



HIGH-QUALITY ENERGY PERFORMANCE
ASSESSMENT AND CERTIFICATION IN EUROPE
ACCELERATING DEEP ENERGY RENOVATION

This project has received funding from the European Union's
Horizon 2020 research and innovation programme under grant
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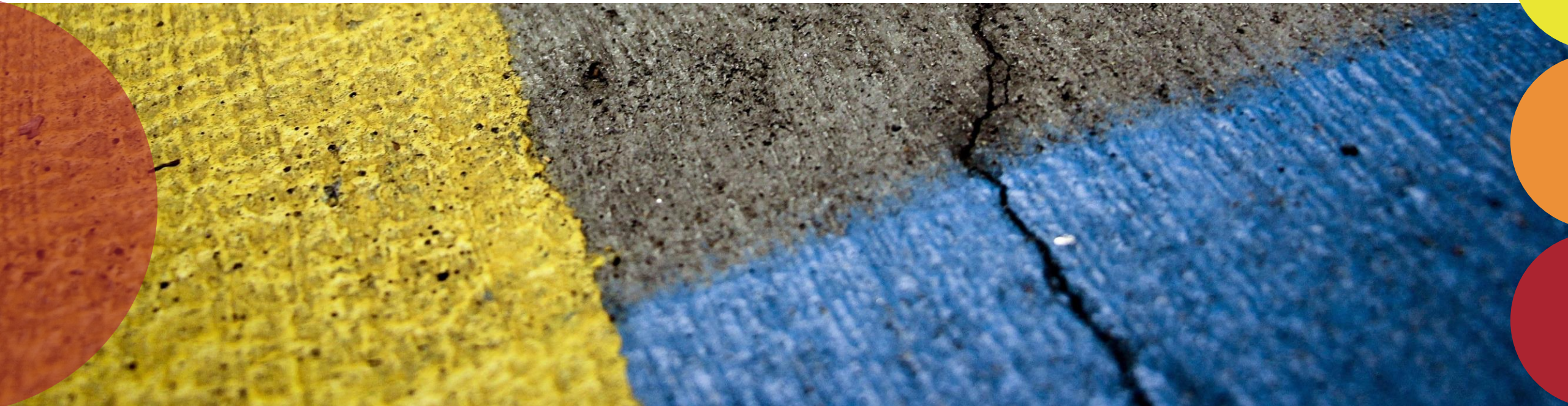
**Harnessing Energy Performance Certificates for Deep Energy
Renovation: Policy recommendations and evidence from testing**

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Project Background



Introduction to QualDeEPC

- High-**quality** **E**nergy **P**erformance Assessment and **C**ertification in Europe Accelerating **D**eep Energy Renovation
- Horizon2020 project
- Project duration from September 2019 - February 2023
- Project coordination by Wuppertal Institut, Germany
- Project partners from Belgium, Bulgaria, Germany, Greece, Hungary, Latvia, Spain, and Sweden
- Please visit our website for further information: www.qualdeepc.eu

QualDeEPC partners

- BME - Budapest University of Technology and Economics (HU)
- CIT Energy Management (SE)
- CRES – Centre for renewable energy sources and saving (GR)
- DENA – German Energy Agency (DE)
- EAP – Energy Agency Plovdiv (BG)
- EKODOMA (LV)
- ENERGIACLUB – Climate Policy Institute and Applied Communications (HU)
- ESCAN (ES)
- E-P-C – EPC project corporation for Climate. Sustainability. Communications (DE)
- FEDARENE – European Federation of Agencies and Regions for Energy and the Environment (BE)
- Wuppertal Institut for Climate, Environment, Energy (DE)

Approach of QualDeEPC

1. **Analysis** of existing EPC schemes, good practice, shortcomings, and priorities for improvement
2. **Development** and **testing** of concrete proposals and tools for enhanced EPC assessment, certification and verification, as well as Deep Renovation Network Platforms
3. **Adaptation** to country needs and **implementation** of consensus elements, as well as developing a roadmap for further **dialogue**, and
4. Development of a **sustainability strategy** and conclusive **policy recommendations** for regional, national, and transnational dialogue, and transfer.

QualDeEPC will stimulate changes by (1) **intensive dialogue** involving the important stakeholders at all levels from the very beginning and (2) **disseminating** its findings among the relevant target audiences in Europe.

