EUB
SuperHub

## European Building Sustainability performance and energy certification Hub

# Quality, Usability and Visibility of Energy and Sustainability Certificates in the Real Estate Market

This project has received funding from the European Union's H2020 research and innovation programme under Grant Agreement No. 101033916.

**Project no.** 101033916

**Project acronym:** EUB SuperHub

**Project title:** European Building Sustainability performance and energy certification Hub

**Call:** H2020-LC-SC3-B4E-4-2020

**Start date of project:** 01.06.2021.

**Duration:** 36 months

**Deliverable title:** *Quality, usability and visibility of energy and sustainability certificates in the real estate market*

**Due date of deliverable:** September 2021

**Organisation name of lead contractor for this deliverable:** *Hochschule München University of Applied Sciences*



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| Dissemination level | | |
|---|---|---|
| **PU** | Public | PU |

| History | | | |
|---|---|---|---|
| **Version** | Date | Reason | Revised by |
| 01 | 06/09/2021 | **Draft** | |
| 02 | 18/09/2021 | **Draft** | **HM** |
| 03 | 20/09/2021 | **Draft** | **HM** |
| 04 | 24/09/2021 | **Draft** | **ALL** |
| 05 | 30/09/2021 | **Final** | **iiSBE, GEO** |

# Table of Contents

## Table of Figures

## Glossary

| | |
|---|---|
| A | Austria |
| A(Vbg) | Austria, Vorarlberg |
| DE | Germany |
| FR | France |
| HR | Croatia |
| HU | Hungary |
| IE | Ireland |
| IT | Italy |
| EPC | Energy performance certificate |
| SC | Sustainability certificate |
| KPI | Key performance indicators |
| MS | Member State |
| EPBD | Energy Performance of Buildings Directive |
| NZEB | nearly zero-energy buildings |
| LCA | Life cycle assessment |

| | |
|---|---|
| LCC | Life cycle cost |
| BER | Building Energy Rating |
| DHW | Domestic hot water |
| HVAC | Heating, ventilation and cooling |
| PHPP | Passive House Planning Package |
| MPCPC | Maximum Permitted Carbon Performance Coefficient |
| MPEPC | Maximum Permitted Energy Performance Coefficient |
| GDPR | General Data Protection Regulation |
| PPs | Project Partners |
| B2B | Business-To-Business |
| EPCs | Energy Performance Certificates |
| SC | Sustainability Certificate |
| GIS | geographic information system |

# Executive Summary

The current study facilitates the understanding of the differences, the challenges, the shortcomings, and the best practices of certification systems both mandatory EPCs and from the arena of sustainability/voluntary assessment schemes, should be regionally focused or international labels. The motivation of the system operators, the flexibility of the decision makers and funding (retrofit) providers is a key driver for identifying the challenges of creating building passports via harmonization efforts.

The EUB SuperHub project consortium intends to take a step-by-step approach to understand the status quo and offer support for greater penetration of certification system on the real estate market and serving the needs of EU citizens. Therefore, Work Package 1 of the project deals with picturing the “state of play”, highlighting the gaps in the certification systems and building performance assessments and try to draw practical conclusions for bettering the assessment methods, based on international standards.

This report naturally the first step in the project workplan to discover the major aspects for developing the EUB SuperHub framework in WP2.

# Introduction

This deliverable presents a summary of the work done in Task 1.1: Mapping of EPCs and sustainability certifications. Evaluation of effectiveness and impact on the market. The task goal is to provide an updated overview of national energy performance certificates and sustainability certification systems in the EUB SuperHub participating countries and to assess their role in the real estate market. To achieve this, the task was divided in two main parts. In the first part deep cross analysis of the current EPCs and sustainability certifications in terms of quality (inputs, outputs, data, methodologies, experts), visibility (awareness, communication, image, perception of certifications, range, advertising) and usability (information, how triggers lead to action,) was made based on the input from all national consortium partners and available literature. The second part of this report studies the role of energy performance corticates (EPCs) and building sustainability certificates (SCs) in purchasing decisions and the stakeholders perceived level of trust in these certificates.

This deliverable is organized in 3 main chapters. The first- and second-chapter present a cross analysis of the local EPCs and sustainability certification schemes in terms of their quality, visibility and usability. The third chapter provides a comprehensive overview about the level of trust perceived by stakeholders towards EPCs and Sustainability Certificates and investigate about the role these certificates play in purchasing decisions. The study was carried out on the basis of series of focus groups meeting that were organized in the PP countries and regions covering a wide array of stakeholders.

# 1 The EPC in selected EU member state: An overview

The demand for transforming the existing building stock in the EU MS into energy efficient and sustainable one is rising due to increasing public awareness, governmental incentives, stricter building codes as well as the attractiveness of the sustainability image to investors. Moreover, as it is expected the vast majority (80%) of the existing building stock in the EU in 2050 will be composed of inefficient and unsustainable buildings that were constructed before introduction of the first EPBD in 2002[1]. Thus, renovating the existing building stock is considered as the "make or break" element in achieving the recently adopted Green Deal program goal of reaching a net zero GHG emission by 2050[2]. In order to improve the energy performance of the EU buildings, the EU lunched in 2002 the Energy Performance of Buildings Directive (EPBD) (Directive 2002/91/EC). The directives aim at vastly improving the energy performance of the buildings in order to have a decarbonised building stock by 2050[3], create a stable environment for investment decisions, improve the economic performance of the building by lowering the its running costs and to increase the real estate market transparency for both private persons and businesses to enable them to make more informed choices. Therefore, EPBD introduced in 2002 the mandatory energy performance certification of buildings (EPC) across the MS and required them to tighten the national building regulations. Since then, the EPBD has been amended several times coving wider aspects and further strengthen the energy performance regulations with the final recast lunched in 2018 requiring all newly building built from 31.12.2020 and later to be nearly zero-energy buildings (NZEB)[4].

Today, some 20 years after the introduction of the first EPBD and despite the various amendments and updates cycles the EPBD went through notable differences between the EPC issued in the different MS in terms of their quality (inputs, outputs, data, methodologies, experts), visibility (awareness, communication, image, perception of certifications, range, how certifications call to action, advertising) and usability (information, how triggers lead to action, choices made, interoperability). This low level of EPC harmonization between the MS hinders the creation of unified EU EPC and constrains the EPC application to the national and sometimes regional boundaries. In this chapter, we are to provide an updated overview of the used EPCs systems in the project participating countries (Austria, Croatia, France, Germany, Hungary, Italy and Ireland) in order to identify overlaps, possible synergies, and gaps. The goal of this analysis is to set the scene for the creation of an EU wide harmonized EPC. The chapter will start by providing an overview of the EPCs used in each pilot region. The other

subchapters will present a brief cross-analysis comparison between the EPCs in terms of their quality, visibility and usability.


*Figure 1: Map showing the EUB SuperHub partner countries*

## 1.1 Overview of EPC in the pilot MS

This subchapter provide the reader with a brief overview about the current state of EPC among the EUB SuperHub consortium countries and region covering the main legislative frameworks that govern the implantation of the EPCs in each MS.

### 1.1.1 AUSTRIA (Vorarlberg)

Since 1 January 2008, the energy performance certificate has been part of the building application documents for new buildings or renovations requiring approval. If subsidies are also claimed in the course of the building project, an energy performance certificate must often be submitted there as well.

The Energy Performance Certificate Act (Energieausweisvorlagegesetz) regulates the obligation to present an energy performance certificate when selling, renting or leasing houses, flats, offices or business premises. The only buildings exempted from the obligation to present an energy performance certificate are those for which no energy performance certificate has to be issued according to the building regulations.

According to the Energy Performance Certificate Presentation Act, landlords or sellers or estate agents or brokers are obliged to provide an energy performance certificate for buildings within 14 days after conclusion of the contract if they are sold, rented or leased[5].

If, despite the obligation, no energy certificate (or an energy certificate that is too old or incomplete) is provided, it is assumed that the overall energy efficiency of the building corresponds to the age and type of the building. Since December 2012, however, the buyer or tenant can sue for the energy certificate or have one issued himself at the expense of the seller/landlord.

#### *1.1.1.1 Governing legislation*

Bautechnikverordnung BTV, Baueingabeverordnung BEV, Österreichisches Institut für Bautechnik Richtlinie 6: Energieeinsparung und Wärmeschutz OIB RL6

#### *1.1.1.2 Overview of the label used*


*Figure 2: the first page of the energy performance certificate used in the state of Vorarlberg in Austria for residential buildings[6].*

#### *1.1.1.3 Coverage*

Regional to the state of Vorarlberg

#### *1.1.1.4 Norm used to energy calculation*

OIB 6

#### *1.1.1.5 Type of buildings that require certification*

All buildings except:

- Buildings that are only kept frost-free, Buildings which are objectively ready for demolition due to their poor state of preservation and which are demolished within three years of the conclusion of the contract.
- Buildings used exclusively for worship and other religious purposes,
- Provisionally constructed buildings with a planned useful life of no more than two years,
- Industrial plants, workshops and agricultural buildings, in each of which the majority of the energy required for conditioning the indoor climate is provided by the waste heat generated in the building,
- Residential buildings that are only used for a limited time per year and whose expected energy demand is less than one quarter of the energy demand for year-round use
- Detached buildings with a total useful floor area of less than 50 square metres.

### 1.1.2 Croatia

In Croatia the implementation of the EPBD at a national level started in 2005 and is the responsibility of the Ministry of Physical Planning, Construction and State Assets.

1st of October 2017 is the key date in the process of building energy certification in Croatia.

Before 1st of October 2017: only one label class on the first page of EPC, which referred to calculated annual energy need for heating per useful floor area calculated for reference climatic data QH,nd [kWh/(m2a)]; no national central EPC database; an Excel spreadsheet format to gather EPC data was used; an electronic copy of the EPC was sent by e-mail to the Ministry of Physical Planning, Construction and State Assets

After 1st of October 2017: calculation to primary energy is an obligation; national central EPC database in place; two label classes on the first page of EPC (the first label class based on the calculated annual energy need for heating per useful floor area for the reference climatic data QH,nd [kWh/(m2a)], the second label class based on the calculated annual primary energy per useful floor area for the reference climatic data Eprim [kWh/(m2a)])

Total number of issued EPC in Croatia (situation existing on the day 30-07-2021) is 230.635. 82.976 EPCs of the total number of issued EPCs are issued using the national central EPC database (data provided by the Ministry of Physical Planning, Construction and State Assets).

#### *1.1.2.1 Governing legislation*

Building Act (Official Gazette 153/13, 20/17, 39/19, 125/19), Technical regulation on rational use of energy and heat retention in buildings (OG 128/15, 70/18, 73/18, 86/18, 102/20), Ordinance on energy audits of buildings and energy certification (OG 88/17, 90/20, 01/21, 45/21), Ordinance on persons authorized for energy certification, energy audit of the building and regular inspection of heating and air-conditioning systems in the building (OG 73/15, 133/15, 60/20, 78/21) and Ordinance on the control of the energy certificate of the building and the report on the regular inspection of heating and air conditioning systems in the building (OG 73/15, 54/20)

#### *1.1.2.2 Overview of the label used*

There are two label classes on the first page of a Croatian EPC:

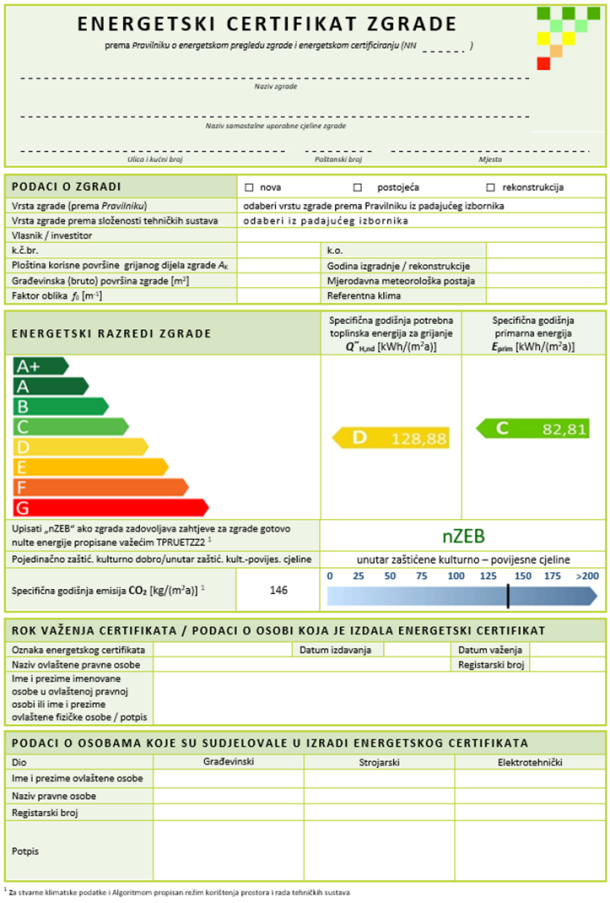
- The first label class based on the calculated annual energy need for heating per useful floor area for the reference climatic data Q”H,nd [kWh/(m2a)],

- The second label class based on the calculated annual primary energy per useful floor area for the reference climatic data Eprim [kWh/(m2a)]).

| $E_{prim}$ [kWh/(m²a)] | MULTI-FAMILY BUILDING | | SINGLE FAMILY HOUSE | | OFFICE BUILDING | | EDUCATIONAL INSTITUTION | | HOSPITAL | | HOTEL AND RESTAURANT | | SPORTS HALL | | SHOP | | OTHER NON-RESIDENTIAL BUILDING | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Label class | K | P | K | P | K | P | K | P | K | P | K | P | K | P | K | P | K | P |
| A+ | ≤ 80 | ≤ 50 | ≤45 | ≤35 | ≤35 | ≤25 | ≤55 | ≤55 | ≤250 | ≤250 | ≤90 | ≤70 | ≤210 | ≤150 | ≤170 | ≤150 | ≤80 | ≤50 |
| A | >80 ≤100 | >50 ≤75 | >45 ≤80 | >35 ≤55 | >35 ≤55 | >25 ≤50 | >55 ≤60 | >55 ≤58 | >250 ≤275 | >250 ≤275 | >90 ≤110 | >70 ≤75 | >210 ≤305 | >150 ≤160 | >170 ≤310 | >150 ≤210 | >80 ≤115 | >50 ≤75 |
| B | >100 ≤120 | >75 ≤90 | >80 ≤115 | >55 ≤70 | >55 ≤70 | >50 ≤70 | >60 ≤65 | >58 ≤60 | >275 ≤300 | >275 ≤300 | >110 ≤130 | >75 ≤80 | >305 ≤400 | >160 ≤170 | >310 ≤450 | >210 ≤280 | >115 ≤150 | >75 ≤100 |
| C | >120 ≤265 | >90 ≤220 | >115 ≤280 | >70 ≤230 | >70 ≤100 | >70 ≤90 | >65 ≤125 | >60 ≤120 | >300 ≤345 | >300 ≤325 | >130 ≤160 | >80 ≤95 | >400 ≤465 | >170 ≤225 | >450 ≤475 | >280 ≤290 | >150 ≤280 | >100 ≤225 |
| D | >265 ≤410 | >220 ≤350 | >280 ≤445 | >230 ≤385 | >100 ≤125 | >90 ≤110 | >125 ≤175 | >120 ≤175 | >345 ≤395 | >325 ≤350 | >160 ≤190 | >95 ≤110 | >465 ≤530 | >225 ≤280 | >475 ≤495 | >290 ≤340 | >280 ≤410 | >225 ≤350 |
| E | >410 ≤515 | >350 ≤435 | >445 ≤560 | >385 ≤485 | >125 ≤155 | >110 ≤140 | >175 ≤220 | >175 ≤220 | >395 ≤495 | >350 ≤440 | >190 ≤240 | >110 ≤140 | >530 ≤665 | >280 ≤350 | >495 ≤620 | >340 ≤425 | >410 ≤515 | >350 ≤435 |
| F | >515 ≤615 | >435 ≤520 | >560 ≤670 | >485 ≤580 | >155 ≤190 | >140 ≤165 | >220 ≤265 | >220 ≤265 | >495 ≤590 | >440 ≤525 | >240 ≤290 | >140 ≤165 | >665 ≤795 | >350 ≤415 | >620 ≤745 | >425 ≤510 | >515 ≤615 | >435 ≤520 |
| G | >615 | >520 | >670 | >580 | >190 | >165 | >265 | >265 | >590 | >525 | >290 | >165 | > 795 | > 415 | > 745 | >510 | > 615 | > 520 |

**K** – continental Croatia
**P** – littoral Croatia

*Figure 3: Croatian EPC label class based on the calculated annual primary energy[7]*



ENERGETSKI CERTIFIKAT ZGRADE

prema *Pravilniku o energetskom pregledu zgrade i energetskom certificiranju* (NN _____ )

Naziv zgrade

Naziv samostalne uporabne cjeline zgrade

Ulica i kućni broj | Poštanski broj | Mjesto

| PODACI O ZGRADI | ☐ nova ☐ postojeća ☐ rekonstrukcija | | |
|---|---|---|---|
| Vrsta zgrade (prema *Pravilniku*) | odaberi vrstu zgrade prema Pravilniku iz padajućeg izbornika | | |
| Vrsta zgrade prema složenosti tehničkih sustava | odaberi iz padajućeg izbornika | | |
| Vlasnik / investitor | | | |
| k.č.br. | | k.o. | |
| Ploština korisne površine grijanog dijela zgrade $A_K$ | | Godina izgradnje / rekonstrukcije | |
| Građevinska (bruto) površina zgrade [m²] | | Mjerodavna meteorološka postaja | |
| Faktor oblika $f_o$ [m⁻¹] | | Referentna klima | |

| ENERGETSKI RAZREDI ZGRADE | Specifična godišnja potrebna toplinska energija za grijanje $Q''_{H,nd}$ [kWh/(m²a)] | Specifična godišnja primarna energija $E_{prim}$ [kWh/(m²a)] |
|---|---|---|
| A+ / A / B / C / D / E / F / G | D 128,88 | C 82,81 |
| Upisati „nZEB" ako zgrada zadovoljava zahtjeve za zgrade gotovo nulte energije propisane važećim TPRUETZZ2 [1] | nZEB | |
| Pojedinačno zaštić. kulturno dobro/unutar zaštić. kult.-povijes. cjeline | unutar zaštićene kulturno – povijesne cjeline | |
| Specifična godišnja emisija $CO_2$ [kg/(m²a)] [1] | 146 | 0 25 50 75 100 125 150 175 >200 |

| ROK VAŽENJA CERTIFIKATA / PODACI O OSOBI KOJA JE IZDALA ENERGETSKI CERTIFIKAT | | | | |
|---|---|---|---|---|
| Oznaka energetskog certifikata | | Datum izdavanja | Datum važenja | |
| Naziv ovlaštene pravne osobe | | | Registarski broj | |
| Ime i prezime imenovane osobe u ovlaštenoj pravnoj osobi ili ime i prezime ovlaštene fizičke osobe / potpis | | | | |

| PODACI O OSOBAMA KOJE SU SUDJELOVALE U IZRADI ENERGETSKOG CERTIFIKATA | | | |
|---|---|---|---|
| Dio | Građevinski | Strojarski | Elektrotehnički |
| Ime i prezime ovlaštene osobe | | | |
| Naziv pravne osobe | | | |
| Registarski broj | | | |
| Potpis | | | |

[1] Za stvarne klimatske podatke i Algoritmom propisan režim korištenja prostora i rada tehničkih sustava

*Figure 4: First page of a Croatian energy performance certificate[7]*

### *1.1.2.3 Coverage*

National

#### *1.1.2.4 Norm used to energy calculation*

EN ISO 13790 - calculation of energy need for space heating QH,nd and cooling QC,nd

DIN V 18599 partly used instead of EU norms EN 15241, EN 15242, and EN 15243 - calculation of delivered energy to technical building system (cooling system, ventilation system)

EN 15193 - calculation of energy used for lighting , EN 15603 - primary energy calculation

#### *1.1.2.5 Type of buildings that require certification*

All new residential and non-residential buildings, all existing public buildings with a total useful floor area over 250 m2, all residential and non-residential buildings or building units sold, rented or leased

### 1.1.3 Germany

The Energy Performance Certificate was already introduced for new buildings in 2002 .Since the 1st of October 2007 Germany adopted the EU's EPBD directive (EPBD) into its national legislation through the introduction of energy saving ordinance (Energieeinsparverordnung – EnEV ). The EnEV regulated the issuing of energy performance certificates in the country. As result, issuing an Energy Performance Certificate for existing residential buildings completed after 1965 that are offered for sale or rent became compulsory. Two years later, the EnEV was amended with EnEV 2009 which strengthened the energy efficiency requirements and the partial use of renewable energy sources became mandatory with the issuing of the Renewable Energies Heat Act (EEWärmeG6). Moreover, the EnEV of 2009 made it compulsory to issue an energy performance certification for newly built non-residential and residential buildings alike. Renewable Energies Heat Act (EEWärmeG6) was amended in 2011 in which public buildings became obliged to cover a part of their energy requirements though renewables in case of major renovations. In 2020 the EnEV has been replaced by the Gebäudeenergiegesetz (GEG) 2020 "Building Energy Act 2020" which introduced the national definition of the nearly zero-energy buildings and further strengthened the energy efficiency requirements and the partial use of renewable energy sources.

