

Key research created by SMARTER to support residential green finance

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Research & Data Structuring
WP coordination



PhD Research - Teaching Assistant



WP Overview



This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement No. 847141.



Research & Data Structuring for Green Homes & Green Mortgages programs

Reviews, surveys and data analysis

Country	Primary Energy?	loads included	RES requirements	Ref nZEB requirements	Energy consumption or EP class	kWh/m ² ·y house	kWh/m ² ·y multifamily	notes	Heating-cooling demand requirement	Envelope U values required or not
1 Bosnia and Herzegovina	energy need for heating (Q _{hnd})	only heating			A++	-14-17	-14-17	B&H North B&H South B&H North B&H South Rep. Srpska	only requirement is this Q _{hnd}	-
2 Bulgaria	PE	ALL		nZEB = class A (PE < 95 kWh/m ² ·y) + 55% off "all but plug" from RES	Final Energy demand for heating and for cooling -> + min. EP class A	< 40 kWh/m ² ·yr		kWh/m ² ·yr A+ < 48 A 48-95		-
3 Czech Republic	maximum EP value based on energy demand	ALL but not plug	15% for houses 10% for multy F		nZEB requirements			limit REFERENCE value Er		YES
4 Georgia	PE	Heating, domestic hot water, cooling, ventilation But not plug			minimum B scores	167 174 200	142 152 170	Climate 1 Climate 2 Climate 3	Heating 35-35 kWh/m ² ·yr Heating 39-37 kWh/m ² ·yr Heating 42-36 kWh/m ² ·yr	YES
5 Greece	PE	ALL	YES, 60% of the DHW from solar systems	nZEB=class A (0,33Re < EP<0,50Re)	minimum nZEB national plan conditions	not officially published	not officially published			YES
6 Ireland	PE	ALL but not plug	20% of PE			~45	~40	0,3 of 2005 ref		YES
7 Italy	PE with RES in design phase	ALL but not plug nor lighting	only in desing phase calulation			90 (+up to 4 units)	70	Reference building methodology		YES
8 Poland	PE	ALL but not plug nor lighting (for housing)	NO explicit requirement		nZEB requirements	70	65			YES
9 Romania	energy specific demand	ALL but not plug	min. 10%			110	100	changes in 2020... climate zones		YES
10 Slovakia	PE... but	only heating+DHW								
11 Turkey	PE	Heating, domestic hot water, lighting, cooling, ventilation But not plug								
12 Ukraine	PE*	Energy consumption for heating, cooling, ventilation system, hot water, lighting	no explicit requirement							

Certifier	Country	Program
1 RoGBC	Romania	Green Homes
2 Irish GBC	Ireland	Home Performance Index (HPI)
3 Green Council BH	Bosnia & Herzegovina	Green Homes
4 EnEffect	Bulgaria	Green Homes
5 CZGBC	Czech Republic	SBToolCZ
6 EEC Georgia	Georgia	Green Homes
7 CRES	Greece	Green Homes
8 GBC Italia	Italy	GBC Home
9 PLGBC	Poland	Green Homes
10 SKGBC	Slovakia	Green Homes
11 Turkeco	Turkey	CEDBIK, LEED & BREEAM
12 EUEA	Ukraine	Green Homes