QualDeEPC— 7 development priorities

Developed practical concepts, proposals, and tools for an enhanced EPC scheme linked to deep renovation based on the identified priorities QualDeEPC in its first phase:

- A. Improving the recommendations for renovation, provided on the EPCs, towards deep energy renovation
- B. Online tool for comparing EPC recommendations to deep energy renovation recommendations
- C. Creating Deep Renovation Network Platforms (One-Stop Shops plus networking and joint communication of supply-side actors)
- D. Regular mandatory EPC assessor training (on assessment and renovation recommendations) required for certification/accreditation and registry
- E. Achieving high user-friendliness of the EPC
- F. Mandatory or at least voluntary advertising guidelines for EPCs.
- G. Improving compliance with the mandatory use of EPCs in real estate advertisements

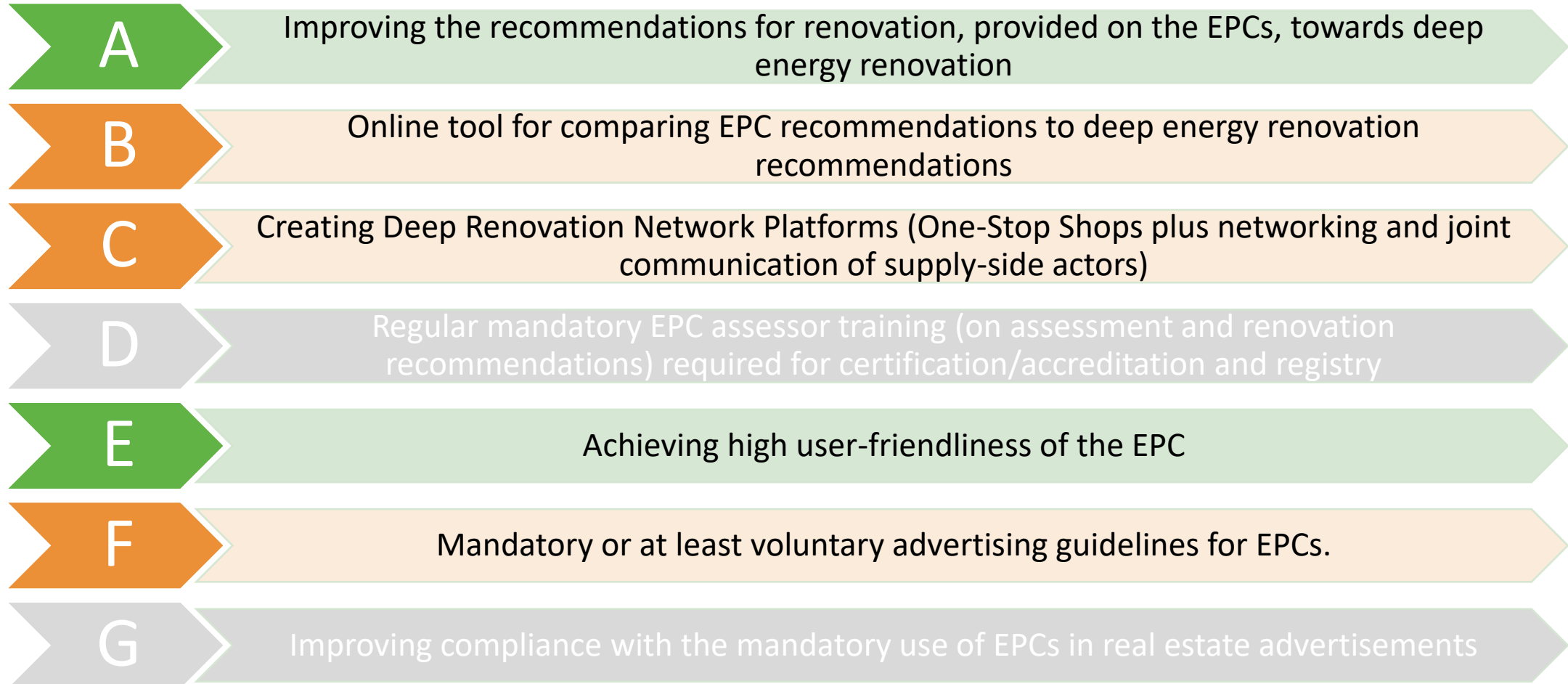
Testing of pilot buildings – selection of pilot buildings



Characteristics of pilot buildings

- **98 pilot buildings** were selected from all QualDeEPC partner countries (Latvia -15; Greece -12; Bulgaria - 8; Sweden – 11; Spain – 15; Germany – 20; Hungary – 17) (Žogla, 2021).
- Most pilot buildings were built between 1960 and 1980.
- 61 are residential buildings (33 are multi-apartment buildings, 20 are single family or row buildings and 8 are single apartments; and 37 are non- residential buildings)
- 50 pilot buildings have had existing EPCs.