#### *1.1.3.1 Governing legislation*

Gebäudeenergiegesetz (GEG) 2020 "Building Energy Act 2020"

#### 1.1.3.2 Overview of the label used

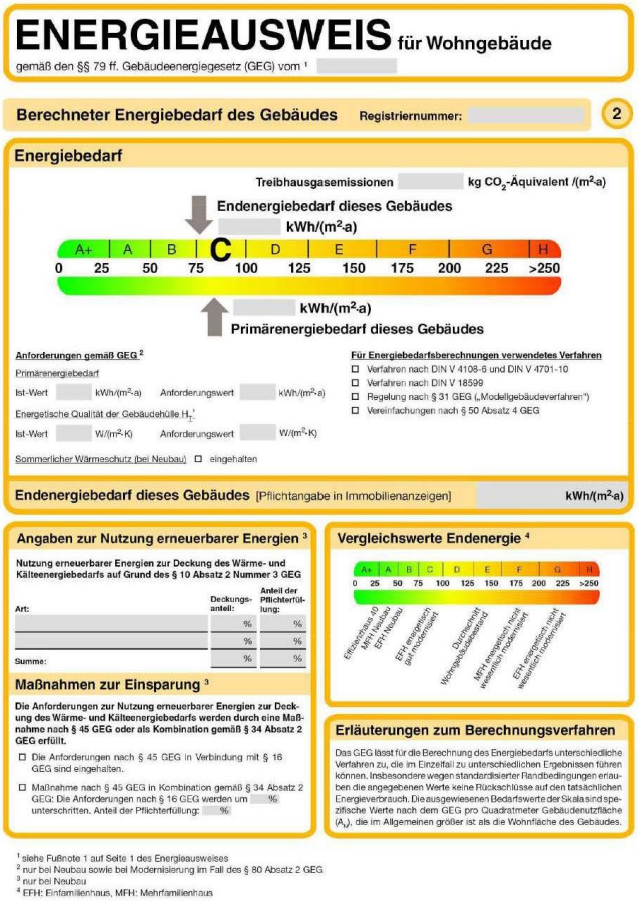



*Figure 5: the first page of a German energy performance certificate for residential buildings[8]*

#### 1.1.3.3 Coverage

National

#### 1.1.3.4 Norm used to energy calculation

DIN V 18599

#### 1.1.3.5 Type of buildings that require certification

All new residential and non-residential buildings and existing residential and non-residential buildings or building units that are being sold, rented or leased except: Religious buildings, temporary structures, buildings for not human use, buildings used for less than 4 months a year, Cultural heritage protected building or part of Cultural heritage protected area , building with a usable area < 50m²

### 1.1.4 France

In France, the current thermal regulation is the RE 2020 (Réglementation Environnementale 2020). In order to reduce energy consumption in buildings, the code includes specific requirements concerning the use of

renewable energies, minimum energy efficiency of buildings, primary energy consumption, summer comfort and air-tightness testing.

In case of a new building construction, the EPC (in France called DPE, Diagnostique de Performance Energétique) is mandatory since 2007 and relies on the project standardized evaluation completed by on-site inspection to check the concordance between the project and the real building. In case of building renting or sale, the EPC is mandatory since 2010. It takes into account primary energy consumption and emissions of greenhouse gases (GHG). The rating is done based on the label classes: the worse of the 2 scores (energy or GHG) defines the final result. Since 2021, for new residential buildings, energy bills and summer comfort estimations are added to the EPC.

The French methodology relies on the energy performance certification processed by private experts and their use of private software or the use of energy consumption statements. Assessors must be accredited by the French accreditation committee (COFRAC) and the Decree of 13th December 2011 supervises the assessors' skills and their accreditation criterion. It namely distinguishes two levels of accreditation: one only for individual housing, apartments and tertiary unit assigned in a dwelling building and the second for all type of buildings. This Decree also made the on-site visit mandatory.

#### *1.1.4.1 Governing legislation*

For residential buildings: "Arrêté du 31 mars 2021 relatif au diagnostic de performance énergétique pour les bâtiments ou parties de bâtiments à usage d'habitation en France métropolitaine"

For non-residential buildings: "Arrêté du 15 septembre 2006 relatif au diagnostic de performance énergétique pour les bâtiments ou parties de bâtiment autres que d'habitation existants proposés à la vente en France métropolitaine"

#### 1.1.4.2 Overview of the label used

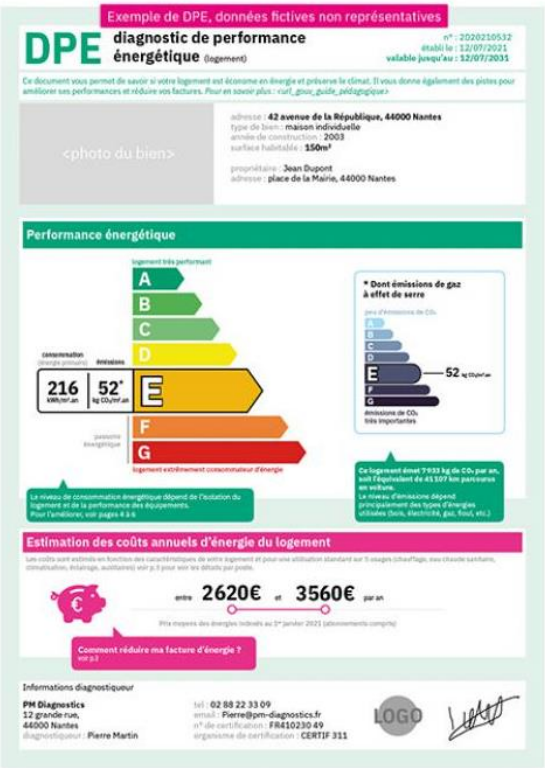



*Figure 6: The first page of a French energy performance certificate for residential buildings[9].*

#### 1.1.4.3 Coverage

National

#### 1.1.4.4 Norm used to energy calculation

RE2020 for newly built residential buildings, all other eligible buildings use the RT2012

#### 1.1.4.5 Type of buildings that require certification

An EPC is mandatory in case of sale or renting of individual houses, collective buildings, dwellings located in collective buildings and non-residential buildings. The owner is obligated to provide a valid certificate to the buyer when the sale or rental is being established. The only exempted buildings are: agricultural, craft and industrial buildings; historical monuments and religious places; some residential buildings that are only used for 4 months a year and those without fixed heating systems

### 1.1.5 Hungary

The preparation of the energy certificate was made compulsory by Decree No. 176/2008. The law make it compulsory to issue an energy performance certificate in case of selling or renting a privately owned piece of real estate. Moreover, Public buildings occupied by public authorities with a floor area

exceeding 250m² have to have their energy performance certificate clearly displayed. The EPC in Hungary uses an index that shows the building's annual energy demand per square metre in (kWh/m². a). In 2016, the energy performance classes were rescaled. The new labels are marked by double letters to differentiate them from the old labelling system. The current certificate classifies in 12 energy performance class starting with "AA++" corresponding to the best energy class, "JJ" is the worst one.

#### *1.1.5.1 Governing legislation*

176/2008. (VI. 30.) decree. 2015 LVII. Act on Energy Efficiency and 122/2015. (V. 26.) Government Decree on the implementation of the Energy Efficiency Act

#### *1.1.5.2 Label used*

HITELES ENERGETIKAI TANÚSÍTVÁNY

ÖSSZESÍTŐ LAP HET-00033613

**Épület (önálló rendeltetési egység)**

Rendeltetés: Lakó- és szállásjellegű
Cím:

HRSZ:
Az épület védettsége: Nem védett

**Megrendelő**

Név:
Cím:

Energetikai minőség szerinti besorolás: EE

AA++
AA+
AA
BB
CC
DD
EE
FF
GG
HH
II
JJ

Átlagosnál jobb

**Energetikai adatok**

Fűtött alapterület: 43 m²
Összesített energetikai jellemző:
-méretezett érték: 199,68 kWh/m²a
-követelményérték: 100 kWh/m²a
-a követelményérték százalékában: 199,68%

**Korszerűsítési javaslat**

A lakás gépészeti rendszere korszerű, az energetikai besorolás javítására a falazatok külső hőszigetelésével van lehetőség. Részletesebben lásd a tanúsítvány számítási részének végén!

A javaslattal elérhető besorolás: BB

**Megjegyzés**

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Jogosultsági szám: TÉ 01-65225 (MMK)
Alátámasztó munkarész:
-kelte: 2018. február 6.
-készítő szoftver megnevezése:
WinWatt 7.71 (2018. 1. 29.)

Tanúsítás módszere: Épületrész, számítással
A tanúsítvány kiállításának oka:
ingatlan adásvétel

Hiteles kiállítás dátuma: 2018. február 6.

Aláírás

(Pecsét helye)

ORSZÁGOS ÉPÍTÉSÜGYI NYILVÁNTARTÁS, E-TANÚSÍTÁS - ET adatlap verzió 2.3.16 https://entan.e-epites.hu

*Figure 7: The first page of Hungarian energy performance certificate [10]*

#### *1.1.5.3 Coverage*

National

#### *1.1.5.4 Norm used to energy calculation*

7/2006. (V. 24.) TNM decree on the determination of the energy characteristics of buildings

#### *1.1.5.5 Type of buildings that require certification*

All new residential and non-residential buildings as well as existing residential and non-residential buildings or building units that are being

sold, rented or leased except: Religious buildings, temporary structures that stand for less than 2 years, buildings for not human use, buildings used for less than 4 months a year, Cultural heritage protected building or part of Cultural heritage protected area, stand-alone building with a usable area < 50m²

### 1.1.6 Italy

Italy transposes Directive 2002/91/EC with Legislative Decree no. 19/08/2005 n.192, corrected with Legislative Decree no. 311/2006. With these measures, a regulation has been established within which the Regions can explain their skills, develop specificities and seize opportunities in their contexts (Legislative Decree no. 192/2005, art. 17). In 2009 D.P.R. n.59 was published, it defines general criteria, calculation methodologies and minimum requirements for the energy performance of buildings, D.M. 26/06/2009 «National guidelines for the energy certification of buildings "when energy certification is made compulsory throughout the national territory. In 2015, with the publication of the D.M. June 26, 2015 is updated the decree that concerns the adjustment.

Energy Audits: Italy with D.Lgs.102/2014 law implementing the Energy Efficiency Directive 2012/27/UE, amending Directives 2009/125/EC and 2010/30/EU and repealing Directives 2004/8/EC and 2006/32/EC. (14G00113).Entry into force of the measure: 19/07/2014 (Last update to the act published on 14/07/2020).

#### *1.1.6.1 Governing legislation*

The legislative framework for energy performance of buildings is the.DM 26/05/2015: Inter-ministerial Decree of 26 June 2015 - Application of the methodologies for calculating energy performance and defining the prescriptions and minimum requirements for buildings.

### 1.1.6.2 Overview of the label used

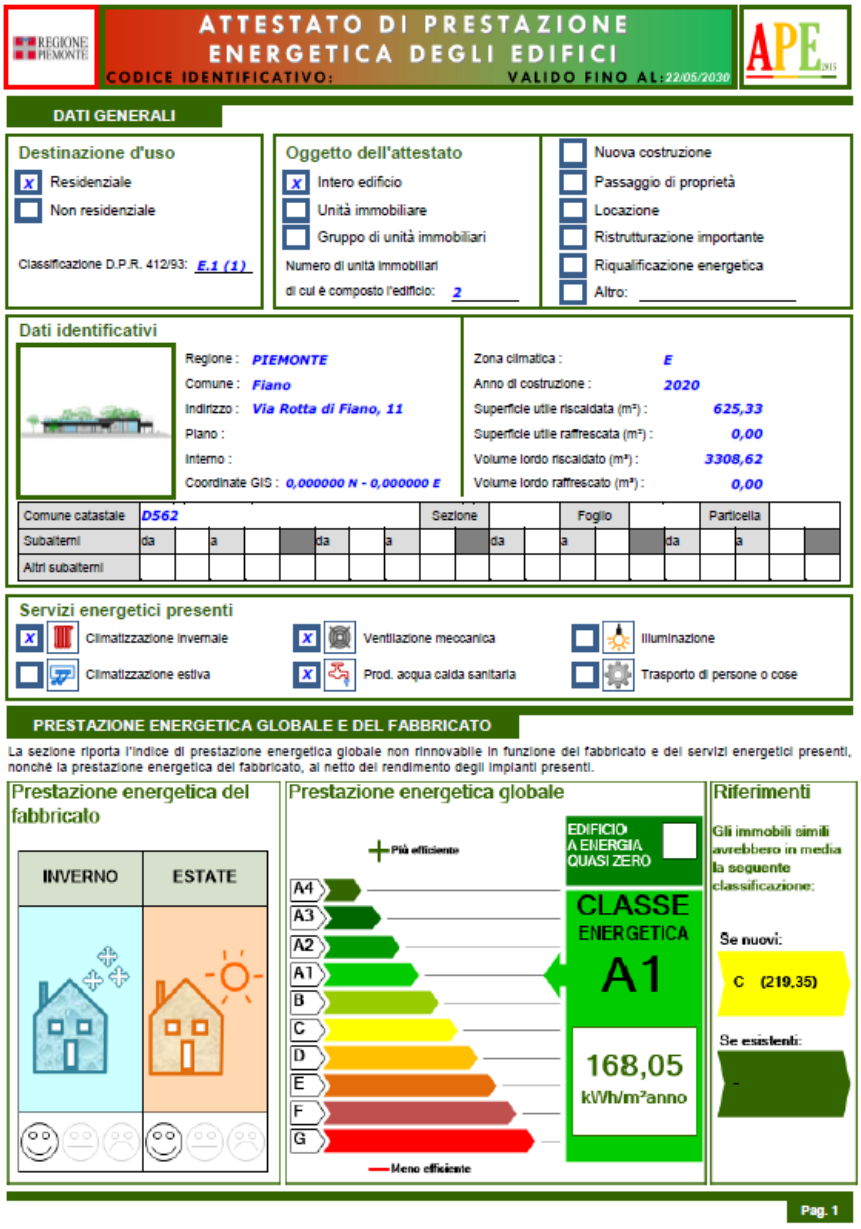



*Figure 8: The first page of an Italian energy performance certificate[11]*

### 1.1.6.3 Coverage

National and Regional for EPC

### 1.1.6.4 Norm used to energy calculation

DM 26/05/2015: Inter-ministerial Decree of 26 June 2015 - Application of the methodologies for calculating energy performance and defining the prescriptions and minimum requirements for buildings EN 13790:2008

UNI EN 15603:2008, UNI 11300-1:2014, 11300-2:2019, 11300-3:2010; 11300-4:2012; 11300-5:2016; 11300-6:2016, UNI 15193-1 :2017

#### *1.1.6.5 Type of buildings that require certification*

All newly built buildings and existing building that are to sold or rented other than: Industrial and craft buildings, rural non-residential buildings without air conditioning, isolated buildings with a floor area of less than 50 square meters, buildings used for places of worship, boxes, cellars, garages, multi-storey parking, depots and seasonal structures

### 1.1.7 Ireland

In Ireland the energy performance certification system is known as Building Energy Rating (BER). Similar to the energy rating label for household electrical appliances, the BER certificate has a scale of A-G, with A-rated buildings the most energy efficient and G the least. BERs are accompanied by an 'Advisory Report', which set out recommendations for cost-effective improvements to the energy performance of the building. A BER certificate is valid for up to 10 years, unless the owner makes changes that will impact on the dwelling's energy performance.

From the start of 2007 in the case of new builds and the beginning of 2009 for existing buildings, a BER certificate is compulsory for all homes available for rent or sale in Ireland. A BER certificate is also required to avail of the government grants for energy-efficiency improvements to the homes. Assessment is carried out by independent assessors registered with Sustainable Energy Authority of Ireland (SEAI). The process follows the Dwelling Energy Assessment Procedure (DEAP) Ireland's official method for calculating the Building Energy Rating of new and existing dwellings. DEAP software and associated guidance and procedural documents are available from SEAI. DEAP calculates the energy consumption and CO2 emissions associated with a standardised use of a dwelling. The energy consumption is expressed in kilowatt hour per square metre floor area per year. Central Statistics Office data shows that there were 1,103,196 BER Certificates issued for dwellings. between Jan 2009 and May 2021.

#### *1.1.7.1 Governing legislation*

S.I. No. 243/2012 - European Union (Energy Performance of Buildings) Regulations 2012 and S.I. No. 426/2014 - European Union (Energy Efficiency) Regulations 2014

### 1.1.7.2 Overview of the label used

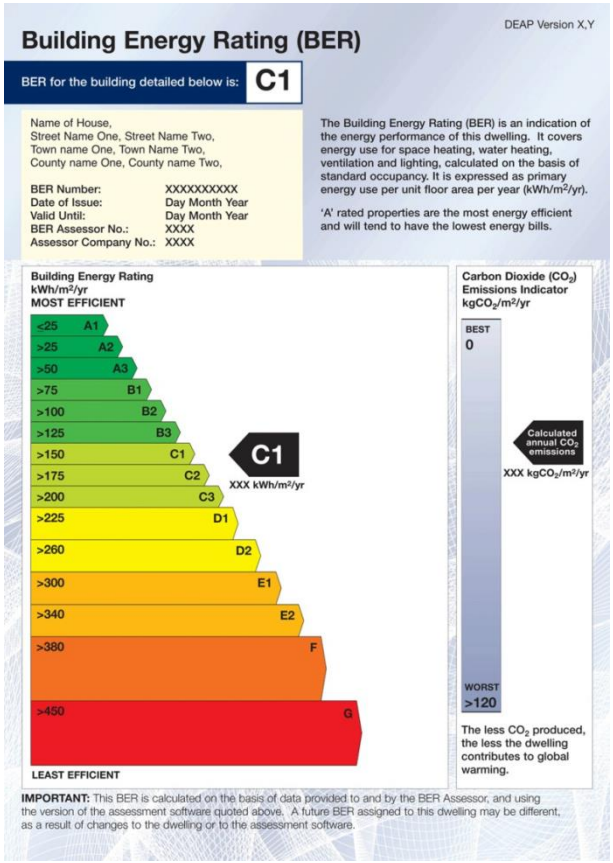



*Figure 9 : First page of an Irish residential Building Energy Rating (BER) Certificate[11]*

*Coverage*

National

### 1.1.7.3 Norm used to energy calculation

The calculation uses the Dwelling Energy Assessment Procedure (DEAP). This is Ireland's official method for calculating a dwelling's BER. The DEAP calculation framework is based on IS EN 13790 and draws heavily on the calculation and data used for the energy rating of dwellings in the UK.

### 1.1.7.4 Type of buildings that require certification

All types of buildings; a handful of buildings are exempt (e.g. religious buildings)

## 1.2 A cross-analysis comparison of the EPC quality aspects across the pilot MS

This chapter represent an in-depth analysis of the various aspects related to the quality assurance and quality control mechanisms implemented among the EUB SuperHub consortium countries. The analysis presented in this section cover aspects such as the quality control of EPC and energy assessors, the auditing process, the type and source of the EPCs input data, the calculation methodology and the definition of the EPC reference and boundary area, the classification of the rating systems, the performance requirements as well as the incorporation of advanced topics such smart system and user wellbeing in the national EPCs.

### 1.2.1 Quality control process

The EPBD of 2010 in Annex II require the MS to introduce an independent control system to monitor the quality and compliance of issued EPCs[4]. These requirements are further strengthened in the recast EPBD of 2018 via the introduction of an optional database for compliance checking. The EPBD request the MS "*to delegate the responsibility for implementing the independent control system to third independent party that can verify the issued EPCs based on random selection of statistically significant percentage of all issued EPCs*". The EPBD propose a 3-level quality control:

1. Validity checks of the input data of the building used to issue the energy performance certificate and the results stated in the certificate;
2. Check of the input data and verification of the results of the energy performance certificate, including the recommendations made;
3. Full check of the input data of the building used to issue the energy performance certificate, full verification of the results stated in the certificate, including the recommendations made, and on-site visit of the building, if possible, to check correspondence between specifications given in the energy performance certificate and the building certified.

The analysis across the EUB Super Hub partners shows that all the involved member states have either implemented or in the process of implementing the 3 level quality control as foreseen by article 18 and Annex II the EPBD[3].

| MS | Quality control process | |
|---|---|---|
| A (Vbg) | Residential | An independent control system (UKS) is being developed in 2021: All issued energy performance certificates are to be controlled via an automated inspection system. In case of anomalies, the energy performance certificates will be |

| | | |
|---|---|---|
| | | forwarded to EPC data platform for individual for inspection. |
| | Non-Residential | Planned in 2022 |
| HR | New Buildings | Quality control schemes at national level - full check of the input data and the results |
| | Existing Buildings | Quality control schemes at national level - full check of the input data and the results, including the recommendations to improve the energy performance of the building or building unit |
| FR | EPCs are Issued by qualified experts selected by the French Accreditation Committee (COFRAC). Once issued, the EPC is automatically sent to the EPC national database (mandatory since 2013). To issue an EPC the expert is to use the Project documentation and must perform an on-site visit. | |
| DE | Quality control in 3 steps:<br>1st step: Automatic validity check by the central registrar (Deutsches Institut für Bautechnik (DIBt))<br>2nd step: plausibility check of the input values, renovation recommendation and results of random sample of the EPCs<br>3rd step: detailed check of all input values and results including a site visit of random sample of the EPCs preformed<br>(2nd and 3rd level) controls are under the sovereignty of the Federal States. | |
| HU | 3 stages of Quality control:<br>• First stage, the EPC is uploaded to an online tool that automatically checks the permit of the energy expert and detect unrealistic entered figures<br>• The second stage is performed by the Hungarian Chamber of Engineers which select a random sample of about 2% of the EPCs to be verified by manually<br>• In the last stage 0.5% of the issued EPCs are verified on-site. | |
| IT | New Buildings | First level control of the presence of all the data entered with the xml file during the loading of the file in the platform and the compilation of some entries by the certifier. Subsequently, the Region checks the correctness of the calculation of the EPCs on report or by sample |

| | | |
|---|---|---|
| | Existing Buildings | ENEA (National Agency for New Technologies, Energy and Sustainable Economic Development) is the Italian public law agency aimed fat research, technological innovation and the provision of advanced services to undertakings, public administration and citizens in the energy sector, the environment and sustainable economic development. ENEA shall set up and maintain a database of companies subject to energy audits in which at least the personal data of the obliged person and the auditor, the date of execution of the diagnosis and the diagnosis report shall be reported |
| IE | In Ireland the energy performance certification system is known as Building Energy Rating (BER). A BER Certificate is legally required in order to sell or lease a building. SEAI is the designated issuing authority for BER Certificates and has responsibility for managing the scheme including its quality control. The Building Control Authority of each local authority oversees the enforcement of compliance with BER obligations. Public buildings are required to display a Display Energy Certificates (DEC). The aim of which is to encourage public building owners to adopt energy efficiency measures by displaying their energy performance updated on an annual basis. | |

### 1.2.2 Auditing process

The analysis across the EUB SuperHub partners revealed some differences in the auditing process adopted in each MS. These differences are mainly connected to the rating method used to issue the EPC (whether an operational rating or an asset rating is used to issue an EPC). While the majority of reviewed auditing process require an onsite visit to made by the assessor to the real estate. In some cases, like in Germany or Austria, the on-site visit by assessor is optional; this is especially the case when issuing an EPC for an existing residential building based on an operational rating method.

