



iBRoad2EPC

Integrating the iBRoad2EPC light version renovation passport with current EPC schemes to boost the decarbonisation of the EU's building stock

Marianna Papaglastra, Sympraxis

Next generation EPC conference – EPBD recast edition, 23 May 2024, Brussels



This project has received funding from the European Union's HORIZON 2020 research and innovation programme under grant agreement No 101033781

Why a Building Renovation Passport (BRP)?

- Renovation can be a challenge, especially when done step by step over a certain timespan.
- When carefully planned, so as to build on one another and to avoid lock-in effects, renovation steps can enable deep renovation to be achieved over a long-term horizon. Accordingly, each renovation contributes to reaching the overall climate target.
- An overarching plan provides guidance about which components to renovate when and how, at which cost and savings
- A long-term plan can take foreseeable occasions (“trigger points”) for renovation into account.

Step by Step Plan

ENERGY CLASS	ENERGY CLASS	ENERGY CLASS
F	D	A
TODAY	WHEN BOILER NEEDS TO BE EXCHANGED	WHEN WINDOWS NEED TO BE EXCHANGED
YOUR BUILDING	RENOVATION STEP 1	RENOVATION STEP 2
	WHAT TO DO? <ul style="list-style-type: none"> Improve the air permeability of the envelope Optimization control system 	WHAT TO DO? <ul style="list-style-type: none"> Installation of a thermal insulating layer on top of concrete ground floor in contact with the ground
	INVESTMENT COSTS 45655 € COSTS FOR MAINTENANCE 2407 €	INVESTMENT COSTS 44 € COSTS FOR MAINTENANCE 44 €
ENERGY BILL 159 €/a	ENERGY BILL 144 €/a	ENERGY BILL 142 €/a

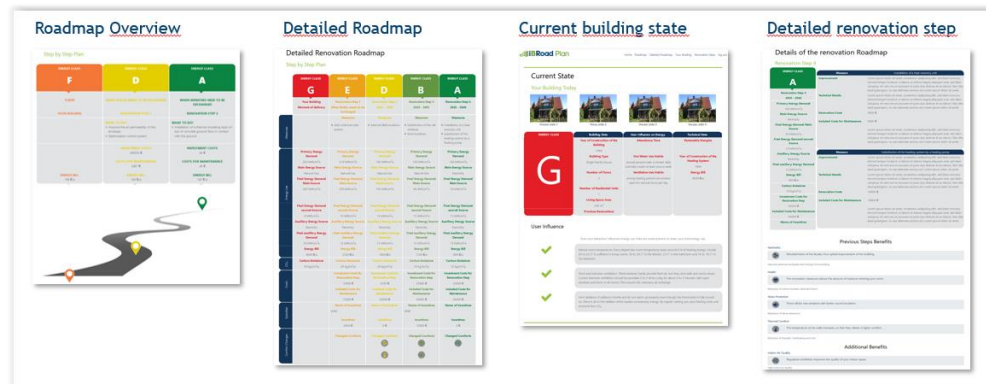


Source: ifeu

Looking back at the iBRoad products

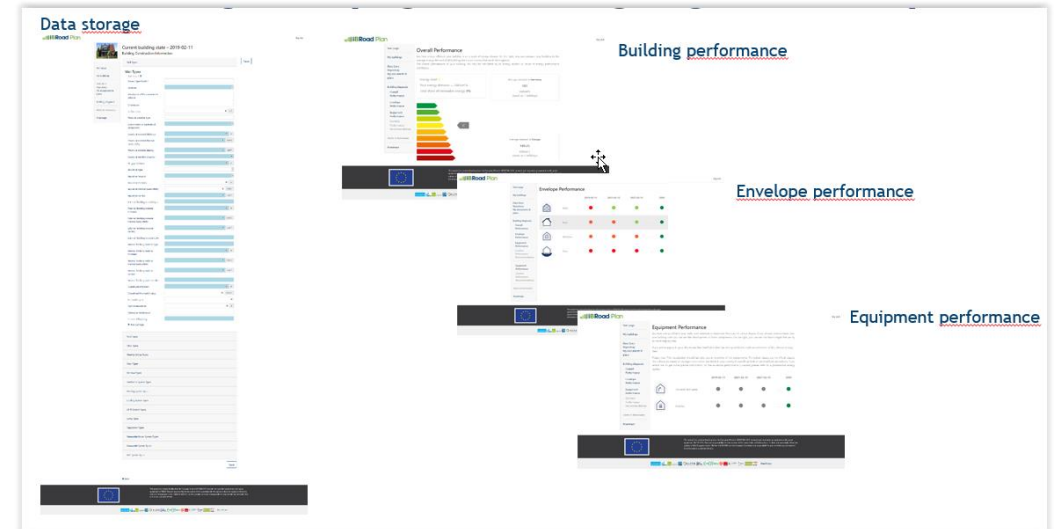
iBRoad Roadmap (BRP)

- Information for building owners about **what to do**, where to start and **in which order** to implement renovation measures;
- Outline of a **customised** renovation plan with a **long-term horizon** for **deep** staged renovation;
- Overview over the full range of renovations **adapted to the individual preferences** of the building occupants;
- Facilitating the owners' decision to invest in deeper renovation.



iBRoad Logbook

- Building repository for the building owner where all building-related information can be stored digitally (e.g., energy bills, incentives, loan and tax documents);
- Simplified assessment of envelope components and building equipment and their temporal development.



iBRoad pilot testing results

Pilot country	No.	Year of construction	Number of renovation steps	Current energy level	Final / future energy level	Current primary energy demand [kWh/m ²]	Future primary energy demand [kWh/m ²]	Estimated date for final renovation step	Completeness
BULGARIA	1	1970	3	G	B	600	362	When plaster needs renovation	complete
	2	-	4	D	B	269	36	2035-2040	complete
	3	1950	3	G	B	600	119	New heating system	complete
	4	1994	3	G	B	504	176	2019	parts missing
	5	1970	4	G	B	479	126	When boiler is exchanged	complete
	6	1980	4	F	A	390	73	2030-2035	complete
	7	1950	3	F	B	600	112	New heating system	-
	8	1968	5	E	A+	411	27	2035-2040	complete
	9	1982	4	G	B	500	111	2030-2035	complete
	10	1947	4	G	A	600	95	2025-2030	complete
	11	1911	2	D	B	362	142	2025-2030	parts missing
	12	2008	2	C	B	203	158	2025-2030	complete
	13	1929	5	G	A	505	109	2035 - 2040	complete
	14	1962	4	D	B	262	108	2035-2040	complete
	15	-	3	D	B	280	136	When windows are exchanged	parts missing

60% average improvement

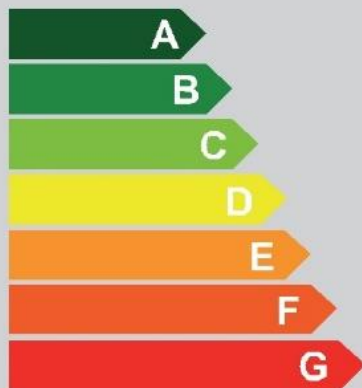
Pilot country	No.	Year of construction	Number of renovation steps	Current energy level	Final / future energy level	Current primary energy demand [kWh/m ²]	Future primary energy demand [kWh/m ²]	Estimated date for final renovation step	Completeness
PORTUGAL	1	1986	5	C	A+	183	74	2035-2040	complete
	2	1500	5	D	A+	155	48	2035-2040	complete
	3	1971	4	E	A+	183	0	When plaster needs renovation	complete
	4	1937	3	F	A+	600	27	2030-2035	complete
	5	2001	3	A	A+	30	0	When boiler is exchanged	complete
	6	1937	4	F	A+	600	19	2030-2035	complete
	7	1919	5	D	A+	356	120	2025-2030	complete
	8	1998	4	C	A+	116	0	When plaster needs renovation	complete
	9	1994	2	A+	A	145	112	2025-2030	parts missing
	10	2002	3	C	A	278	104	2030-2035	complete
	11	1575	4	D	A	319	42	2025-2030	complete
	12	1988	4	F	A+	423	117	When windows are exchanged	complete
	13	1998	5	E	B-	203	0	2025-2030	complete
	14	1972	4	D	B-	387	250	2025-2030	complete
	15	1995	3	C	A	176	19	2030-2035	parts missing
	16	1966	2	E	A	326	27	2025-2030	complete
	17	1946	4	F	A	350	92	2030-2035	-
	18	1989	5	D	A+	116	20	When plaster needs renovation	complete
	19	2001	5	E	A	192	19	When plaster needs renovation	complete
	20	1981	4	C	A	211	34	2025-2030	complete