QualDeEPC– Testing the priorities



Enhanced EPC template proposed by QualDeEPC

ENERGY PERFORMANCE CERTIFICATE

in accordance with Building Energy ACT XZY

Registration no.: 00000/0000	Security no.: 0000-0000-0000-0000	Valid until: DD/MM/YYYY
Building <input checked="" type="checkbox"/> / Building unit <input type="checkbox"/> no	1st Secondary School of Pallini-B I	
Use of building/building unit	Educational	
Address	16th km Marathonos Ave.	
Postal Code, City	15351 Pallini - Attiki	
Climate zone	B	
Year of construction	1981	
Total area	1196.0 m ²	
Useful area	1170.5 m ²	



Energy classification and performance

minValue	maxValue	Energy class	Primary energy consumption (kWh/m ²)	"Improved value" of Main Option* (kWh/m ²)
EP ≤ 0.33 R _a	EP ≤ 0.50 R _a	A+		
0.33 R _a < EP	EP ≤ 0.75 R _a	A		
0.50 R _a < EP	EP ≤ 1.00 R _a	B+		
0.75 R _a < EP	EP ≤ 1.41 R _a	B		55.1
1.00 R _a < EP	EP ≤ 1.82 R _a	B-		
1.41 R _a < EP	EP ≤ 2.27 R _a	C	129.8	
1.82 R _a < EP	EP ≤ 2.73 R _a	D		
2.27 R _a < EP	EP ≤ 3.00 R _a	E		
2.73 R _a < EP	EP ≤ 3.33 R _a	F		
		G		

*The underlined renovation recommendations and implementation scheme for main Option are given on p. 3 & 4.

Calculated annual primary energy consumption

Calculated primary energy consumption of reference building	72.1kWh/m ²
Calculated primary energy consumption of audited building	129.8kWh/m ²

Annual CO₂ emissions of audited building

Calculated annual CO ₂ emissions	36.9kg/m ²
Real annual CO ₂ emissions	n/a

Comfort conditions and quality of indoor air

Thermal comfort	<input type="checkbox"/>	Visual comfort	<input type="checkbox"/>	Acoustic comfort	<input type="checkbox"/>	IAQ	<input type="checkbox"/>
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Potential primary energy savings of renovation according to Main Option* (see p. 3 and 4):
87436.3 kWh/y



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Details on the current energy performance of the building

Energy consumption**		measured:			modelled:		
No.	Period of measurement (from – to)	Energy source			Energy consumption for heating/cooling/lighting/DHW [kWh/yr]		
		Electricity [kWh/yr]	Fossil fuel [kWh/yr]	Other	Total	Thermal	Electrical
1	n/a				100194.8	76901.85	23292.95
2	n/a						
3	n/a						

**Measured energy consumption depends on occupants' behaviour, the number of occupants and weather conditions during the period of measurement; modelled energy consumption may differ from actual consumption.

Assessment of building envelope and technical system

Building envelope	Area [m ²]	Description or Avg. U-value	Energy rating
Roof or ceiling to attic	723.0	3.05	
External walls	670.58	0.85, 1.2	
Windows	224.36	4.5, 6.0	
Doors	20.08	6.0, 4.5	
Ground floor or floor to unheated basement	723.0	3.1	
Floor in contact with air (on pilotis)			

Technical systems	Year of construction/ installation	Energy source, power, EU energy label	Energy rating
Heating system	n/a	Fuel oil-276.74kW COP: 0.75	
Domestic hot water			
Ventilation system			
Cooling system	n/a	Electricity-24.22kW EER: 2.2, 2.9	
Renewable energy systems			
Lighting	n/a	Electricity-6.5kW	



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Renovation recommendations – component evaluation

Building envelope	Recommendation	"new" avg. U-value	New Energy rating	Cost effectiveness (e.g. payback time)	Included in Main option
Roof or attic	Installation of roof insulation	0.45		11.8y	<input checked="" type="checkbox"/>
External walls					<input type="checkbox"/>
Windows	Replacement of windows	2.9		127.5y	<input type="checkbox"/>
Doors					<input type="checkbox"/>
Ground floor or floor to unheated basement					<input type="checkbox"/>
Floor in contact with air (on pilotis)					<input type="checkbox"/>

Technical systems	Recommendation	Energy source, provided power, EU energy label	New Energy rating	Cost effectiveness (e.g. payback time)	Included in Option 1?
Heating system	Boiler replacement	Fuel oil-276.74kW COP: 0.95		7.6y	<input checked="" type="checkbox"/>
Domestic hot water					<input type="checkbox"/>
Ventilation system					<input type="checkbox"/>
Cooling system	Replacement of AC split units	Electricity-24.22kW EER:5.7		8.9y	<input checked="" type="checkbox"/>
Renewable energy systems	Installation of PVs	Solar – 5 kWp, 60m ²		15.5y	<input checked="" type="checkbox"/>
Other:					<input type="checkbox"/>