| MS | Auditing process |
|---|---|
| A (Vbg) | Each certificate is to be developed by a qualified energy expert and submitted to the EPC platform. The development of the certification can be done with or without a site visit. In case no site visit is made, the assessor must insure that photos and information about the building are provided |

| | | |
|---|---|---|
| HR | New Buildings | Energy audit of new building includes:<br>- Preparatory actions,<br>- Collection of all necessary data and information on the building that are necessary for the implementation of the energy certification procedure and determination of the energy class of the building,<br>- Suggestion of recommendations for using the building,<br>- Preparation of an energy audit report with recommendations for using the building. |
| | Existing Buildings | Energy audit of an existing building includes:<br>- preparatory actions,<br>- collection of all necessary data and information on the building that are necessary for the implementation of the energy certification procedure and determination of the energy class of the building,<br>- carrying out control measurements as needed,<br>- analysis of consumption and costs of all forms of energy, and water for the period of the previous three calendar years,<br>- suggestion of measures for improving the energy efficiency of the building, ie for improving the energy performance of the building which are economically justified with the calculation of the payback period and the sources of prices for the implementation of the proposed measures,<br>- preparation of an energy audit report with recommendations suggested in the order of implementation of economically justified measures for improving the energy efficiency of the building, ie energy properties of the building |
| FR | | After filling the EPC, the assessor must perform an on-site visit, inspecting the envelope, HVAC and domestic hot water systems. |
| DE | | Each certificate is to be developed by a qualified energy expert and submitted to the central registration for first level control. The development of the certification can be done with or without a site visit. In case no site visit is made, the assessor must insure that enough photos and information about the building are provided. |
| HU | | Each certificate is to be developed by a qualified energy expert and submitted to the central registration for first level control. The assessor must perform an on-site visit, inspecting the envelope, HVAC and domestic hot water systems. |
| IT | New | Process oh the EPC<br>-Assessor entrustment<br>-Preliminary contacts and data collection<br>-Information collected and check list;<br>-Inspection<br>-Analysis and modelling and extraction of energy indicators, energy saving interventions<br>-Inclusion of information in the regional platform and extraction of the certificate |

| | | |
|---|---|---|
| | In Use | The structure of the energy diagnosis defined by the standard:<br>-Assessor entrustment<br>-Preliminary contacts, first operational meeting, data collection<br>-Information collected and check list;<br>-Elements of analysis;<br>-Aspects of improvement measures: Flow chart of activities;<br>-Inspection site,<br>-Analysis and modelling and extraction of energy indicators, energy saving interventions, energy signature, type report<br>-Diagnosis report, final meeting<br>-Delivery to the ENEA energy diagnosis portal |
| IE | | SEAI is responsible for auditing the BER assessment process |

### 1.2.3 Compliance/ enforcement method (administrative, monetary penalties)

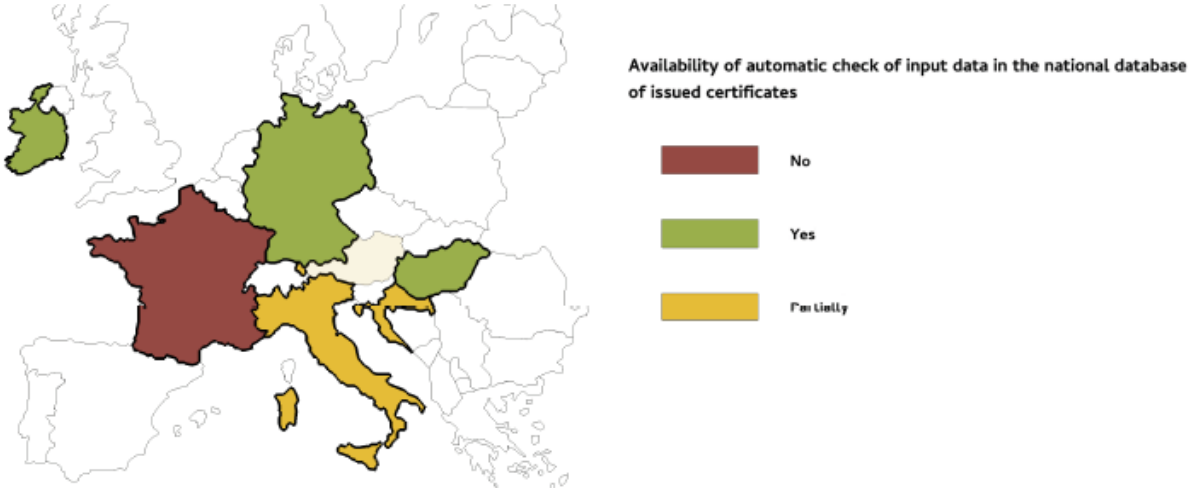
In an effort to ensure the quality of issued EPCs, Article 27 of the EPBD instructed the MS to "lay down the rules on penalties applicable to infringements of the national provisions adopted pursuant to this Directive and shall take all measures necessary to ensure that they are implemented" [4]. The analysis across the EUB Super Hub partners shows that all analysed MS have introduced penalties on the assessors to ensure that the issued EPCs comply with local regulations. These penalties vary between an administrative, monetary penalties or combination of both.

| MS | | Compliance / enforcement method (administrative, monetary penalties) |
|---|---|---|
| A (Vbg) | | monetary penalty of up to 1.450€ by not providing the EPC |
| HR | | administrative penalty for non-compliance: formal warning, recertification or suspension of the certifier's licence |
| FR | | Since August 2015, a 1500 € fine can be imposed to non-compliant building administrators. |
| DE | | monetary penalty of up to 15.000 € for not providing an EPC when selling, renting or leasing a real estate |
| HU | | Administrative penalty for non-compliance: in case a controlled EPC showed deviation of 2 energy classes or more it would lead to a 3 year licence suspension of the certifier's licence. Moreover, further sanctions can be applied, including fines and penalties. |
| IT | New | Penalties for both the owner and for the certifier, if the calculation of the EPC does not comply with the calculation modalities of the UNI standards, if the characteristics of the building-plant system are not relevant to reality and if the |

| | | |
|---|---|---|
| | | details of the installation booklet are not present, which affects the duration of the validity of the certificate |
| | In Use | Legislative Decree No 48/2020 implementing the Directive (EU) 2018/2002 amending Directive 2012/27/EU on energy efficiency allocates penalties in case of failure to perform energy audits and in case of failure to implement at least one of the efficiency measures identified by the diagnoses. ENEA shall carry out the checks to verify the compliance of diagnoses with the requirements of this Article, by means of an annual selection of a statistically significant percentage of the population of the undertakings subject to the obligation, at least 3%. |
| IE | | SEAI and Building Control Authorities of local authorities control the enforcement of the BER assessment process. The BCA within the area of a specific building may request to enter the building or inspect documents relating to the BER to see whether the BER granted was actually warranted, and may also prosecute a person who is considered to have committed an offence. |

### 1.2.4 Availability of automatic check of input data in the national database of issued certificates

In line with the requirements of article 18 of the EPBD about the introduction of an independent control system to monitor the quality and compliance of issued EPC, the analysis revealed that most MS have or are in the process of introducing an automatic validity check for the input data of the EPCs as part of their first level control strategy.



| MS | | Availability of automatic check of input data in the national database of issued certificates |
|---|---|---|
| A (Vbg) | Residential | Yes (See Quality control process) |
| | Non-Residential | Planned in 2022 |
| HR | | Partly |
| FR | | No |
| DE | | Yes |
| HU | | Yes |
| IT | New | No |
| | In use | ENEA (National Agency for New Technologies, Energy and Sustainable Economic Development) controls 100% of the audits carried out by internal auditors of companies subject to energy audits. ENEA Carries out the veracity of energy audits through inspections. |
| IE | | Completed assessments submitted to the national administration system for BER Assessments are put through validation checks to highlight any unexpected data. |

### 1.2.5 Assessor qualification requirements

To ensure the quality of the EPCs, it is important to ensure that the energy assessor possess relevant educational and expertise about the factors that impact the energy use in a building. Such background is important to ensure the quality of the issue EPCs and the ability of energy assessor to provide the real estate owner with proper consultation and recommendations for improving the energy performance of the building. The importance of this topic is reflected on the fact that all analysed MS have a clear set of qualification requirements that the energy assessor is to meet in order to be able to issue an EPC.

| MS | Assessor qualification requirements |
|---|---|
| A (Vbg) | In Vorarlberg, energy performance certificates may be issued by all those who are authorized to do so according to the Civil Technician Act or the Trade Regulation Act. These are primarily architects, master builders and technical offices. |

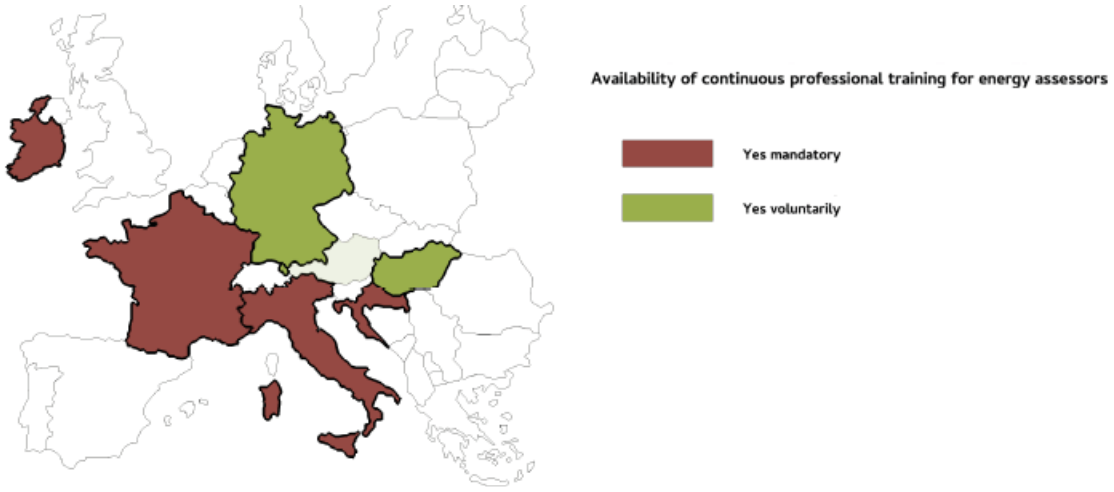
| | |
|---|---|
| HR | technical university degree (i.e., architecture, civil, mechanical and electrical engineering) |
| FR | Assessors must have successfully completed a training course. According to a regulatory requirement, the work of each qualified expert must be checked on a continuous basis. New experts are checked 4 times during the first year, and 4 more times in the following 4 years. Following this first cycle of certification, experts are checked 4 times every 5 years. |
| DE | Degree holders in fields related to construction (architecture, building construction, civil engineering, etc) or other degree in technical or scientific subjects with evidence of an additional qualification (major in energy-saving construction, advanced training in accordance with the requirements of the GEG or public appointment as an expert in the field of energy-saving construction). |
| HU | 'A person can issue an energy certificate (266/2013 (VII.11.) Gov. Decree), who:<br>has one of the following qualifications: certified architect, certified settlement engineer, certified construction engineer, certified transport infrastructure engineer, certified mechanical engineer, certified electrical engineer, certified energy engineer, architect, settlement engineer, water engineer, a transport infrastructure engineer, a mechanical engineer, an electrical engineer, an energy engineer;<br>have at least one year of professional experience after graduation;<br>has passed an effective eligibility test;<br>has been registered with the Chamber of Engineers and Chamber of Architects (following registration the code is “TÉ”);<br>is not subject to a disqualification from the profession; has notified its intention to act as an assessor to the chamber." |
| IT | Mainly the qualification of energy certifier is obtained with the participation in the training courses with final examination at the end of which the qualification is awarded. But in some regions, the certifiers are also made aware of the use of special software for the exclusive use of the region which adopts a more restrictive legislative system for the drafting of Epas; in addition, there are regions in which the professionals, architects and engineers, can act as energy certifiers with only the registration in the regional register, because their technical preparation is considered sufficient.<br>ENEA controls 100 percent of the diagnoses carried out by in-house auditors. On-the-spot checks may also be carried out. |
| IE | Have to complete an accredited training course and pass a national exam, typically every two years. |

### 1.2.6 Assessor relevant professional experience requirements

| MS | Assessor relevant professional experience requirements |
|---|---|
| A (Vbg) | Energy performance certificates may only be issued by qualified and/or accredited experts, who in any case have building physics and corresponding technical knowledge. |
| HR | Yes- relevant professional experience required - between 2 to 10 years - depends on the type of energy certifier and the assessor education level |
| FR | Yes, at least 3 years for technicians, 2 years for first cycle graduates and 1 year for second cycle graduates. |
| DE | Depends on the type of energy certification method (Asset or operational rating) and the assessor education level. For Degree holders in fields related to buildings and construction no experience is required |
| HU | Yes, 1 year of professional experience |
| IT | Yes |
| IE | 2-years (full time) of significant relevant experience within a construction-related environment for technicians that do not hold a full degree in construction related filled |

### 1.2.7 Availability of continuous professional training for energy assessors

Attending a continuous professional training for energy assessors is compulsory to maintain and renew their licence in the majority of MS. However, in Austria, Germany and Hungary the assessor is not obliged to attend such courses and they are attended on voluntarily bases by the energy. The training workshops are usually organized by national EPC bodies or via the professional chambers. The aim of these training events is to deepen the assessor's knowledge about energy saving technologies, building technical systems and update them on the new energy regulations, funding options as well as about building renovation methods. Hence, we think that it would useful for the quality of EPC to make the attendance of continuous professional training a compulsory requirement for energy assessors.




| MS | Availability of continuous professional training of energy assessors |
|---|---|
| A (Vbg) | Yes, but voluntarily |
| HR | Yes- Obligation to attend a program of continues professional training: periodic training is required - once every two years |
| FR | Yes |
| DE | Yes, but voluntarily |
| HU | Yes, but voluntarily |
| IT | Yes - Training agencies and bodies, which meet the requirements, provide training courses for energy certifiers and refresher courses with a final examination to obtain a regional or national rating |
| IE | Yes |

### 1.2.8 Definition of nearly zero-energy buildings (NZEB)

Article 9 of the EPBD directs all MS to outline national definitions of NZEB and to ensure that all newly built building built from 2021 onward meet the national definition of nearly zero-energy buildings (NZEB). Moreover, the EPBD instruct the MS to create national road map with clear milestones to decarbonize the existing building stock by 2050. The analysis shows that all EUB SuperHub participant countries have some sort of a nearly zero-energy buildings (NZEB) definition in place, however, it also shows that NZEB definitions varies greatly between MS which represent a major hurdle for achieving a harmonized and unified EPC across the EU.

| MS | | Definition of nearly zero-energy buildings (NZEB ) |
|---|---|---|
| A (Vbg) | | NZEB has been incorporated into the Austrian National Plan. Austria defines NZEB at an energy level that is far worse than the one with the lowest life cycle costs. The Energy Institute has made a proposal for improvement in order to align the transfer to the energy certificate with the climate targets and the economic optimum. So far, it cannot be said, that the requirements for an NZEB have been implemented in the energy certificate. |
| HR | Residential (In use) | After 31 December 2019, all new residential buildings heated to a temperature of 18°C or more with useful floor area over 50 m2 are nearly zero-energy buildings<br>Maximum allowed annual primary energy per useful floor area:<br>1. Single-family houses® continental Croatia 45 kWh/(m2a), littoral Croatia 35 kWh/(m2a)<br>2. Multi-storey residential buildings ® continental Croatia 80 kWh/(m2a), littoral Croatia 50 kWh/(m2a)<br>Maximum allowed energy need for heating per useful floor area is also defined for continental and littoral Croatia separately and it depends on the building shape factor. |
| | Non-Residential (New) | After 31 December 2019, all new non-residential buildings heated to a temperature of 18°C or more with useful floor area over 50 m2 are nearly zero-energy buildings<br>Maximum allowed annual primary energy per useful floor area:<br>1. Office buildings® continental Croatia 35 kWh/(m2a), littoral Croatia 25 kWh/(m2a)<br>2. Educational institutions ® continental Croatia 55 kWh/(m2a), littoral Croatia 55 kWh/(m2a)<br>3. Hospitals ® continental Croatia 250 kWh/(m2a), littoral Croatia 250 kWh/(m2a)<br>4. Hotels and restaurants ® continental Croatia 90 kWh/(m2a), littoral Croatia 70 kWh/(m2a)<br>5. Sports hall ® continental Croatia 210 kWh/(m2a), littoral Croatia 150 kWh/(m2a)<br>6. Shops ® continental Croatia 170 kWh/(m2a), littoral Croatia 150 kWh/(m2a)<br>Maximum allowed energy need for heating per useful floor area is also defined for continental and littoral Croatia separately and it depends on the building shape factor. |
| | Non-Residential (in use) | When an existing non-residential building, heated to a temperature higher than 12°C, is upgraded with the space of the usable floor area of more than or equal to 50 m2, for the upgraded part the requirement for NZEB should be applied. |

| | | |
|---|---|---|
| FR | | The NZEB concept is not considered as such in France, but the energy performance of buildings is evaluated in the national regulation as well as in design tools. The present version of this regulation includes 5 indicators :<br>• "bioclimatic needs", including the energy needs for heating, cooling, energy use for ventilation and lighting, with the objective to impose a good envelope performance,<br>• total primary energy use,<br>• primary energy use including non-renewable and limited renewable (e.g. wood, hydro-electricity), with partial compensation (considering local renewable energy generation, but only 1/2.58 of the exported electricity),<br>• total life cycle CO2 emissions,<br>• life cycle CO2 emissions of materials (excluding operation and exported energy). |
| DE | | Compliance with the Building Energy Act 2020 requirements is considered sufficient to achieve the NZEB state (usually achieving A rating (max. 50 kWh/m² year) |
| HU | | NZEB requirements are mandatory for all newly built building from 2021 onwards. The NZEB threshold of the specific primary energy consumption for residential buildings is 100 (kWh/m2.year) which is equal to the building rating class of BB. The NZEB outline specific thresholds on thermal transmittance value (U value) of the building envelope and glazing. Also the NZEB define limits building technical systems maximum output and energy efficiency class. Moreover, the building must cover at least 25% of its energy demand by renewables to meet the NZEB requirements. |
| IT | | From 01/01/2021 is mandatory for all new constructions or major renovation of first level of existing buildings meeting the requirements for building NZEB |
| IE | Residential | For all new builds, NZEB is equivalent to a 25% improvement in energy performance on the 2011 Building RegulationsNZEB compliance includes a Maximum Energy Performance Coefficient of 0.3, a Maximum Carbon Performance of 0.35 and a renewable Energy Ratio of 20%. |
| | Non-Residential | For all new builds, an equivalent to a 60% improvement in energy performance on the 2008 Building Regulations is required. This means an improved energy performance for the fabric, services and lighting specification. It also introduces a mandatory requirement for renewable sources. The renewable sources must in general provide 20% of the primary energy use, however there is flexibility where the building is more energy efficient than the regulations. This typically corresponds to an A3 Building Energy Rating. For In-use buildings the NZEB his will require that the building is brought up to cost optimal level, which is defined in the building regulations as: |

| | | |
|---|---|---|
| | | Upgrade Heating System more than 15 years' old<br>Upgrade Cooling and Ventilation Systems more than 15 years' old<br>Upgrade Lighting more than 15 years old |

### 1.2.9 Definition of EPC reference area

In order to have a comparable and harmonized EPC across the EU it is of vital importance that the EPC uses a comparable definition about the area of the property that is included in the EPC calculation. The analysis shows that among EUB SuperHub countries several definitions are used to define the EPC reference area. Even in the same county the more than one definition is sometimes used to define the EPC area as per the building usage. The lack of unified definitions of the reference area of the EPC makes the creation of comparable and harmonized EPC across the EU a complicated task.

| MS | | Definition of EPC reference area |
|---|---|---|
| A (Vbg) | | Based on the building Gross floor area (GRF) |
| HR | | In the case of a building with several zones of different purposes (e.g one building with three different zones: office building, educational institution and restaurant), it is possible to issue either an EPC for the building as a whole based on predominant purpose or for each building zone of different purpose separate EPC |
| FR | Residential | The constructed floor area, after deduction of the areas occupied by walls, partitions, steps and stairwells, sheaths, door and window openings. The surface area of unfinished attics, cellars, basements, sheds, garages, terraces, loggias, balconies, drying rooms outside the dwelling, verandas, communal premises and other outbuildings of the dwellings, as well as parts of premises with a height of less than 1.80 meters, are not taken into account. |
| | Non-Residential | The constructed floor area, after deduction of the areas occupied by walls (including insulation), fixed partitions, posts, steps and stairwells, sheathing, door and window frames, parts of rooms less than 1.80 m high, parts of the lower storey used as a staircase or ramp, or parts of the lower storey at which the shafts of lifts, hoists, shafts and smoke or ventilation ducts terminate, technical rooms. The result must be multiplied by a factor of 1,1. |

| | | |
|---|---|---|
| DE | Residential | The EPC area is calculated based on the building useable area (An) which is based as : An = 0,32 m-1 · Ve (Ve is the building volume in m³). The EPC consider only the heated or cooled rooms (Net floor area), alternatively the EPC area can be calculated by multiplying the conditioned area of the building with the factor of 1.2 or 1.35 for small residential building (max 2 dwellings) |
| | Non-Residential | The EPC area is calculated based on the building's net floor area |
| HU | | The EPC area is calculated based on the building "useful" heated floor area |
| IT | | The energy performance certificate shall be calculated on the air-conditioned useful area of the building, excluding non-heated or cooled areas, providing a non-renewable primary energy value related to the heated useful area. In addition, the information also provides a heated gross volume value and a dispersing surface of the building or real estate unit. |
| IE | | Except where otherwise indicated linear measurements for the calculation of wall, roof and floor areas and building volumes should be taken between the finished internal faces of the appropriate external building elements and, in the case of roofs, in the plane of the insulation. Linear measurements for the calculation of the areas of external door, window and roof light openings should be taken between internal faces of appropriate sills, lintels and reveals. |

### 1.2.10 Definition of Physical boundary of assessed real estate

Similar to the case of defining the reference assessed area of the EPC, the analysis across EUB SuperHub countries reveal that several definitions are used to define the physical boundary of the real estate for which the EPC apply. Some countries constrain the EPC to each building unit separately other apply it to the whole building some apply it to both.

| MS | Definition of Physical boundary of assessed real estate |
|---|---|
| A (Vbg) | Whole building |
| HR | An EPC can be issued either for the building as a whole or each building unit (apartment) separately! |
| FR | An EPC is issued either for the whole building or dwellings located in collective buildings. |

| | | |
|---|---|---|
| DE | Residential | An EPC can be issued either for the building as a whole or each building unit (apartment) separately |
| | Non-Residential | whole building with same use, by mix use with space use over 10% then separate EPC for each usage |
| HU | | An EPC is issued to the whole building |
| IT | | Whole building |
| IE | | Residential dwellings require an EPC to be generated for each building unit (apartment) separately. Depending on their makeup, commercial buildings may be granted an EPC based upon the entire building as a whole or else for each individual unit separately. |

