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„Multiple Project Benefits" von Energieeffizienz (IEA DSM Task 16)

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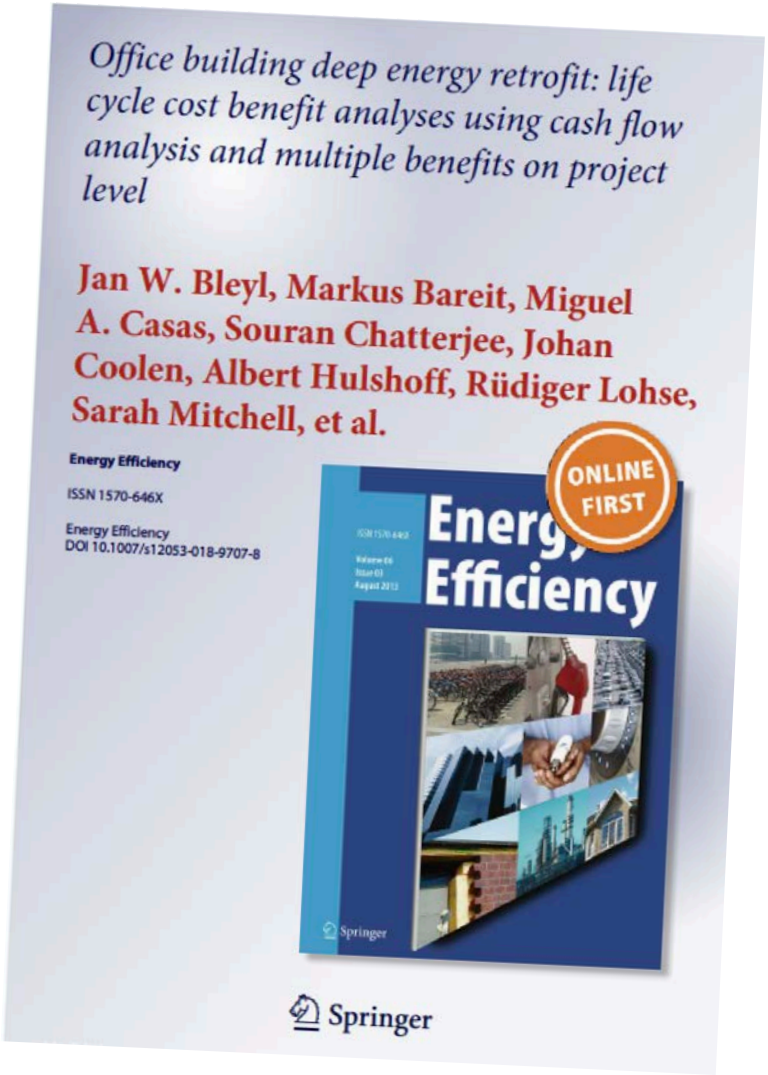
Sarah Mitchell & **Mark Robertson** (Canada), **Diana Ürge-Vorsatz** (Hungary)

Scientific publication of results and IEA DSM University Webinar

Bleyl, Jan W. et al.
Office building deep energy retrofit: Life cycle cost benefit analyses using cash flow analysis and multiple benefits on project level,
"Energy Efficiency" special journal 2018:
https://doi.org/10.1007/s12053-018-9707-8

by **Bareit; Bleyl; Casas; Chaterjee; Coolen; Hulshoff; Lohse; Mitchel; Robertson; Ürge-Vorsatz**

Leonardo ENERGY Webinar *(DSMU#36):*
https://www.youtube.com/watch?v=j344zdQTL4I&feature=youtu.be

