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MAJOR RENOVATION - DEFINITION IN MONETARY TERMS

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1 Background and approach

The current proposal for the recasting of the EPBD contains in Article 2 ("Definitions") the following explanation of "major renovation":

"Major renovation" means the renovation of a building where

(a) the total cost of the renovation related to the building envelope or the technical building systems is higher than 25 % of the value of the building, excluding the value of the land upon which the building is situated, or
(b) more than 25 % of the surface of the building envelope undergoes renovation;

Following a discussion with ECEEE, Ecofys was assigned to assess in a Quick-Scan background information to support ongoing discussions on whether the 25% in the value-related definition of major retrofit represents a balanced and practical value.

Therefore the following steps were taken:

1. Definition of typical maintenance measures that offer opportunities for cost effective coupled renovation and choice of reference buildings to which these measures are applied.
2. Scan on possible methods and available data/indicators in the EU regarding total building value.
3. Assessment of costs of measures and values of buildings for several member states / climate zones according to defined approach on basis of available data.
4. Assessment of share of maintenance costs related to building value for a matrix of measures and climate zones, including a sensitivity analysis esp. regarding building value.

Methodology, input and results of the different steps are described hereinafter.

2 Methodology, inputs and results

2.1 Definition of measures and choice of reference buildings

The definition of major renovation aims to identify moments and situations within the lifetime of a building, in which a renovation measure (which is not primarily dedicated to energy savings) on the building envelope or technical building system can be cost effectively combined with or upgraded to energy efficiency measures, e.g. via the application of thermal insulation or the use of highly insulating windows.
The following renovation measures that deal with the building envelope and the technical building system were taken into account:

Renovation of the Façade:

- Removal of existing plaster
- applying new plaster and paintings

Renovation of the roof:

- Removal of old tiles of pitched roofs
- Adding new tiles including wind/moisture barriers

Replacement of windows:

- Replacement of existing windows with available standard windows

Renovation of 25% of the building envelope:
To create a link to the second definition of major renovation that is related to the surface of the building envelope a measure was assessed that includes renovation of the façade (see first measure) applied to an area that represents 25% of the total building envelope (here: façade, roof, ground floor and windows).

Exchange of heating system

- Replacement of old heating system by new standard heating system

To be able to assess these renovation costs and also the total building value, reference buildings with fixed geometries had to be defined. These were taken from reference buildings defined in [Ecofys 2005a] and [Ecofys 2005b].

2 geometries were chosen:

- Single family house as semi attached building
- Multi family house / Non-residential buildings

These geometries are described in the table below.

Geometry reference buildings	Semi-detached house in all zones	Multi-family house/ Non-res in all zones
Floor area [m²]	120	1.637
Covered Volume [m³]	421	5.374
A/V-value	0,64	0,38
Surfaces		
Cellar ceiling [m²]	70	437
Exterior walls [m²]	108	919
Roof [m²]	81	505
Windows north [m²]	3	80
Windows east [m²]	0	0
Windows south [m²]	14	144
Windows west [m²]	3	0

Table 1: Geometries reference buildings

2.2 Costs of maintenance measures and values of buildings

The total costs of non-primarily energy related maintenance measures on facades, windows and heating systems are taken from [Ecofys 2005a] and [Ecofys 2005b]. The increase in construction prices since 2005 is taken into account by use of price indices for the construction sector supplied by EUROSTAT. The costs for roof renovation (including new tiles) were derived from current market information on prices. The investment costs reflect the average situation in the building stock, differentiated by climate zones.

The total costs (including VAT) of the maintenance measures in different climate zones are described in table below.

Costs of measures Fullcosts retrofit only	EU north	EU moderate	EU south	EU eastern
Semi-detached house				
Facade [€/ m²]	83	56	42	21
Roof [€/ m²]	90	60	45	22
Window [€/ m²]	478	343	143	193
Boiler [€]	6.687	5.416	4.594	2.756
Multi-family house/ Non-res				
Facade [€/ m²]	83	56	42	21
Roof [€/ m²]	90	60	45	22
Window [€/ m²]	478	343	143	193
Boiler [€]	20.843	16.882	14.319	11.429

Table 2: Total costs of maintenance measures

Differing from Construction costs of new buildings, for which costs/value can be derived from indicators like EURO per m^2 or EURO per m^3, the value of an existing building is normally best described by its achievable sales price, upon which also banks or insurances in many cases base their valuation.
The price of buildings very much depends on where the building is situated (metropolitan or rural area) as well as the condition and geometry of a building. Even after

- excluding the value of the land upon which the building is situated and
- focusing on existing building from the 60s and 70s with clear demand for renovation

Large spans in building values can be perceived.