Pilot country	No.	Year of construction	Number of renovation steps	Current energy level	Final / future energy level	Current primary energy demand [kWh/m ²]	Future primary energy demand [kWh/m ²]	Estimated date for final renovation step	Completeness
POLAND	1	1975	3	medium orange	light green	474	134	Substitution of the old windows	complete
	2	1978	3	dark orange	orange	123	123	2030-2035	complete
	3	1987	4	dark orange	orange				complete
	4	1950	3						
	5	1978	1						
	6	1975	3						
	7	1981	3						
	8	2000	3						
	9	1978							
	10	1990							
	11	1991							
	12	1936							
	13	1978							
	14	198							
	15	19							
	16								
	17								
	18								
	19								
	20	1982	2	yellow	green				complete



Bridging the iBRoad BRP with the EPC

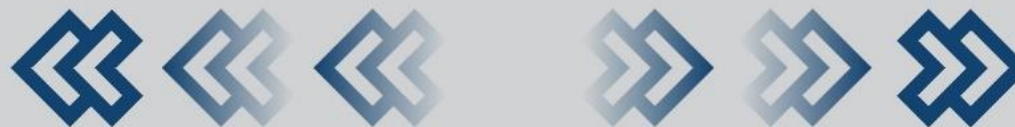
EPC



iBRoad2EPC

Building Renovation Passport

A small thumbnail image of a 'Building Renovation Passport' document, showing a grid with columns labeled G, E, D, B, A and various rows of data.



Effort:

2 - 4 hours

1,5 - 2 days

Price:

50 - 250 Euro

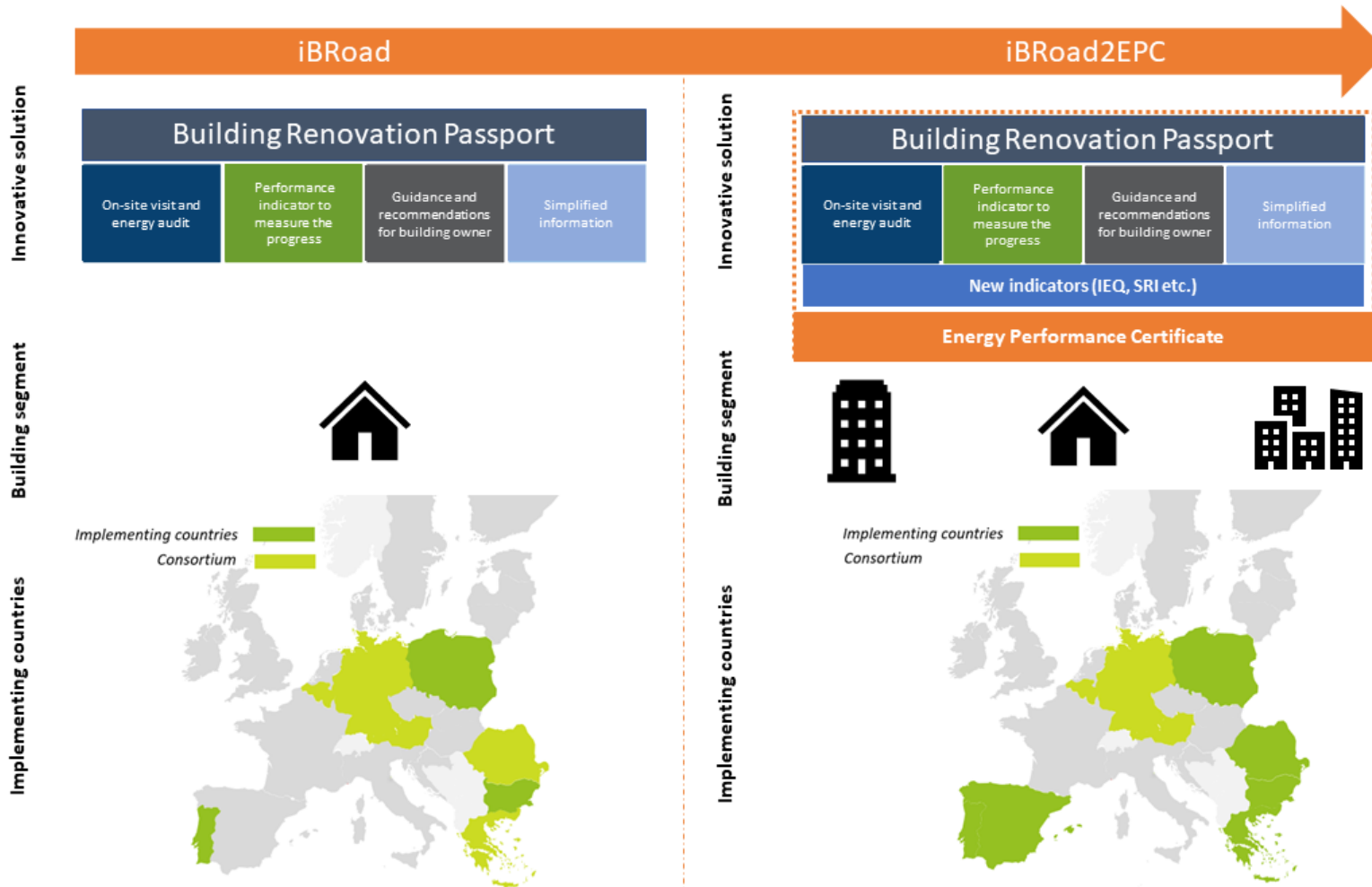
1000 - 3000 Euro

Coverage:

5 - 15% of the building stock obligatory voluntary several thousand buildings



From iBRoad to iBRoad2EPC



Long-term planning

What do we know about the (future of the) building?