Potential thermal energy savings when Main option is implemented: 38977.6 kWh/yr

Potential electrical energy savings when Main option is implemented: 17557.5 kWh/yr



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Renovation recommendations – renovation concepts

Description of useful combination of renovation measures and stepwise implementation of Main Option:

It is recommended that the proposed renovation measures are implemented in the following steps:

1. Installation of roof insulations, 2. Replacement of boiler, 3. Replacement of AC split units with more efficient ones, 4. Installation of PVs.

These measures if implemented can improve the energy performance to class B.

Main option meets requirements for: nearly zero energy buildings in case of renovation:

- Air tightness: ☐
- Reduced thermal bridging: ☐
- Min. 50% RES or equivalent measures: ☐

Description of useful combination of renovations and stepwise implementation for further renovation options not included in Main Option:

Further to the above recommended measures which are included in the Main Option, an additional measure suggested is: 5. Replacement of windows. By implementing this measure the energy class can be raised to B+ (meeting the requirement of deep renovation target).

The measure is not included in the Main option due to high investment cost and long payback period; it would be feasible if funded under national incentive programme.

Further information

The following link(s) provide further information on energy performance certification, use of EPCs and renovations to improve energy performance including financial assistance programmes:

<http://www.cres.gr/energyhubforall/>
<https://exaikonomisi.ypen.gr/>

Issuer

Registration no.