To assess sales prices of buildings (excluding additional expenses for notaries, cadastral register etc.), data have been gathered from Germany, France, UK, the Netherlands, Sweden, Spain, Poland and Bulgaria and were merged into average values for 4 climate zones.
With the same size and geometry assumed for existing multifamily houses and non-residential buildings, the spans of values per m^2 floor have been set at the same values in the framework of this Quick-Scan.
The results are described in Table 3

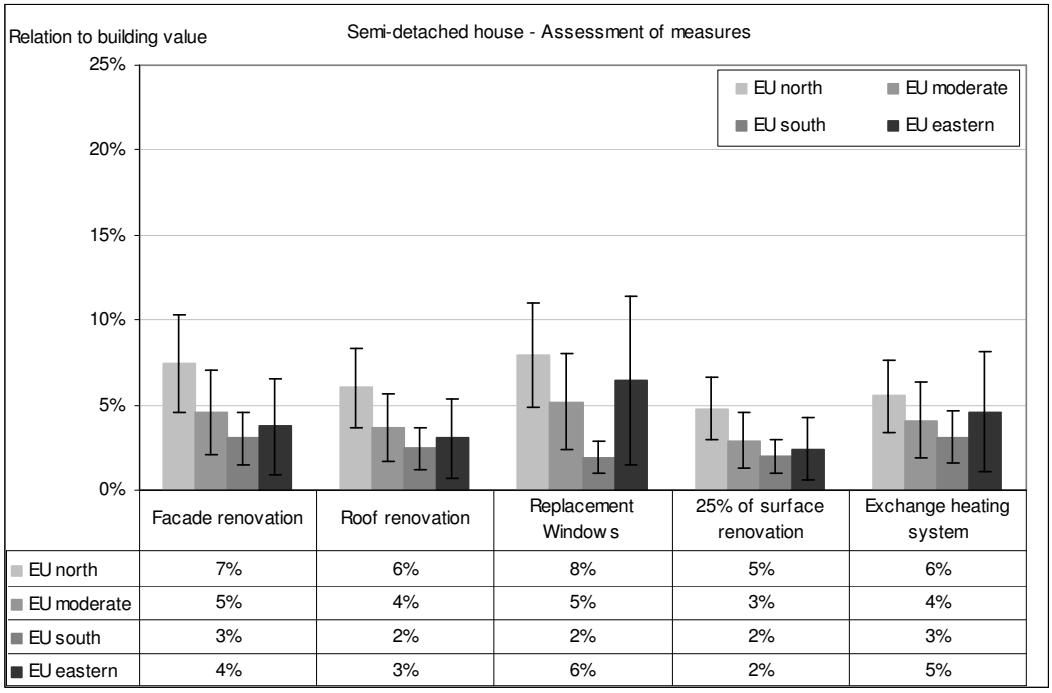
Building value without land	EU north		EU moderate		EU south		EU eastern	
[€/ m^2 floor area]	min	max	min	max	min	max	min	max
Semi-detached house	725	1.650	713	2.450	825	2.450	283	2.113
Multi-family house/ Non-res	287	1.242	275	1.699	325	1.699	107	1.232

Table 3: Value of buildings, sales prices excluding land

Please note that the survey has been done on background of the recent / current market situation, which represents a moment, were in most European markets the prices for existing property are under pressure. As medium to long term vision, prices might drop further and stabilize and increase again later.

