



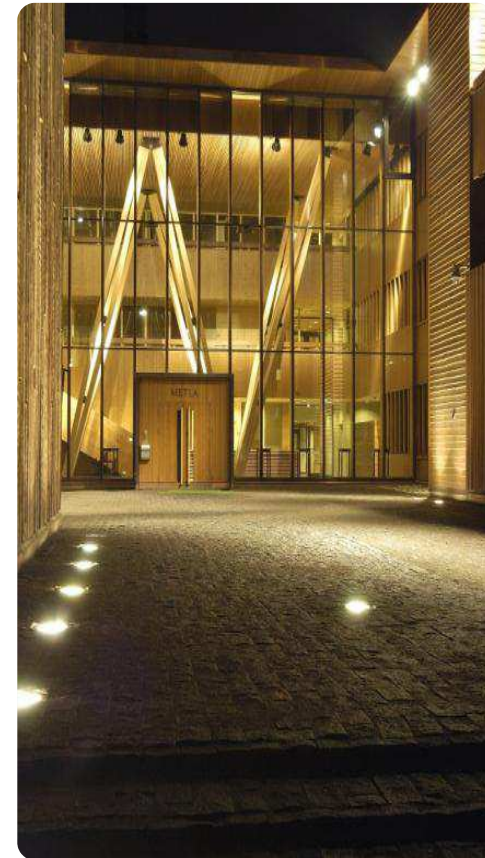
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# Monetary value of energy efficiency and its impact on the value of the building

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# Sustainability and Monetary Value of Buildings

- Investments to good and energy efficient indoor environment are very profitable, according to the latest research findings.
- Excellent and energy efficient indoor conditions has a significant impact on real estate asset value, occupancy rate and rental yield.