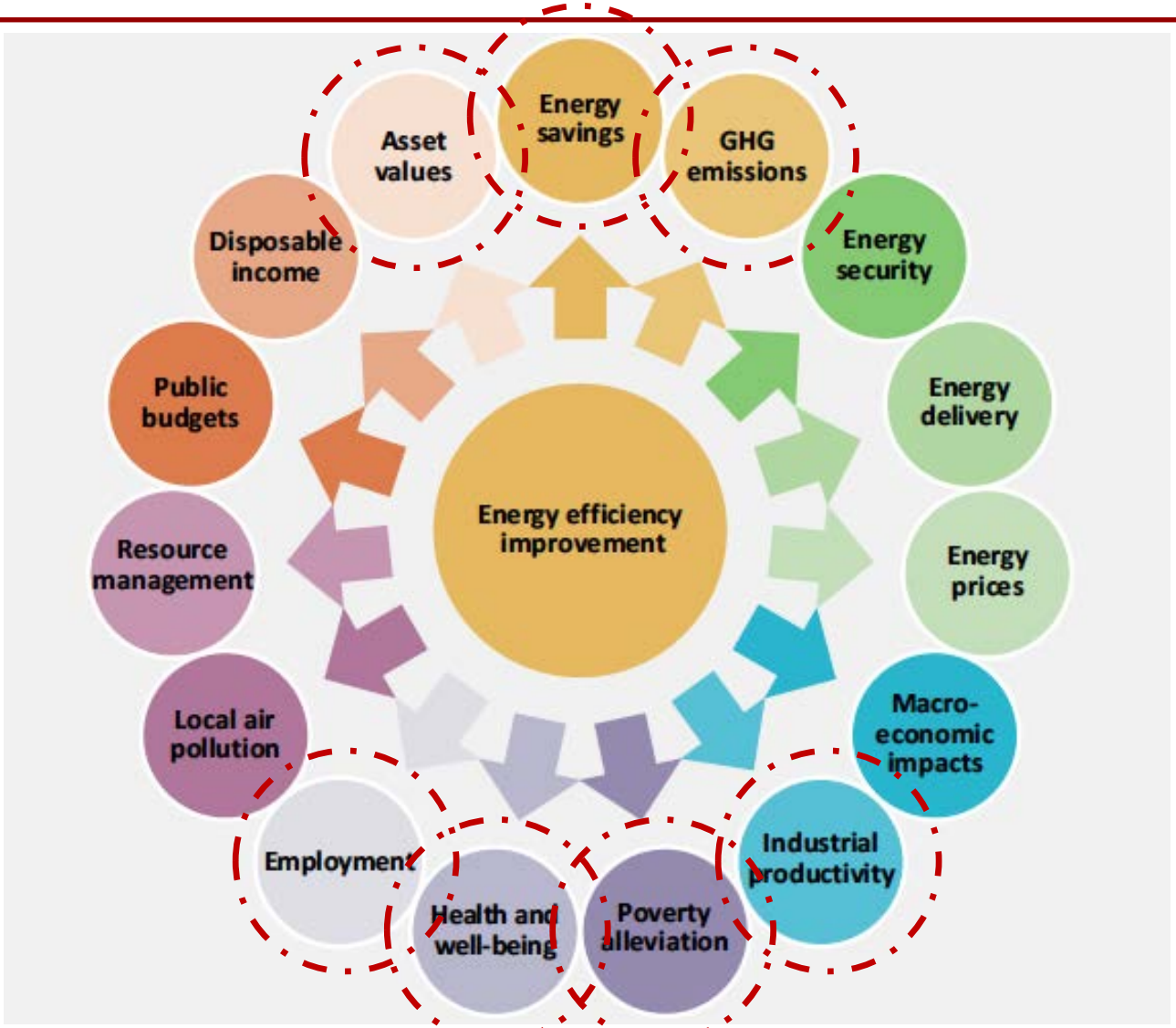


Outline

1. (Motivation, questions and goals)
2. (Method of approach)
3. (Case study: **Office building deep energy retrofit** (DER)**: Dynamic investment analyses)**
4. **‚Multiple Benefits' of building DER on project level => ‚MPBs' and ‚Multiple Beneficiaries'**
5. **Monetary valuation of ‚MPBs'**
6. **Discussion and conclusion**