### 1.2.11 Energy Services covered

The range of energy service that are used as input parameter for creation of an EPC show similar variation of definitions as in the case of the reference assessed area of the EPC. The analysis across EUB SuperHub countries reveal that several energy services such as space heating, lighting, ventilation, cooling, etc. are included in the EPC depending on usage of the building. These variations of energy service covered have a decisive impact of the level of comparably of the issued EPC across EU.

| MS | | Energy Services covered |
|---|---|---|
| A (Vbg) | New | Heating, hot water, domestic electricity, (cooling) |
| | In use | Heating, hot water, electricity without process energy, (cooling), |
| HR | Residential | heating and domestic hot water (DHW)<br>Mechanical ventilation is taken into account if exists! |
| | Non - Residential | depends on the non-residential building type:<br>1. office buildings and shops → heating, cooling, and lighting<br>2. educational institutions and other non-residential buildings → heating, and lighting<br>3. hospitals, hotels and restaurants, sports hall → heating, cooling, domestic hot water preparation, and lighting<br>For all non-residential building types, mechanical ventilation is taken into account if exists! |
| FR | | Heating, DHW, cooling, lighting, auxiliary systems. |
| DE | Residential | Heating and domestic hot water (DHW) mechanical ventilation and cooling are taken into account if exists! |

| | | |
|---|---|---|
| | Non - Residential | Heating and domestic hot water (DHW), lighting, Mechanical ventilation and cooling are taken into account if exists! |
| HU | Residential | Heating, DHW, mechanical ventilation and cooling are considered, if exists. Airtightness measurements are not required, but the quality of windows is examined visually by experts on-site and the estimated infiltration is considered in the calculation. |
| | Non - Residential | Heating, DHW and lighting. Mechanical ventilation and cooling are taken into account, if exists. |
| IT | | Thermal and electrical |
| IE | Residential (New) | Space and water heating systems in dwellings must be energy efficient, with efficient heat sources and effective controls. Guidance is given on three main issues: (a) heat generator efficiency; (b) space heating and hot water supply system controls; and (c) insulation of hot water storage vessels, pipes and ducts |
| | Residential (In use) | Space and water heating systems in existing dwellings or extensions to existing dwellings should be energy efficient and have efficient heat sources and effective controls. Guidance is given on three main issues: (a) heat generator efficiency; (b) space heating and hot water supply system controls; and (c) insulation of hot water storage vessels, pipes and ducts. |
| | Non - Residential (New) | Space and water heating systems should be energy efficient and have efficient heat sources and effective controls. Guidance is given on a few main issues: heat generator efficiency; space heating and hot water supply system controls; air conditioning and mechanical ventilation (ACMV); cooling system; ACMV controls; insulation of storage vessels, pipes and ducts; and artificial lighting. |
| | Non - Residential (In use) | Space and water heating systems should be energy efficient and have efficient heat sources and effective controls. Guidance is given on a few main issues: heat generator efficiency; space heating and hot water supply system controls; air conditioning and mechanical ventilation (ACMV); cooling system; ACMV controls; insulation of storage vessels, pipes and ducts; and artificial lighting. |

### 1.2.12 Label classes

The building label classes are introduced by all EU MS as a tool to commentate and classify the building energy performance in an easy, comparable and understandable manner. However, in order to create an EU wide comparable and harmonized EPC it is important to have a unified

rating class system that can be communicated beyond the boundaries of each MS. The analysis of rating label classes used among the EUB SuperHub countries display a wide range of alphabetical and numerical ratings are used to define the building performance. For example, the best rating class used in Italy is the A4 class, while in Croatia and Germany the notion A+ is given for the best preforming building. In Hungary the double AA++ is used. The same is also true to the worst preforming classes. For example the worst class in Croatia, Austria, Ireland and Italy is G. In Germany the rating extends to H up to JJ in Hungary.

| MS | | Label classes |
|---|---|---|
| A (Vbg) | | A++, A+, A, B, C, D, E, F, G, |
| HR | | A+, A, B, C, D, E, F, G |
| FR | Residential | The energy efficiency band, from A to G (A being the most efficient) is determined according to 2 factors: primary energy consumption and emissions of greenhouse gases (GHG). The rating is done based on the label classes. The worse of the 2 scores (energy or GHG) defines the final result. |
| | Non-Residential | The energy efficiency band, from A to I (A being the most efficient) is determined according to 2 factors: primary energy consumption and emissions of greenhouse gases (GHG). The rating is done based on the label classes. |
| DE | | A+, A, B, C, D, E, F, G, H |
| HU | | AA++, AA+, AA, BB, CC, DD, EE, FF, GG, HH, II, JJ |
| IT | | A4, A3, A2, A1, B ,C ,D , E, F, G. |
| IE | | A1, A2, A3, B1, B2, B3, C1, C2, C3, D1, D2, E1, E2, F, G |

### 1.2.13 Performance rating scale

Similar to the wide array of building label classes used in the EPC in several MS, the performance rating scale which determine is achieved label class varies greatly as well. This lack of harmonization among the rating scales and label classes makes the comparability of issued EPC beyond the boundaries of each MS a very complicated task. The analysis of performance rating scale used among the EUB SuperHub countries display a wide range of thresholds. For example to achieve the A+ rating in Austria that building primary energy demand is not exceed thresholds of 70 kWh/m²a. In The France the primary energy demand thresholds of a 70 kWh/m²a is equivalent to an A rating, while in Ireland the primary energy demand of 70 kWh/m²a is equivalent to a B1 rating.

| MS | | Performance rating scale |
|---|---|---|
| A (Vbg) | | Heating energy demand: A++ (max. 10 kWh/m²a), A+(max. 15kWh/m² a), A (max. 30kWh/m²a), B (max. 50 kWh/m²a), C (max. 100 kWh/m²a), D (max. 150 kWh/m²a), E (max. 200 kWh/m²a), F (max. 250 kWh/m²a), G higher<br>Primary energy : A++ (max. 60 kWh/m²a), A+(max. 70kWh/m² a), A (max. 80kWh/m²a), B (max. 160 kWh/m²a), C (max. 220 kWh/m²a), D (max. 280 kWh/m²a), E (max. 340 kWh/m²a), F (max. 400 kWh/m²a), G higher<br>C02: A++ (max. 8 kg/m²a), A+(max. 10kg/m² a), A (max. 15kg/m²a), B (max. 30 kg/m²a), C (max. 40 kg/m²a), D (max. 50 kg/m²a), E (max. 60 kg/m²a), F (max. 70 kg/m²a), G higher<br>Energy efficiency factor: A++ (max. 0,55), A+(max. 0,7), A (max. 0,85), B (max. 1), C (max. 1,75), D (max. 2,5), E (max. 3,25), F (max. 4), G higher |
| HR | | There are two performance rating scales or two energy classes in Croatia:<br>1. energy class expressed as annual energy need for heating per useful floor area (Q''H,nd,ref, kWh/(m2a)) in the reference climate (continental or littoral) (A+≤15, A ≤25, B≤50, C≤100, D≤150, E≤200, F≤250, G>250)<br>2. energy class expressed as annual primary energy pre useful floor area (Eprim, kWh/(m2a)) in the reference climate (continental or littoral) depending on the building type (multi storey residential building, single family house, office building, education institution, hospital, hotel and restaurant, sports hall, shop, other non-residential building) |
| FR | Residential | Primary energy consumption: < 70kWhep/m²/year = label A, < 110kWhep/m²/year = label B, < 180kWhep/m²/year = label C, < 250kWhep/m²/year label = D. Emissions of greenhouse gases: <6kgCO2 eq/m²/year =label A, <11kgCO2 eq/m²/year =label B, <30kgCO2 eq/m²/year =label C, <50kgCO2 eq/m²/year =label D. The thresholds for the labels vary according to location (altitude and climatic zone) for the E, F and G labels. |
| | Non-Residential | Primary energy consumption: < 50kWhep/m²/year = label A, < 90kWhep/m²/year = label B, < 150kWhep/m²/year = label C, < 230kWhep/m²/year label = D, < 330kWhep/m²/year label = E, <450kWhep/m²/year label = F, < 590kWhep/m²/year label = G, < 750kWhep/m²/year label = H, >750kWhep/m²/year label = I. Emissions of greenhouse gases: <5kgCO2 eq/m²/year =label A, <10kgCO2 eq/m²/year =label B, <20kgCO2 eq/m²/year =label C, <35kgCO2 eq/m²/year =label D, <55kgCO2 eq/m²/year =label E, <80kgCO2 eq/m²/year =label F, <110kgCO2 eq/m²/year =label G, <145kgCO2 eq/m²/year =label H, >145kgCO2 eq/m²/year =label I. |

| | |
|---|---|
| DE | based on the annual final energy demand in kWh and ranges from<br>: A+ (max. 30 kWh*/m² year), A (max. 50 kWh/m² year), B (max. 75 kWh/m²<br>year), C (max. 100 kWh/m² year), D (max. 130 kWh/m² year), E (max. 160 kWh/m² year), F (max. 200 kWh/m² year), G (max. 250 kWh/m² year) H (over. 250 kWh/m² year) |
| HU | AA++ "Minimum energy requirements"<br>calculated energy consumption value below 40 KWh/m²<br>AA+ "Outstandingly high energy efficiency"<br>calculated energy consumption between 40 and 60 KWh/m²a<br>AA “Better than the 'NZEB’ energy demand requirement”<br>calculated energy consumption between 61 and 80 KWh/m²a<br>BB "Meets ‘NZEB’ energy requirements"<br>calculated energy consumption between 81 and 100 KWh/m²a<br>CC "Modern"<br>calculated energy consumption between 101 and 130 KWh/m²a<br>DD "Close to modern"<br>calculated energy consumption between 131 and 160 KWh/m²a<br>EE "Better than average"<br>calculated energy consumption between 161 and 200 KWh/m²a<br>FF "Average"<br>calculated energy consumption between 201 and 251 KWh/m²a<br>GG "Close to average"<br>calculated energy consumption between 251 and 310 KWh/m²a<br>HH "Weak"<br>calculated energy consumption between 311 and 400 KWh/m²a<br>II "Bad"<br>calculated energy consumption between 401 and 500 KWh/m²a<br>JJ 'Extremely bad'<br>calculated energy consumption value above 500 KWh/m²a |
| IT | A4 < 0,40 EPgl,nren,rif,standard (2019/21),0,40 EPgl,nren,rif,standard (2019/21)<br><A3 =< 0,60 EPgl,nren,rif,standard (2019/21)<br>0,60 EPgl,nren,rif,standard (2019/21) <<br>A2 =< 0,80 EPgl,nren,rif,standard (2019/21)<br>0,80 EPgl,nren,rif,standard (2019/21) <<br>A1 =< 1,00 EPgl,nren,rif,standard (2019/21)<br>1,00 EPgl,nren,rif,standard (2019/21) <<br>B =< 1,20 EPgl,nren,rif,standard (2019/21)<br>1,20 EPgl,nren,rif,standard (2019/21) < |

| | |
|---|---|
| | C =< 1,50 EPgl,nren,rif,standard (2019/21)<br>1,50 EPgl,nren,rif,standard (2019/21) <<br>D =< 2,00 EPgl,nren,rif,standard (2019/21)<br>2,00 EPgl,nren,rif,standard (2019/21) <<br>E =< 2,60 EPgl,nren,rif,standard (2019/21)<br>2,60 EPgl,nren,rif,standard (2019/21) <<br>F =< 3,50 EPgl,nren,rif,standard (2019/21)<br>G> 0,40 EPgl,nren,rif,standard (2019/21),<br>EPgl,nren,rif,standard (2019/21)= Non-renewable primary energy index of the standard reference building, built with 2019/2021 limits and standard technologies, or a reference building with which to compare the energy certification building |
| IE | The BER a quantifies the $CO_2$ output in Kg of $CO_2$ per $m^2$ per annum ($kg/CO_2/m^2/yr$) on scale of best (0 $kg/CO_2/m^2/yr$ ) to worst (>120 $kg/CO_2/m^2/yr$) and the primary energy consumption in $kWh/m^2/yr$ as per following the scales:<br>A1 < 25 , A2 > 25, A3 > 50 , B1 > 75 , B2 > 100, B3 > 125, C1 > 150, C2 > 175, C3 > 200, D1> 225, D2 > 260, E1 > 300, E2 > 340, F > 380, G > 450 |

### 1.2.14 Global Energy Performance Indicators

| MS | Global Energy Performance Indicators |
|---|---|
| A (Vbg) | HWB (Heating demand), EEB (Final energy demand), PEB (Primary energy demand), CO2 (Carbon dioxide emissions), (OI: Oekoindex describes the ecological quality of the thermal building envelope. It is formed by the share of non-renewable primary energy (PENRT), global warming potential (GWP) and the acidification potential AP of the building materials. (The lower the OI value, the less the building pollutes the environment) |
| HR | Annual energy needs for heating for the reference climatic data per useful floor area [kWh/(ma)]<br>Annual primary energy for the reference climatic data per useful floor area [kWh/(m2a)] |
| FR | Primary energy consumption [$kWhpe/m^2$/ year] and greenhouse gases emission [kgCO2 eq/$m^2$/year]. |
| DE | Primary and final energy (kWh/$m^2$. a) + specific transmission heat loss (W/$m^2$. K) + greenhouse gas (GHG) emissions (kg CO2 equivalent /$m^2$.a) |
| HU | Primary energy consumption (kWh/$m^2$. a),<br>Building energetic attribute/performance (in %) |
| IT | Non-renewable primary energy, CO2 emission, Renewable primary energy |
| IE | CO2 emission and primary energy demand |

### 1.2.15 Compulsory performance values

| MS | | Compulsory performance vales |
|---|---|---|
| A (Vbg) | | Heat-transferring components, Heating demand, primary energy and CO2 need minimum values, also renewable Heating proportion, summer thermal insulation, requirement for electrical resistance heating, requirement for heat recovery, highly efficient alternative energy systems, requirement for central heat provision and heat distribution |
| HR | Residential | Maximum allowed heat transmission coefficient U [W/(m2K)] for building elements of new buildings<br>Maximum allowed annual energy need for heating per useful floor area [kWh/(m2a)]<br>Maximum allowed annual primary energy per useful floor area [kWh/(m2a)] |
| | Non-Residential | - Maximum allowed heat transmission coefficient U [W/(m2K)] for building elements<br>- Maximum allowed annual energy need for heating per useful floor area [kWh/(m2a)]<br>- Maximum allowed annual primary energy per useful floor area [kWh/(m2a)] |
| FR | Residential | Properties with an F and G rating are considered as "energy leak". They will have to comply with new obligations such as the establishment of an energy audit in the context of a future sale from 1 January 2022. |
| | Non-Residential | The "Tertiary Eco Energy" scheme stipulates that all or part of the buildings (public or private) which house tertiary activities, and whose cumulative floor area is equal to or greater than 1000 m², must reach a threshold energy consumption per decade, defined according to the category of building (absolute value) or by default, gradually reduce its energy consumption by 40% in 2030, 50% in 2040 and 60% in 2050. |
| DE | Residential | Compliance with summer heat protection values + The primary energy of the building must not exceed 0.75 times the primary energy requirement of the reference building + Compliance with the specific transmission heat loss requirements of the building envelope |
| | Non-Residential | The primary energy of the building must not exceed 1.4 times the primary energy requirement of the reference building + Compliance with the mean heat transfer coefficient requirements of the building envelope (a 25% deviation over the higher the value of the reference building can be tolerated) |

| | | |
|---|---|---|
| HU | | A number of minimum performance levels exist for use of renewable energy sources, fabric insulation, air tightness, air heat generator, building services controls, insulation of pipes, ducts and vessels, ventilation, minimum requirements on fresh air supply and thermal comfort values. |
| IT | | In case the building is a new construction or a new building the mandatory limits in the case of energy upgrading to be respected are different and are imposed by values in DM 26/06/2015. |
| IE | Residential (New) | A number of minimum performance levels exist for use of renewable energy sources, fabric insulation, air tightness, heat generator, building services controls, insulation of pipes, ducts and vessels, mechanical ventilation systems, limiting heat gains and performance of the completed dwelling. The minimum performance levels are set to ensure reasonable levels of performance for all factors affecting energy use. |
| | Residential (In use) | A number of minimum performance levels exist for fabric insulation, air tightness, heat generator, building services controls, and the insulation of pipes, ducts and vessels. The minimum performance levels are set to ensure reasonable levels of performance for all factors affecting energy use. |

### 1.2.16 Minimum share of renewable energy

| MS | Minimum share of renewable energy |
|---|---|
| A (Vbg) | The requirement of the minimum level of energy from renewable sources in new construction and major renovation of a building is fulfilled if at least one of the following points from a) or b) is applied:<br>(a) use of renewable sources outside the 'building' system boundaries:<br>- At least 50 % of the required heat demand for space heating and hot water shall be covered by biomass, a heat pump or by district heating from a heating plant based on renewable energy sources or high-efficiency CHP and/or waste heat, in compliance with the requirements for the maximum permissible heating energy demand applicable for this purpose;<br><br>(b) use of renewable sources by generating on-site or nearby yields:<br>- Net final energy yields at the site or in the vicinity of at least 10 % of the final energy demand for hot water without these active measures shall be generated by active measures, such as solar thermal energy;<br>- Active measures, such as photovoltaics, must generate net final energy yields at the site or in the vicinity of at least 10 % |

| | | |
|---|---|---|
| | | of the final energy demand for household electricity or operating electricity without these active measures;<br><br>- Through active measures, such as heat recovery, net final energy yields at the site or in the vicinity of at least 10 % of the final energy demand for space heating are to be achieved without these active measures;<br>• Equivalent to the three aforementioned options is the reduction of the maximum permissible final energy demand or the maximum permissible energy performance factor fGEE for the new building by at least 5 % through any combination of measures of solar thermal energy, photovoltaics, heat recovery or efficiency improvements. |
| HR | New Building (NZEB) | ≥ 30 % of annual delivered energy for the operation of technical building system |
| | Existing building undergoing major renovation | ≥ 10 % of annual delivered energy for the operation of technical building system |
| FR | Residential | It must be demonstrated that the contribution of renewable energy to the building's energy consumption is greater than or equal to 5 kWhpe/(m². year) |
| | Non-Residential | No |
| DE | Residential | 15% of thermal energy |
| | Non-Residential | 15% of thermal energy mandatory only for publicly owned building that undergo major renovation |
| HU | | 25% of the energy need of the building should be covered from renewable energy sources for the building to qualify to NZEB standard – category “BB” (mandatory since 2021). The 25% share is compared to the calculated value of the specific yearly primary energy. |
| IT | New | 50% for thermal primary energy;<br>The minimum electrical power to be installed is linked to the national legislation (it depends from the covered surface of the building). |
| | In use | No |

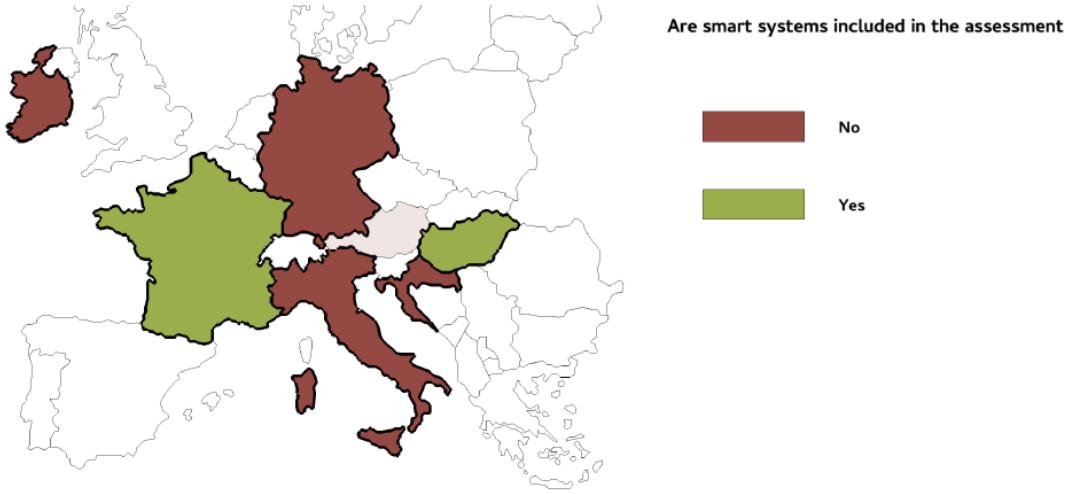
| | | |
|---|---|---|
| IE | Residential | The minimum share of renewable energy required in a dwelling is based on a Renewable Energy Ratio (RER). Where the MPEPC of 0.3 and MPCPC of 0.35 are achieved, a RER of 0.20 represents 20% of the primary energy provision from renewable energy technologies. |
| | Non-Residential | The minimum share of renewable energy required in a dwelling is based on a Renewable Energy Ratio (RER). Where the MPEPC of 1.0 and MPCPC of 1.15 is achieved an RER of 0.20 represents 20% of the primary energy provision from renewable energy technologies. Where an EPC of 0.9 and a CPC of 1.04 is achieved, an RER of 1.0 represents 10% of the primary energy provision from renewable energy technologies. |

### 1.2.17 Inclusion of Smart systems in the calculation of EPC

ANNEX IA of the EPBD outline that the commission shall establish a methodology t to evaluate the smart readiness of the buildings. The methodology shall rely on three key functionalities relating to the building and its technical building systems:

A. the ability to maintain energy performance and operation of the building through the adaptation of energy consumption for example through use of energy from renewable sources;
B. the ability to adapt its operation mode in response to the needs of the occupant while paying due attention to the availability of user-friendliness, maintaining healthy indoor climate conditions and the ability to report on energy use; and
C. the flexibility of a building's overall electricity demand, including its ability to enable participation in active and passive as well as implicit and explicit demand response, in relation to the grid, for example through flexibility and load shifting capacities

This analysis examined whether the existing EPC issued in the countries of the EUB SuperHub consortium already account for the existence of smart systems in the EPC. The analysis showed that with exception of Hungary, France and Italy no other countries include the smart systems in their EPC calculation.