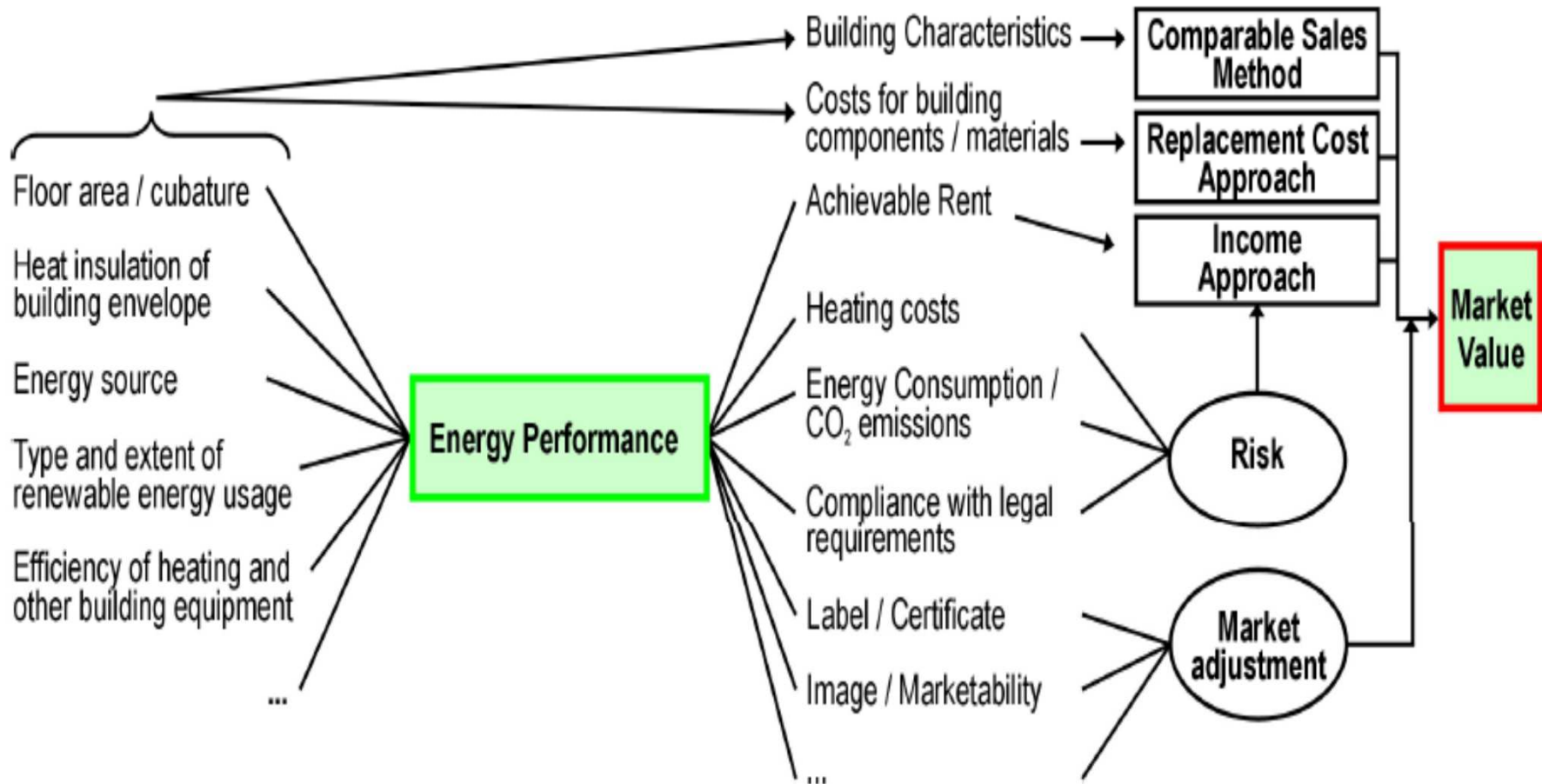


# Still the current situation

- There is a lack of understanding on how energy efficiency and sustainability can improve earning logics of owners, investors and tenants.
- Currently the selected solutions are often fostered by regulations not business interests.
- Only few investor and owners have realized the potential of sustainability for their business.



# The link of energy performance on the value of a building



# Benefits for owner

- reduced operation expenses for refurbishment
- higher rents
- higher sale prices
- shorter letting periods
- better brand value image

