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# Methodologies for integration of energy performance into property valuation practice (IMMOVALUE Project)

- Transforming green features into values -

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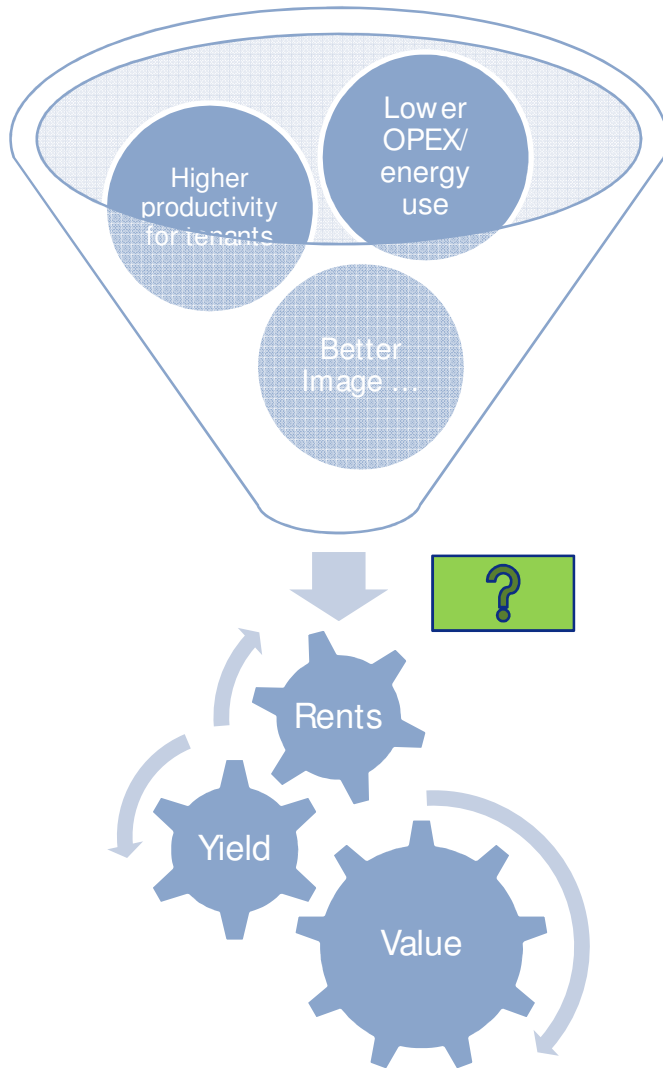
## IMMOVALUE – Valuation Approaches for integration of energy efficiency Green Value vs. Market Value



- § A **Green Building** is a property that uses resources efficiently, reduce waste and CO2 emission, provide superior indoor air and other qualities, and avoid negative social impacts.
- § **Energy efficiency** is therefore part of the various green building features.
- § A **Green Value** is the net value added obtainable by a green property in the market compared to a non-green peer group.
- § According to the definitions of green and market value it can be assumed that the green value is an **integral part of the overall market value.**