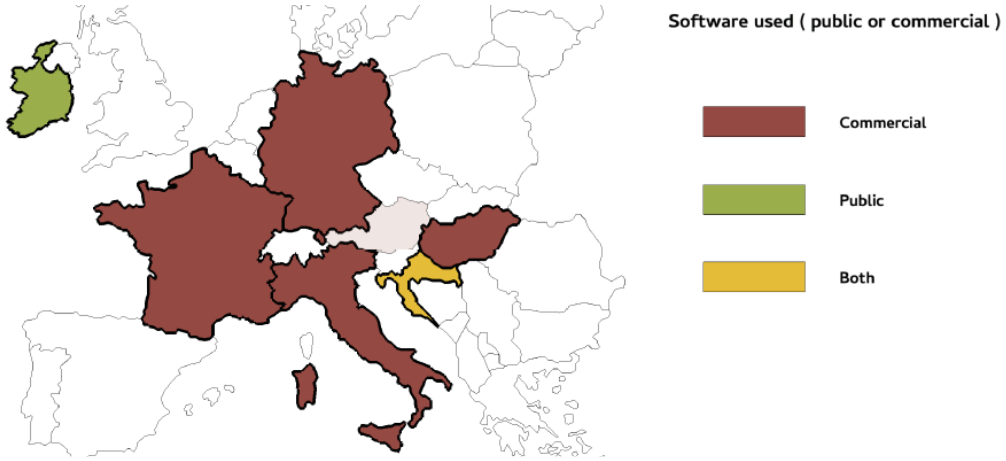



| MS | | Are smart systems included in the assessment |
|---|---|---|
| A (Vbg) | | No |
| HR | | No |
| FR | | Yes, in a limited extent |
| DE | | No |
| HU | | Yes, smart devices or controllers are being checked/assessed above certain energy class which is: >= BB (NZEB equivalent) |
| IT | New | No |
| | In use | No, but indirectly.<br>In the energy estimation in asset operational (rating A3 of the UNi 11300) of the building carried out during operation through consumption, the control and automation systems (BACS) that reduce the consumption of the building itself are also considered, therefore their quantification takes place through the calculation of the reduction of consumption. For example, control and automation systems, by adjusting the user profiles, the amount of lighting through presence sensors, temperature probes, CO2 probes automatic opening of windows, etc, affect the energy savings of the building. |
| IE | | No, based on the definition of a smart system as something which incorporates functions of sensing, actuation and control in order to describe and analyse a situation and make decisions based on the available data in a predictive or adaptive manner |

### 1.2.18 Software used (public or commercial)

To ensure the consistency of the EPC results generated by an assessor, it is important to ensure that all software used assessor to calculate the EPC follow the same calculation methodology. This can be obtained by having either single official software that is used by all the EPC assessor, or via

providing a range of officially certified EPC software solutions that the assessors can choose from. In all member states, either official or private EPC software are available. Among the EUB SuperHub project partner countries only Hungary, uses a wide range uncertified private EPC software, while the rest of the countries have either an official software or a private certified software.

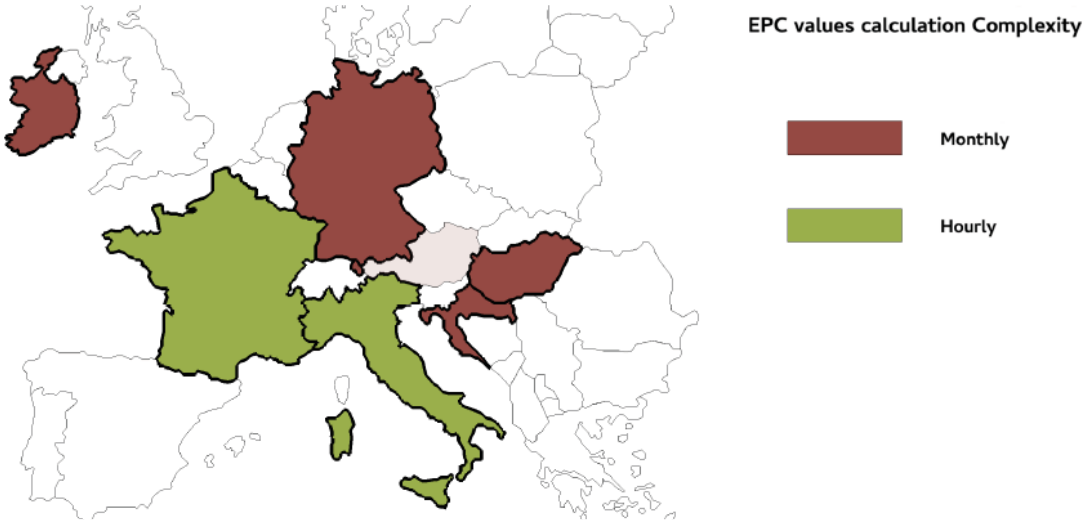



| MS | | Software used (public or commercial) |
|---|---|---|
| A (Vbg) | | Certified commercial software |
| HR | | Both public and commercial software (approved by the Ministry of Physical Planning, Construction and State Assets) are accepted |
| FR | | Commercial EPC software |
| DE | | Certified commercial software as per the DIN V 18599 |
| HU | | Commercial EPC software |
| IT | | Certified commercial software CTI. |
| IE | Residential | The public software DEAP 4.2.0 is a web-based tool provided to support the Domestic Energy Assessment Procedure (DEAP) used for BER calculations |
| | Non-Residential | Simplified Building Energy Model for Ireland (SBEMie) is public software provided to support the Non-Domestic Energy Assessment Procedure (NEAP) for calculating a BER for non-domestic buildings. |

### 1.2.19 Complexity of EPC Calculation Methodology

The MSs are free to select the EPC calculation methodology as long as it follows the general guidelines of the EPBD. As a result, several EPC calculation methodologies are used across the EU, which in return make the

result of the EPCs incomparable across the EU. It goes without saying the quality of the EPC results are very much depended on the accuracy on the input data. However, having more accurate input data would usually result in increasing the cost and time required to develop an EPC. Thus, we observe that among the EUB SuperHub project partner countries, most of the MSs follow the less demanding and subsequently less accurate simplified quasi-steady state calculation as per the EN ISO 13790 and DIN 18599 that balances the energy demand based on monthly averages while a few MSs follow the more demanding dynamic hourly energy balancing simulation method.




| MS | EPC values calculation Complexity |
|---|---|
| A (Vbg) | Monthly |
| HR | For the calculation of energy need for space heating and space cooling, the hourly method is used but only for a characteristic day in a month |
| FR | Hourly |
| DE | Monthly |
| HU | Monthly |
| IT | Hourly |
| IE | Monthly |

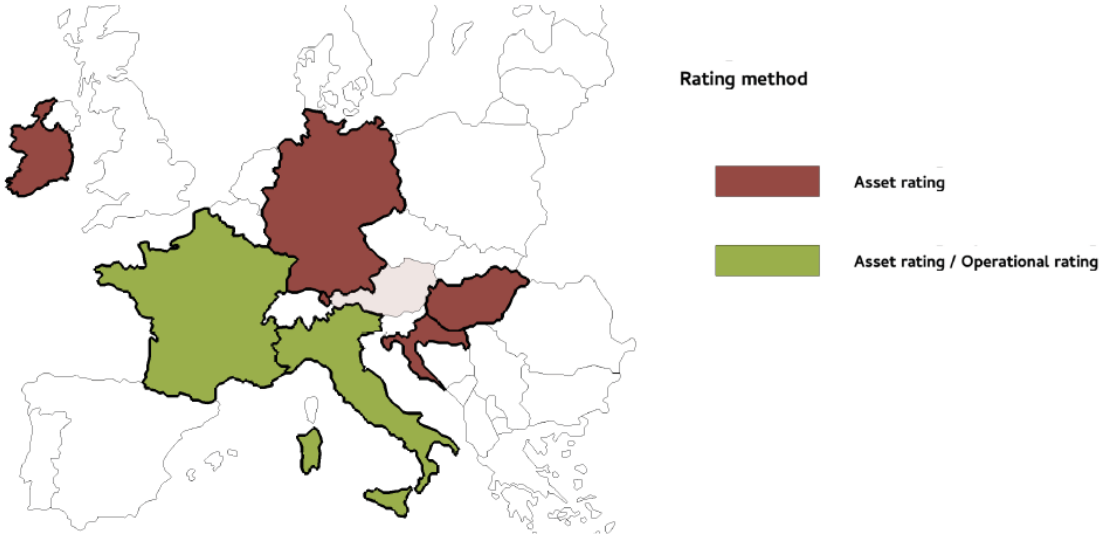
### 1.2.20 Source of input data for the energy calculation

The quality of the EPC is very much dependent the quality of input data. Having clear and reliable information about the building envelope and technical systems is a straightforward procedure in case of issuing an EPC for a newly built building. However, in the case of existing building such information is not always readily available and might be hart get. Therefore, serval nations introduce a set of default values that can be used by the energy assessor in order to fill in the information gap and to ensure that all issued EPC uses the same set of default values. However, it is to ensure the validity of the data used to evaluate the condition of a building envelope and technical systems accurately, a mandatory onsite visit by the energy assessor to the building is foreseen in some but not all MSs. Onsite inspection allows for producing a reliable EPCs as the assessor is able to verify on the spot the building technical and structural elements. Moreover, the site visit allows the assessor to provide more accurate and realistic renovation recommendations and user behaviour adjustment to the client.

| MS | | Source of input data for the energy calculation? (onsite visit, default values, project documentation, etc) |
|---|---|---|
| A (Vbg) | | Default values and project documentation |
| HR | | data collected during an onsite visit, project documentation |
| FR | | Project documentation |
| DE | Residential | Project documentation and default values from the norm DIN 18599 |
| | Non-Residential | onsite visit (voluntary): usually through the use of the project documentation, default values can be used, energy bills of the last 3 years |
| HU | | Default values for input data, building blue prints. The On-site<br>inspection and inclusion of photographs is mandatory |
| IT | New | onsite visit, default values, project documentation |
| | In use | onsite visit, default values, project documentation, energy bills of the last 3 years |
| IE | New | Onsite visit, Project documentation |
| | In use | Onsite visit, project documentation and default values are used extensively and are primarily based on the age of the building. |

### 1.2.21 Rating method

For the calculation of the EPC two primary rating methods are used across the EU, which are operational rating and asset rating methods. The operational rating uses the actual metered data of the building to determine the energy rating class of the building. The asset rating predicts the energy consumption of the building based on energy simulation. Thus, the asset rating is widely used to predict the energy demand of newly built building as no metered data are available. Some MSs uses the asset rating method to calculate the energy demand of existing building as well. The disadvantage of asset rating especially in the case of issuing an EPC for an existing building is that it the result can show a large discrepancy between the actual and predicted energy consumption values, thus in a way misguiding the end user. In other MS such as Germany the assessor is generally free to use either an asset rating or an operational rating for existing buildings, however, the drawback of such a method is the fact that end user would and the assessor cannot make an accurate judgment about condition of the building technical and structural elements and/or on the user behaviour patterns as well as the number of users of the property which can significantly influence the end result of the EPC.




| MS | | Rating method |
|---|---|---|
| A (Vbg) | | Asset rating |
| HR | | Asset rating |
| FR | New | Asset rating |
| | In use | Asset rating for buildings built after 1948.For older buildings: operational rating. |

| | | |
|---|---|---|
| DE | New | Asset rating |
| | In use | Asset rating required only for small residential building constructed before 11.1977 other buildings can chose asset or operational rating (operational rating based on the energy consumption of the last 3 years ) |
| HU | | Asset rating |
| IT | New | Asset rating |
| | In use | Operational rating |
| IE | | Asset rating. |

## 1.3 A cross-analysis comparison of the EPC visibility aspects across the pilot MS

This chapter represent an in-depth analysis of the various mechanisms used by the the EUB SuperHub consortium countries that contribute to the visibility, acceptance, understanding of the EPCs. Hence, the analysis looks at the type of information contained at the EPC, the availability of an open public database of issued EPCs and energy assessors as well as best practices, the degree of compliance with providing the EPC in the real-estate advertisement and the use of advanced technologies the such as GIS maps and digital application to view the EPCs as well as the availability of active promotional campaigns and workshops to promote the use of EPCs for the inhabitants.

### 1.3.1 Key Information contained in the EPC

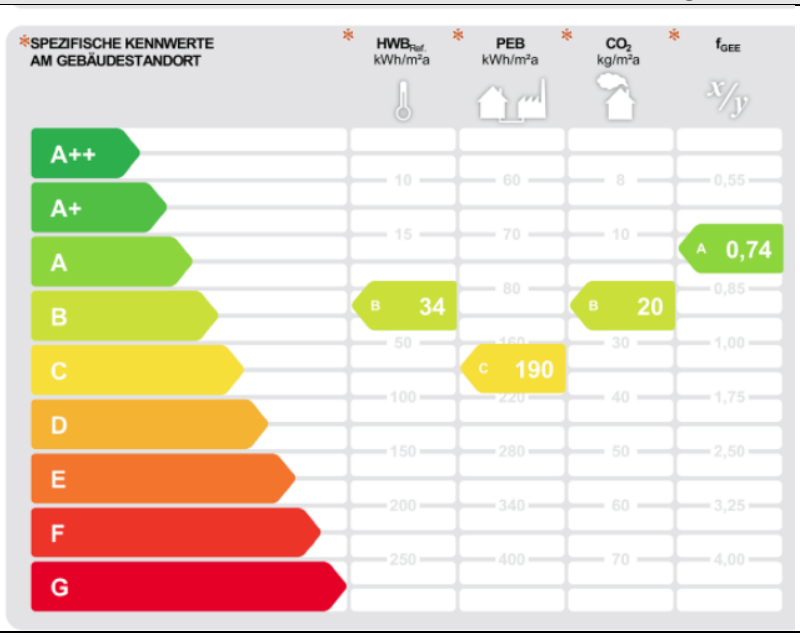
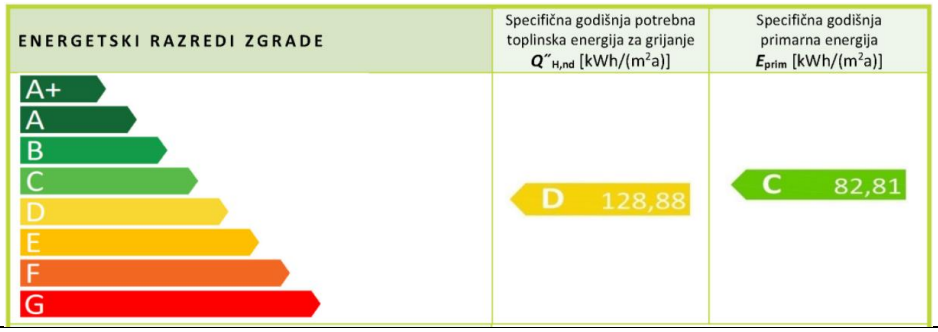
The good communication of the results of the EPC is directly related the amount and readability of information the EPC contain. Generally, the more information that the EPC provide the better the end user is able to make an educated judgment on the condition of the real-estate. However, it must be noted that it is almost always the case that information presented in the EPC contain very abstract and very specific information that end user is hardly able to make a meaningful use of them. For example, most EPCs indicate the amount of greenhouse gas emissions in Kg CO- equivalent. This unit though scientifically accurate and reflect an important aspect of the building, it is hard to interpret by the end user as such units are rarely used in daily life.

| MS | | Key information contained in the EPC |
|---|---|---|
| A (Vbg) | | Reference heating demand, primary energy demand, carbon dioxide emissions, energy performance factor, achieved rating class |
| HR | Residential | calculated annual energy needs for heating per useful floor area [kWh/(m2a)],<br>calculated annual primary energy per useful floor area [kWh/(m2a)], achieved rating class |
| | Non-Residential | calculated annual energy needs for heating per useful floor area [kWh/(m2a)],<br>calculated annual primary energy per useful floor area [kWh/(m2a)], calculated annual primary energy per useful floor area [kWh/(m2a)] after implementation of the recommended energy saving measures, achieved rating class |
| FR | | Reference of the EPC, issue and expiry date, photo of the building, building address, type and use, construction year, assessed area, name and address of the building owner, two colour-coded scales from A to I (A being the most efficient |

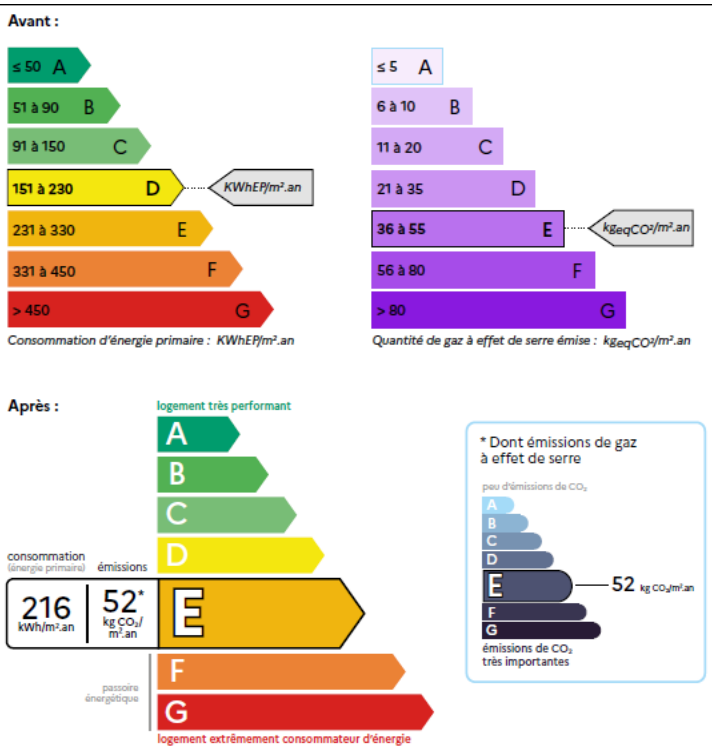
| | |
|---|---|
| | with the lowest primary energy consumption in the first scale and A being the most efficient with the lowest emissions of greenhouse gases in the second one), information about the assessor. |
| DE | Greenhouse gas emissions in Kg CO2 - equivalent / (m2.a), Final energy demand in kWh/(m2.a), Primary energy demand in kWh/(m2.a),<br>Energetic quality of the building envelops (W / (m2.K), Share of renewable energies used to cover the heating and cooling energy demand (%), Compliance with summer thermal insulation (for new buildings only), achieved rating class |
| HU | First page is the quality controlled (centrally) official part, and overview of the building: admin info, cultural heritage (yes/no), primary energy consumption, rating class e..g BB (equivalent to NZEB), certification method (whole building or building part e.g. dwelling, calculation), reason of the certification (e.g. sale), retrofit options (a summary)<br><br>Second page: building type (e.g. flat), primary energy consumption, rating class, building age, building floors (in numbers), calculation method (simplified or detailed) |
| IT | Performance rating of the building envelope in summer and winter, Active services covered (winter and summer air conditioning, domestic hot water supply, lighting, ventilation and transport of people), Non-renewable primary energy value, Comparison non-renewable primary energy value through a reference building as if the certified existing building were calculated as a new construction, achieved rating class |
| IE | Software used to rate home; BER rating; home address; BER number; BER assessor number; assessor company number; BER rating A-G; CO2 emissions for the building |

### 1.3.2 Presentation of the EPC label classes rating

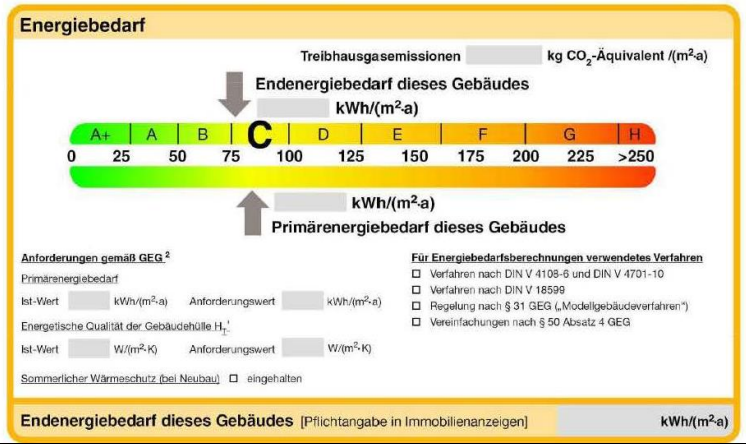
Several EPC represent the rating class of the building using various colour scales (usually from green to dark red) and diagrams (a ladder or sliding bar). The analysis shows that the ladder shaped diagram that cascade from the best rating at the top of the ladder to the worst rating at its bottom supplemented with an arrow to indicate the achieved rating class of the building appear to be the most widely used method to present the rating classes. This choice is rather understandable as it resembles the efficiency rating class used for electrical appliances.

| MS | EPC label classes rating |
|---|---|
| A (Vbg) |  |
| HR |  |

FR

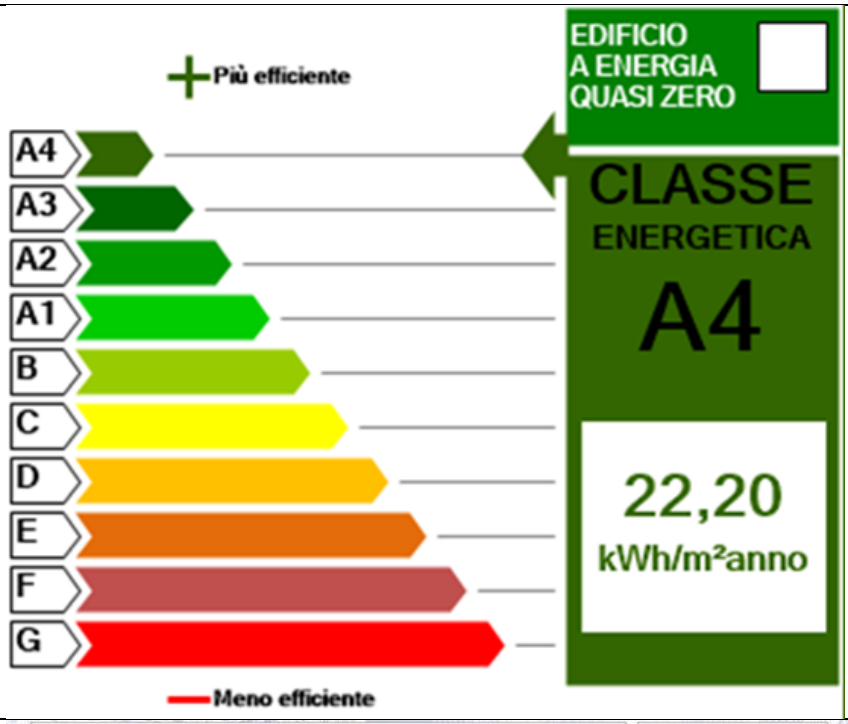
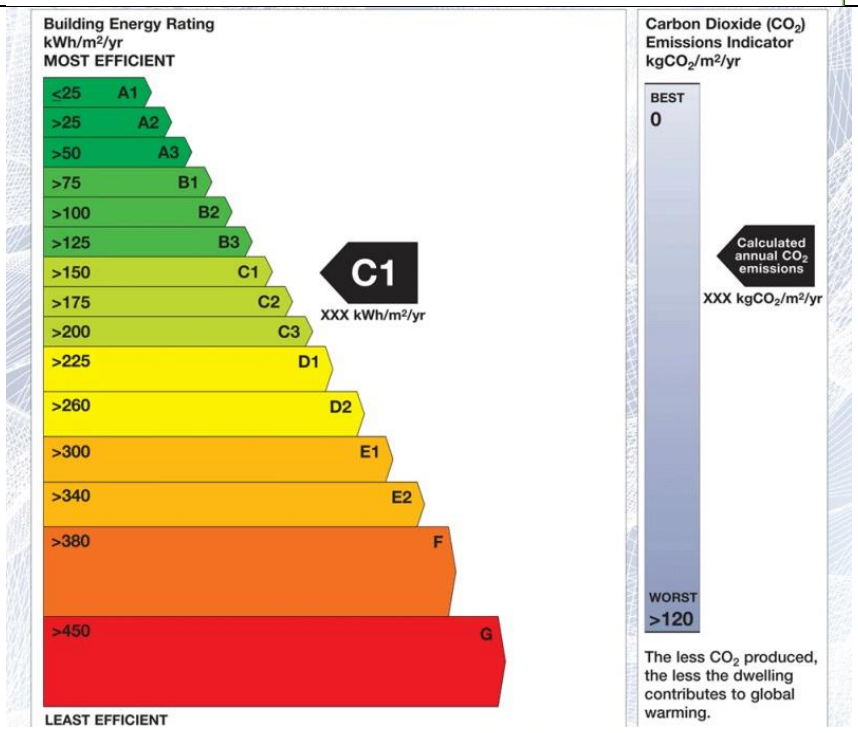