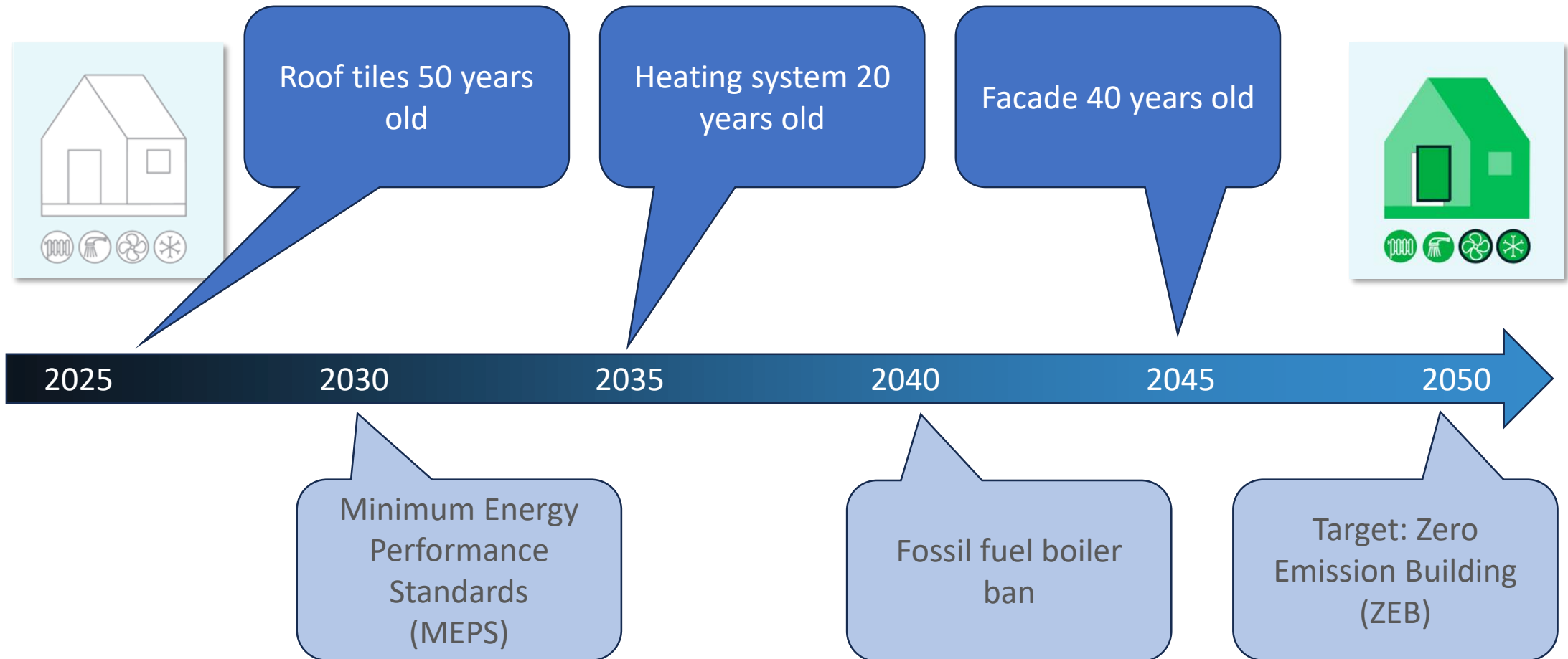
Minimum Energy Performance Standards (MEPS)

Fossil fuel boiler ban

Target: Zero Emission Building (ZEB)

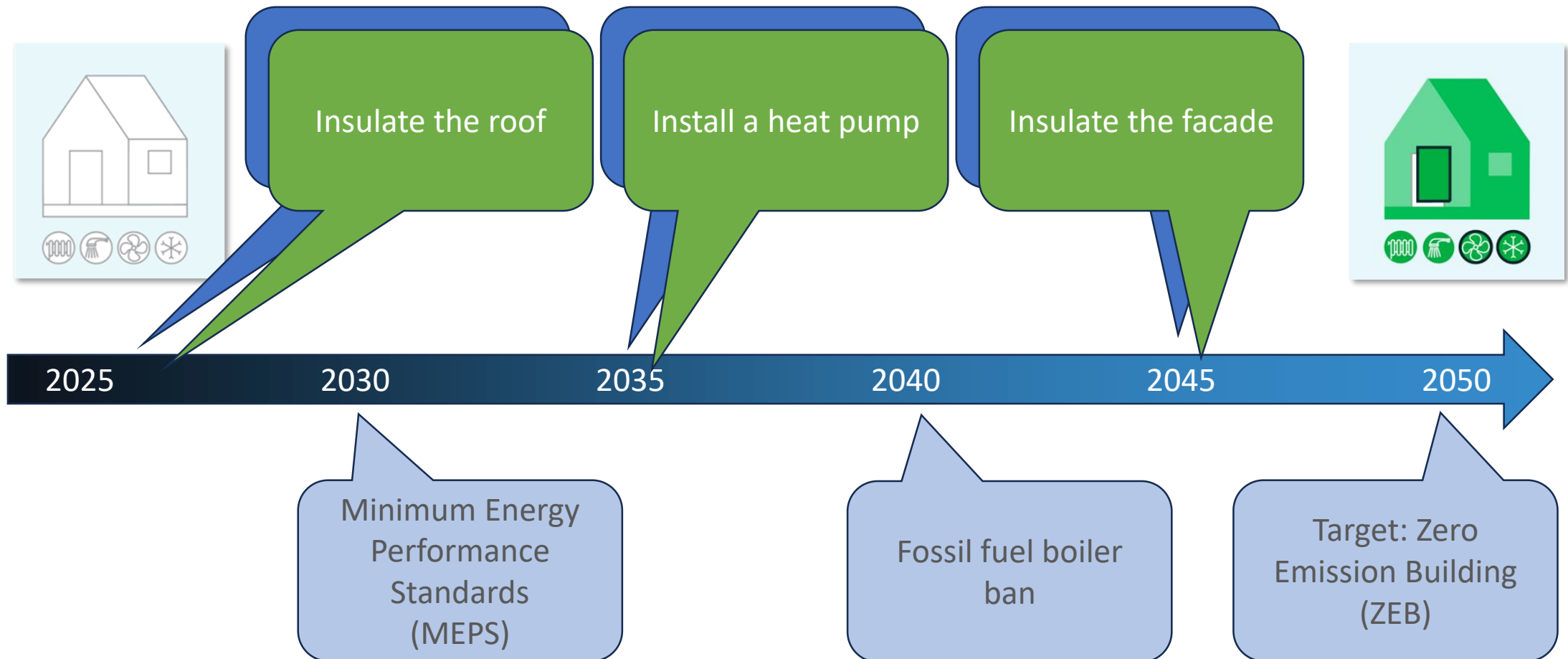
Long-term planning

What do we know about the (future of the) building?