# IMMOVALUE – Valuation Approaches for integration of energy efficiency

## What does a green building promise?



### In US-Numbers (here LEED)...

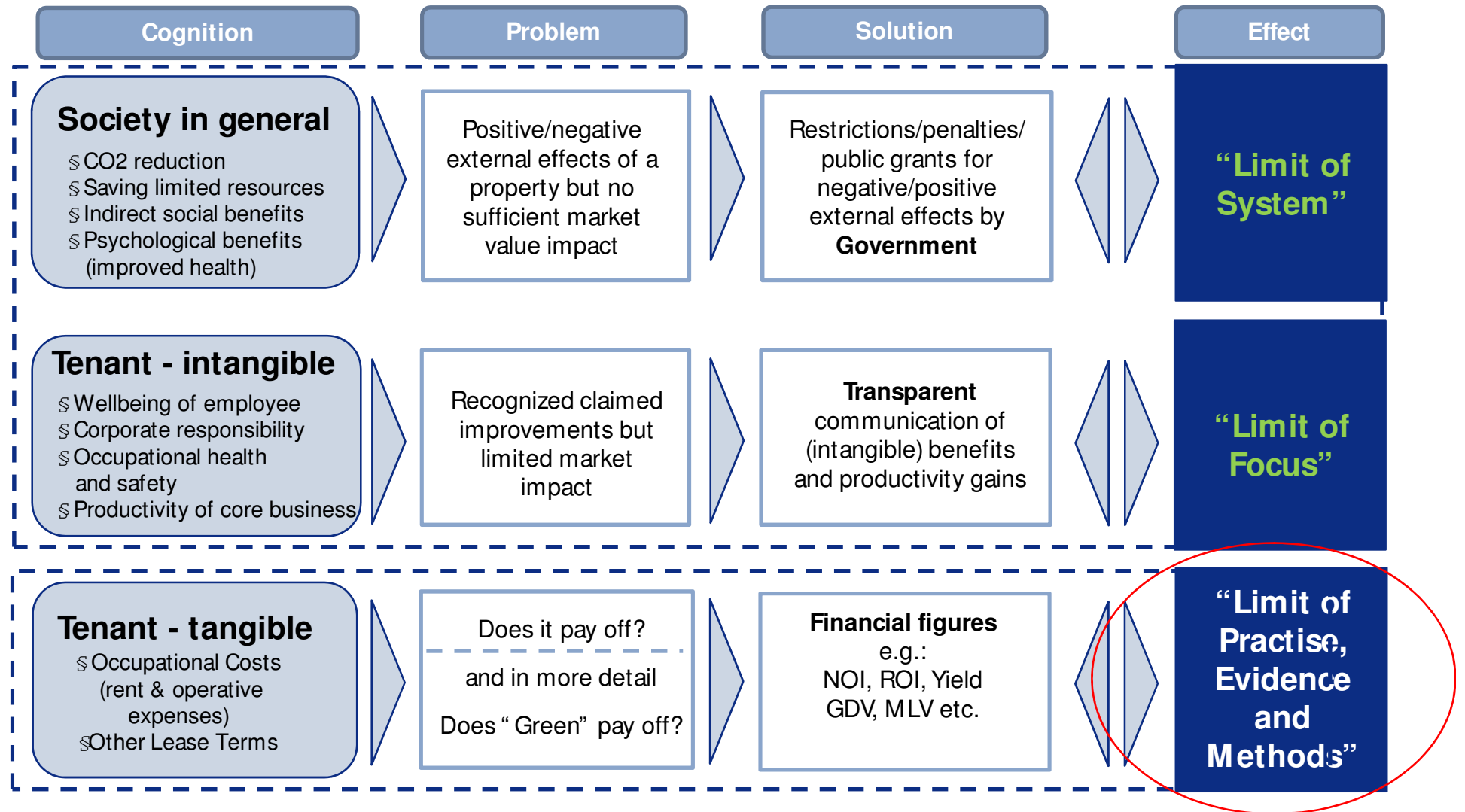


- 8-9 % Decrease of operating expenses
- 7,5 % Increase of the current market value
- 6,6 % Increase of the ROI
- 3,5 % Increase of the occupancy rate
- 3 % Increase of rent