Avant :
≤ 50 A
51 à 90 B
91 à 150 C
151 à 230 D
231 à 330 E
331 à 450 F
> 450 G
KWhEP/m².an
Consommation d'énergie primaire : KWhEP/m².an
≤ 5 A
6 à 10 B
11 à 20 C
21 à 35 D
36 à 55 E
56 à 80 F
> 80 G
kgeqCO²/m².an
Quantité de gaz à effet de serre émise : kgeqCO²/m².an
Après :
logement très performant
A
B
C
D
E
F
G
consommation (énergie primaire)
émissions
216 kWh/m².an
52* kg CO₂/m².an
passoire énergétique
logement extrêmement consommateur d'énergie
* Dont émissions de gaz à effet de serre
peu d'émissions de CO₂
52 kg CO₂/m².an
émissions de CO₂ très importantes

DE


Energiebedarf
Treibhausgasemissionen kg CO2-Äquivalent /(m²a)
Endenergiebedarf dieses Gebäudes
kWh/(m²a)
A+ A B C D E F G H
0 25 50 75 100 125 150 175 200 225 >250
kWh/(m²a)
Primärenergiebedarf dieses Gebäudes
Anforderungen gemäß GEG
Primärenergiebedarf
Ist-Wert kWh/(m²a) Anforderungswert kWh/(m²a)
Energetische Qualität der Gebäudehülle
Ist-Wert W/(m²K) Anforderungswert W/(m²K)
Sommerlicher Wärmeschutz (bei Neubau) eingehalten
Für Energiebedarfsberechnungen verwendetes Verfahren
Verfahren nach DIN V 4108-6 und DIN V 4701-10
Verfahren nach DIN V 18599
Regelung nach § 31 GEG („Modellgebäudeverfahren")
Vereinfachungen nach § 50 Absatz 4 GEG
Endenergiebedarf dieses Gebäudes [Pflichtangabe in Immobilienanzeigen]
kWh/(m²a)

HU

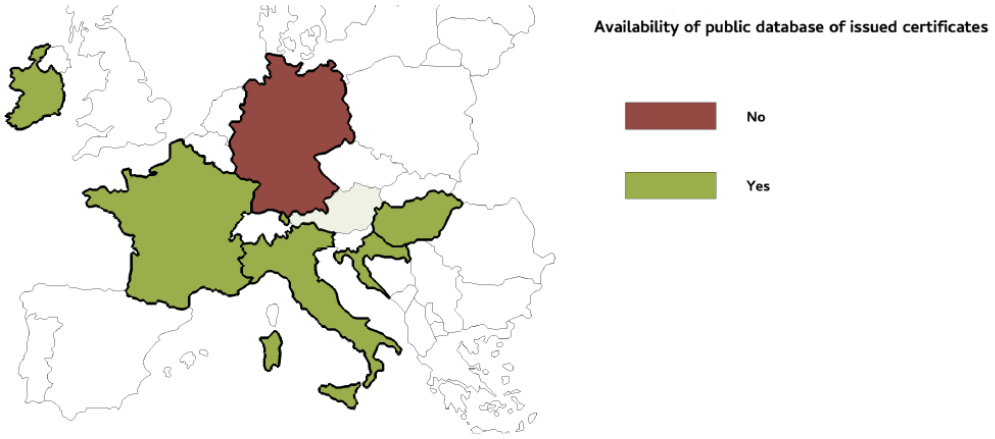

Az energetikai tanúsítvány kategóriái
2016. január 1-jétől érvényes energetikai minőség szerinti besorolás:
AA++ <40% - Minimális energiaigényű
AA+ 40-60% - Kiemelkedően nagy energiahatékonyságú
AA 40-60% - Közel nulla energiaigényre vonatkozó követelménynél jobb
BB 61-80% - Közel nulla energiaigényre vonatkozó követelményeknek megfelelő
CC 101-130% - Korszerű
DD 131-160% - Korszerűt megközelítő
EE 161-200% - Átlagosnál jobb
FF 201-250% - Átlagos
GG 251-310% - Átlagost megközelítő
HH 311-400% - Gyenge
II 401-500% - Rossz
JJ >500% - Kiemelkedően rossz

| | |
|---|---|
| IT |  |
| IE |  |

### 1.3.3 Availability of public database of issued certificates

The EBPD of 2018 mention the introduction of database for compliance checking and for producing statistics on the regional or national building stocks. Moreover, the EPBD it states in paragraph 6b the “At least aggregated anonymised data compliant with Union and national data protection requirements shall be made available on request for statistical and research purposes and to the building owner”.

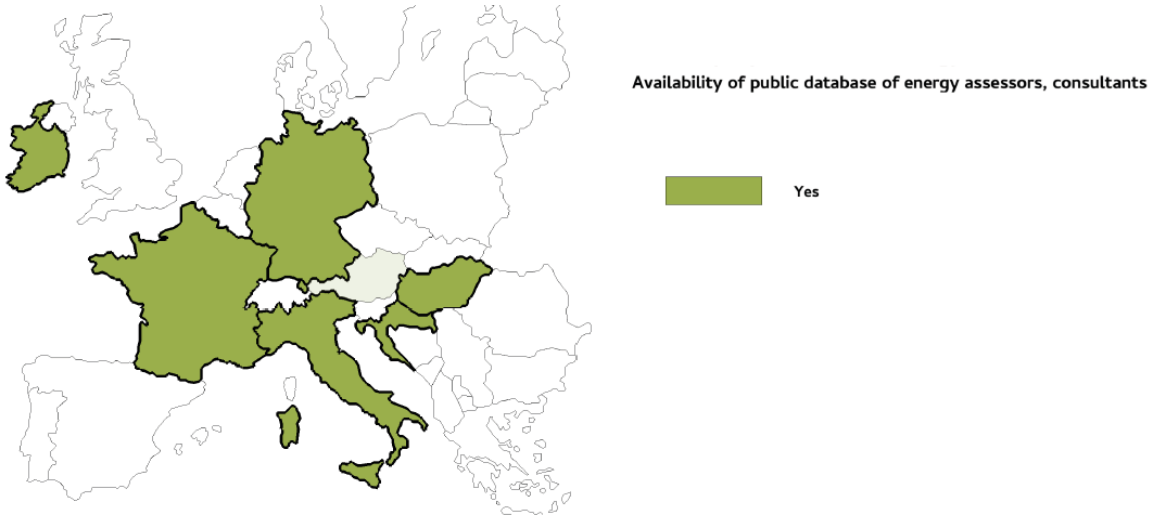
The analysis across the EUB Super Hub partners shows that most member states maintain database of issued EPC and provide an access to the issued EPC to the general public. However, the amount of information that can be retrieved from these databases is usually limited to some key information such as the building rating class, the building address and the validity of the EPC. In some cases, like in Germany, the access to the EPC database is not granted to the general public.




| MS | Availability of public database of issued certificates |
|---|---|
| A (Vbg) | Yes, in the Energieausweiszentrale |
| HR | All issued certificates are publicly available, only data which refers to owner (owner's name) of the building/building unit are not visible due to the GDPR (General Data Protection Regulation) |
| FR | Yes |
| DE | No. the data base is not open for public |
| HU | Yes |
| IT | Public databases present in regional platforms with the possibility of extraction and consultation of data by citizens, notaries and other certifiers; ENEA manages the database at national level |
| IE | Yes, the national BER Register |

### 1.3.4 Availability of public database of energy assessors, consultants

Due to the ever-changing regulation related to the EPC, it might be challenging for the property owner to find a qualified and certified energy assessor that is best suited for their needs. Therefore, having a public database of qualified and certified energy assessor that is managed by public or professional association is helpful for both the assessor and their client to make the correct match. The analysis show that such a database is widely used and available across the EUB SuperHub countries




| MS | Availability of public database of energy assessors, consultants |
|---|---|
| A (Vbg) | Yes, in the Energieausweiszentrale |
| HR | Two lists of certificate assessors (natural persons, legal entities) are publicly available on the web site of the IEC register (natural persons and legal entities are listed separately in 2 different pdf files) https://eenergetskicertifikat.mgipu.hr/login.html |
| FR | Yes |
| DE | Yes but the list managed by local professional associations (i.e Bavarin chamber of architects ) |
| HU | Yes (chamber of architects, chamber of engineer's registers) |
| IT | Certified databases in the respective regional portals |
| IE | Yes |

### 1.3.5 Use of EPC Certificate advertisement of real-estate

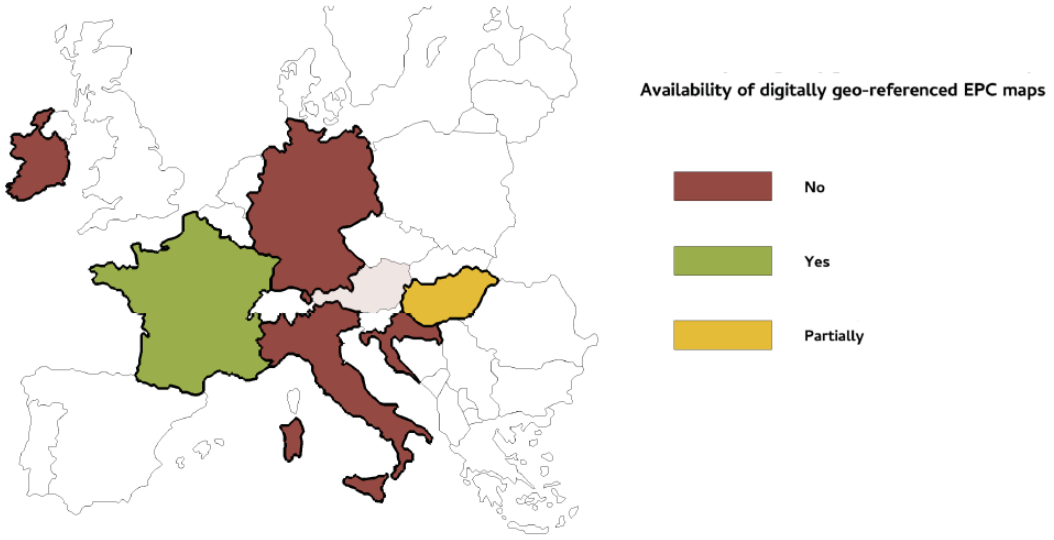
Article 12 of the EPBD requires the MSs to display the energy performance indicator of the energy performance certificate in all real-estate advertisements; however, it does not outline compliance mechanisms. As a result, the analysis shows that among the EUB SuperHub countries there is a varying degree of compliance with the Article 12 of the EPBD.

| MS | Use of EPC Certificate advertisement of real-estate |
|---|---|
| A (Vbg) | The energy performance indicator (energy label) should be stated in commercial media, but you may find advertisements without energy label class in local newspapers. There is no control mechanism for advertisements. |
| HR | When a building (or building unit) (either new or in-use) is offered for sale or rent, the energy performance indicator (energy label) has to be stated in commercial media. However, it is still possible to find some advertisements without energy label class stated. There is no control mechanism in real estate advertisements and it is possible to advertise without stated energy label class! |
| FR | Yes |

| | |
|---|---|
| DE | Yes, it is mandatory by law to indicate the final energy values for heating (and electricity for non-residential buildings) |
| HU | Yes, it is mandatory (only the rating category e.g.: "BB") by law but it's hardly implemented in the market as it is neither controlled nor sanctioned. |
| IT | Yes, it is required by law and provides a non-renewable primary energy value of the building |
| IE | Yes |

### 1.3.6 Availability of digitally geo-referenced EPC maps

Linking the EPC database to a digital GIS map helps to attract investments and developing a targeted local renovation policy's and improves the overall transparency of the EPC. Although, most EPC contains the geo referencing coordinates for the buildings, among the EUB SuperHub countries a dedicated GIS map server is available only in France.



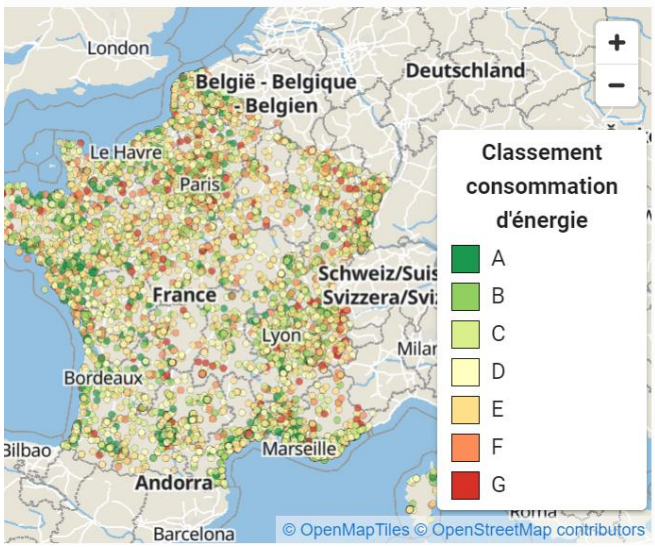
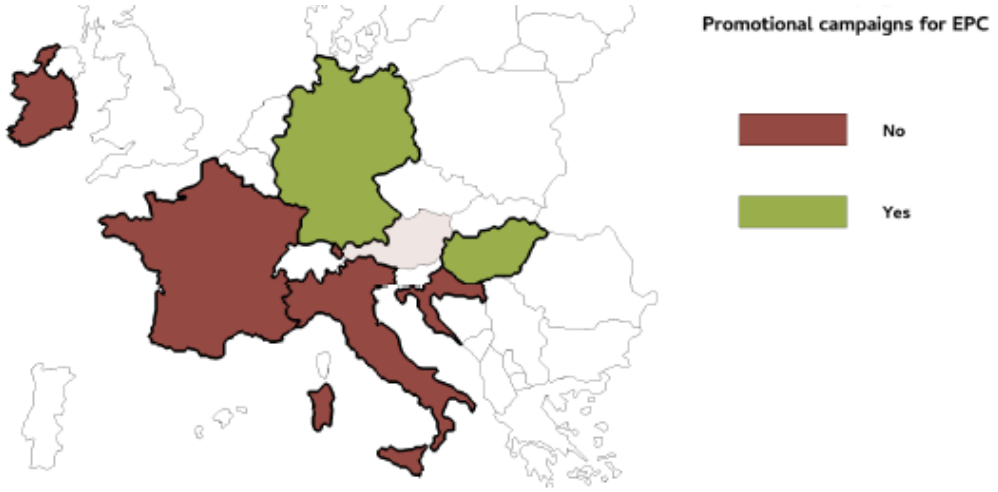




*Figure 10: A screen shot of the French EPC system showing the use of georeferenced maps to display the location of EPCs*

| MS | Availability of georeferenced EPC maps |
|---|---|
| A (Vbg) | No |
| HR | No |
| FR | Yes, on the French Environment and Energy Management Agency (ADEME) open database (data.ademe.fr/datasets/dpe-france). |
| DE | No |
| HU | Partially. The online data base allows to view the certificate (and places the building on a map), however it is not a map server service |
| IT | No, each EPC contain the coordinates for geo referencing, however, no maps are available |
| IE | No |

### 1.3.7 Promotional campaigns for EPC

Article 20 of the EPBD instruct the MSs to take necessary measures to inform the owners or tenants of buildings about the EPCs and the Commission commit itself to assist Member States in staging information campaigns. However, the analysis shows that there are EPC related information campaigns are rarely implemented among the EUB SuperHub countries.




| MS | Promotional campaigns for EPC |
|---|---|
| A (Vbg) | No |
| HR | In 2010 to 2012 – not any more |
| FR | No |
| DE | Yes, mainly via the KFW bank (German state investment and development bank) and dena (German energy agency) |
| HU | Yes, The Ministry for National Development has adopted the Action Plan to Improve Awareness for Energy Efficiency and Climate Protection in 2015. |

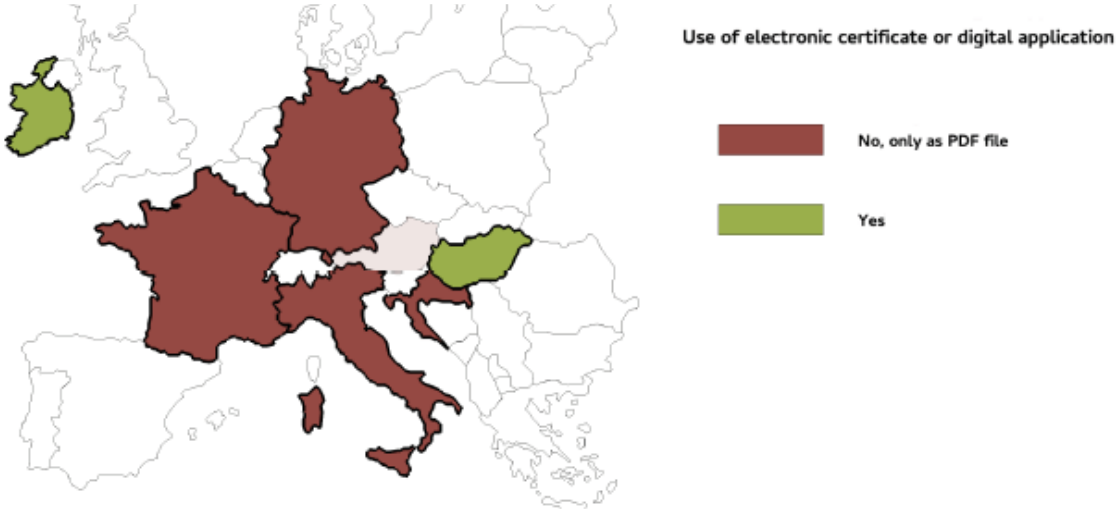
| | |
|---|---|
| IT | No |
| IE | There used to be promotional campaigns encouraging people to get a BER but now that it's a legal requirement this isn't so necessary. |

### 1.3.8 Events and workshops on for energy efficient buildings and energy renovations

| MS | Events and workshops on for energy efficient and sustainable building/ renovation |
|---|---|
| A (Vbg) | Yes, via the EIV (energy institute vorarlberg) |
| HR | Yes |
| FR | No |
| DE | Yes, mainly via local professional associations |
| HU | Yes, mainly via local professional associations |
| IT | Information seminars and training courses promoted by certification and training bodies |
| IE | SEAI holds events and workshops for assessors and if they were rolling out a pilot scheme (*e.g.*, community heating systems) |

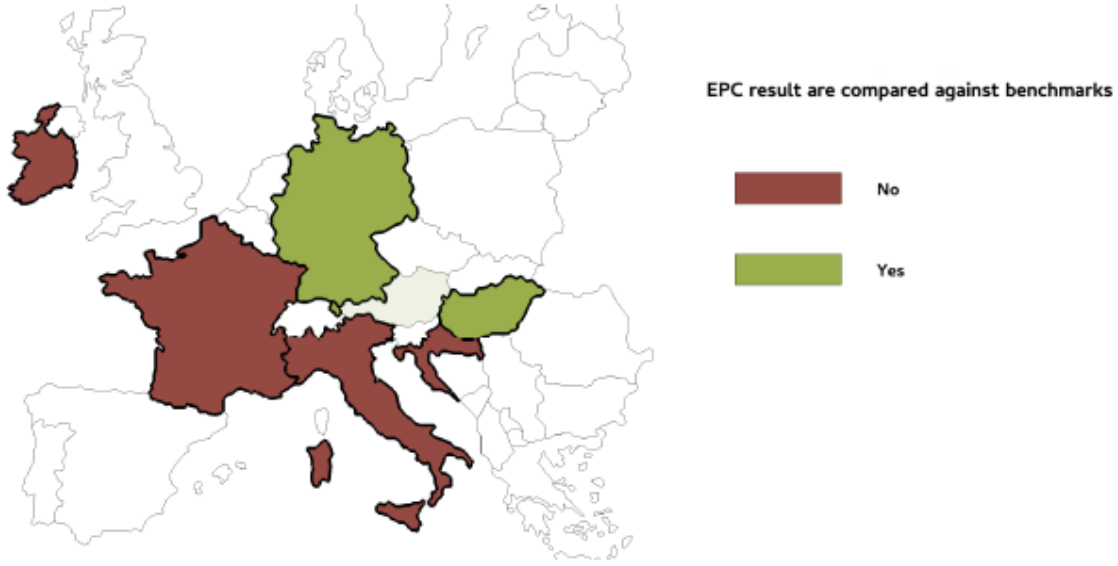
### 1.3.9 Use of electronic certificate or digital application

In the digital age, the use of an Electronic EPC can improve the trust in the issued EPCs and make its use more convenient and secure taking into consideration the long validity of the EPCs (10 years). However, the analysis shows that there are very few countries among the EUB SuperHub such as Ireland and Hungary that offer such a service.



