland should continue its tried and tested thermo refurbishment program as long as such good rates keep being achieved for use of subsidies and savings on heating costs.
- Estonia, Latvia and Lithuania should base their approaches to financing on the Polish thermo-refurbishment program.
- The weak point of the Polish thermo-refurbishment program is, however, the relatively high own capital (on average 23%) so that it must be assumed that to date only the financially stronger condominiums communities (as well as the cooperatives) have been able to participate in it. Furthermore success is dependent on the level of construction costs remaining as low as before (as stated: to date astonishingly only around half of the construction costs level in the Baltic countries).
- The fact that relatively high purchasing prices were asked from residents during privatization (up to €250 per flat – see 3.3) is a disadvantage for the reaching of less financially-strong condominium ownerships in Poland. Debts from the purchase of the flat reduce the financial scope for refurbishment measures. Since, due to the high purchase prices, the rate of privatization in Poland - at around 50% - is relatively low (compared to more than 90% in Baltic countries) and up to 50% of flats still belong to the municipal authorities (see 3.8), it remains to be see whether this will have a positive or negative effect on broadly getting refurbishments up and running. These problems do not exist in the Baltic States where previous tenants could become owners of their flats virtually at no

extra expense and where financing of refurbishments has not been made so difficult due to past debts.

The considerations and recommendations on optimization of support that follow focus on the following progressive targets:

- **Realization of the classic package of energy-saving measures (including where necessary the general refurbishment measures) with a cost amount of approx. €5,000 per flat**
- **The second aim is to ensure that not only the financially stronger but in principle all condominiums communities that arose after privatization are able to afford this package of measures since only then is it possible to achieve the broad target of getting refurbishments up and running.**

Recommendation 8:
Optimum support is support with a low-cost loan from one source which covers up to 100% of the refurbishment investment costs.

- Subsidy programs (in Lithuania up to 30% - see 6.1) cost the state a lot of money. They require however that the recipients of support are able to take out a bank loan for the largest part of the investment and that own capital contribution required has been saved.
- To this extent, subsidy programs are often too much for financially weak owners, particularly for condominiums communities that came about after privatization in the new EU countries.
- Subsidy programs are therefore good news for owners who do not actually need support because they have the money for the investment together. Any small subsidy (also 10%) is welcome even though they don't actually need ("take-away effect"). This is, for example, also the case with the current "CO_2 building refurbishment program" in Germany where, as an alternative to a loan, a subsidy of up to 10% is offered so that owners who do not need loan financing can also obtain a nominal amount of support. The low average investments attained with the Estonian 10% subsidy support program also lead to the assumption that owners who intended to carry out smaller essential maintenance anyway evidently make use of a subsidy offered even where it is low.
- Only those who do not have the money for the necessary investment and, without support, would not be able to carry out the investment or else not in the same scope, really need support. Anyone who really needs support requires a loan at terms which make the investment affordable, for which they have no money of their own available. Put differently: Anyone who does not require a loan because the financing already exists does not require support.

If support in conjunction with a loan is the ideal, why has precisely the loan support program in Latvia had the least success? The German-Latvian energy saving pilot program (only 33% used of the €5 million available) was a failure because:

- The credit sum of €5 million was refinanced in 2002 at 5.7% interest. Including the margins of the Latvian bank involved, the final credit recipient interest was 9.10%, which was reduced in the first year to 4.4% but rose by 0.32% to 9.1% in the eleventh year due to annual interest digression. When the support program was offered to condominiums communities in 2004 and 2005, interest (with support) was already higher than credits obtainable on the open market. The partners were not able to adjust the loan conditions to the lower level of interest and so remain attractive, as was the intention in 2002 (when the program was conceived).
- The fixed credit contracts of the Latvian bank involved, which were not aimed at the concerns of condominiums communities, were the second problem. The bank was, for instance, not prepared to allow the borrowers the option of gratis premature repayments.

- The third problem was that the overwhelming number of condominiums communities actually interested in support was unsuccessful due to the minimum agreement rate of 75%. There was no income-dependent support component, which would have enabled agreement for households with lower incomes.