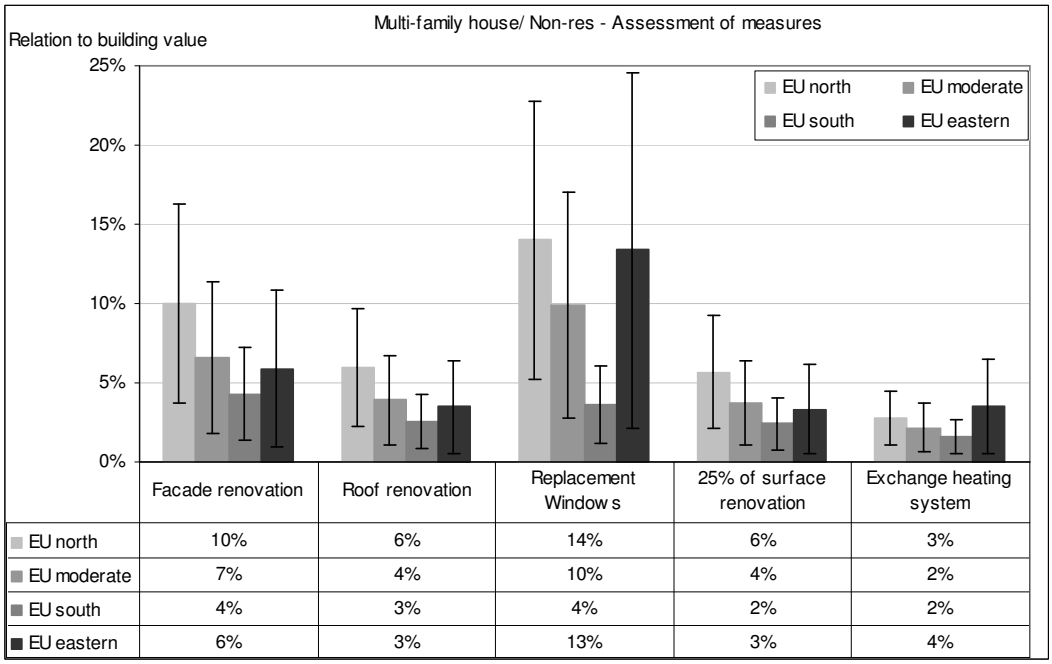
2.3 Share of maintenance costs related to total building value

When calculating the share of the costs of the assessed renovation measures in relation to the span of building value, the corresponding % ratio of measures that can give the opportunity for cost effective coupled renovation can be displayed, see Figure 1and Figure 2.



	Facade renovation	Roof renovation	Replacement Windows	25% of surface renovation	Exchange heating system
EU north	7%	6%	8%	5%	6%
EU moderate	5%	4%	5%	3%	4%
EU south	3%	2%	2%	2%	3%
EU eastern	4%	3%	6%	2%	5%

Figure 1: Share of renovation costs in relation to building value, semi-detached single family house



	Facade renovation	Roof renovation	Replacement Windows	25% of surface renovation	Exchange heating system
EU north	10%	6%	14%	6%	3%
EU moderate	7%	4%	10%	4%	2%
EU south	4%	3%	4%	2%	2%
EU eastern	6%	3%	13%	3%	4%

Figure 2: % Share of renovation costs in relation to building value, multi family house /non-residential building

The percentage values, visualized as grey columns, thereby represent the arithmetic mean of the span found (the span is described by the error bars) as a result of varying building values. This does not take into account any weighting related to numbers of buildings with higher or lower value. Additional uncertainties occur via differing cost of the measures, depending on local market circumstances, volume of purchase etc. Consequently, a monetary definition is subject to considerable uncertainties. The higher percentage values for multifamily houses/non-residential buildings in comparison to the previous graph on single family houses is thereby caused by the lower value per m² of these buildings.

3 Conclusions

Looking at the % values of the different assessed measures, the 25% mentioned in the cost related definition of major renovation would be reached in a combination of measures (e.g. renovation of facade, roof, exchange of windows and heating system in case of single family houses, see Figure 1). On the other hand already single measures, like renovation of the total façade, offer opportunities for cost effective coupled renovation.
It can be assumed, that the monetary definition especially aims at measures that are not related to the building envelope (e.g. exchange of heating system) or usually represent less than 25% of the building envelope (e.g. renewal of windows) and would therefore not be covered by the current surface related definition. When looking at the relation between maintenance costs and building value, see Figure 1 and Figure 2, even the combination of these measures (renewal of windows and exchange of heating system) would in an average situation not be considered as major renovation via the current monetary definition. Still, such situation usually offers good opportunities to introduce high performing components in a coupled renovation.
A lowering of the 25% threshold, e.g. to 10% or 15%, could therefore be considered. This is supported by the fact that the surface related definition, when translated to monetary terms, already represents a more strict definition of major renovation.

However, the considerable span in results for the ratio between maintenance costs and building value that is caused by differences between countries, building types and building locations, makes it difficult to define one "optimal" threshold on EU level as regards the value definition.
At the same time, a value related definition is in the first place unspecific regarding components (like façade, windows, heating system etc.) and corresponding measures that offer possibilities for cost effective coupled renovation. This also counts to a certain extent for the surface related definition, which looks at the building envelope as a whole.

Consequently, a - maybe additional - component related definition (dealing with components like facades, windows, heating system etc.) of major renovation could be beneficial to identify more precisely situations that offer possibilities for cost effective coupled renovation.
A corresponding setup of definitions on EU level (mechanisms and numbers) would require further in depth investigation and is beyond the scope of this Quick-Scan. However the results of this study provide indication that the current definitions leave uncertainties in this crucial issue that could be topic of further investigation/discussion.

4 References

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