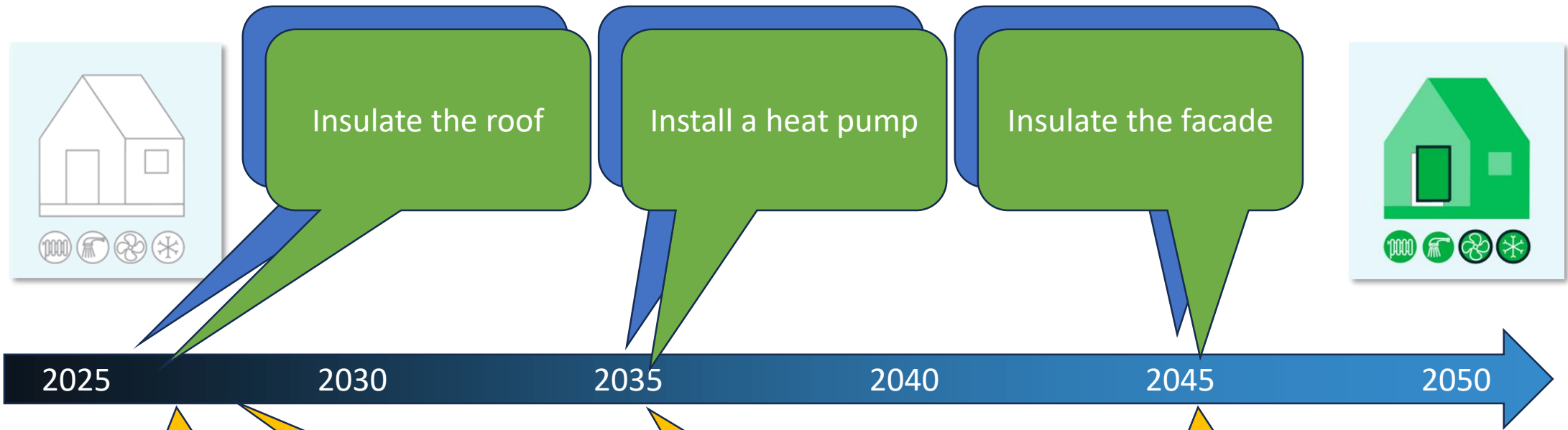
Long-term planning

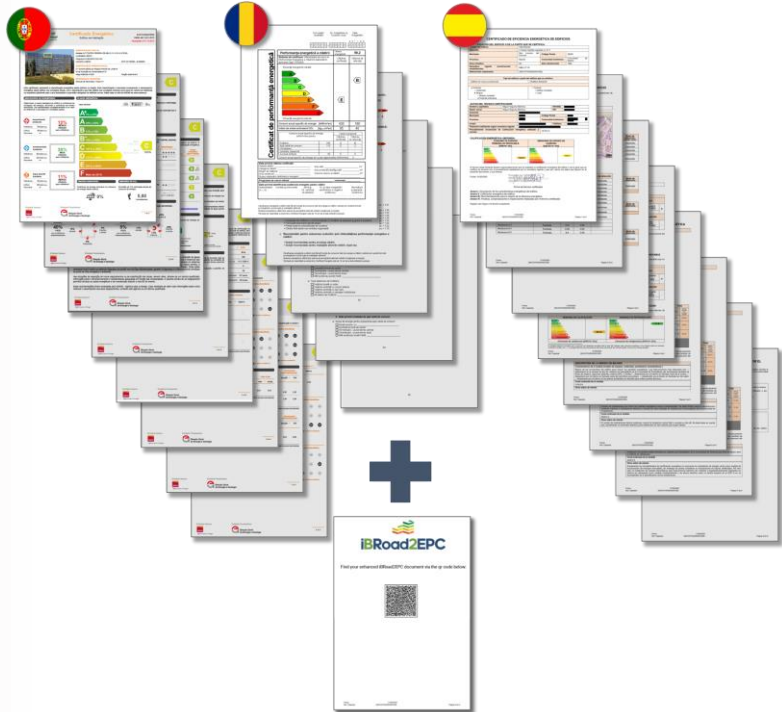
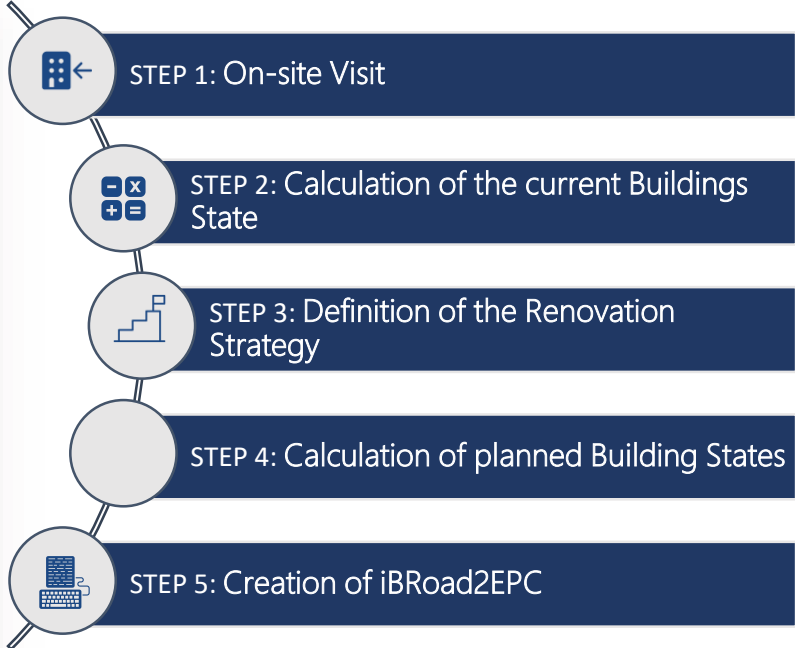
What do we know about the (future of the) building? **A lot**



Long-term planning

What do we know about the future of the building? Prepare for later steps





	Year of construction	Energy improvements / renovations in the past	Step 1: 2020 no appl requirements	Step 2: 2030 at least class E	Step 3: 2040 at least class D ban on low local fuel boilers	Step 4: 2050 climate neutral building
Building	1967				Life insurance payout	
inhabitants				Roof insulation, New tiles		External insulation house windows
roof	1967					
outer walls	1996	double glazed windows				
windows / doors	1996	insulated windows	Insulate from below			
floor / cellar	1967				Air/water Heat pump	
heating system	2007	condensing boiler				Ventilation with heat recovery and (boiling)
domestic hot water	2007					
ventilation	none					
cooling	none					

Issuing the iBRoad2EPC

Present building state according to EPC

Step 1 Which renovation measures are pending?

Renovation steps Support to meet all future requirements

Target state Climate neutral building

House icons
Represent the quality of the envelop

Technology icons
Represent the quality of the technical equipment

Timing of renovation steps
According to climate targets

Brief description of the renovation measures contained in the step

Now 2022 G
The house icon represents the current state of the building, but gives no information about its quality.

Step 1 soon
- External Wall insulation
- Replacement of the windows

Step 2 2030
- Installation of a heat pump

Step 3 2040
- Roof insulation
- Insulation of the cellar ceiling

Step 4 2050 B
- Replacement of the door
- Installation of a ventilation system
- Installation of a smart home system
- Installation of a cooling system

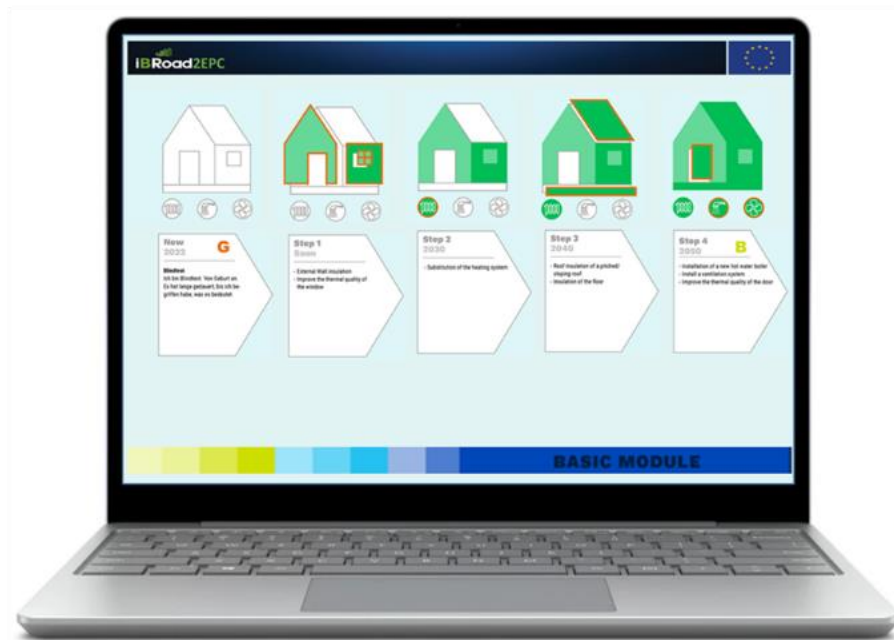
Imprint

Disclaimer
Your iBRoad2EPC does not substitute detailed planning. Here you can ask for a comprehensive energy audit: www.local-energy-agency.eu

FUNDING NOTICE
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No.1011033781



Overview of iBRoad2EPC tools



Overview Page

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Date 18. August 2022

RENOVATION STRATEGY ▼

Welcome to your iBRoad2EPC
The iBRoad2EPC gives you an overview of the renovation steps you can take to make your building climate-neutral by 2050 and how the individual steps build on each other in a meaningful renovation strategy.

About the iBRoad2EPC ▼

Present building state
according to EPC

Step 1
Which renovation measures are pending?

Renovation steps
Support to meet all future requirements

Target state
Climate neutral building

Now 2022 G

The house icon represents the current state of the building, but gives no information about its quality.