Source: U.S. Green Building Council, Date: 15.04.2008

# IMMOVALUE – Valuation Approaches for integration of energy efficiency

## Integration of green attributes – three major obstacles (Or why markets failed)



# IMMOVALUE – Valuation Approaches for integration of energy efficiency

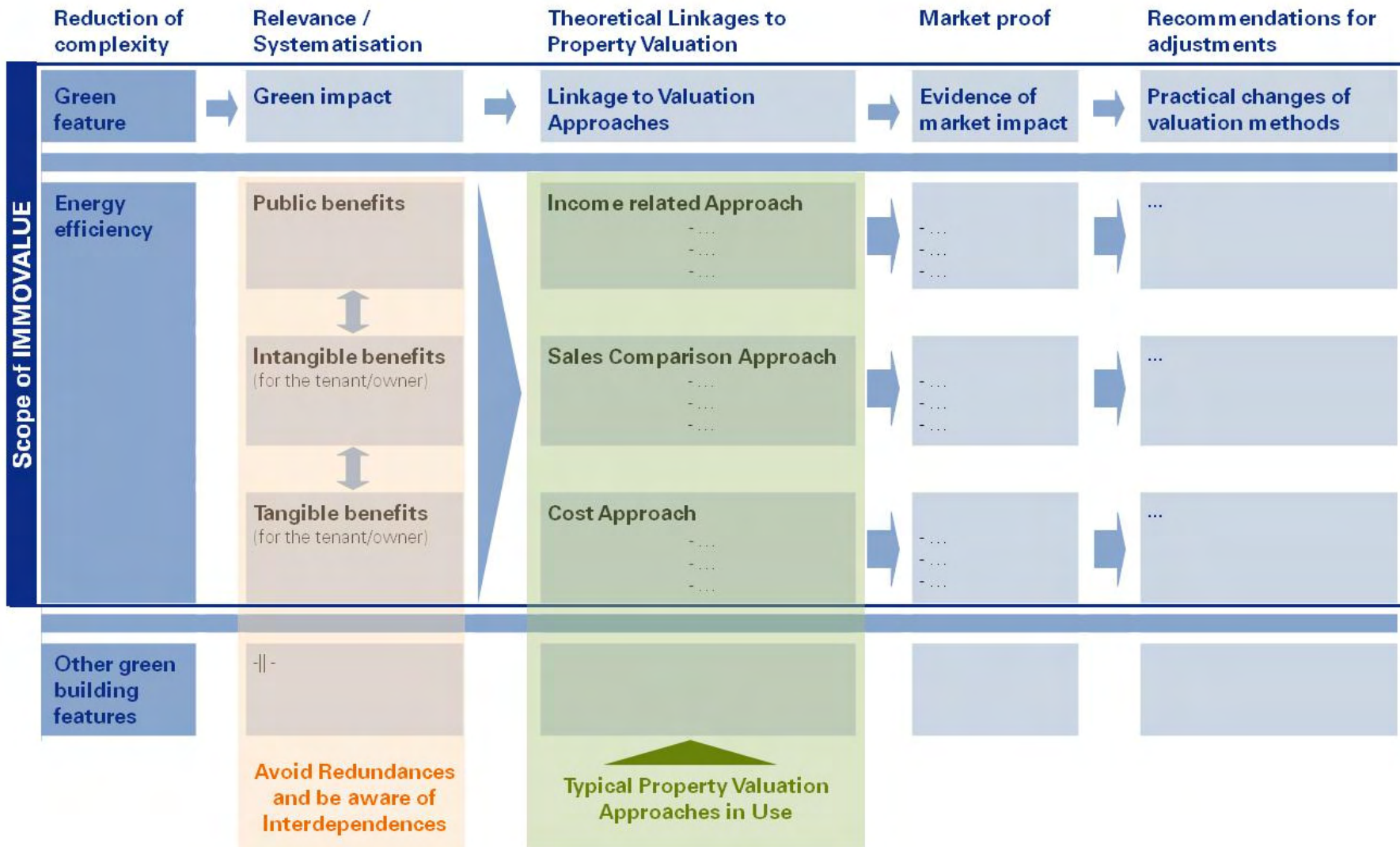
## Some basic answer!



- 1 Could there be a general premium / discount rule? **NO**  
(due to willingness to pay)
- 2 Do we need new valuation methods? **NO**  
(since existing tools can display everything)
- 3 Could there be a pan-European approach/ guidance to these aspects? **YES**  
(since the fundamental challenge is the same)
- 4 Should we distinguish between developed and less transparent markets? **YES**  
(since data input is required for proper calculation)
- 5 Do we also need to revise report structures accordingly? **YES**  
(since the aspects need to be addressed in the text)
- 6 Since in principle things are not new. Are there already valuers who handle this aspect in the right way? **NO**  
(since some training will be necessary for everyone)

