



U-CERT

User-Centred Energy Performance
Assessment and Certification

TripleA-reno - Combined label method



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User-Centred Energy Performance
Assessment and Certification



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**comfort
consulting**

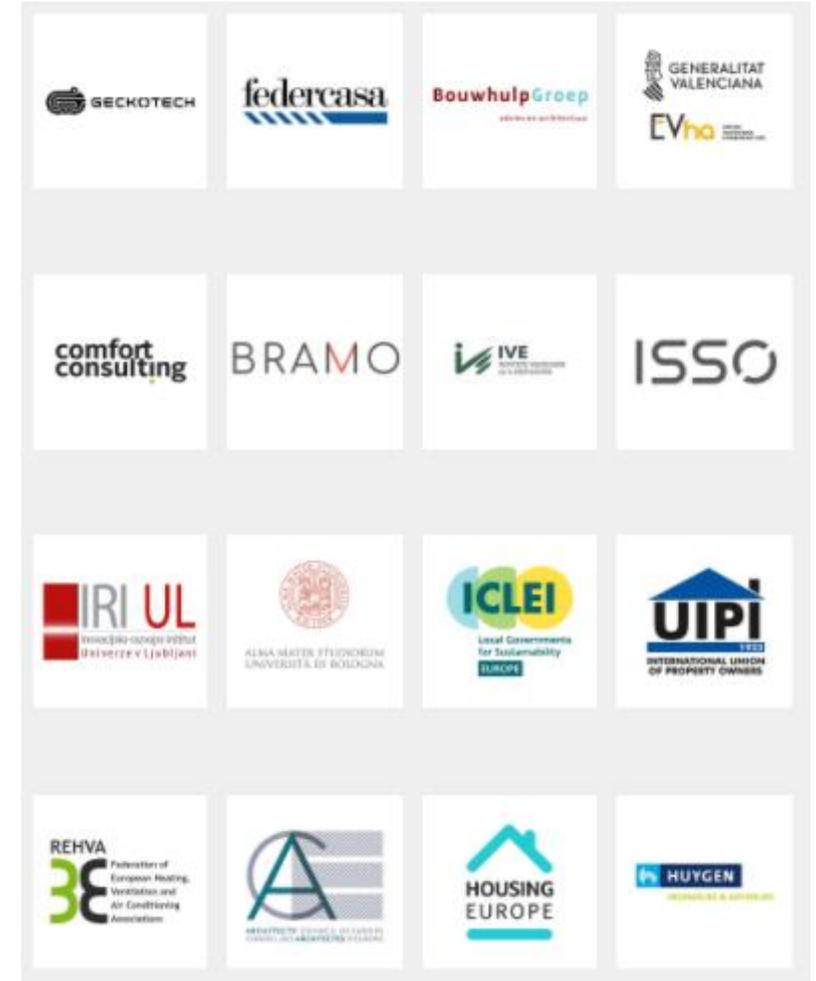


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TripleA-reno H2020 project

- Attractive, acceptable and affordable deep renovation for dwellings
- 2018 - 2021
- www.tripleA-reno.eu
- 16 partners