Step 1 soon

- External Wall insulation
- Replacement of the windows

Step 2 2030

- Installation of a heat pump

Step 3 2040

- Roof insulation
- Insulation of the cellar ceiling

Step 4 2050 B

- Replacement of the door
- Installation of a ventilation system
- Installation a smart home system
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Imprint

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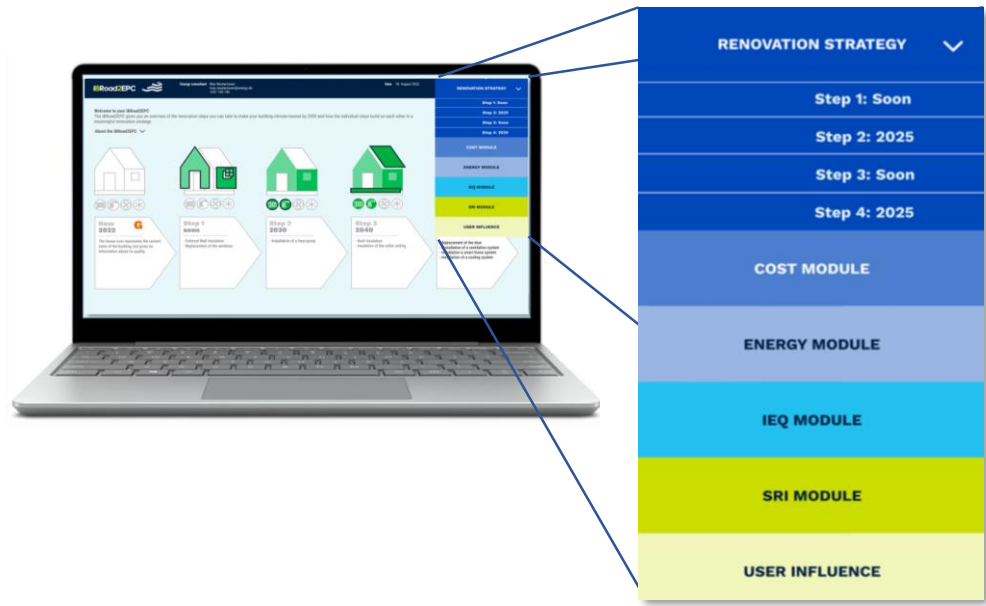
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- House icons**
Represent the quality of the envelop
- Technology icons**
Represent the quality of the technical equipment
- Timing of renovation steps**
According to climate targets
- Brief description of the renovation measures contained in the step**

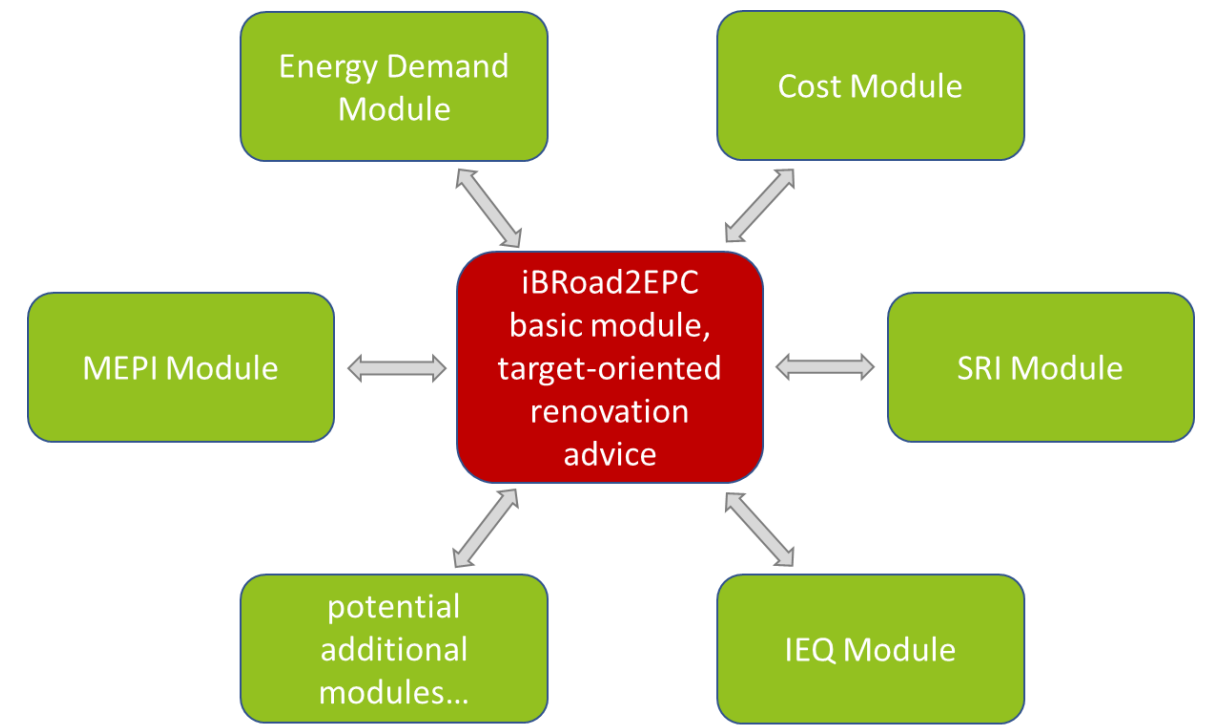
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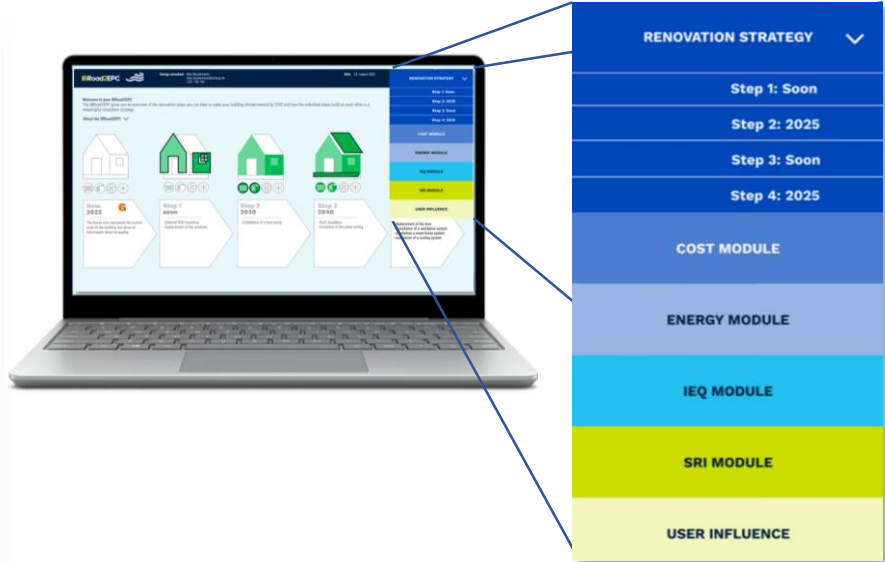




iBRoad2EPC modular/open approach



iBRoad2EPC modular/open approach



Step 2 2030

D

Energy source
electricity-heat pump

Final energy demand
95 kWh/m²a
GHG emissions
50 kg/m²
Energy costs
1.900 €/a

Step 2 2030

13.000 € Maintenance Costs
+ 2.000 € Energy-related Costs
15.000 € Investment Costs

5.000 € Funding

Funding is rated in "Subsidies-EU"
www.subsidies-in-your-country.eu
(Status as of 24.11.2022)

«XTENDING the energy performance assessment and certification schemes via a modular approach

Feature 4

Real energy consumption

Guidelines
April 2022

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 847056.