# IMMOVALUE – Valuation Approaches for integration of energy efficiency

## Approach to IMMOVALUE results



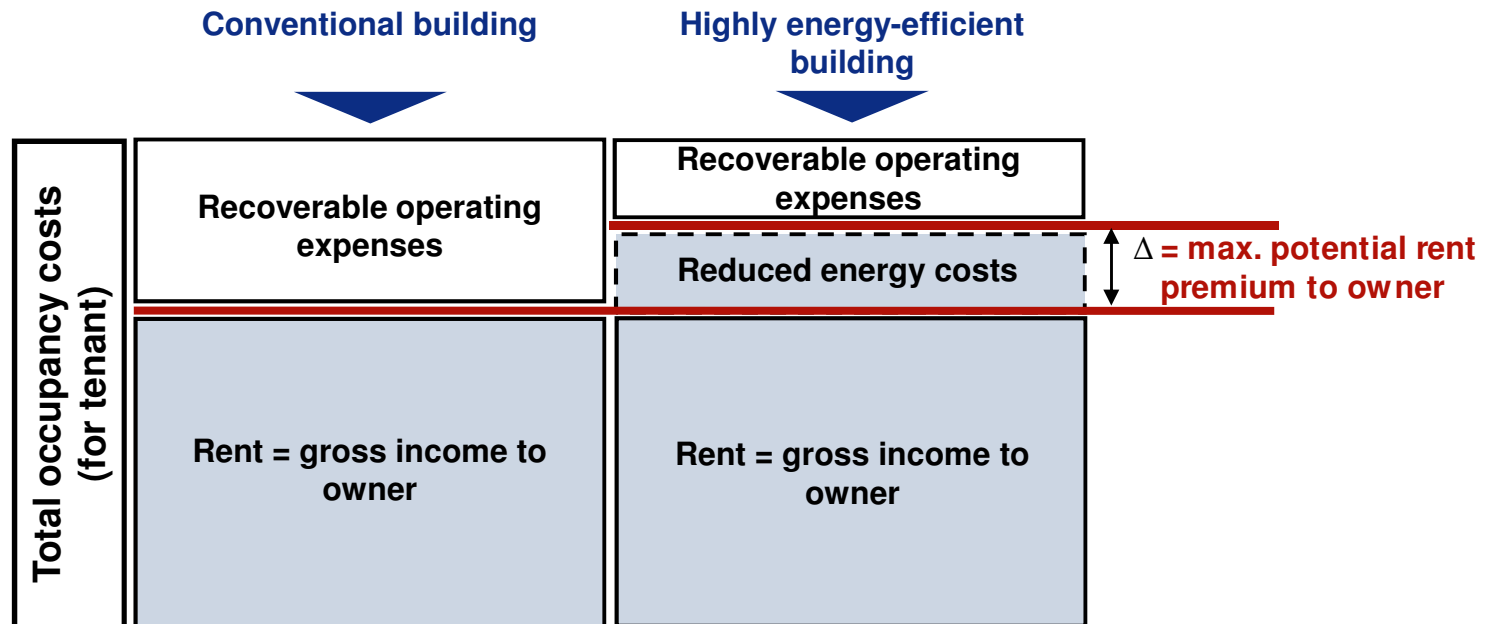
# Methodologies for integration of energy efficiency into property valuation practise

## Published empirical research results on green value

Variable \ Country	USA (Mc Graw, Hill Construction 2005)	USA (Mc Graw, Hill Construction 2008)	USA (Miller et al. 2008, using CoStar Database)	USA (Fürst, McAllister. 2008, using CoStar Database)	USA (Eichholtz et al. 2009, using CoStar Database)	Australia (Bowman, Willis 2008)
Rental Growth for non-Green	-	-	-	-	-	-1.50%
Rent Premium for Green	3.00%	6.10%	-	-	3.00%	X
Energy Star	-	-	2.80%	-	-	
LEED	-	-	0.30%	-	-	
Energy Star/LEED	-	-	-	11.80%	-	
Effective Rent	-	-	-	-	6.00%	-
Decrease Operating Expenses	8.00-9.00%	13.60%	-	-	-	-
Reduction cap rate	-	-	-	-	-	0.25-0.50%
Improved ROI	6.60%	9.90%	-	-	-	-
Increase occupancy ratio	3.50%	6.40%	-	-	-	-
Market value	7.50%	10.90%	-	-	-	-
Selling price	-	-	-	-	16.00%	X
Energy Star	-	-	5.76%	10.00%	-	
LEED	-	-	9.94%	31.00%	-	
Energy Star/LEED	-	-	-	11.40%	-	