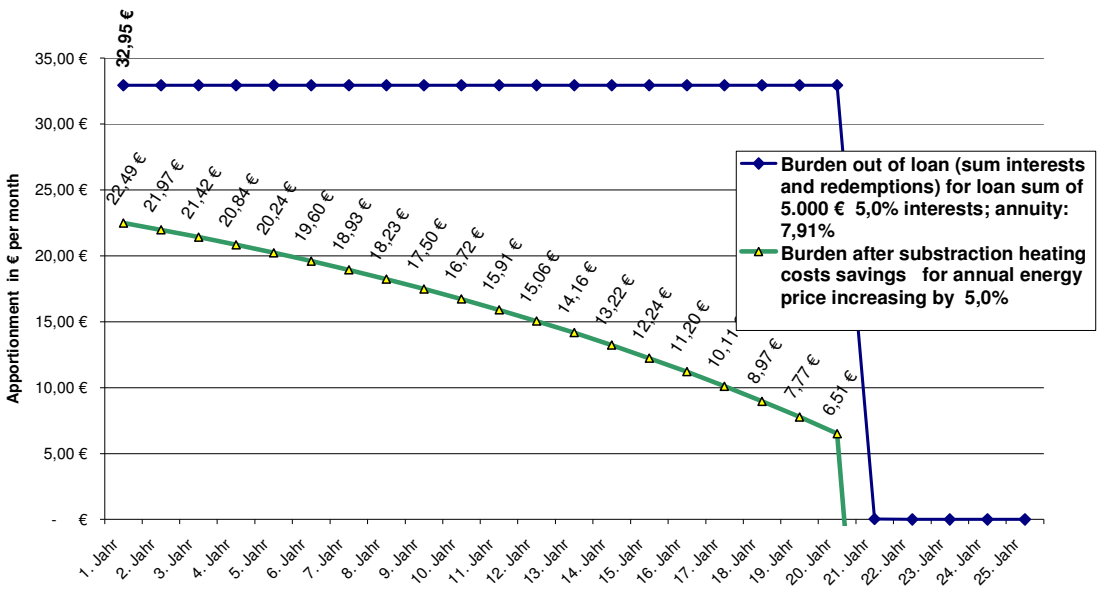
Recommendation 8a:
Support loans are handed out from a rotating refurbishment fund which is managed by a state organization (subsidy funds or subsidy bank).

For example in Germany, the KfW is the state bank for support and has the task of procuring funds on the capital market required for ensuring refurbishment loans and making this available for refurbishments. Firstly, this is an organizational task, which initially requires no funds from the public budget. As the state subsidy bank, KfW has the best possible banking rating and can therefore procure the funds from the capital market for support loans at the most favorable interest terms possible. This leads to the KfW being able to offer refurbishment credits at interest levels around 0.5% less than commercial banks.
Secondly, KfW can obtain specific subsidies from the public household budget to reduce interest on loans for certain purposes (e.g. refurbishment of prefabricated housing in 1990s or for certain packages of energy-saving measures at present) enabling it to offer credits for specially-favored purposes at significantly lower interest (e.g. final borrower interest of 2% for loans for certain energy-saving measures).

Recommendation 8b:
Support loans are granted with interest and redemption terms that enable each condominiums community to afford implementation of the classic package of energy-saving measures (at investment costs of around €5.000 per flat) and with a monthly burden of no more than €25 per flat (for an average-sized flat). This means: • **Loan covering up to 100% of investment costs (maximum approx. €5,000 per flat);** • **Credit payment term: 20 years;** • **Maximum interest of 4% to 5% (at minimum 0.5% less than conventional credit rates on the free market);** • **Fixed interest period of 10 years;** • **Credit extended in the form of annuity credits with a set constant repayment rate.**

Only with a significant extension (compared to the current credit practice in the new EU countries) of the borrowing period to 20 years can credit rates be attained which enable an attractive ratio of burden and benefit from refurbishment. Handing out annuities credit with credit rates for interest and amortization that remain constant overall also serves this purpose.
With interest of 5% this only results in a monthly burden after heating costs savings of approx. €23 per flat (without heating cost savings €33).

The monthly burden per flat out of a favourable support loan for the entire package of energy efficient measures (refurbishment loan 5.000 € per flat)



Recommendation 8c:
Loans are handed out at terms which the support recipient considers fair and attractive. This means in particular: • **Premature repayment at all times or increased redemption possible without prepayment penalties;** • **100 % payout of credit sum; handling fees contained in final borrower interest** • **Assurance in contract that, in the eleventh year, the interest will be adjusted to contemporary low market interest levels;** • **Fair securing of risk of loan according to Recommendation 9.**

As experiences with the German-Latvian energy-saving pilot program have shown, it is extremely important that secondary credit terms are also perceived as fair. This includes in particular:

- No hidden side costs (100% payout, no interest additions).
- Though condominiums communities are aware of the advantages and appropriateness of a 20 year credit period, they are afraid to commit themselves over 20 years. Only by allowing premature repayment at any time and supplementary costs will the necessary trust be created on this matter. This is for example also standard with the KfW programs in Germany. This has the advantage for the rotating refurbishment fund that money flows back sooner and is available for new projects.
- For the end of the fixed interest period, condominiums communities also require a written clause on interest adjustment to remove their fear that interest might double.