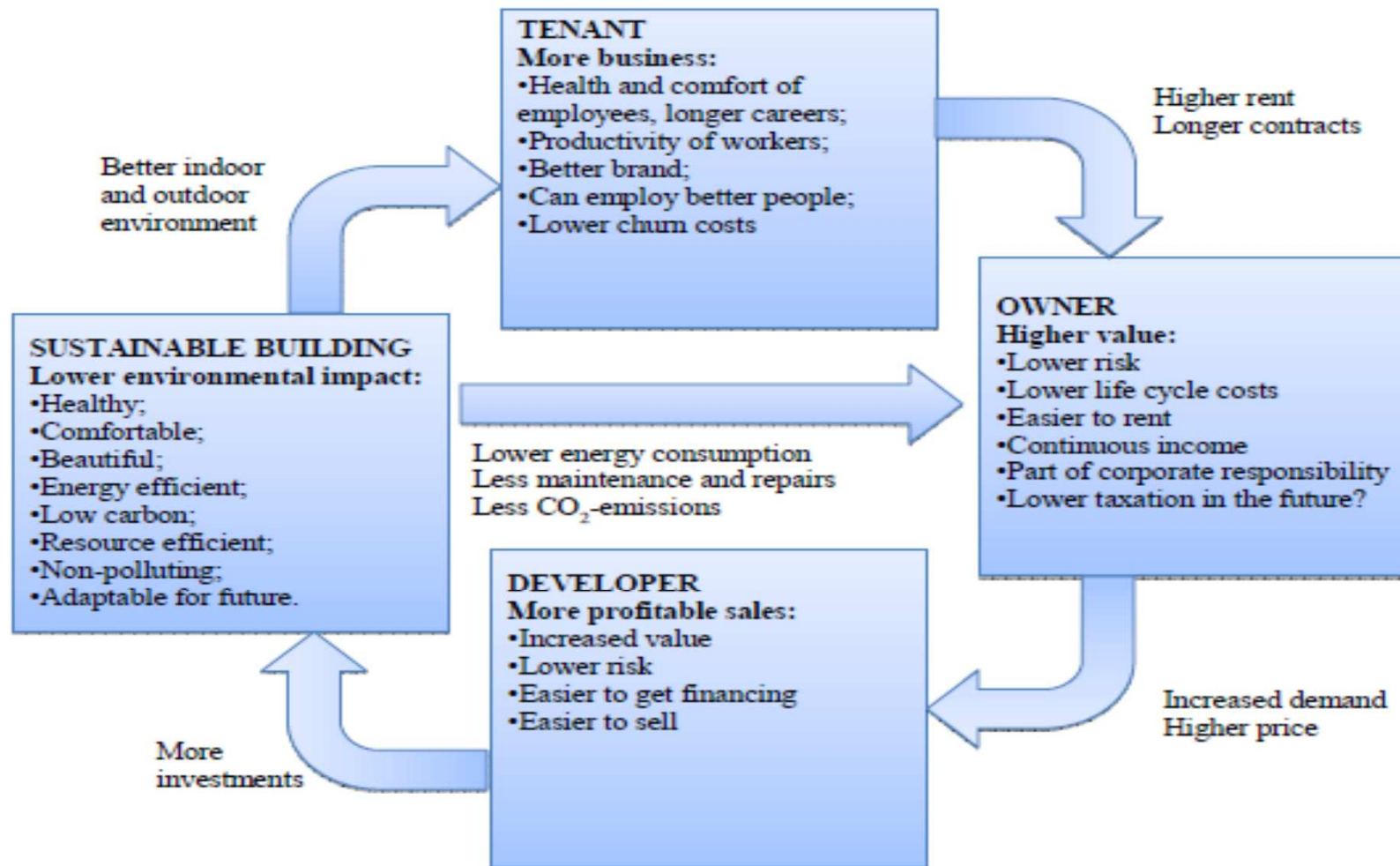


# Benefits for occupiers and users

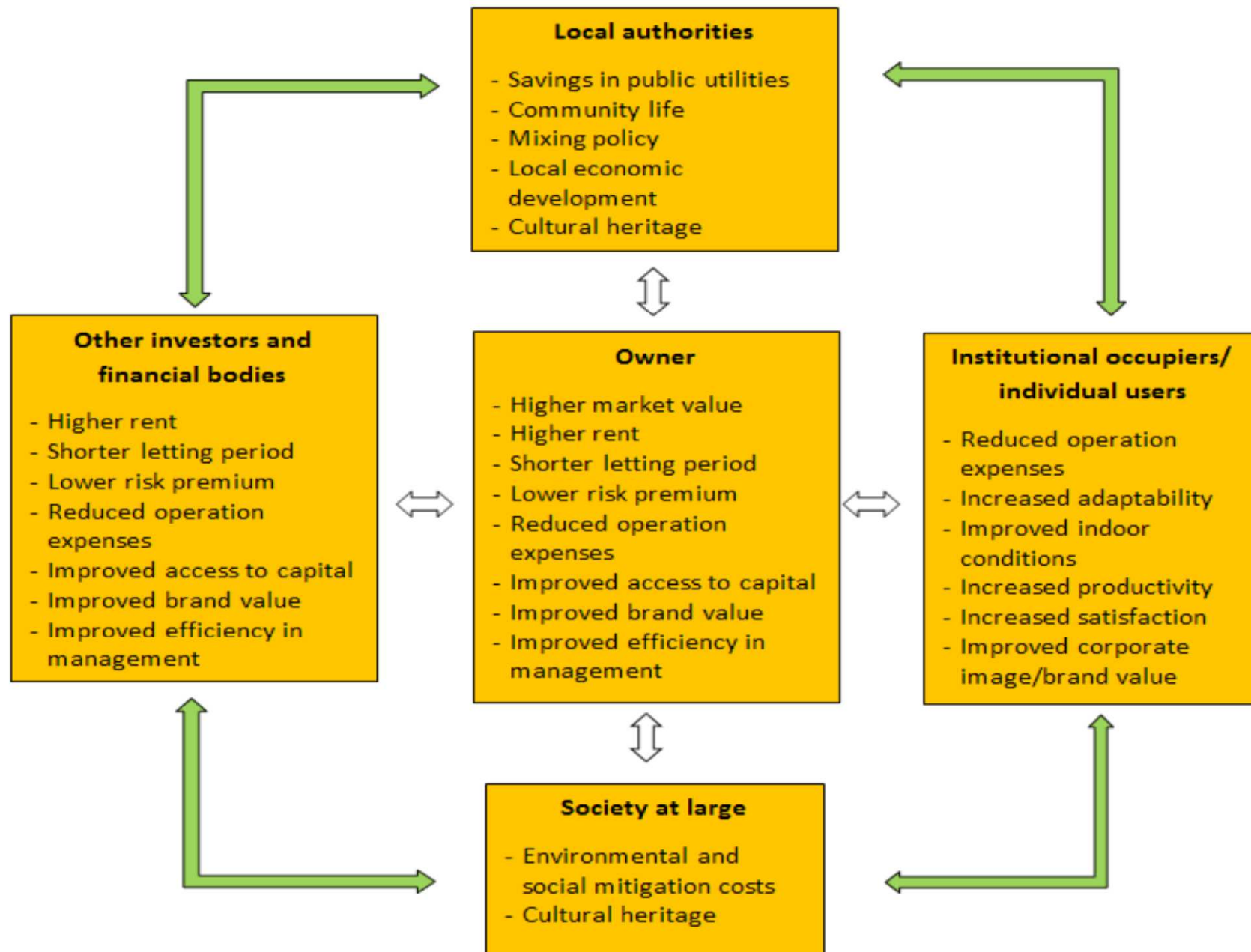
- costs savings (energy, water, waste, etc.)
- Improved comfort and health
- better adaptability of the premises resulting in lower churn costs
- Improved brand of organizations