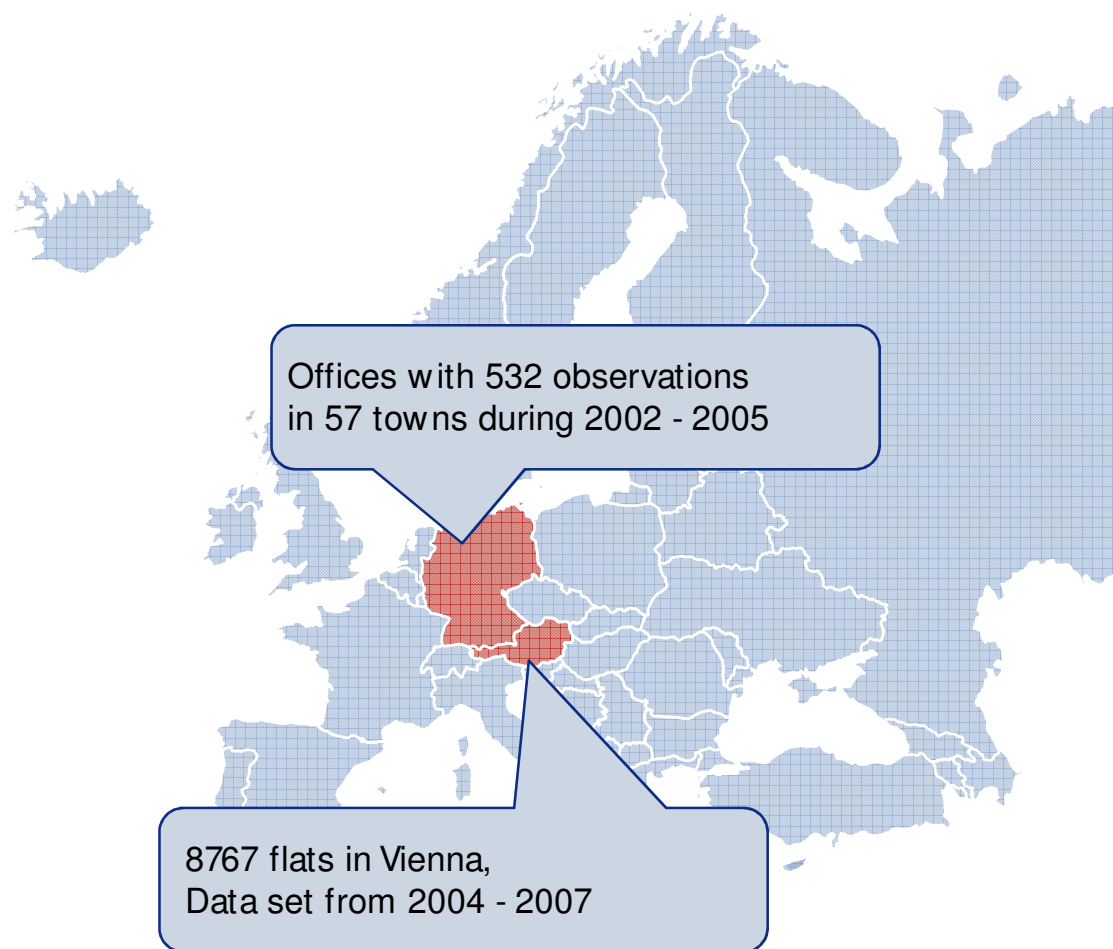
# IMMOVALUE – Valuation Approaches for integration of energy efficiency