6.6.3 Resume and recommendations on state guarantees for refurbishment loans

The result of considerations on assurance of refurbishment loans by banks was as follows (see 6.4.2):

- Types 2 and 3 Ownership (cooperatives and rental property) can guarantee refurbishment credits by land registry entry (land charge, real security, mortgage) straight away. State guarantees are only required if lending values are estimated to be insufficient.
- Condominiums communities (Type 1 and 1A Ownership) cannot implement land registry guarantees however (see 6.4.2). Full consensus exists on this in all new EU countries.47
- For this reason, approaches exist in Lithuania and Estonia which must essentially be assessed as positive to bridge this gap using guarantee programs (see 6.4.1). In Poland, the banks involved in the thermo refurbishment program have developed a security method under private law, which has so far worked for the thermo-refurbishment program successfully (see 6.4.1).
- Existing guarantee approaches would however no longer suffice for a broad loan program according to the recommendations in 6.6.2.

For this reason, the following recommendations can be made for accompanying state guarantees for securing a loan program by banks as in 6.6.2:

Recommendation 9:
Refurbishment loans (up to €5,000 per flat) are handed out without land registry security at condominium ownerships (owner type 1 and 1A). For that the support funds gets the necessary state guarantee. The state specifies the criteria by which loans are handed out, so they can estimate the default risk. This includes in particular: • **Only those condominiums communities for which a minimum number of condominium owners (e.g. 75%) approve the taking out of a credit receive a communal refurbishment credit.[48]** • **Agreements should be made for payment of cancellations which enable enforced measures against defaulting payers (e.g. entering of a security entry in the land charge folio of the defaulting condominium owner).**

The default guarantee required must not lead to indebted defaulting condominium owners being able to become wealthy at the expense of the state. If necessary a rule must be entered in the housing ownership laws which clearly enables, in the case of payment cancellations, in a simplified process, a security mortgage to be entered in the land registry folio of a defaulting debtor.

47 This is also the reason why condominiums communities in Germany – for the total of some five million condominiums in Germany – have so far not been able take advantage of the favorable KfW credits for energy-saving measures.

48 This should not be too difficult to attain under the terms in 6.6.2 and when accompanied by income-based subsidies for refurbishment apportionments as in 6.6.4.

Recommendation 9a:

As in Recommendation 8c, guarantee terms must be comprehensible and fair from the perspective of condominium ownerships:

- **A fee can and should be demanded for the state credit guarantee to cover standard cancellations costs.**
- **A one-off fee of no more than 2% of the refurbishment credit guaranteed should be demanded without any other hidden side costs[49] for the condominiums.**
- **The state guarantee should be a clear 100% cancellation guarantee for the subsidy bank. A restricted guarantee whereby the condominiums community does not know what to expect in an emergency is counterproductive.[50]**
- **This does not exclude, but rather demands the greatest possible amount of transparency to allow the state office supplying the guarantee to cooperate with the subsidy bank on just how the latter should proceed when condominium ownerships default on a loan, thus keeping the instance of guarantee cancellations as low as possible.**

6.6.4 Resume and recommendations on accompanying subject support for low-income households

The lowest possible valid agreement vote of 50% + 1 for refurbishment resolutions in all new EU countries for condominiums communities (see 4.4) is optimal if this concerns refurbishment measures which can be paid with money that has been stockpiled. A vote as close as this will not suffice however for credits. The banks want to know how the condominiums community intends to guarantee that all owners pay their shares (see 4.4.3). In this respect Recommendation 9 states that the overwhelming majority (at least 75%) of condominium owners must have approved the measure to keep cancellation risks low.