# Benefits of key players



# Benefits for all stakeholders



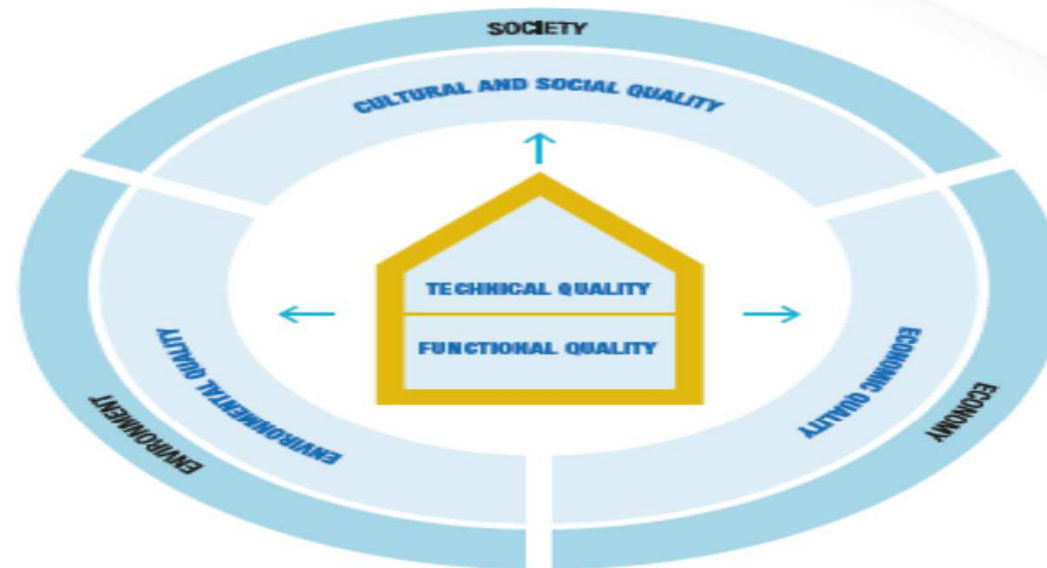


# Information needs for decision-making processes

Required information/data at the building level to support corporate decision-making can be subdivided into:

- ***physical property characteristics*** (e.g. size and volume, HVAC-system, building envelope, etc.) which should be known from the planning phase (e.g. BIM-models)
- ***performance / quality characteristics*** (e.g. energy consumption, occupant comfort, etc.) which can be measured during the operating phase