## Theoretical potential rent premium



# Methodologies for integration of energy efficiency into property valuation practise

## Few empirical results in Europe (hedonic pricing/multiple regression) – IMMOVALUE research for developed markets



- 1 The „hard“ way: using advanced methods!
- 2 Question at the beginning: can a single valuer ever perform this for every valuation? - **NO**
- 3 Aim: Finding the proof for the connection between lower energy cost and higher rents
- 4 Log-Log and Log-Lin model
- 5 Semiparametric model / P(enalized)-splines (PLS)
- 6 Geoaddivitive model / Spatial effects

# Methodologies for integration of energy efficiency into property valuation practise

## German data set analysis – results (simple regression)

$$\ln(\text{rent\_psqm}) = \beta_0 + \beta_1 \text{quality\_h} + \beta_2 \text{quality\_m} + \beta_3 \text{elev} + \beta_4 \text{full\_air} \\ + \beta_5 \text{part\_air} + \beta_6 \text{age} + \sum_{i=7}^{10} \beta_i \text{year}_i + \sum_{j=11}^{31} \beta_j \text{city\_no}_j \\ + \beta_{32} \ln(\text{ngf}) + \beta_{33} \ln(\text{maint\_psqm}) + \beta_{34} \ln(\text{energy\_psqm}) + \beta_{35} \ln(\text{other\_psqm}) + \mathbf{u}$$

### Linear Model

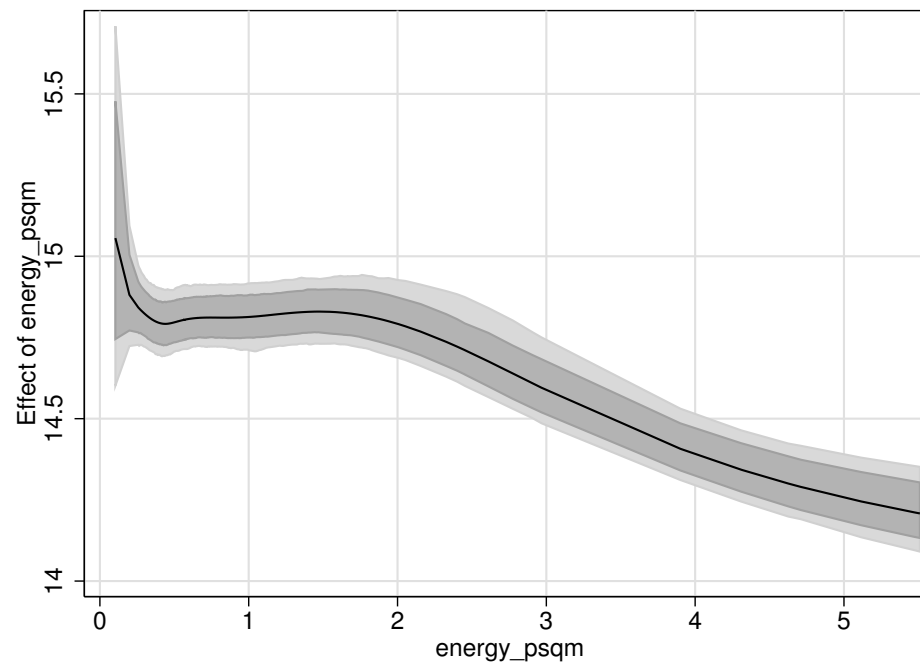
Number of obs	532
F( 33, 498)	10.58
Prob > F	0.0000
R-squared	0.4121
Adj R-squared	0.3732
Root MSE	0.3115

logrent_psqm	Coef.	Std. Err.	t	P> t
_cons	2.615	0.210	12.43	0.000
logngf	-0.058	0.018	-3.19	0.002
age	-0.002	0.001	-2.09	0.038
logmaint_psqm	-0.020	0.018	-1.07	0.285
<b>logenergy_psqm</b>	<b>-0.095</b>	<b>0.035</b>	<b>-2.73</b>	<b>0.007</b>
logother_psqm	0.270	0.042	6.38	0.000
year_2003	0.044	0.043	1.03	0.304
year_2004	-0.023	0.041	-0.57	0.569
year_2005	-0.107	0.040	-2.67	0.008
quality_h	0.357	0.064	5.62	0.000
quality_m	0.125	0.053	2.34	0.019
elev	-0.142	0.145	-0.98	0.326
full_air	0.104	0.057	1.82	0.069
part_air	0.093	0.036	2.58	0.010