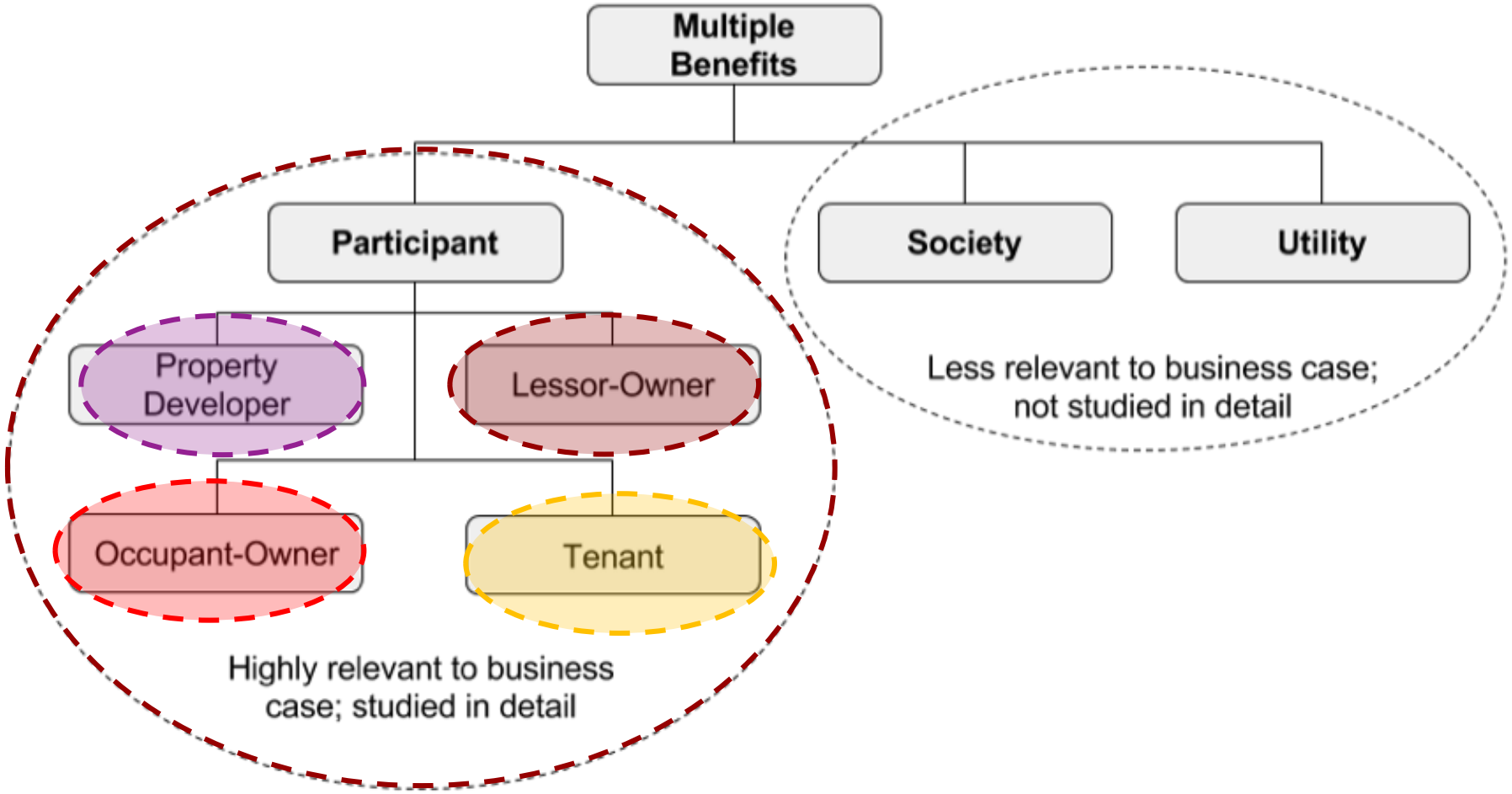
Additional revenues from Multiple Project Benefits (MPB)?