| MS | Use of electronic certificate or digital application |
|---|---|
| A (Vbg) | No, only as Pdf file |
| HR | No, only as Pdf file |
| FR | No, only as a Pdf file |
| DE | No, only as a Pdf file |
| HU | The public data base can be access online and it gives information about building energy class and address. Detailed information and calculations are not open for public. Moreover, electronic and printed versions (PDF) can be used for official procedures and in each issued EPC there is a QR code to check the validity of the EPC |
| IT | No, only as a Pdf file |
| IE | BER is produced electronically. With the BER number you can access the BER certificate online. To access the report itself you to need to contact the BER assessor themselves. |

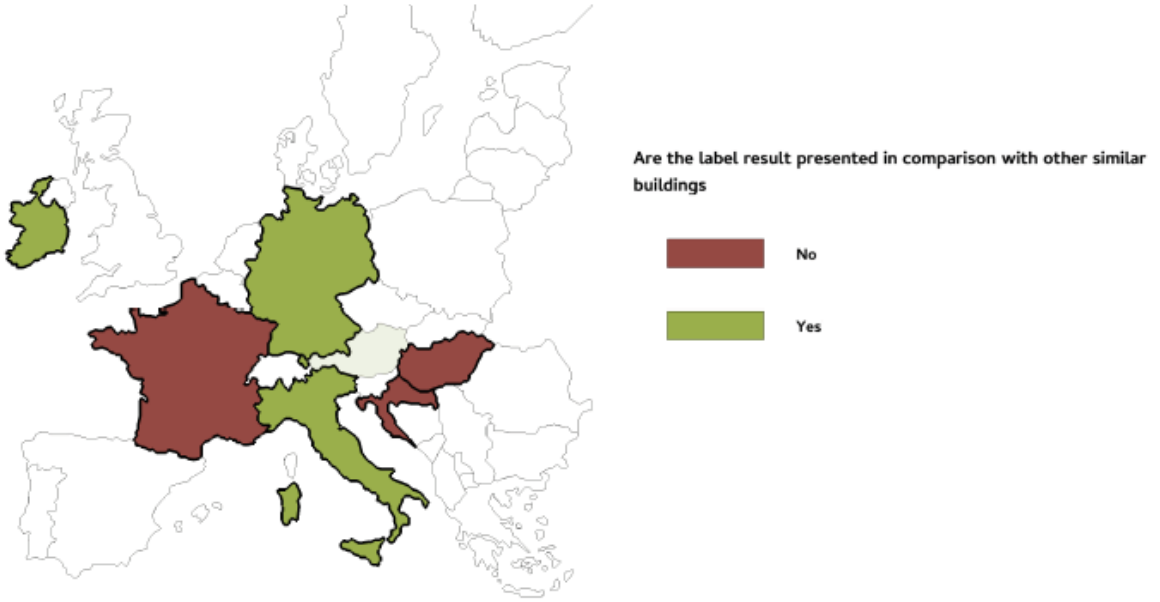
### 1.3.10 EPC result are compared against benchmarks

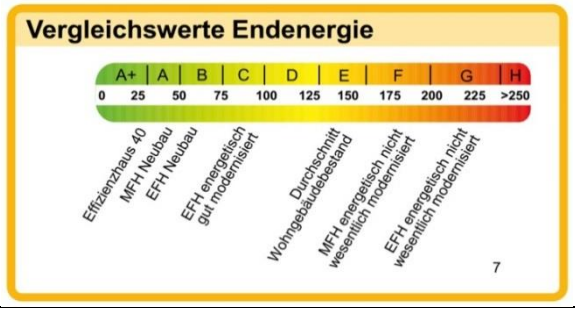



| MS | EPC result are compared against benchmark |
|---|---|
| A (Vbg) | The energy performance factor is the quotient of the final energy demand and a reference final energy demand. The smaller the value, the better the considered building is compared to the reference building. The value is difficult to understand and is not a comprehensible benchmark. |
| HR | No |
| FR | No |
| DE | Yes, the building rating is compared against a benchmark of a reference/ similar building. |

| | |
|---|---|
| HU | Yes, the building primary energy consumption is compared against a benchmark of a reference (NZEB) building |
| IT | No |
| IE | No |

### 1.3.11 Is the label result presented in comparison with other similar buildings?

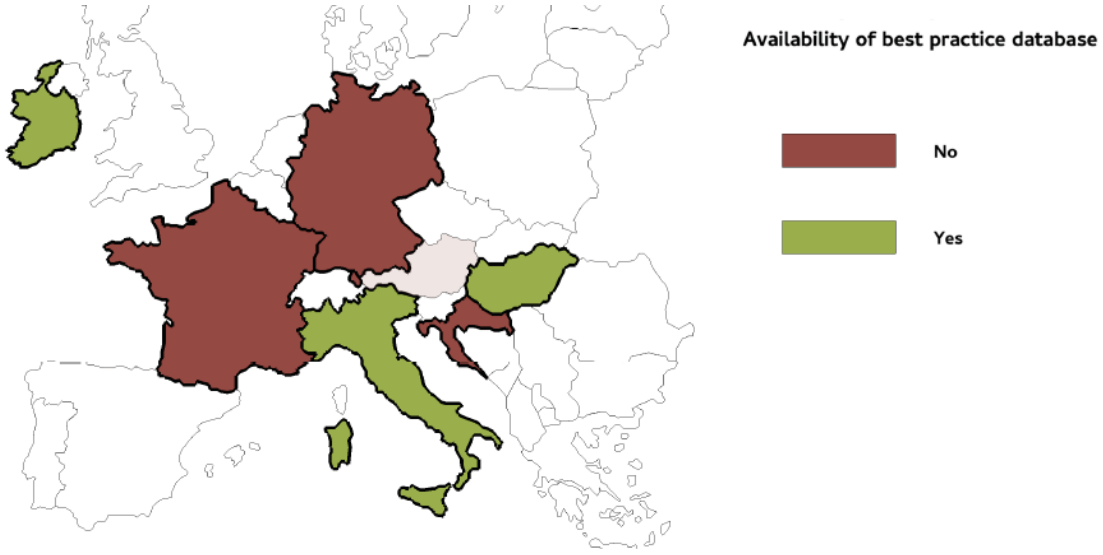



| MS | Label result presented in comparison with other similar buildings |
|---|---|
| A (Vbg) | Yes, the energy performance factor in the energy performance certificate for buildings is a comparative value that compares the energy demand of a building for which an energy performance certificate has been issued with the energy demand of a building that was constructed in the same year and is used as a reference building.<br>The energy performance factor is the quotient of both values. f GEE<br>If the factor is smaller than the number 1, then the building to be compared has a better energy efficiency; if it is larger than the number 1, then this building has a worse energy efficiency than the reference building. |
| HR | No |
| FR | No |
| DE | Yes on a sliding bar<br>  |
| HU | No |

| | |
|---|---|
| IT | Yes, EPC values are compared with a reference building built according to limit values for the envelope and with standard technologies for plants |
| IE | Yes |

### 1.3.12 Availability of best practice database

A Best Practice Database present a valuable information resource for both the energy assessors and the owners as it provides them with inspirations and examples about possible renovation and construction methods. The analysis shows that an increasing number of countries among the EUB SuperHub partners have recognized the importance of databases and actively using them.




| MS | Availability of best practice database |
|---|---|
| A (Vbg) | No |
| HR | No |
| FR | No |
| DE | No |
| HU | Yes, Advisory material is available on best practice (e.g. retrofit) on a governmental portal |
| IT | In the ENEA portal, with the periodic update of the data received on the buildings has been created an annual report of the collected data and sporadically is updated in a manual representing best practices |
| IE | Advisory material is available on best practice on SEAI website |

## 1.4 A cross-analysis comparison of the EPC usability aspects across the pilot MS

This chapter looks at various mechanisms used by the EUB SuperHub consortium countries that contribute to the usability of EPCs by the end user. In this sense, the analysis in depth at the availability of aspects that increase the usability of the EPC and such aspects contribute to make better informed decision and triggers actions. Therefore, this chapter make an extensive cross analysis of usability related topics such as the cost of issuing an EPC, the amount and quality of recommendation that the EPC provide, the domains the EPC recommendation cover and whether a decision support mechanism that support the property owner in finding the best retrofitting strategy is available or not.

### 1.4.1 Cost to issue an EPC

In the analysed the countries with the exception of Hungry, the cost of issuing an EPC is regulated by the market, therefore, the provided costs in the section are to be seen as a general overview of the EPC cost. The analysis shows that cost of issuing an EPC varies greatly based on the calculation method used (asset or operational) and on the building usage (residential and non-Residential). Based on the analysis made across the EUB SuperHub countries it is safe to say that the cost of issuing an EPC remain affordable in relation to the value of the property.

| MS | | Cost to issue an EPC |
|---|---|---|
| A (Vbg) | Residential (New) | Multi-family houses approx. 1,200€, single-family houses approx. 500€. |
| | Residential (In use) | Rather a little more expensive, because stock-taking is more expensive. |
| | Non-Residential | Energy certificates for public buildings or operational buildings are more expensive. A quote depending on the complexity can vary greatly. |
| HR | Residential | Single family house - prices vary strongly between €80 and €280 depending on the useful floor area, energy assessor and whether the house has the necessary projects/plans<br>Single family house- (from 0,35 to 1,00 €/m2 useful floor area)<br>Multi-storey residential buildings - (from 0,50 to 1,00 €/m2 useful floor area) |
| | Non-Residential | Non-residential buildings - prices vary also strongly depending on the useful floor area, energy assessor (from 0,35 to 1,50 €/m2 useful floor area) |

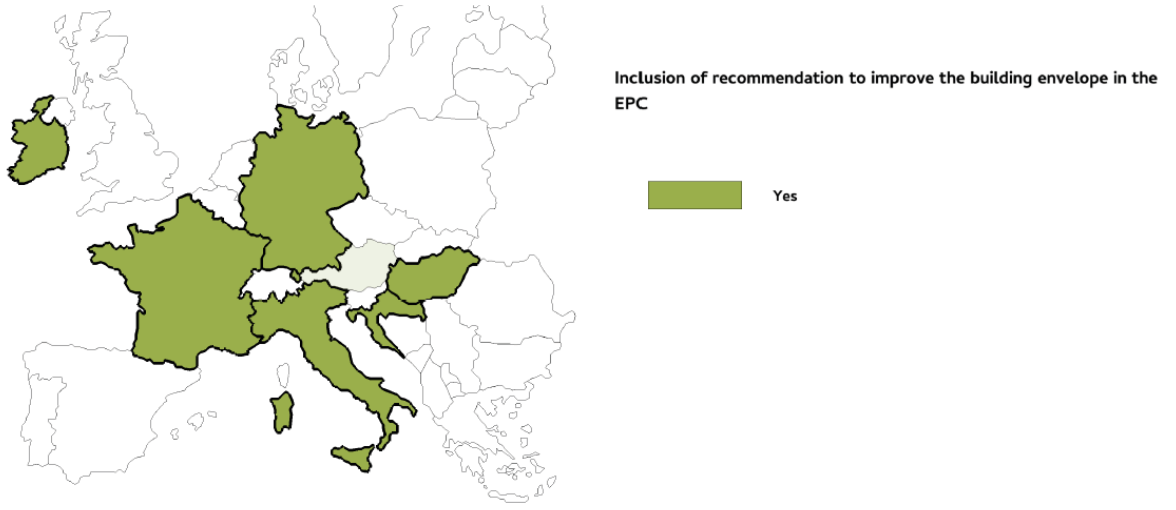
| | | |
|---|---|---|
| FR | Residential | The costs are generally between 100 and 250 euros. This variation in the price depends on the surface area of the dwelling, the location, the heating system, the assessor. |
| | Non-Residential | The average cost per non-residential EPCs amounts to approximately €800 per certified building. Nevertheless, the final price depends on the surface area of the dwelling, the location, the heating system, the assessor. |
| DE | Residential (New) | prices vary strongly as per the project complexity starting from 500€ to over 1500€ |
| | Residential (In use) | Depends on the rating method and project complexity: Asset rating start from 500€ operational rating for about 50€ |
| | Non-Residential (New) | prices vary strongly as per the project complexity starting from 500€ to over 1500€ |
| | Non-Residential (in use) | Depends on the rating method and project complexity: Asset rating start from 500€ operational rating for about 250€ |
| HU | Residential | The cost of a certificate a residential unit is set by law at about 40 € + VAT per unit. |
| | Non-Residentia | For non-residential buildings, there is no legally defined amount of the cost of an EP. The cost can vary between 100 and 1,500 € depending on the size and complexity of the building |
| IT | New | Cost for applying to the certification Body (Region): 15€ per real estate unit.<br>Cost for the Assessor (data collection, data calculation and drafting of certification report): an average of 175€ per real estate unit. |
| | In use | The costs of an energy audit depend on many factors, such as the volume, the data available, the checks and measurements to be carried out, the data on energy bills, the complexity of the envelope and the plants to be evaluated; therefore, no precise cost can be defined. |
| IE | | There is no standard fee for employing a BER assessor, costs are set by the market. These fees include a levy charged by SEAI for each BER assessment carried out – €30 for publication of a domestic BER and €60 for publication of non-domestic BER. |

### 1.4.2 Inclusion of recommendation to improve the building envelope in the EPC

An EPC can act as useful tool to provide the owner of property with a set of clear recommendation on how to reduce their energy consumption values and improve the energy rating. Actually Article 11 of the EPBD instruct the MSs to include "recommendations for the cost-optimal or cost-effective improvement of the energy performance of *a* building or building unit"[4] in the issued EPCs. Furthermore, The EPBD state that the recommendations included in the energy performance certificate shall cover:

1. measures carried out in connection with a major renovation of the building envelope or technical building system(s);
2. measures for individual building elements independent of a major renovation of the building envelope or technical building system(s).

This analysis gives an overview about the inclusion of such recommendation to improve the building envelope in the EPCs as stated in the first point. The analysis shows that all the issued EPCs include such recommendation, however, it must be noted that the accuracy and practicality of these recommendations must be treated with care as in some cases they are based on general assumptions made by the energy assessor about the state of the building envelope and not based on thorough on-site investigation of the building.

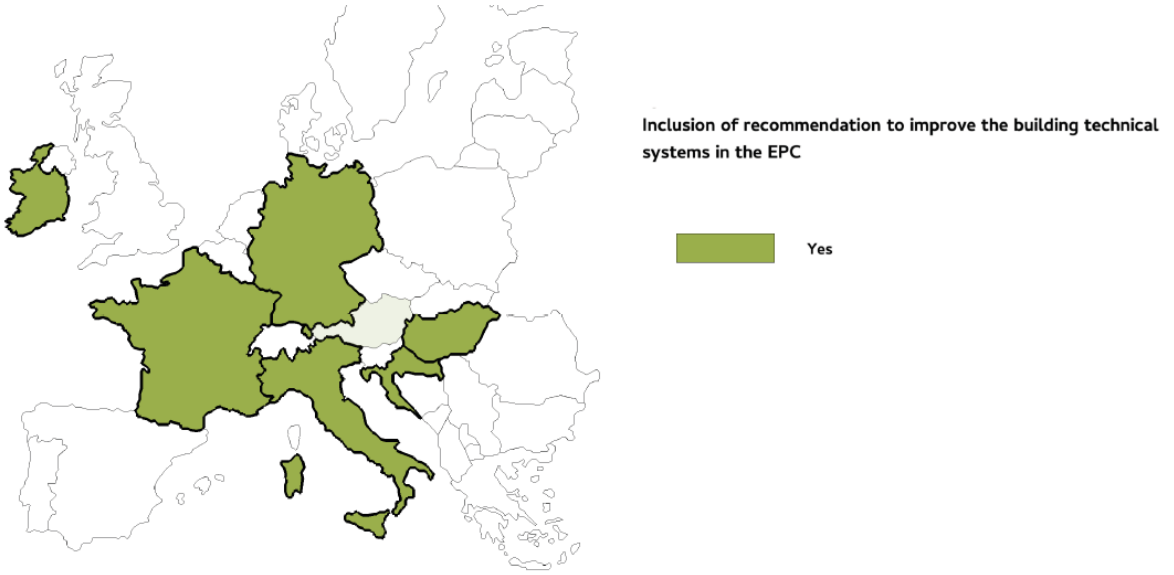



| MS | Inclusion of recommendation to improve the building envelope in the EPC |
|---|---|
| A (Vbg) | Yes |
| HR | Yes – for existing buildings |

| | | |
|---|---|---|
| FR | Residential | Yes, two packages of energy saving measures should be defined by the assessor: 1/ priority renovations; 2/ high performance renovation+ some generic recommendations regarding these two packages; * for each package: description of renovation action per component and indication of the recommended requirement for this component + estimation of total expenses for this package* the indication of the new labels after renovation (for each package). |
| | Non-Residential | Yes, a list of energy improvement recommendations. |
| DE | | Yes |
| HU | | Yes |
| IT | | Yes |
| IE | | Yes |

### 1.4.3 Inclusion of recommendation to improve the building technical systems in the EPC

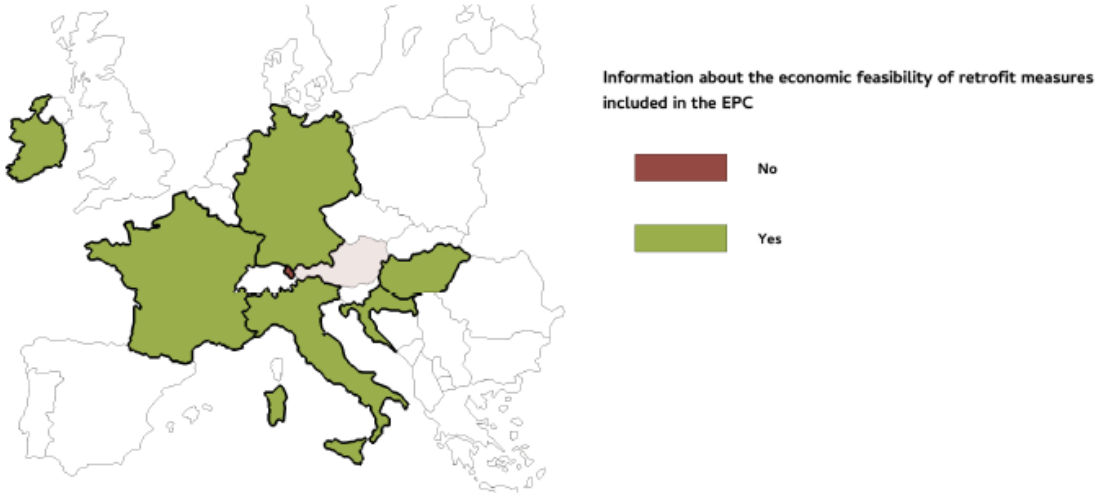
As stated, article 11 of the EPBD instruct the MSs to ensure that recommendations included in the energy performance certificate shall cover measures carried out in connection with a major renovation of the building envelope or technical building system. This analysis gives an overview about the inclusion of such recommendation to improve the building technical system in the EPCs as stated in the EPBD. The analysis shows that all the issued EPCs include such recommendation, however, it must be noted that the accuracy and practicality of these recommendations must be treated with care as in some cases they are based on general assumptions made by the energy assessor about the state of the building technical systems and not based on thorough on-site investigation of the building.




| MS | | Inclusion of recommendation to improve the building technical systems in the EPC |
|---|---|---|
| A (Vbg) | | Yes |
| HR | | Yes – for existing buildings |
| FR | Residential | Yes, two packages of energy saving measures should be defined by the assessor: 1/ priority renovations; 2/ high performance renovation<br>+ some generic recommendations regarding these two packages;<br>* for each package: description of renovation action per component and indication of the recommended requirement for this component + estimation of total expenses for this package<br>* the indication of the new labels after renovation (for each package). |
| | Non-Residential | Yes, a list of energy improvement recommendations. |
| DE | | Yes, and it indicate to implement the recommendation either as standalone measure or in combination with other improvements |
| HU | | Yes |
| IT | | Yes |
| IE | | Yes |

### 1.4.4 Information about the economic feasibility of retrofit measures included in the EPC

Article 11 of the EPBD instruct the MSs to include "*recommendations for the cost-optimal or cost-effective improvement of the energy performance of a building or building unit*" in the issued EPCs. Hence, it is expected that in some sort of an economic feasibility study is to be provided in conjunction with the energy improvement recommendation. The analysis show that the inclusion of an economic feasibility in the form of simple payback estimation in the EPCs issued among EUB SuperHub countries is almost always done, however, in some cases their inclusion remain voluntarily or is offered as an extra paid service.