# Methodologies for integration of energy efficiency into property valuation practise

## German data set analysis – results (P-Splines)

$$\begin{aligned}\ln(\text{rent\_psqm}) = & \beta_0 + \beta_1 \text{quality\_h} + \beta_2 \text{quality\_m} + \beta_3 \text{elev} + \beta_4 \text{full\_air} \\ & + \beta_5 \text{part\_air} + \beta_6 \text{age} + \sum_{i=7}^{10} \beta_i \text{year}_i + \sum_{j=11}^{31} \beta_j \text{city\_no}_j \\ & + f(\ln(\text{ngf})) + f(\ln(\text{maint\_psqm})) + f(\ln(\text{energy\_psqm})) + f(\ln(\text{other\_psqm})) + \mathbf{u}\end{aligned}$$



# Methodologies for integration of energy efficiency into property valuation practise

## Summary of hedonic approach



- 1** Result: 100 % increase in energy cost will shift rental income up to 95 BP
- 2** So up front investment cost for energy saving can be compared to rental premiums
- 3** There is no “One fits all marktes rule”!
- 4** National valuation organizations should run regression for general guidance.
- 5** There must be some guidance for emerging/ less transparent markets.
- 6** Due to the various types of EPCs across Europe direct integration of the label information is not possible.

# IMMOVALUE – Valuation Approaches for integration of energy efficiency

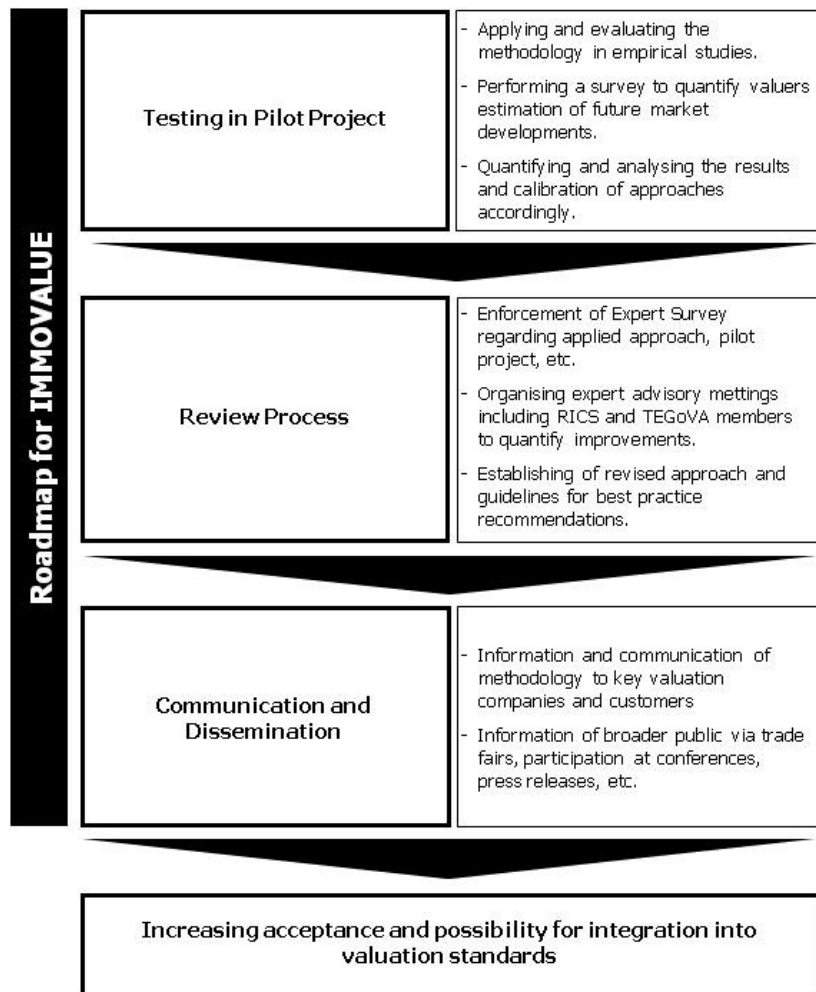
## Scoring for daily work guidance (here – impact on rents)