‘Multiple Benefits of Energy Efficiency’ (IEA 2014)



Source: [IEA 2014]

Classification of MBs according to primary beneficiaries => 'Multiple Beneficiaries'



=> „**Multiple Project Benefits** (MPB)"

[Source: Bleyl et al. 2017 based on Lazar & Colburn 2013]

Results: Monetarily valuated Multiple Project Benefits (MPB)

Multiple Project Benefits of DER	
1.	**Work productivity increase** (0.57% - 1.14%)
2a.	**Rental income increase** (1% - 5.3%)
2b.	**Building sales price increase** (2.5% - 6.5%)
3.	**CO_2 savings** (6 - 79 EUR/t)
4.	**Maintenance cost savings** (2.1 - 3 EUR/m2/y)
5a.	**Energy cost savings project term** (25 years)
5b.	**Add. energy cost savings over techn. lifetime** (40 y.)

Source: [Bleyl et al. 2017]

Pecuniary values of DER MPBs

2 Metrics: EUR / m² => per year & PVs of P-CF

	Multiple Project Benefits of DER	Range	Valuation EUR/ (m² * y)	Valuation PV: EUR/m²
1.	**Work productivity increase** (0.57% - 1.14%)	Lower	10,4	219
		Upper	20,8	439
2a.	**Rental income increase** (1% - 5.3%)	Lower	1,2	25
		Upper	6,4	134
2b.	**Building sales price increase** (2.5% - 6.5%)	Lower	100	
		Upper	260	
3.	**CO_2 savings** (6 - 79 EUR/t)	Lower	0,3	6
		Upper	3,8	79
4.	**Maintenance cost savings** (2.1 - 3 EUR/m2/y)	Lower	2,1	44
		Upper	3,0	63
5a.	**Energy cost savings project term** (25 years)	Lower	16,8	354
		Upper	16,8	354
5b.	**Add. energy cost savings over techn. lifetime** (40 y.)	Lower	16,8	157
		Upper	16,8	157

Source: [Bleyl et al. 2017]

Annotations:

Conservative values!

Present values (PV) of project cash flows (P-CF) over 25 years; 1,5%/year price increase; 3% WACC as discount rate.

To compare:

CAPEX (for energy retrofit only): **330 EUR/m²**

Pecuniary values of DER Multiple Benefits and accountability to different stakeholders

Multiple Project Benefits of DER	Range	Valuation PV in [EUR/m²]	Beneficiaries: Different owner perspectives — Property develop.	Occupant - owner	Lessor - owner	Tenant
1. Work productivity increase	Lower	219	-	219	-	219
	Upper	439		439		439
2a. Rental income increase	Lower	25	-	-	25	-25
	Upper	134			134	-134
2b. Building sales price increase	Lower	100	100	[100]	[100]	-
	Upper	260	260	[260]	[260]	
3. CO_2 savings	Lower	6	-	6	-	6
	Upper	79		79		79
4. Maintenance cost savings	Lower	44	-	44	44	-
	Upper	63		63	63	
5a. Energy cost savings project term	Lower	354	-	354	-	354
	Upper	354		354		354
5b. Add. energy cost savings over techn. Lifetime	Lower	157	-	157		[157]
	Upper	157		157		[157]
Totals	Lower		**100**	**780**	**69**	**554**
	Upper		260	1092	197	738

Source: [Bleyl et al. 2017]

Discussion and conclusions

1. **DERs generate tangible and quantifiable benefits on the project level** (=> 'MPB'); e.g. higher rents & real estate values, lower maintenance cost, CO_2 savings and higher work productivity => **MPBs can make a DER business case more attractive**
2. However **'split incentive' requires differentiation between different types of investors/owners and tenants**
3. MPBs can help to identify **strategic allies for DER project development and programs**
4. Furthermore, the approach can support policy makers to develop policy measures needed to achieve 2050 goals, in particular **facilitate private sector investments**
5. *Outlook:* **Similar analyses** e.g. **for residential sector?**

Thank you!

Questions, remarks and collaborations welcome!

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