Triple  -reno



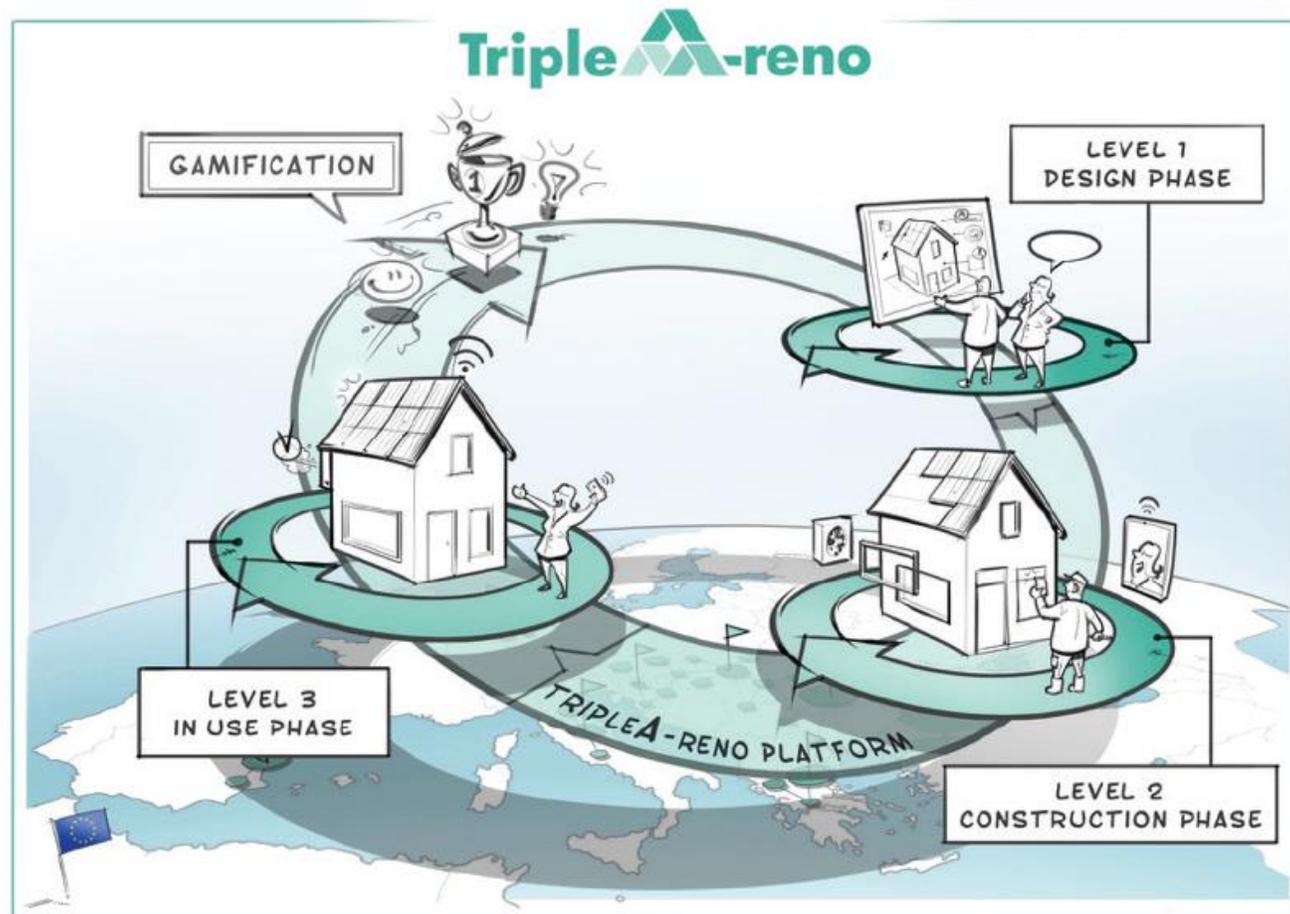
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Levels of the TripleA-reno Platform



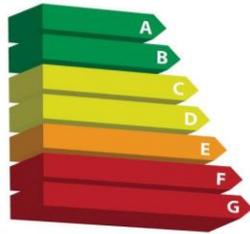
Why is the combined labelling necessary?

Performance evidence based approach

1. People would like to live in **energy efficient and comfortable home**.
2. The **evaluation of the technical building system** is necessary, because it influences the IEQ and occupants' well-being.
3. The **measurements are needed**, because the measured values can be very different from the calculated figures.
4. People would like to **get information on renovated buildings**, both on the energy performance and comfort.

What does the combined labelling include?

The TripleA-reno combined labelling was developed especially for dwellings, which presents altogether:



energy performance



indoor environmental quality and

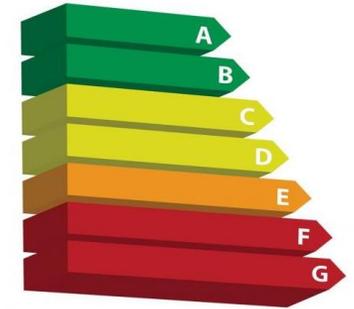


well-being indicators

Energy performance indicators

Main objectives

1. Express the **energy efficiency**.
2. Ensure **comparison with other buildings** through energy efficiency class, calculated total primary energy use and delivered energy use (align with EPBD and Level(s)).
3. Ensure **monitoring** of the energy consumption by presenting the measured delivered energy uses.



1. Energy performance indicators

	Indicators	Unit	Calculation method	Source
1.1	Energy efficiency class	-	Energy performance certification (align with national regulation)	EPBD
1.2	Calculated total primary energy use	kWh/m ² a	Align with EN 15603 and EN ISO 13790, or EN ISO 52000 standard series	EPBD, Level(s)
1.3	Calculated delivered energy use per energy sources: - Fuel - Electricity - District heating/cooling	kWh/m ² a	Align with EN 15603 and EN ISO 13790, or EN ISO 52000 standard series	Level(s)
1.4	Measured delivered energy use per energy sources: - Fuel - Electricity - District heating/cooling	kWh/m ² a	Based on measurement or energy bills	-
1.5	Share of RES	%	$RER_p = \frac{\sum E_{Pr en, RER}}{\sum E_{Ptot}}$	REHVA
1.6	Average thermal transmittance	W/m ² K	$\bar{U} = \frac{\sum A_i * U_i}{\sum A_i}$	-