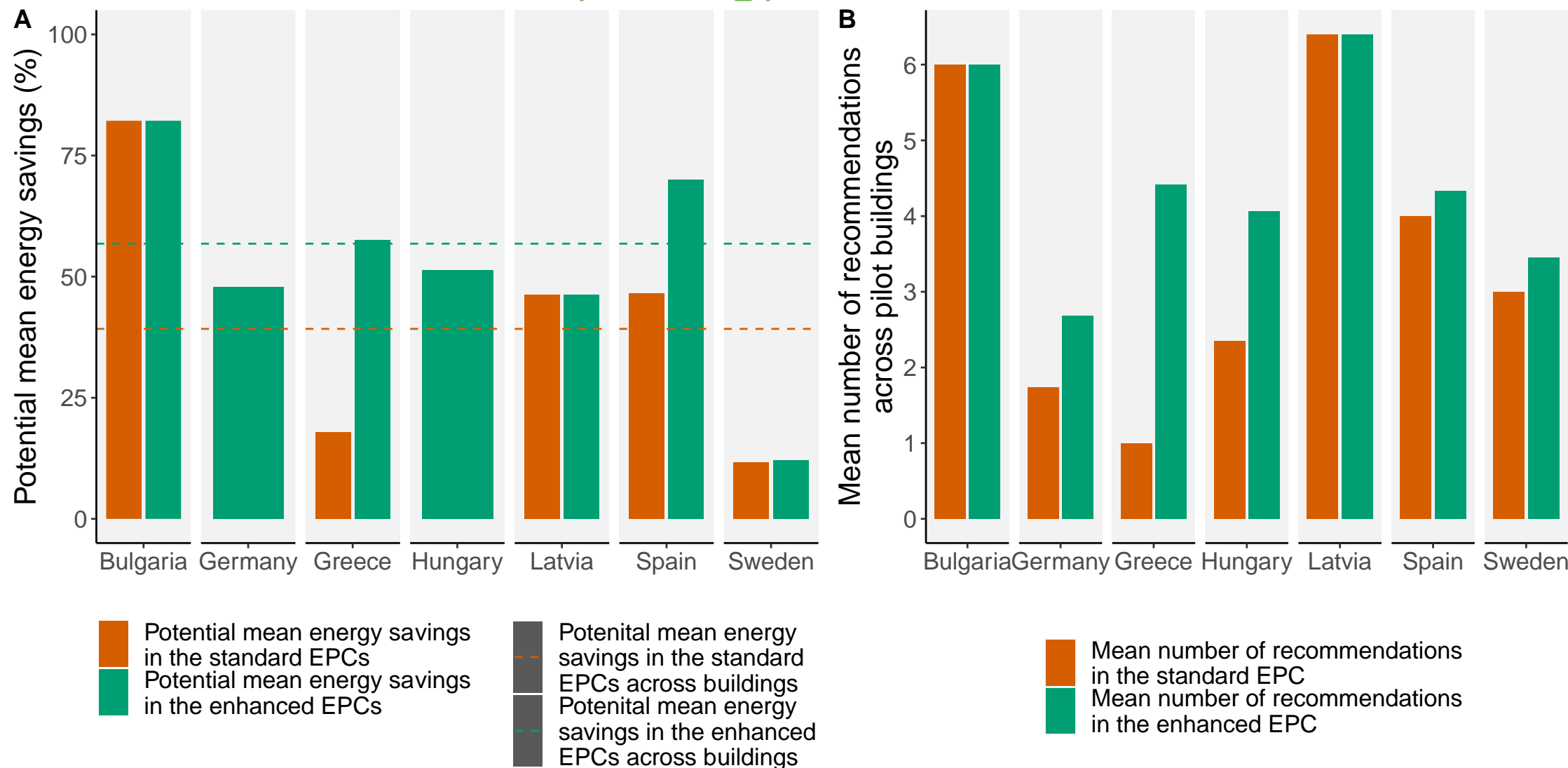
Date

Signature / Stamp



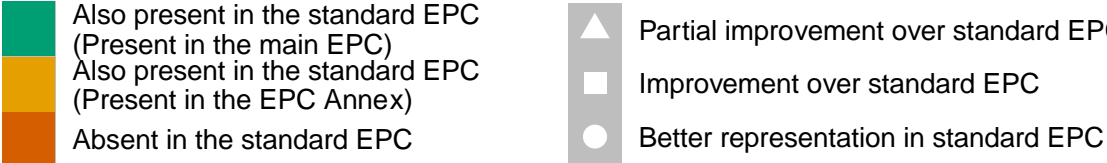
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Priority A. Improving the recommendations for renovation towards deep energy renovation



Priority A.

Key features for presenting recommendations in enhanced EPCs



Comparison of the recommendations and their presentation in Standard EPCs and QualDeEPC enhanced template and feedback from the stakhoelder roundtables

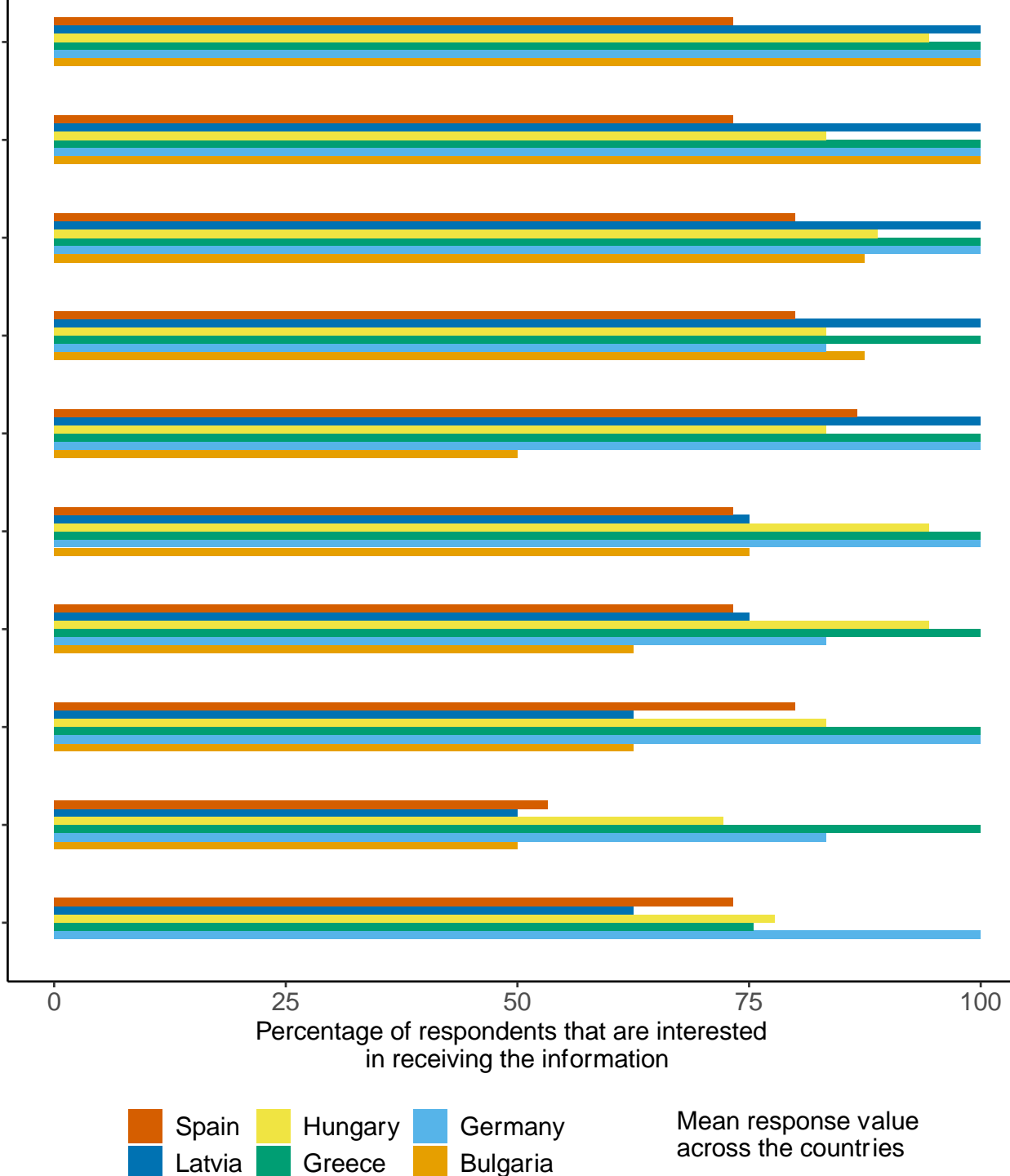
Priority B. An online tool for comparing EPC recommendations with deep energy renovation recommendations