Factors responsible for under-heating				Factors that reduce under-heating			
Geography				Location			
Country: Poland				Location of the building: City			
Climatic zone: Climate zone V				Site characteristics			
Site characteristics: Mutual shading of glazed areas from trees/buildings in winter: No				Barriers to wind (e.g. trees, buildings etc.)			
Building characteristics: Existing buildings before and after renovation would have significant difference in indoor comfort levels due to insulation against thermal discomfort and are primary components of heat loss in the fabric of buildings.				Exposed thermal mass			
Insulation (wall/roof/floor): Walls+Roof+Floor				Central heating system			
Windows: Single				Heat gain			
Heat loss: Age of the building is a determinant of the degradation of the envelope and its capacity to provide air-tightness.				Orientation of windows			
Age of the building: Post 2010							

Smart Readiness Indicator for Buildings

The SRI calculations have been performed with an experimental tool. Please note that the scores and the visual presentation of results are solely provided for testing purposes. Using this experimental tool can by no means lead to any claims on an actual score or certificate for a building.

SRI spreadsheet tool Version 4.5

TOTAL SRI SCORE: 100,0% **SRI CLASS: Higher than 90%**

IMPACT SCORES

Energy efficiency	100,0%
Energy flexibility and storage	100,0%
Comfort	100,0%
Convenience	100,0%
Health, well-being and accessibility	100,0%
Maintenance and fault prediction	100,0%
Information to occupants	100,0%

DOMAIN SCORES

Heating	100,0%
Domestic hot water	100,0%
Cooling	100,0%
Ventilation	100,0%
Lighting	100,0%
Dynamic building envelope	100,0%
Electricity	100,0%
Electric vehicle charging	100,0%
Monitoring and control	100,0%

DETAILED SCORES

	Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
Heating	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%
Domestic hot water	100,0%	100,0%	0,0%	100,0%	0,0%	100,0%	100,0%
Cooling	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%
Ventilation	100,0%	0,0%	100,0%	100,0%	100,0%	100,0%	100,0%
Lighting	100,0%	0,0%	100,0%	100,0%	100,0%	100,0%	100,0%
Dynamic building envelope	100,0%	0,0%	100,0%	100,0%	100,0%	100,0%	100,0%
Electricity	100,0%	0,0%	100,0%	100,0%	100,0%	100,0%	100,0%
Electric vehicle charging	100,0%	0,0%	100,0%	100,0%	100,0%	100,0%	100,0%
Monitoring and control	100,0%	0,0%	100,0%	100,0%	100,0%	100,0%	100,0%

Smart Readiness Indicator (SRI)

ASSESSMENT PACKAGE: PRACTICAL GUIDE SRI CALCULATION FRAMEWORK v 4.5

Authors: Ylvaq Ma, Stijn Verbeke, Christina Protopapadaki (VITO), Sophie Dourfens-Quaranta (R2M Solution)

Date: April 2023

Step 2 2025

IEQ value

5.0

Comfort Asset Rating Procedure (CARP)

User-guide

Version 1.0

2022

This document describes Comfort Asset Rating Procedure (CARP). Dated 21.04.2022.

This version is applicable to new and existing residential buildings, schools and offices that are unoccupied.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 847056.

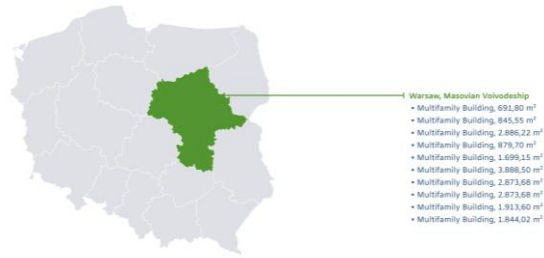
Step 2 2025

SRI score

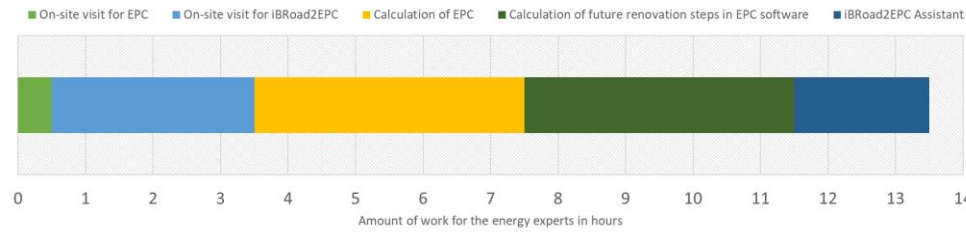
33.0

Pilot testing

iBRoad2EPC Field Tests in Poland



- Warsaw, Masovian Voivodeship**
- Multifamily Building, 691,80 m²
 - Multifamily Building, 845,55 m²
 - Multifamily Building, 2,886,22 m²
 - Multifamily Building, 878,70 m²
 - Multifamily Building, 1,699,15 m²
 - Multifamily Building, 3,889,50 m²
 - Multifamily Building, 2,873,68 m²
 - Multifamily Building, 2,873,68 m²
 - Multifamily Building, 1,913,60 m²
 - Multifamily Building, 1,844,02 m²



iBRoad2EPC Field Tests in Romania



- Timiș**
- Multi-Family building (private), 1,486,8 m²
 - Single-family building (private), 190,0 m²
 - Building for education (public), 232,1 m²
 - Office building (public), 207,2 m²

- Ialomița**
- Single-family building (private), 218,8 m²

iBRoad2EPC Field Tests in Portugal



- North Region, Porto Metropolitan Area, Porto**
- Single family house, 28,96 m²

- Central Region, Leiria Region, Pombal**
- Secondary school in Pombal (central Portugal) - managed by Construção Publica E.P.E. Public Company, 10,638,17 m²

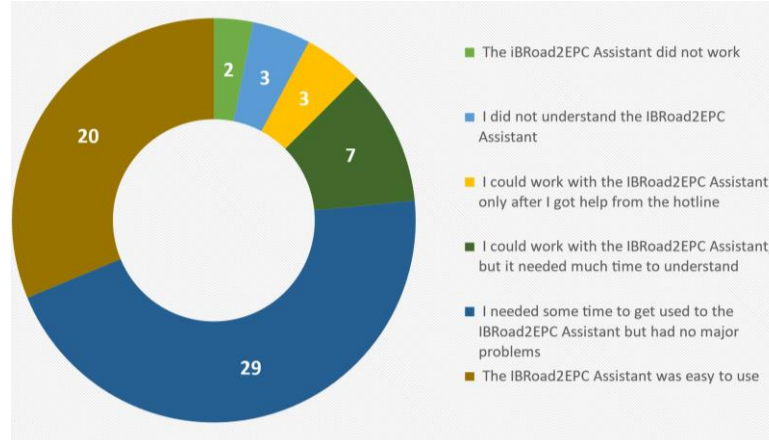
- Greater Lisbon, Lisbon**
- Large non-residential building - Offices - headquarters of Construção Publica E.P.E. Public Company, 31,578,40 m²
 - Multifamily building owned by SCML - social services institution and privately rented to residents, 479,76 m²
 - Multifamily building (social housing building managed by GEBALIS - Lisbon Social Housing company), 2,160,00 m²
 - Multifamily building (social housing building managed by GEBALIS - Lisbon Social Housing company), 1,026,00 m²
 - Single family house building (owned by SCML - social services institution and privately rented to residents), 291,91 m²
 - Single family house (social housing building managed by GEBALIS - Lisbon Social Housing company), 17,31 m²
 - Single family house (social housing building managed by GEBALIS - Lisbon Social Housing company), 51,67 m²
 - Bi-family house (owned by SCML - social services institution and privately rented to residents), 66,60 m²