# Quality characteristics



## Technical quality

- Structural safety
- Fire protection
- Noise protection
- Moisture protection
- Maintainability
- Flexibility and adaptability
- Ease of cleaning
- Durability
- Resilience against natural and man-made hazards
- Design for deconstruction and recyclability

## Functional quality

- Serviceability (fitness for purpose, usability)
- Space efficiency

## Cultural and social quality

- Aesthetic quality
- Urban design quality
- Cultural value
- Health & well-being
- Indoor air quality
- Comfort (thermal, visual, acoustic, olfactory)
- User safety
- User participation and control
- Accessibility (to and inside the building)

## Environmental quality

- Energy performance
- Resource depletion
- GHG-emissions & GWP
- Other impacts on the global & local environment incl. risks to the local environment
- Land use change & sealing
- Water consumption
- Wastewater
- Waste (construction & user related)

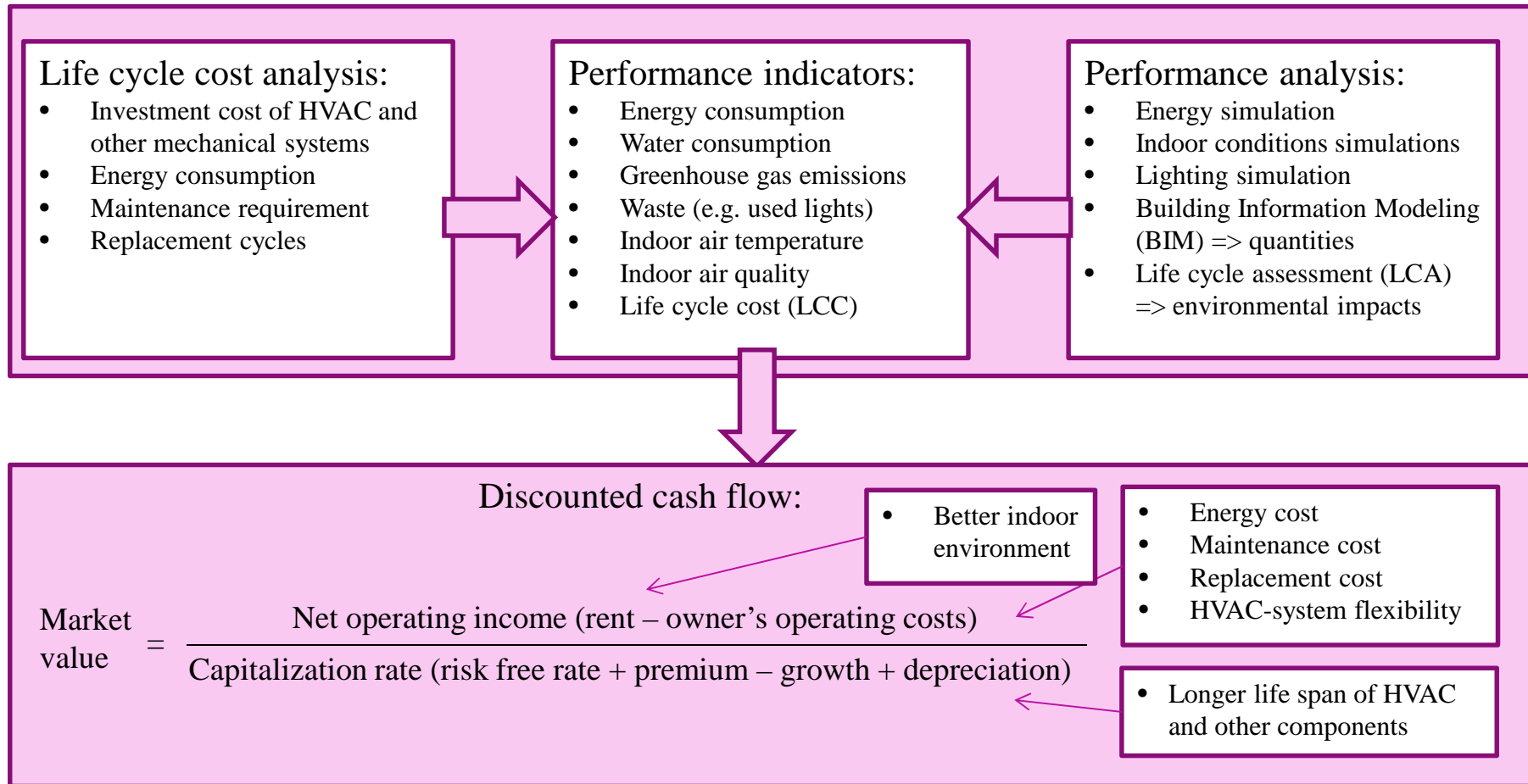
## Economic quality

- Life cycle costs

# Sustainable buildings value for different market players

Categories of value	Investor (direct and indirect)	Owner-occupier	Developer/constructor	Bank	Insurance companies	Tenant	User/inhabitant/visitor	Local authorities	Society
Market value	●	●	●	●	●			●	●
Investment value (worth)	●	●	●	●		●			
Use value	●	●	●			●	●	●	●
Intangible value	●	●	●			●	●	●	
Social value	●	●	●		●	●	●	●	●
Cultural value	●	●	●			●	●	●	●
Environmental value	●	●	●	●	●		●	●	●

# Impact of the technology on market value



# Improved asset value

Study / authors	Country	Property Type	Credentials	+ / - Magnitude	Impact on
Brounen and Kok, 2010	The Netherlands	Residential Homes	Energy Performance Certificate (Class A, B, C)	+ 2,8 %	Selling price
Eichholtz, Kok and Quigley, 2010	USA	Office Buildings	LEED	+ 11,1 %	Selling price