- Overall, well received and widely accepted.
- On national level, these platforms should be operated by the energy agencies.
- The cost related information is perceived as unreliable due to the dynamically fluctuating market environment.
- Instead of a standalone online tool, few participants proposed that this should be part of the DRNPs (see priority C.).

Priority B.

Questions to the building representatives on potential features of an online tool for analysing deep energy renovation

- The tool estimates costs of building energy renovation
- The tool estimates simple payback period of building energy renovation in years and shows actions with shortest payback period
- Calculated energy costs before and after renovation of the building and potential energy cost savings presented in monetary units [EUR per year, EUR/m2 per year, e.t.c.]
- Calculated energy class before and after renovation of the building [A, B, C, e.t.c.]
- Energy efficiency measures that will be calculated for building renovation can be selected by the user of the tool
- Energy efficiency measures that will be calculated for building renovation are suggested by the tool
- The tool shows whether the current energy consumption of the building meets legal requirements
- Calculated energy demand before and after renovation of my building and potential energy savings presented in energy units [MWh per year, kWh/m2 per year, e.t.c.]
- Estimation of CO2 emissions after renovation of the building [tonnes CO2 per year, kgCO2/m2 per year, e.t.c.]
- The tool estimates economic gains (eg through net present value (NPV), internal rate of returns (IRR) values) for my building renovation and shows which are the actions with the highest gains