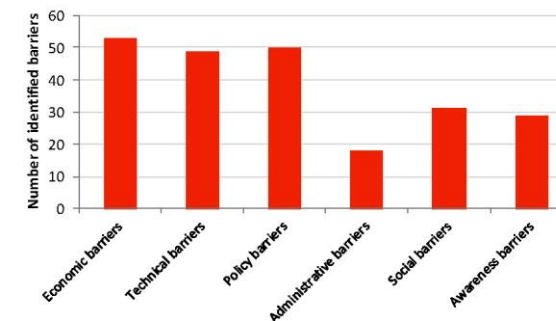


Figure 1. Number of identified main barriers by categories

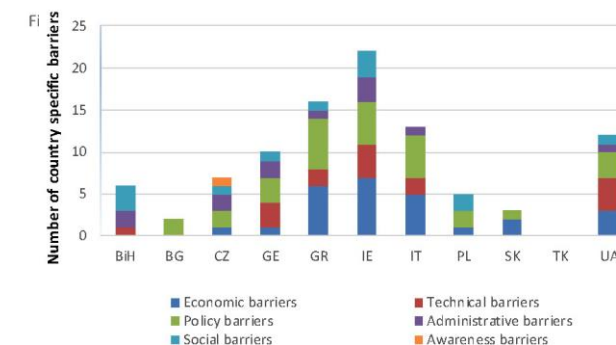
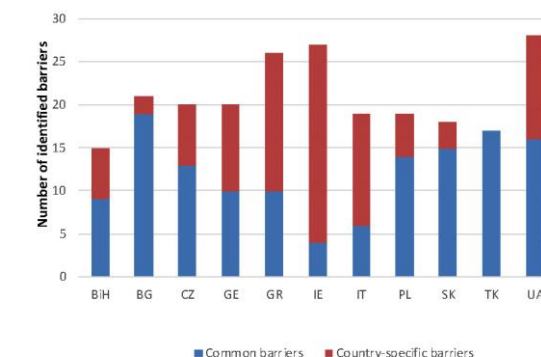


Figure 3. Number of analyzed country-specific barriers by categories

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Research & Data Structuring for Green Homes & Green Mortgages programs

- 1) Review of key **research** on default risk effect of green homes
- 2) **EPB scores** as a proxy for more extensive Green certifications → **for mortgage portfolios**
- 3) Assessment of construction **Cost Premiums** of Green Homes
- 4) Country by country identification of **legal, social, economic, policy... barriers** to green mortgages
- 5) Upgrading plan for existing Green Homes certification programs **in line with Level(s)**
- 6) Upgrading plan for **alignment with CEN standards** and other relevant national standards
- 7) Assessing **minimum requirements for Green and EPB Certificates** for local programs eligibility – and as a minimum level “**Green investment**” tagging
- 8) **Data collection structure** for energy performance and other green criteria – meaningful for mortgage portfolios and compatible with e.g. EFIG's DEEP database and EeMAP's EeDAP database.
- 9) Recommendation and **guidelines to Green-Homes valuation**

Reference Research on default risk effect of green homes – lead partner Turkeco

A. Focusing on **energy savings** relating to financial risks/benefits e.g.

- From 1998 key references show “evidence of Rational Market Valuations for Home Energy Efficiency” (Nevin & Watson)
- To “New results and implications for energy efficiency investments” (Mathew, Wallace et.al. 2018 -Berkeley Lab)
- To “Policies to finance energy efficiency: An applied welfare assessment” (McCoy et.al, LSE, 2018)

Such studies

- confirm the **direct default risk impacts of energy efficiency** and related factors as energy pricing...
- allow to better evaluate the cost-effectiveness of public policies and even
- Invite to consider and value the **multiple and non-financial benefits energy efficient buildings**.

B. Addressing **health, comfort + other quality/ benefits** relating to value & financial risks e.g.

- HEALTHY HOME LOAN PACKAGE studies from ANZ Bank (New Zealand 2019)
- Residential Green Valuation Tools. (Adomatis, Appraisal Institute Chicago 2014)
- Inadequate housing and health: an overview. (Bonnefoy, Paris, 2007)

Higher Real Estate value
mainly supported by certifications

Even with less quantitative data and direct evidence, these studies confirm the default-risk correlation and the **financial and value benefits of healthier and more comfortable homes**

Highlights of Outcomes and Results WP2

Green Homes **COST PREMIUMS** ?

Table 1 Elements and factors affecting sustainable building cost

Building Life Cycle Cost	RIBA Work Stages	Sustainable Building	
		Elements	Green cost premium factors
Initial Cost ↑ Preliminary Cost Design Cost Construction Cost ↓	1. Preparation and Brief		
	2. Design Concept		1. Experience of consultants in sustainable building design. 2. Higher consultant fees.
	3. Design Development	E4	3. Complexity of sustainable design –longer design time needed. 4. Additional design concerning sustainability.
	4. Technical Design		5. Maturity level of sustainable design. 6. Inconsistency of drawing. 7. Imperfect specification.
	5. Construction	E5	1. Types of contract use. 2. Appointment of prefabricated manufacturer.
		E6	1. Lack of proficiency with sustainable technology. 2. Less competition among contractors (dominated by G7).
		E1	1. Scarcity of materials. 2. Research and development (more testing and code approval required). 3. Lack of information on sustainable materials.
		E2	1. Complexity of installation process. 2. Expensive. 3. Difficulties in matching the equipment with the design requirements.
		E3	<u>IBS</u> 1. Higher management cost. 2. Higher transportation cost – raw materials to prefabrication site and prefabricated elements to construction site. 3. Assembly cost –special PC installation, frequency of tower crane usage, higher jointing cost. 4. Higher machinery cost.
			<u>BIM</u> 1. Higher implementation cost. 2. Uncertain ROI recovering.
		E7	1. Additional values of the coverage provisions.