Qualitative well-being and IEQ indicator

Number	Name	Unit	Classif.
	2.1 Control of heating system	-	5 cat
	2.2 Control of cooling system	-	5 cat
	2.3 Fresh air flow (mechanical ventilation) per number of occupants	l/s	3 cat
	2.4 Air tightness of windows and doors	-	3 cat
	2.5 Exterior shading	%	11 cat
	2.6 Radiant heating and/or cooling system	%	2 cat
	2.7 Radiant temperature asymmetry	-	2 cat

2.	Well-being and IEQ performance (Related to the building system)	Scores
2.1	Control of the heating system	Room temperature control: 20 points Apartment temperature control: 10 points Central (building) temperature control: 5 points No control: 0 point
2.2	Control of the cooling system	Room temperature control: 20 points Apartment temperature control: 10 points Central (building) temperature control: 5 points No control: 0 point
2.3	Fresh air flow (mechanical ventilation) per person is at least 7 l/s.	Fresh air flow per number of occupants meets EN 16798-1 category I, II: 20 points Fresh air flow per number of occupants meets EN 16798-1 category III: 10 points
2.4	Air tightness of windows and doors	Good air-tightness: 10 points Medium air-tightness: 5 points Poor air-tightness: 0 point
2.5	Exterior shading	10 points for 100% of glazed openings from East to West (except North) have exterior shading 9 points for 90%-100% ... 0 point for 0-10%
2.6	Radiant heating and/or cooling system operates in rooms at least 50% of the conditioned floor area	Radiant heating and/or cooling system operates in rooms at least 50% of the conditioned floor area: 10 points
2.7	Radiant temperature asymmetry	Radiant temperature asymmetry meets ISO 7730 Category A or B: 10 points

Measured well-being and IEQ indicators

(Mostly depending on occupant habits)

- Onsite measurements = providing information to the occupants on which parameters are good and which should be improved in order to improve IEQ and well-being
- Measurement place: living room
- Achieved category from the standards: min. 85% of the measured values meet the requirement of the category



Measured well-being and IEQ indicator

Number	Name	Unit	Classif.
	3.1 Operative temperature – heating season	°C	3 cat
	3.2 Operative temperature – cooling season	°C	3 cat
	3.3 Relative humidity of indoor air is between 30 % and 70 %	%	Y/N
	3.4 CO ₂ concentration	ppm	3 cat
	3.5 TVOC	µg/m ³	2 cat
	3.6 Formaldehyde	ppb	2 cat
	3.7 PM _{2,5}	µg/m ³	2 cat
	3.8 PM ₁₀	µg/m ³	2 cat

3.	Measured well-being and IEQ indicator (Related to the apartment and depending on occupant habits)	Scores
3.1	Operative temperature - heating	30 points - EN 16798-1 Category II 15 points - EN 16798-1 Category III 0 point - EN 16798-1 Category IV
3.2	Operative temperature - cooling	15 points - EN 16798-1 Category II 8 points - EN 16798-1 Category III 0 point - EN 16798-1 Category IV
3.3	Relative humidity of indoor air is between 30 % and 70 %	5 points if RH is between 30 and 70%RH
3.4	CO ₂ concentration	20 points - EN 16798-1 Category II 10 points - EN 16798-1 Category III 0 point - EN 16798-1 Category IV
3.5	TVOC	10 points - TVOC is under 500 µg/m ³
3.6	Formaldehyde	10 points - Formaldehyde is under 100 µg/m ³
3.7	PM _{2,5}	5 points if PM _{2.5} is under 15 µg/m ³
3.8	PM ₁₀	5 points if PM ₁₀ is under 50 µg/m ³

Labelling method

The energy performance indicators are presented one-by-one

Energy efficiency class	Calculated total primary energy use	Calculated delivered energy use	Measured delivered energy use	Share of RES	Average U value
F	201 kWh/m ² a	158,85 kWh/m ² a	185 kWh/m ² a	3 %	1,23 W/m ² K

Joint assessment of well-being and IEQ

1. Calculate the percentage of total gained points / total theoretical maximum points.
2. The output is one class: excellent (90-100%) good (80-89%), acceptable (60-79%) weak (50-59%) or very weak (0-49 %)

Well-being and Indoor Environmental Quality		Measured well-being and Indoor Environmental Quality
58%	Weak	63% Acceptable

Case studies



■ Hungary

Building was built in 1981 and it has 60 apartments



■ Italy

Building was built in 1978 and it has 21 apartments



■ Spain

Building was built in 1982 and involves 5 multifamily buildings



■ The Netherlands

Dwelling-1 in a semi-detached house.
Dwelling-2 in a row house.



■ Slovenia

Block of flats, 51 residential units, built in 1976.



■ Greece

Student House, 138 dormitory studios, built in 1986.



THANK YOU FOR
YOUR ATTENTION!

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