iBRoad2EPC Field Tests in Spain

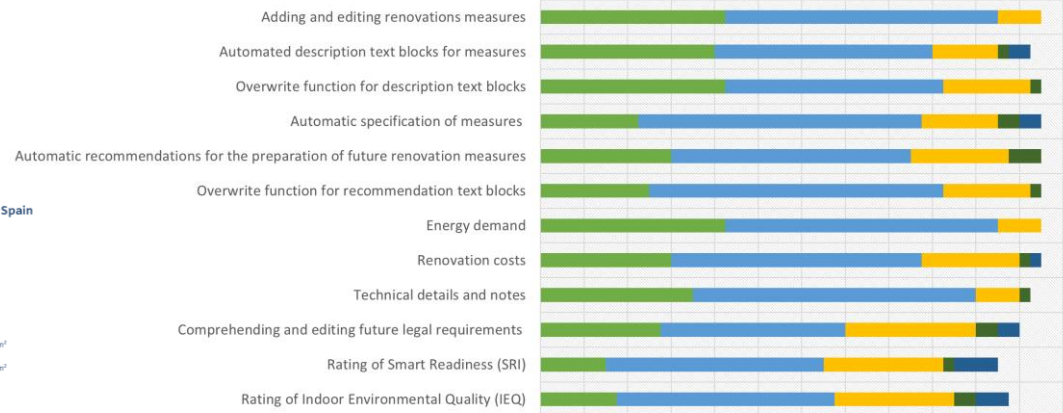


- Basque Country**
- Multi-family private building in Vitoria, 742,77 m²
 - Multi-family private building in Vitoria, 638,6 m²
 - Multi-family private building in Vitoria, 527,75 m²
 - Multi-family private building in Vitoria, 2,000,41 m²
 - Multi-family private building in Vitoria, 506,05 m²
 - Multi-family private building in Vitoria, 1,131,00 m²
 - Multi-family private building in Vitoria, 996,00 m²

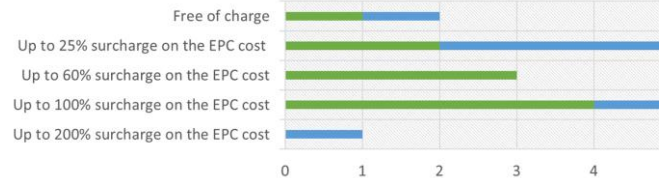
- Community of Madrid**
- Madrid: Public-owned, private-use office building, 28,280,41 m²
 - Madrid: Public-owned government office building, 116,223 m²



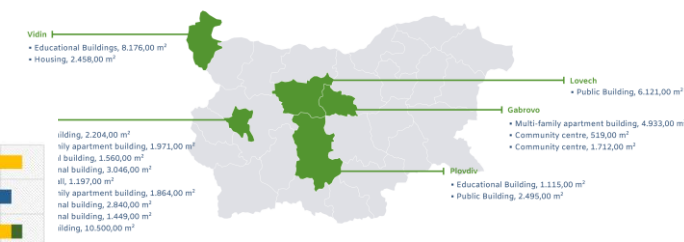
Extremely useful Very useful Somewhat useful Slightly useful Not useful



Building owners Energy experts



iBRoad2EPC Field Tests in Bulgaria



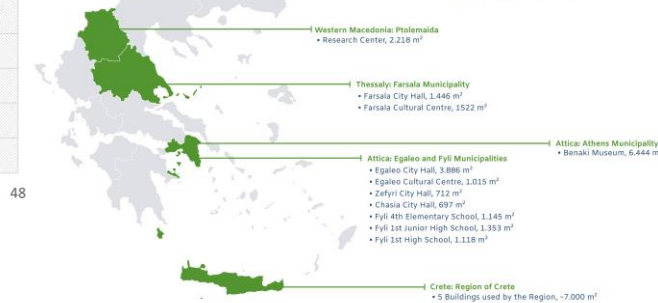
- Vidin**
- Educational Buildings, 8,176,00 m²
 - Housing, 2,458,00 m²

- Lovech**
- Public Building, 6,121,00 m²

- Gabrovo**
- Multi-family apartment building, 4,933,00 m²
 - Community centre, 519,00 m²
 - Community centre, 1,712,00 m²

- Plovdiv**
- Educational Building, 1,115,00 m²
 - Public Building, 2,495,00 m²

iBRoad2EPC Field Tests in Greece



- Western Macedonia Ptolemaida**
- Research Center, 2,218 m²

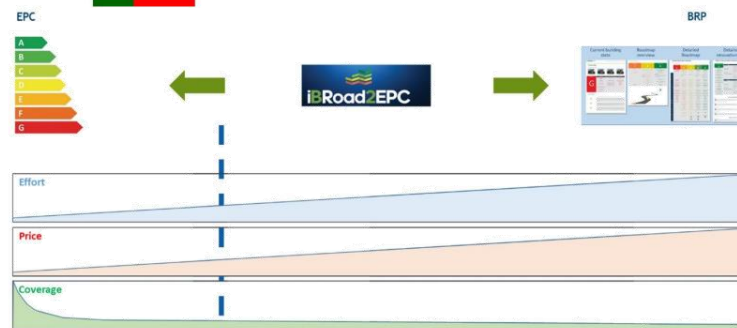
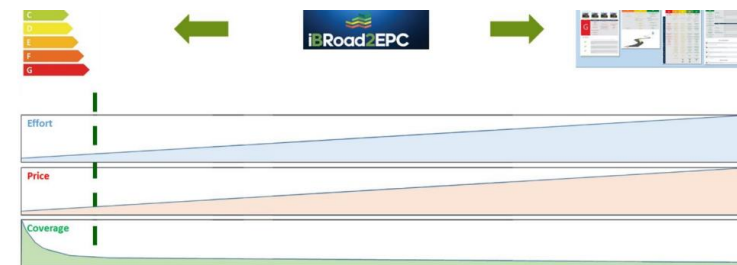
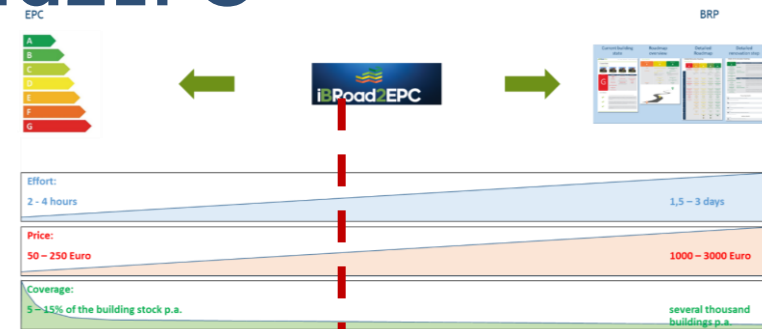
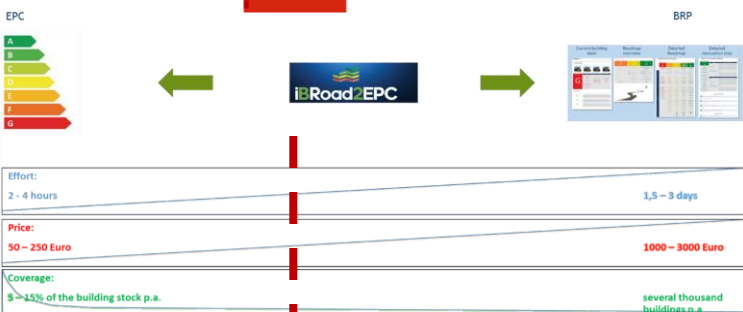
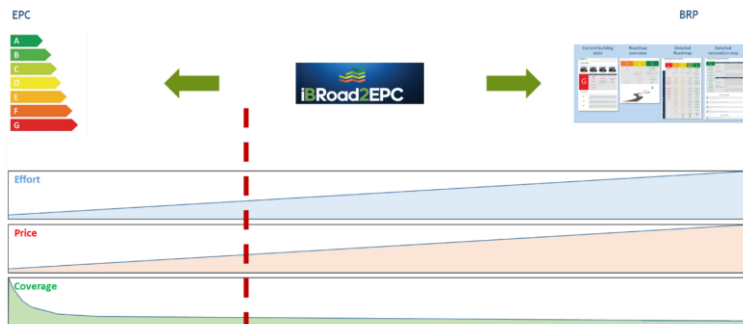
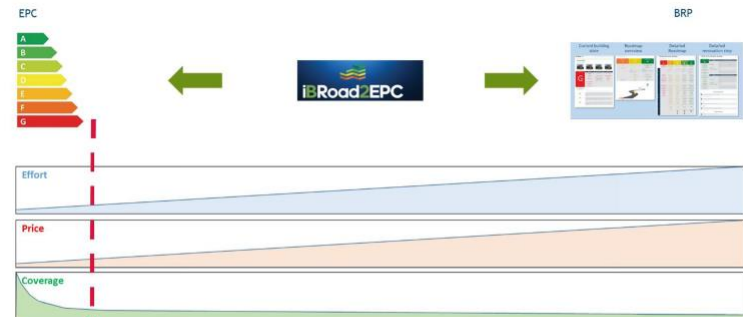
- Thessaly: Farsala Municipality**
- Farsala City Hall, 1,146 m²
 - Farsala Cultural Center, 1,522 m²