Legend: E1-sustainable material, E2 –sustainable equipment, E3 –sustainable technology, E4 –sustainable design, E5 –tendering, E6 –contractor's experience, E7 –insurance



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- **Average 12% ~ 15% of extra cost considered for a Green-Home certified building.**
- **Research shows much lower and affordable situation and even no extra-cost (market and building codes evolution...)**
- **Integrating GH objectives form the beginning allow to limit the potential cost-premiums. (Planning, Design, Studies phases)**
- **Some green requirements/choices may mean up-front savings.**

Russ N, Hanid M, Kho MY. Literature Review on Green Cost Premium of Sustainable Building Construction. Int J Technol. 2018 Dec 30;9:1715.

Highlights of Outcomes and Results WP2

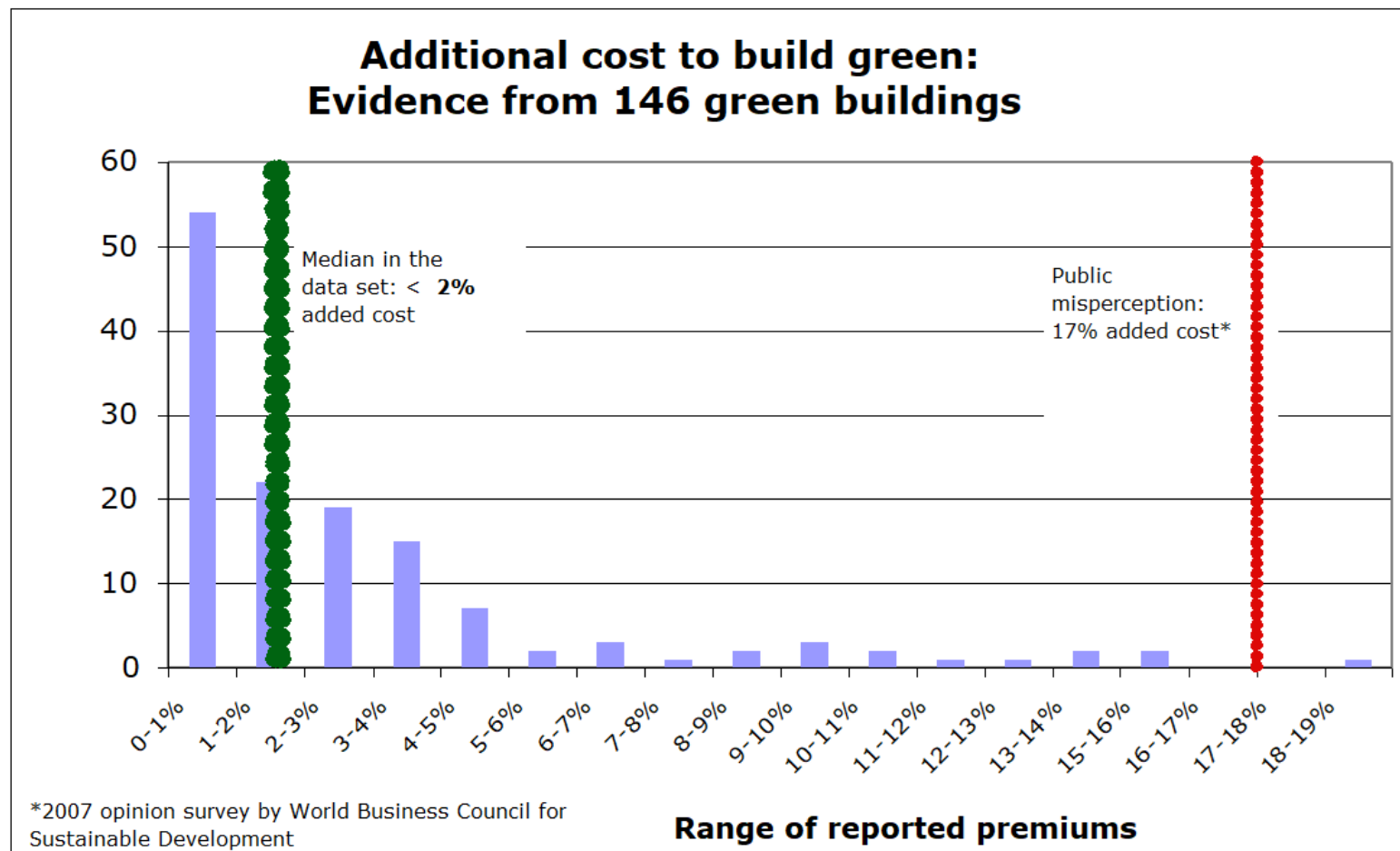
Green Homes **COST PREMIUMS**?