Fuerst and McAllister, 2008	USA	Office Buildings	LEED	+ 31 % - 35 %	Selling price
Salvi et. al, 2008	Switzerland	Residential Homes	MINERGIE Label	+ 7 %	Selling price

# Higher occupancy

Study / authors	Country	Property Type	Credentials	+ / - Magnitude	Impact on
Fuerst and McAllister, 2010	USA	Office Buildings	LEED	+ 8 %	Occupancy Rates
Pivo and Fischer, 2010	USA	Office Buildings	Energy Star, close distance to transit, location in redevelopment areas	+ 0.2 % - 1.3 %	Occupancy Rates
Wiley, Benefield and Johnson, 2008	USA	Office Buildings	LEED, Energy Star	+ 10 - 18 %	Occupancy Rates
MIT, 2012	USA	Office Buildings	Design flexibility	30 %	Occupancy Rates

# Rental yield

Study / authors	Country	Property Type	Credentials	+ / - Magnitude	Impact on
City of Darmstadt, Rental Index, 2010	Germany (Darmstadt)	Residential multi-family houses	Primary energy value below 175 kWh/m <sup>2</sup> a	+ 0,50 €/m <sup>2</sup>	Rental Price
Pivo and Fischer, 2010	USA	Office Buildings	Energy Star, close distance to transit, location in redevelopment areas	+ 4.8 % - 5.2 %	Occupancy Rates
Salvi et. al, 2010	Switzerland	Residential Flats	MINERGIE Label	+ 6 %	Rental Price
Wiley, Benefield and Johnson, 2008	USA	Office Buildings	LEED	+ 7 % - 17 %	Rental Price

# The effect of energy and sustainability on market value

		Traditional Building	Low energy building (-25%)	Sustainable Building
Rent	€/m <sup>2</sup> ,a	300	300	305
Maintenance	€/m <sup>2</sup> ,a	10	10	12
Energy	€/m <sup>2</sup> ,a	20	15	15
Net rent income	€/m <sup>2</sup> ,a	270	275	278
Renting process	rental months	6	6	5
Free rent period	rental months	3	3	2.5
Churn	rental months	3	3	2.5
Total months	rental months	12	12	10
Rental period	years	6	6	7
Net operating income	€/m <sup>2</sup> ,a	220	225	242
Capitalization rate	%	6.25	6.25	6.15
Value	€/m <sup>2</sup>	<b>3520</b>	<b>3600</b>	<b>3935</b>
Change	%		+ 2,3 %	+11.8 %



# Thank you