Experiences, in particular with the German-Latvian energy-saving program, have shown that though simple majorities can be achieved easily, qualified majorities of 75% and more are difficult (only with 7 out of 130 projects – see 6.2). In practice, this means the following:

- Virtually no condominium owners doubt the sense and benefits of refurbishment measures.
- Agreement regularly comes from the condominium owners who can pay for the resulting cost apportionments resulting from the refurbishment measures.
- Practically all households which are against refurbishment measures are those which cannot afford them because :
  - the households currently have a low income (pensioners, below-average incomes),
  - they are afraid they will have less money at their disposal in the near future (fear of unemployment or soon-to-be pensioners).

Recommendation 10:

In addition to favorable loans (Recommendations 7 to 9a), which is tailored to average household income, low-income households also requires the following supplementary support measures:

- **income-dependent interest subsidies, or**
- **income-dependent allowances towards refurbishment apportionments.**

This makes it possible for low-income households too to afford refurbishments desired by a majority of residents. It must be noted that such income-based support to subjects is only fully effective if residents can plan reliable with.

[49] The fees demanded to date in the guarantee programs (see 6.4.1) are disproportionately high.

[50] Like with the percentage-based restrictions in the existing guarantee programs (see 6.4.1) to date where nobody knows what these mean in practice.

The presumption that condominiums communities in the new EU countries can now afford refurbishment measures with apportionments of approx. €25 per flat per month is based on figures for the average income (see 2.2). For households with incomes significantly below the average, this means that they can come up with a part of the apportionment but not the whole sum, while maintaining a reasonable relation between income and housing costs.

Accompanying income–based subsidies on refurbishment measures would have the following necessary effect:

- With income-based subsidies that cover a share of the refurbishment apportionment, weak income households can also approve the implementation of refurbishment measures so that agreement rates above 75% are reached.
- Conversely, condominiums communities can also commission the construction measures despite full agreement not having been reached, as they know that weak income households receive reasonable additional support and as such there is not the danger that an occupant has to give up their flat after refurbishment.

In order for an income-dependent support subsidy to attain this result, it must be reliable enough that residents can plan with it. If the possibility of income-dependent support is qualified with a "maybe yes, maybe no", it makes no sense to offer it in the first place.

Recommendation 10a:
Introducing accompanying income-based allowances for refurbishment apportionments must not fail because overly complex income criteria are developed. Simple criteria for income are sufficient as the accompanying subject support is not general housing allowance but only extends to new larger-scale refurbishment measures

The attempt to introduce idealized income criteria only for the purposes of accompanying subject support for refurbishment apportionments would signal the death of this approach before it had really got started.

As long as there is no easily-importable certification about incomes in the new EU countries in other contexts (general housing costs, income limitations for acquiring a flat from social security) criteria which is as simple as possible should be developed, for example:

- Simple staggering of subject subsidy: 25% and 50%.
- Pensioner households and households with children generally receive 25%.
- The higher subject subsidy (50%) is maintained if the responsible municipal authority certifies the requirement.

6.6.5 Resume of contracting financing

- Contracting financing (leasing), as an alternative to own investment, has so far only been used with residential buildings (unlike with public buildings[51]) for consumption-measurement and consumption-based billing.
- An increase of contracting offers by energy providers is to be expected for local heat supply as an alternative to district heat supply if the prices for district heating rise further.
- Favorable contracting offers for implementing the whole package of energy-saving measures are however not expected in reality (see 6.1.5). It was not even possible after the implementation of the pilot project Ozolciema 46/3 in Riga to persuade companies to offer at least one more project using a contracting model.

[51] Here, however, only in relation to optimization of the energy-efficient running of buildings but not with regards to investments in improved thermal protection of the building envelope – see footnote 42.

6.6.6 Resume and recommendations for use of EU co-financing options for national support programs

In the support period 2007 to 2013 new EU- member states have the option for the first time of using EU structure funds to refinance national programs for supporting housing refurbishments (see 6.1.4).

Recommendation 11:
The existing option for new EU countries to refinance national support programs for refurbishment measures during the EU support period 2007 to 2013 should be exploited in full by adding new and more comprehensive refurbishment programs for implementation of BEEN Recommendations 7 to 10.

Implementation of BEEN recommendations would lead to refurbishments getting broadly up and running. For this, larger support programs than has been the case to date in terms of volume are required. The option to refinance funds from these programs up to 85% using EU structural funds, which has existed since 2007, has now removed the last obstacle to carrying out refurbishment (with the focus on energy-saving measures) in the interest of maintaining housing stock and bringing it in line with appropriate national support programs, as an efficient contribution to climate protection.