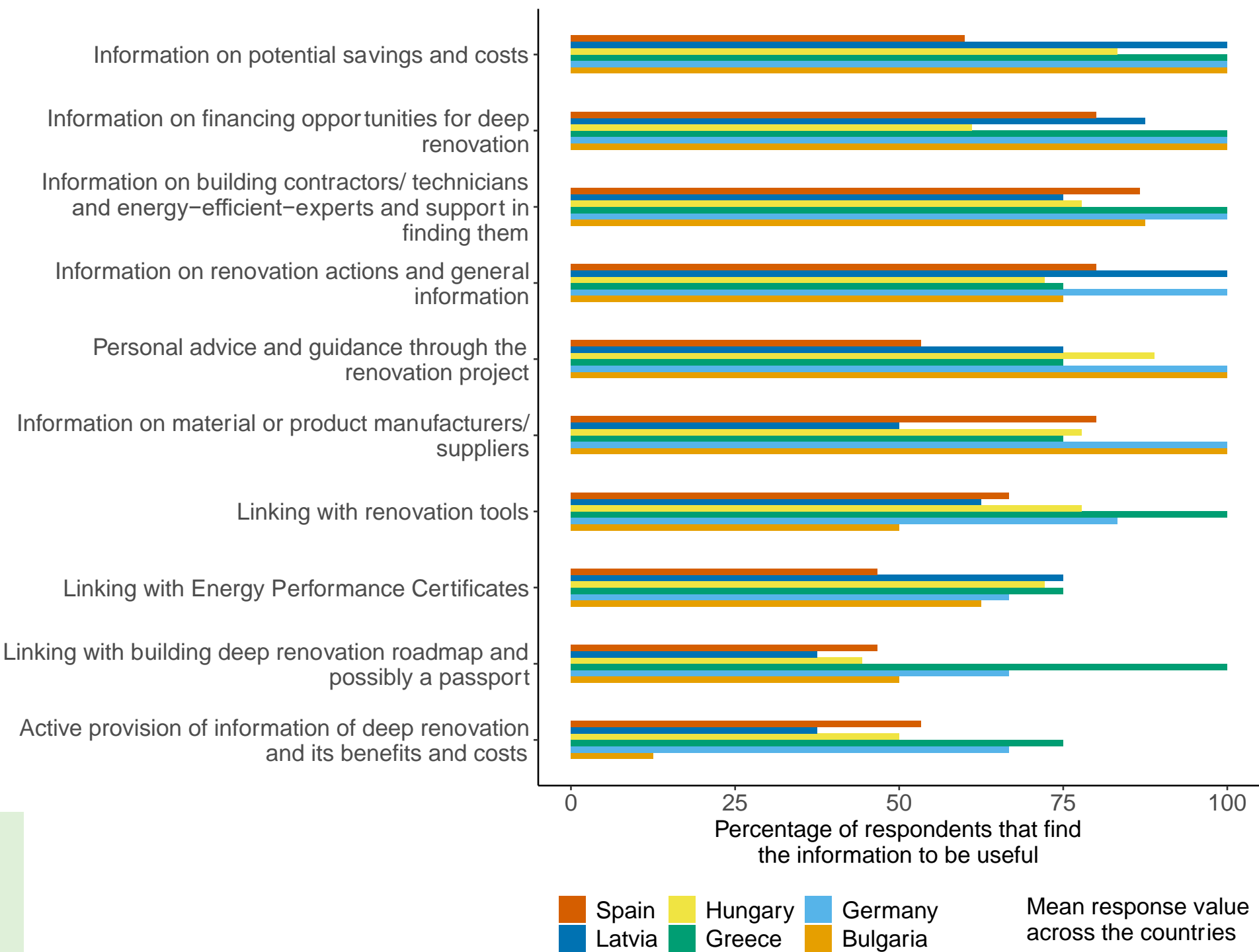
Feedback from building representatives collected through questionnaires (n=77)

Priority C. Creating Deep Renovation Network Platforms

- A good definition of the recommendations for improvement measures, and characteristics of the construction systems and equipment (prices, transmittances, or the relevant data according to the improvement).
- Feature the catalogues with ideas and standard equipment to guide the EPC certifier.
- Investment planning for end consumers.
- Include national case studies/best practices with technical and financial information.
- Link to a database of certified technicians and qualified handwokders.

Priority C.

Aspects of the comprehensive website (Deep Renovation Network Platform) proposed by QualDeEPC



Feedback from building representatives collected through questionnaires (n=77)




Priority E. Achieving a high user-friendliness of the EPC




- The EPC clearly shows what energy efficiency measures should be implemented in my building
- The EPC helps me to decide on energy-efficient renovation measures.
- The energy efficiency potential of my building is clearly shown in the EPC.

Priority E.

Key features of user friendliness
in the enhanced EPCs

Primary energy consumption of existing building		▲		▲	■		
Calculated final energy consumption of existing building by end-use	●			▲			
Modelled energy consumption of existing building				▲			●
Final energy consumption of existing building		▲		▲			
Calculated final energy consumption of existing building by energy source				▲			
CO ₂ -/GHG-emissions of existing building		▲		■	●		
Specifications of existing building envelope and technical systems				■			
Measured energy consumption of existing building		▲		▲			●
Assessment of existing building envelope and technical systems				■			■
Measured energy consumption of existing building by end-use				▲			▲
Measured energy consumption of existing building by fuel source				▲			●
Energy rating of existing building envelope and technical systems with a 'traffic light system'	■	■	■	■	■	■	■
	Bulgaria	Germany	Greece	Hungary	Latvia	Spain	Sweden

 Also present in the standard EPC (Present in the main EPC)
 Also present in the standard EPC (Present in the EPC Annex)
 Absent in the standard EPC

 Partial improvement over standard EPC
 Improvement over standard EPC
 Better representation in standard EPC