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Good news is that
it is more of a
perceived barrier
than a factual
financial issue



Cost of building green: evidence from 146 green buildings. *Greg Kats, Capital-E and Good Energies*

Highlights of Outcomes and Results



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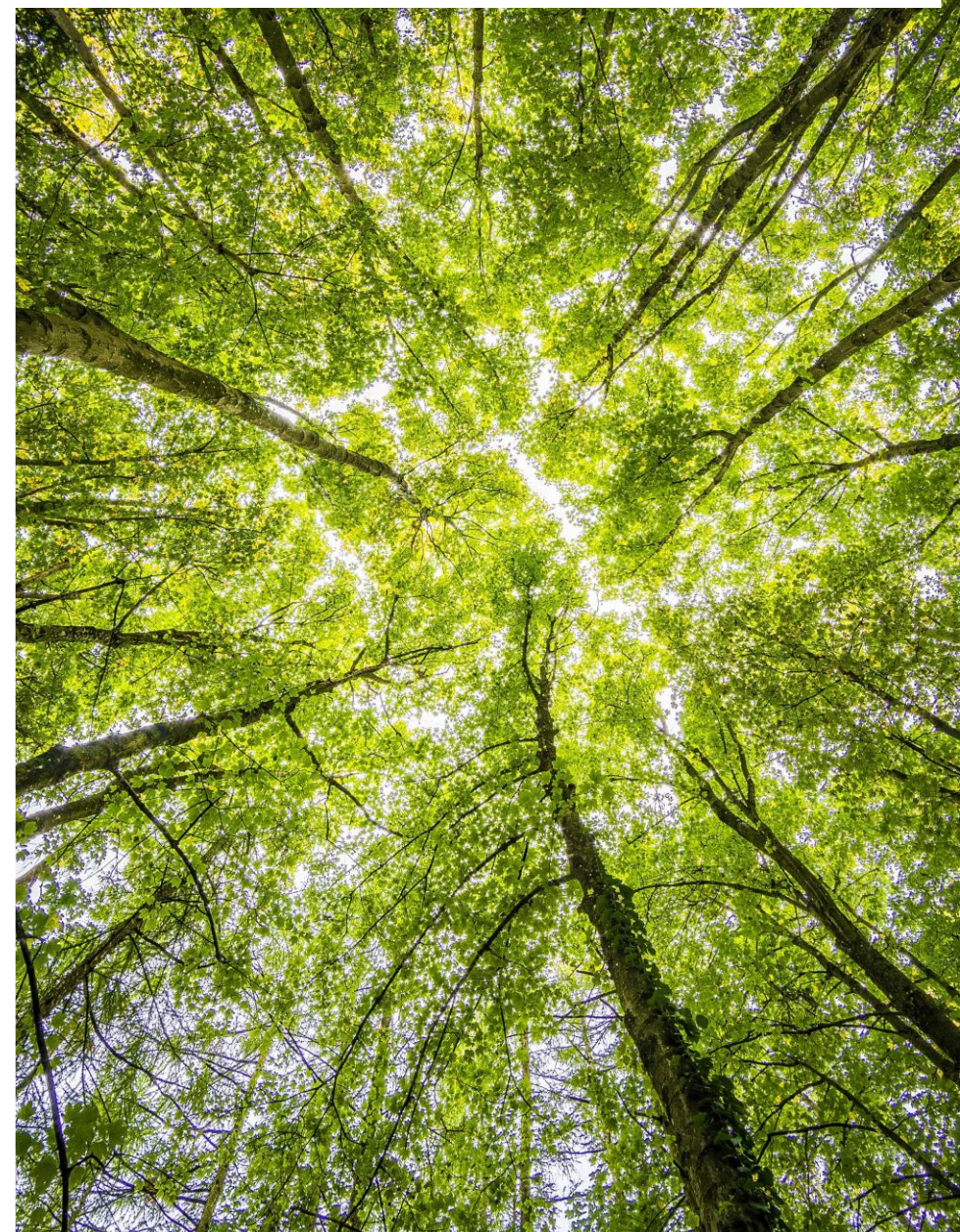
Visit project online platform

<https://c2e2.unepdtu.org/smarter/>

& EU CORDIS project page

For further reference and public deliverables

<https://cordis.europa.eu/project/id/847141>



Green-Homes valuation

Green investment tagging...

Certification programs
alignment with
Level(s) framework
for buildings
sustainability assessment...

→ *Coming up next*