- Attica: Egaleo and Fyli Municipalities**
- Egaleo City Hall, 3,886 m²
 - Egaleo Cultural Centre, 1,015 m²
 - Zefyrli City Hall, 712 m²
 - Ossia City Hall, 693 m²
 - Fyli 4th Elementary School, 1,145 m²
 - Fyli 1st Junior High School, 1,353 m²
 - Fyli 1st High School, 1,118 m²


- Attica: Athens Municipality**
- Benaki Museum, 6,444 m²

- Crete Region of Creta**
- 5 Buildings used by the Region, ~7,000 m²


Strategic market placement of iBRoad2EPC




Training, training, training




Integrating Building Renovation Passports into Energy Performance Certification schemes for a decarbonised building stock



Training toolkit
Handbook for issuers – Guidance on how to create an iBRoad2EPC



ifeu – Institute for Energy and Environmental Research
December 2023



www.ibroad2epc.eu
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N° 101033781



Integrating Building Renovation Passports into Energy Performance Certification schemes for a decarbonised building stock



Training module for construction professionals
Using iBRoad2EPC for staged renovation design and construction



Center for Energy Efficiency EnEffect
December 2023



www.ibroad2epc.eu
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N° 101033781



Integrating Building Renovation Passports into Energy Performance Certification schemes for a decarbonised building stock



Training module for public authorities



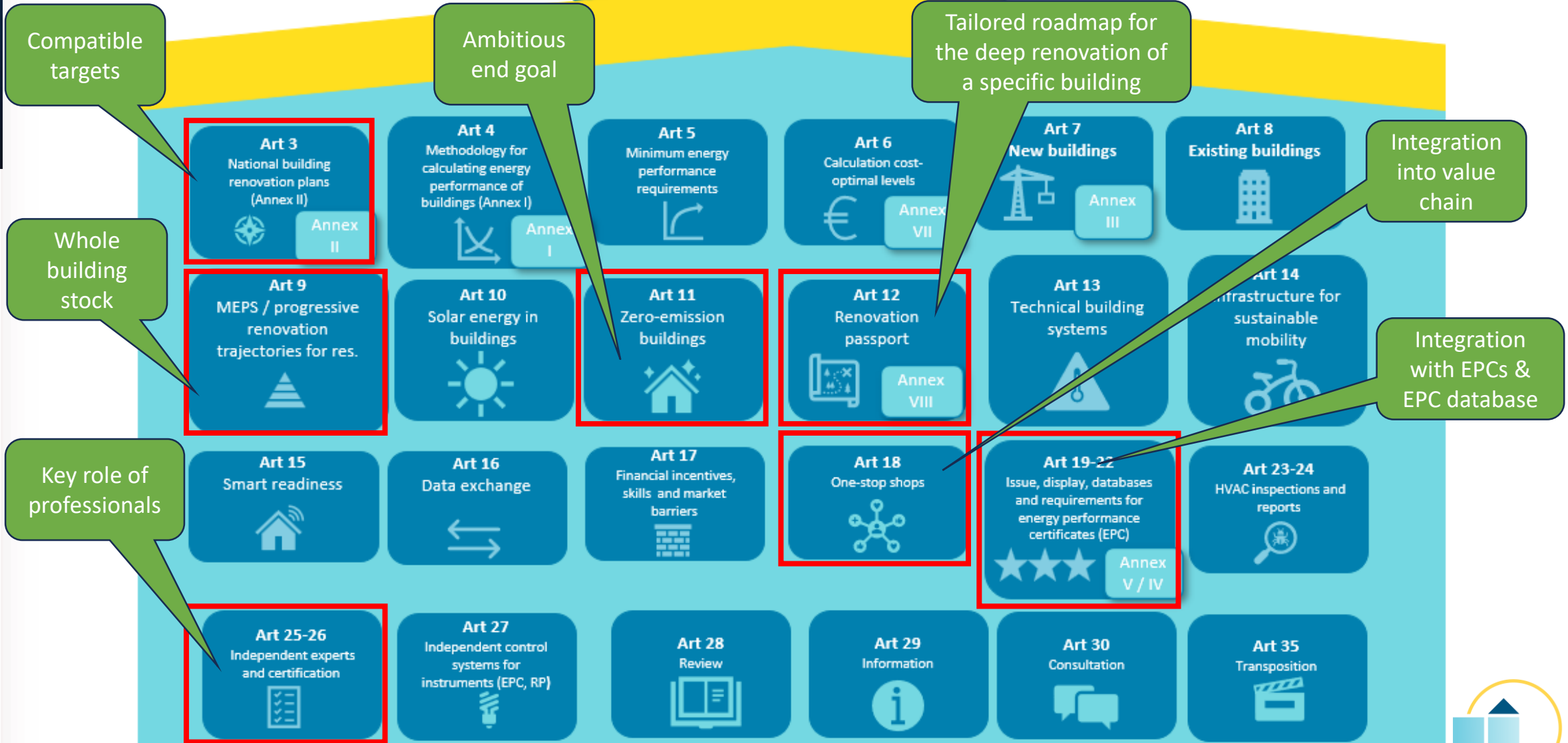
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Indicative relevance to recast EPBD

Energy Performance of Buildings Directive (EPBD)



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Key findings

- ✓ 47 energy experts, 37 owners
- ✓ 58 buildings in total > 300.000m²
- ✓ iBRoad2EPC provides added value for building owners regarding a long-term renovation plan, preparation for future measures and avoidance of lock-in effects
- ✓ The content of iBRoad2EPC is of high quality and interest to both building owners and experts
- ✓ iBRoad2EPC is mostly suitable for residential (including multi-family) and public buildings, less so for building units
- ✓ Issuing iBRoad2EPC raised the effort by approx. 140% compared to only EPC, mostly due to the on-site visit and calculation of future renovation steps. There is potential for saving time in the work with the Assistant.
- ✓ The proposed/acceptable rise in value/money on top of EPC is very country dependent
- ✓ iBRoad2EPC is mostly proposed to be a voluntary complement to the EPC
- ✓ The IEQ and cost modules are considered important additions to the EPC
- ✓ The SRI and IEQ modules are overall considered complicated; energy experts highlighted a market need for training on the use of the SRI and IEQ modules
- ✓ The measured energy performance module included in iBRoad2EPC was considered by energy experts to be a quite complex and demanding process; in most cases there is no data to support its application.
- ✓ 71% of the energy assessors see potential in the integration of iBRoad2EPC into the EPC
- ✓ 94% of the energy assessors would offer iBRoad2EPC to their clients