Key Valuation Parameter	Market maturity	Significant adjustment	Medium adjustment	Low adjustment	neutral
Market rent	<b>Opaque (Emerging) Market</b> -> Premium for energetic building (primarily in emerging market)	- high price elasticity <input type="checkbox"/> - ...	<input type="checkbox"/> - ...	<input type="checkbox"/> - low price elasticity <input type="checkbox"/> - tenants do not pay attention on sustainability and energy efficiency at all	<input type="checkbox"/> - media does not recognise green buildings benefits at all <input type="checkbox"/> - majority of property market is not willing to pay rent premium for green buildings
	--> Discount for non-energetic building (mainly in further developed markets)	- omnipresence of green building issues in the media <input type="checkbox"/> - high market sensitivity for operating expenses and energy costs (especially in gross rent-orientated property markets) <input type="checkbox"/> - good general economic conditions <input type="checkbox"/> - ... <input type="checkbox"/>	<input type="checkbox"/> - ... <input type="checkbox"/> - ... <input type="checkbox"/> - ... <input type="checkbox"/> - ...	<input type="checkbox"/> - building achieve green building requirements <input type="checkbox"/> - market does not postulate green buildings <input type="checkbox"/> - no effect on occupier demand and <input type="checkbox"/> - ... <input type="checkbox"/>	<input type="checkbox"/> - building does not achieve energy performance standards/codes <input type="checkbox"/> - market postulate green building standards/codes <input type="checkbox"/> - high obsolescence and potential loss of occupier demand and <input type="checkbox"/> - ... <input type="checkbox"/>
Market adjustment rate (MAR)		<div style="display: flex; justify-content: space-between; align-items: center;"> <div style="width: 20%; text-align: center;">+/- 75-100 %</div> <div style="width: 20%; text-align: center;">+/- 50-75 %</div> <div style="width: 20%; text-align: center;">+/- 25-50 %</div> <div style="width: 20%; text-align: center;">+/- 0-25 %</div> </div>			
x Average adjustment parameter (AAP)*		+/- [ ] [%] -> AAP derived from market evidence / valuers expectations due to replicable argumentation or estimation			
x Valuers estimation adjustment (VEA)*		+/- [ ] [%] -> Valuers estimation adjustment due to probability of occurrence, uncertainty, etc. regarding the AAP			
= --> Weighted Adjustment Factor (WAF)		+/- [ ] [%] -> = MAR x AAP x VEA			
		Key Valuation Parameter (KVP) x [ ] [€/m <sup>2</sup> p.m.]		Valuation Parameter Adjustment (VPA) = [ ] [€/m <sup>2</sup> p.m.]	

- I. Decide PREMIUM or DISCOUNT
- II. Structure impact of more qualitative aspects (run the scoring)
- III. Calculate overall market impact based on scoring
- IV. Insert calculated maximum "Energy cost saving potential" (ECSP)
- V. Adjustment based on own experience
- VI. Calculate result
- VII. Insert market rent
- VIII. Calculate result

# IMMOVALUE – Valuation Approaches for integration of energy efficiency

## Roadmap for IMMOVALUE



- 1** Current Pilot Projects and a survey which quantify the valuers expectation concerning the overall topic is underway
- 2** The methodology will be reviewed by nominated international valuation experts in the next few month
- 3** On the basis of the results from the expert review and pilot projects a revised methodology will be created
- 4** To derive an broad acceptance and influence on future related work – Approaches will be communicated to key decision makers in the property valuation society
- 3** First results are expected in beginning of 2010 and will be available at [www.immvalue.org](http://www.immvalue.org)

## IMMOVALUE Project Contact

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