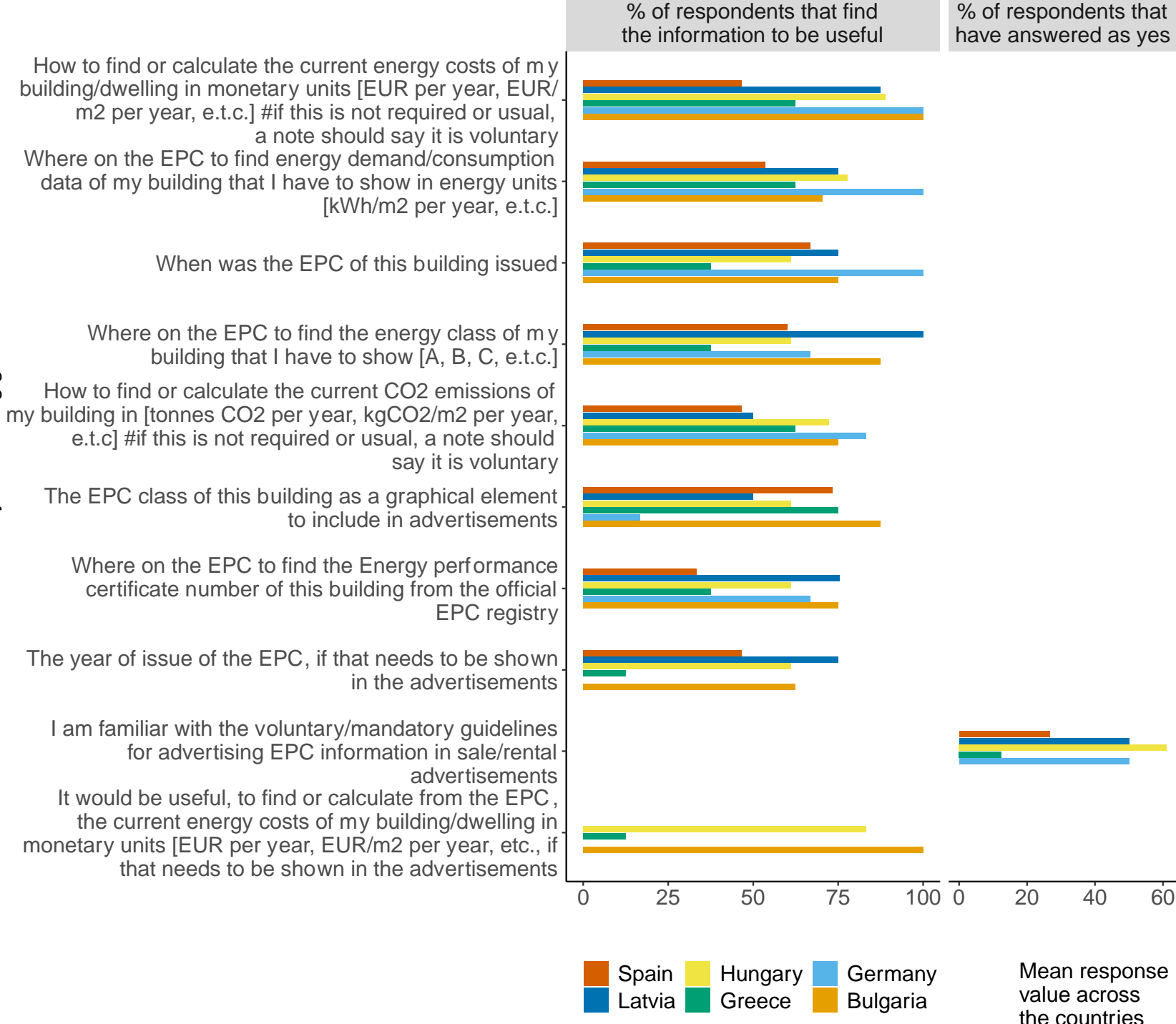
Comparison of the elements of user friendliness in Standard EPCs and QualDeEPC enhanced template and feedback from stakeholder roundtables

Priority F. Voluntary/mandatory advertising guidelines for EPCs

- Stakeholders broadly agreed control mechanisms to monitor the energy class and energy data from the buildings' EPC's in advertisements need to be strengthened.
- The provision of guidelines on “how to” find, present, or calculate different values, is a task that also the EPC assessors should undertake when handing in the EPC to the building owner/representative.
- Furthermore, stakeholders supported the proposal to provide general/indicative guidelines for building owners-users related to the legal requirements when advertising to media.

Priority F.

QuaDeEPC proposals for advertisement guidelines to ease compliance with mandatory advertising guidelines



Feedback from building representatives collected through questionnaires (n=77)

- Various aspects of Energy performance certificates (EPCs) differ between various Member States. Nevertheless, There exists a high potential for convergence of EPCs various Member States.
- Evidence from testing the enhanced EPC scheme developed by QualDeEPC clearly shows that improved renovation recommendations – both in number and in ambition regarding the energy savings that can be achieved – and their presentation on the EPCs in a user-friendly manner is an important first step towards deep energy renovation.
- This should be accompanied by tools such as an online tool to calculate energy savings post deep energy renovation. An eco-system for deep energy renovation should be fostered e.g., with the deep renovation network platform.



Thank you

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