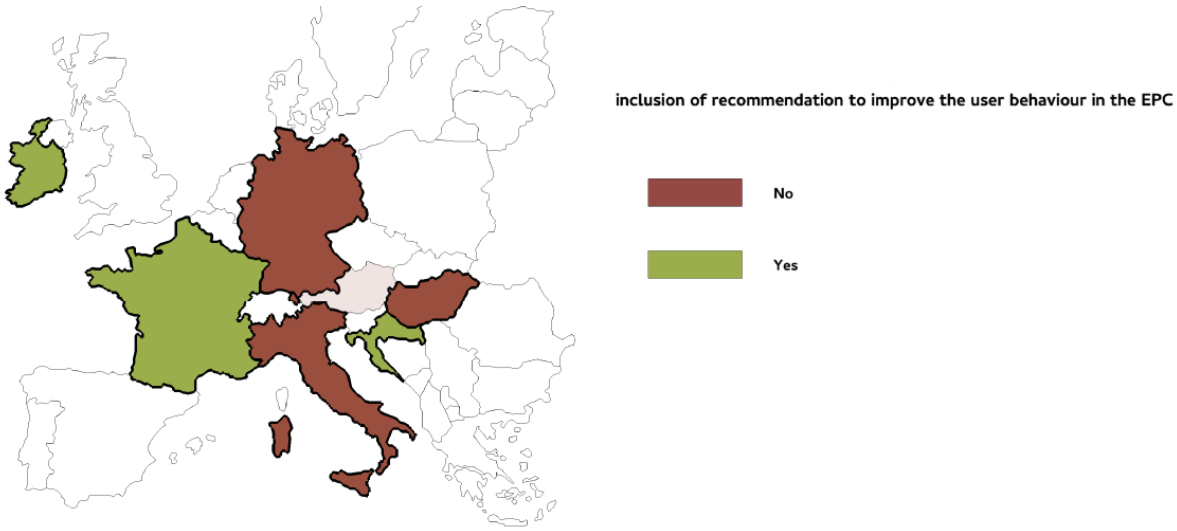



| MS | Does the EPC include information about the economic feasibility of retrofit measures? |
|---|---|
| A (Vbg) | No |
| HR | Yes- For each suggested measure (except for user behaviour improvements), the simple payback period is given |
| FR | Yes, only for residential building an estimation of total costs for each "retrofit solutions package". |
| DE | Yes, but its inclusion in the EPC is voluntarily |
| HU | yes, but its inclusion is an extra (paid) service |
| IT | Yes. For each suggested measure (except for user behaviour improvements), the simple payback period is given |
| IE | An estimated payback period may be detailed, but prices or savings wouldn't be included. |

### 1.4.5 Inclusion of recommendation to improve the user behaviour in the EPC

The user behaviour and their level of awareness and correct user of energy systems can have a high impact on the energy consumption values and, in many cases, a considerable saving in the energy consumption can be achieved though the correct use of the installed systems. The analysis shows that the inclusion of recommendation to improve the user behaviour in the

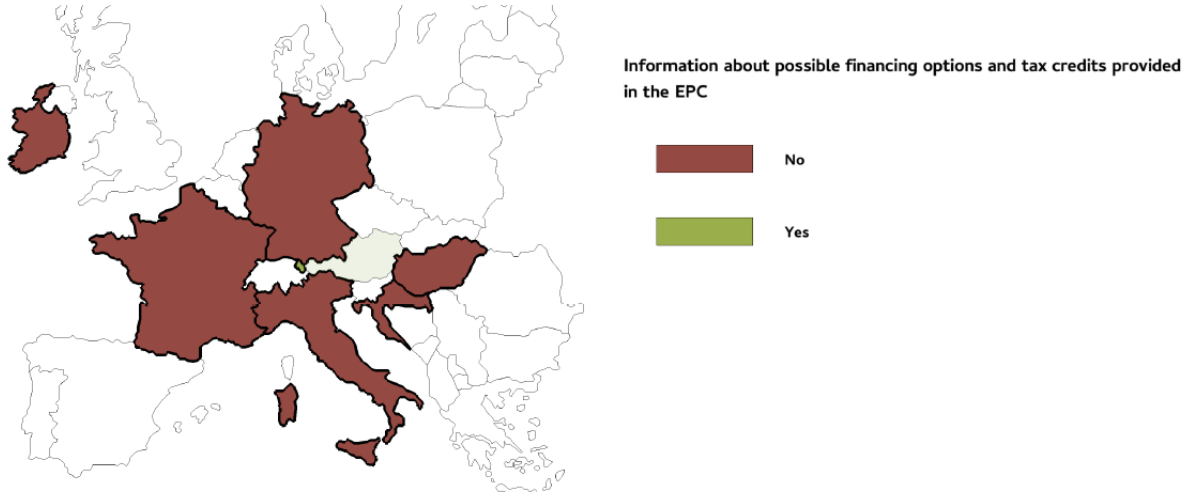
EPCs issued among EUB SuperHub countries is increasing as more and more countries are including them. It is anticipated that the inclusion of with user behaviour recommendation will become more widely adopted with introduction of the smart readiness rating as envisioned in Annex IA of EPBD[3].




| MS | Inclusion of recommendation to improve the user behaviour in the EPC |
|---|---|
| A (Vbg) | No |
| HR | Yes |
| FR | Yes, including recommendations for equipment maintenance. |
| DE | No |
| HU | No |
| IT | No |
| IE | Yes |

### 1.4.6 Information about possible financing options and tax credits provided in the EPC

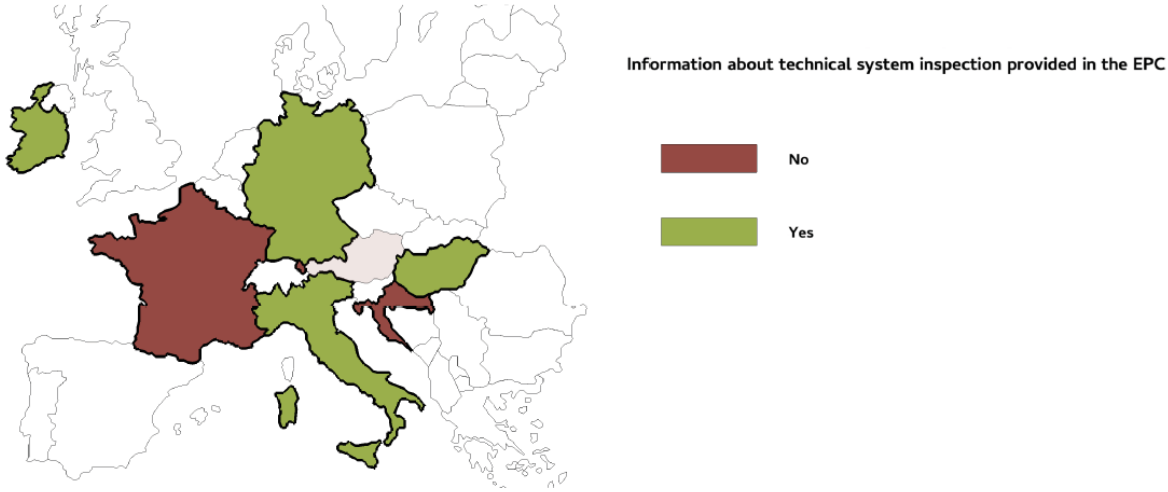
To increase the renovation rates, most member states offer tax credits or financial support building owners that wish to make a deep renovation of their property. Linking the energy improvement recommendation in the EPC to national financial support options such as incentives or subsidy schemes can encourage the owner to implement the energy improvement recommendation. The analysis shows that to date only few countries among the EUB SuperHub partnership include such information in the EPC.




| MS | Does the EPC include information about possible financing options and tax credit? |
|---|---|
| A (Vbg) | Yes |
| HR | No |
| FR | No |
| DE | No |
| HU | No |
| IT | No |
| IE | No |

### 1.4.7 Information about technical system inspection provided in the EPC

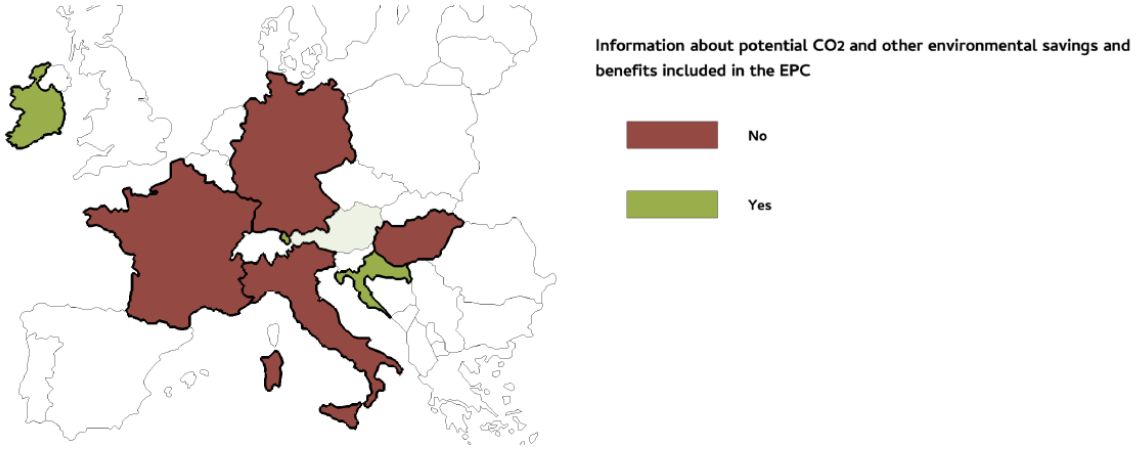
Article 14 and 15 of the EPBD require the MSs to draft the necessary measures for the regular inspections of t air-conditioning and heating systems above a certain power output. Withing the EUB SuperHub partnership several countries already include the information about the inspection of the technical system in their EPCs.



| MS | Does the EPC include information about inspection technical systems? |
|---|---|
| A (Vbg) | No |
| HR | No |
| FR | No |
| DE | Yes |
| HU | Yes |
| IT | Yes |
| IE | General information on what systems need to be checked and how regularly. This is usually part of advisory documents, separate to the BER assessment. |

### 1.4.8 Information about potential greenhouse gas and other environmental savings and benefits included in the EPC

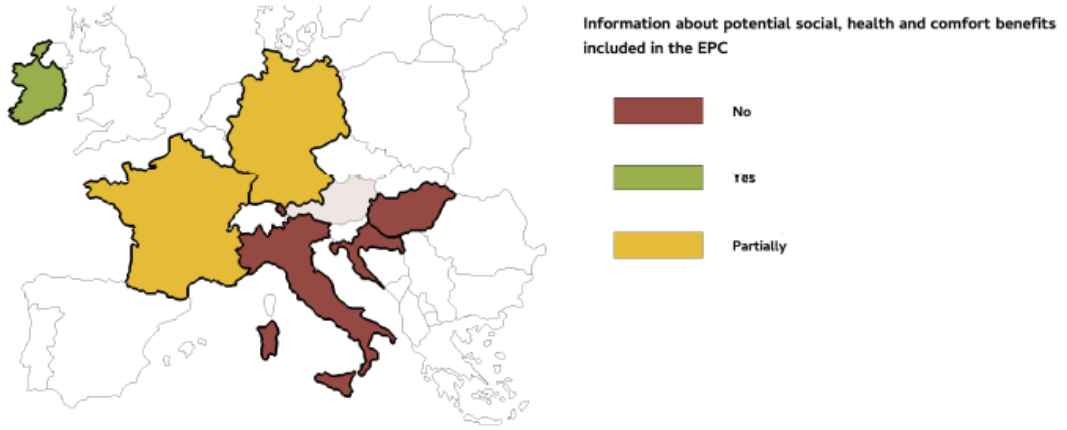
One of the main objectives of the introduction of the EPC in the EU is to contribute to the reduction the union's greenhouse gas emission. Therefore, it is expected that the EPCs would include within its energy improvement recommendation a set of information about potential greenhouse gas and other environmental savings and benefits that can attained. The analysis shows that the inclusion of information about potential greenhouse gas and other environmental savings and benefits recommendation in the EPCs issued among EUB SuperHub countries are not always available.




| MS | Are Information about potential greenhouse gas emission and other environmental savings and benefits included in the EPC? |
|---|---|
| A (Vbg) | Yes, through comparing the CO2 values before and after |
| HR | Yes - for existing buildings |
| FR | No |
| DE | No |
| HU | No |
| IT | No |
| IE | Yes |

### 1.4.9 Information about potential social, health and comfort benefits included in the EPC

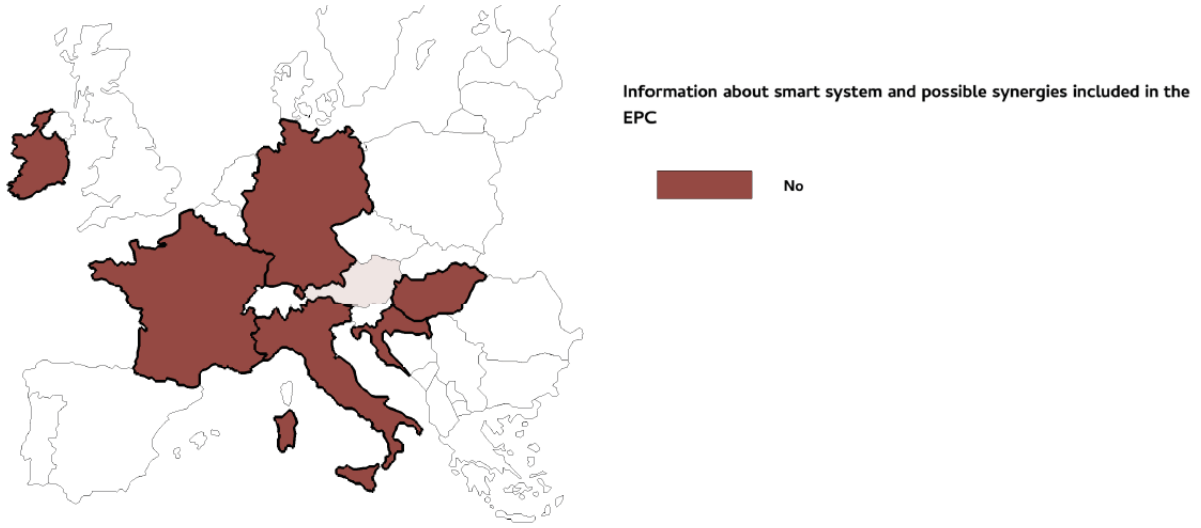
The EPBD state that the building energy needs shall be calculated in order to optimise health, indoor air quality and comfort levels of the occupant. The inclusion of such information in the EPCs is yet to be mandatory. Within the EUB SuperHub partnership several countries already include some information about the social, health and comfort levels in their EPCs.




| MS | Does the EPC include information about potential social, health and comfort benefits? |
|---|---|
| A (Vbg) | No |
| HR | No |
| FR | Yes, only for residential building a generic recommendations on how to improve summer comfort. |
| DE | Only an indication if the building fulfils the summer heat protection requirements |
| HU | No |
| IT | No |
| IE | Yes, thermal comfort in included in the BER rating. For new dwellings an indoor air quality rating is mandatory |

### 1.4.10 Information about smart systems and possible synergies included in the EPC

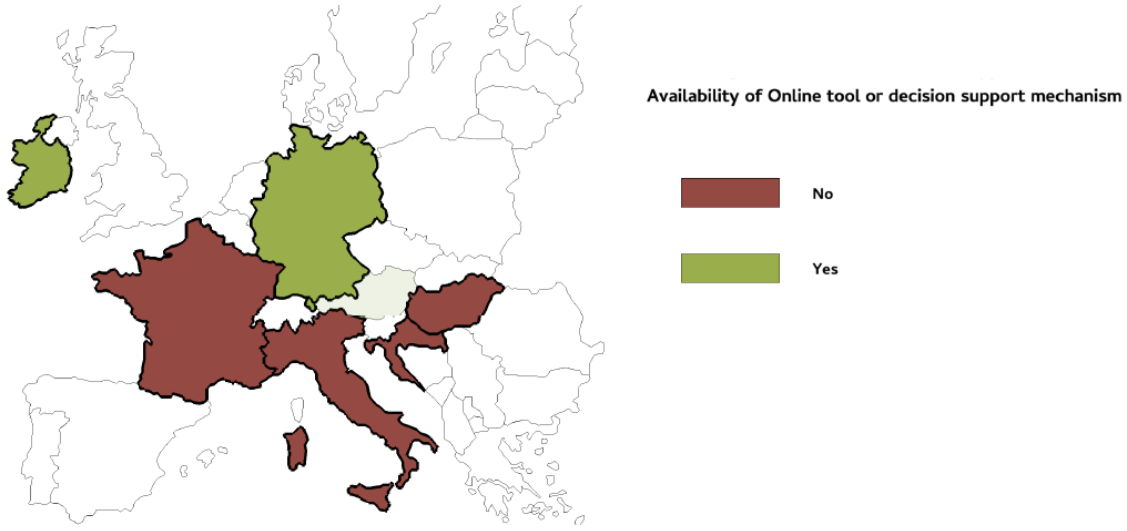
The EPBD intended to introduce a set of smart readiness indicators. The smart readiness indicators aim at enhancing energy savings and energy flexibility as well as to exploit the functionalities and capabilities resulting from more interconnected and intelligent device. The inclusion of such information in the EPCs is yet to be mandatory. Within the EUB SuperHub partnership no MS include such information about the smart systems in their EPCs.




| MS | Does the EPC include information about smart systems and possible synergies? |
|---|---|
| A (Vbg) | No |
| HR | No |
| FR | No |
| DE | No |
| HU | No |
| IT | No |
| IE | No |

### 1.4.11 Availability of Online tool or decision support mechanism

A Decision Support Mechanism (DSM) is usually presented as online based, interactive, tool that guides the user through a series of questions to assists them in making the most appropriate renovation decision for a property. The analysis made here show that the availability of DSMs is starting to gain popularity are among the EUB SuperHub investigated countries



| MS | Online tool or decision support mechanism |
|---|---|
| A (Vbg) | Yes, Optimierer and Optiqus are tools in the software which offer optimization support |
| HR | No |
| FR | No |
| DE | Yes, for existing residential buildings only https://www.sanierungskonfigurator.de/ |
| HU | No |
| IT | No |
| IE | Yes |

# 2 The use of sustainability certification systems in Pilot EU member state: An overview

With the increased interest in sustainable development in the past 30 years a large number of building sustainability certification and evaluation systems emerged. Today the market is overwhelmed with a large number of national and international systems that are used and applied by various buildings types and regions. Despite the large variety in the assessment methods used by each system, they all aim at improving the building design and operation from an environmental, economic and social point of view. Moreover, the certification system act as quality verification tool for investors and buyers as they enable the building designer and constructors to achieve a high level of building design and operation quality that usually outperform the conventional building performance targets dictated by national building codes.

The existing linear planning process that follows the triple constrains paradigm of time, quality and cost has proved to be ill-suited to address the interconnected, dynamic and multi scale issues of sustainability. To incorporate sustainability in the planning process, a shift toward a holistic multi-dimensional circular planning process is needed. Building designers, owners and investors can be overwhelmed by complexity of such a shift in the planning process and require tools that help them navigate the intertwined field of sustainable building development. The sustainability certification uses performance indicators, that cover and balance the building performance in three main spheres of sustainability: ecology, economy and society, therefore, they can be also act as decision support system, allowing the building stakeholders make better informed decisions about the building sustainably and performance targets.

Due to the universal nature of most sustainability assessment systems, the past decade witnessed an increased interest in the development of local sustainability assessment systems that are a more in line with the local building regulations and sustainability targets such as the BNK and BNB in Germany, the KGA in the state of Vorarlberg in Austria and the Protocollo ITACA in Italy. Moreover, the sustainability local systems are now being connected to local funding schemes that make their use more attractive by local owners. The recast EBDP of 2018, addresses many the same topics covered by the sustainability certification systems such as indoor air quality, user comfort and wellbeing as well as topic related to circular economy and sustainable resources. This trend indicates that in the near future, the local sustainability systems are going to gradually move from being purely voluntary into becoming a mandatory part of the enxt generation of EPCs. This positive development at the local and national scale is making the

development of EU wide harmonized system that is recognizable and comparable across the EU an urgent task. The EU Level(s) initiative is already leading the way for new, holistic view of the EU buildings taking into account sustainability principles (LCA, LCC etc.). However, there is still a missing connection between the assessment systems that are used at the local national scale that reflect national targets and the ones developed at European scale that are aligned with the EU policies and targets. Therefore, in order to bridge this gap, the EUB SuperHub project has set its goal to tie the „distributed" systems, assessment schemes and certifications spread across MSs, based on common criteria that act as a common transnational building passport. Achieving this connection will allow to unleash the full potential of the sustainability certification system by making their creation, communication and utilization transparent, holistic and harmonized across the MSs and the stakeholder's value chain.

To achieve this goal, this chapter will analyse the national sustainability certification systems that are developed and used locally within the EUB SuperHub regions and compare them in terms of quality, usability and visibility in similar fashion to the comparison done in the previous chapter.


*Figure 11: A map showing the EUB SuperHub countries that have at least one nationally developed and used sustainability rating system.*

## 2.1 Overview of national Sustainability certification systems in the pilot MS

This subchapter provides the reader with a brief overview about the local building sustainability rating system used among the EUB SuperHub consortium countries and region covering the main features of each local sustainability rating system.

### 2.1.1 AUSTRIA (Vorarlberg): Kommunalgebäudeausweis - KGA

Since 2011, the amount of state funding for municipal buildings has been based on their sustainability. The higher the sustainability in process, execution and quality assurance, the higher the subsidies awarded. The municipal building certificate is carried and issued as a basis for assessment.

The KGA is currently applied to all types of non- residential buildings relevant to demand allocation, such as municipal office buildings, compulsory schools including multi-purpose and gymnasiums, cultural halls and nursing homes, as well as kindergartens. There is a catalogue of criteria for new buildings and one for general renovations. Renovations of parts of buildings and partial renovations are not taken into account.

In the municipal building certificate, there are 19 differently weighted criteria in 4 assessment categories, each with must or can criteria. The basic structures of new construction and general renovation are identical. Both use a 1000-point system. The process and planning quality, energy and supply, health and comfort, as well as building materials and construction are evaluated.

### 2.1.1.1 Overview of the label used

**Criteria Kommunalgebäudeausweis Vorarlberg 2018 - New construction and renovation**

Municipal office buildings, compulsory schools including multi-purpose and gymnasiums, cultural halls, nursing homes, kindergartens, childcare facilities

**Projekt**

| Please choose<br>This building is a | Generalsanierung |
|---|---|

**Gesamt** 0

| Nr. | | | Titel | max. score | reached points |
|---|---|---|---|---|---|
| **A** | | | **Process and planning quality** | ***max. 230*** | **0** |
| A | 1. | 1 | Definition of verifiable energetic and ecological goals - ecological program | 10 | 0 |
| A | 1. | 2 | simplified calculation of economic efficiency | 10 | 0 |
| A | 1. | 3 | Product management - Use of regional, low-emission products and constructions | 110 | 0 |
| A | 1. | 4 | Natural design of outer space | 40 | 0 |
| A | 1. | 5 | Bicycle parking and electric mobility | 25 | 0 |
| A | 1. | 6 | Quality of daylight usage | 10 | 0 |
| A | 1 | 7 | Conducting an architectural competition and establishing an energetic and ecological standard in architect's agreements | 50 | 0 |
| **B** | | | **Energy and supply** | **max. 450** | **0** |
| **B** | **1.** | | **Verification by PHPP** | **max. 450** | **0** |
| B | 1. | 1 | Energy value of heating demand PHPP | 125 | 0 |
| B | 1. | 2 | Energy value cooling demand PHPP | 75 | 0 |
| B | 1. | 3 | Primary energy demand PHPP | 135 | 0 |
| B | 1. | 4 | Emissions of CO2 equivalents according to PHPP | 135 | 0 |
| B | 1. | 5 | Use of renewable energy sources | 10 | 0 |
| B | 1. | 6 | Differentiated consumption recording and user training (MUST CRITERION) | 0 | 0 |
| **B** | **1.** | **b** | **alternative: Verification by OIB RL 6** | **max. 450** | **0** |
| B | 1. | 1.1b | Heating demand $HWB_{SK}$ | 75 | 0 |
| B | 1. | 1.2b | $LEK_T$ Value | 75 | 0 |
| B | 1. | 2b | Cooling demand $KB_{SK}$ | 50 | 0 |
| B | 1. | 3b | Primary energy demand $PEB_{SK}$ | 135 | 0 |
| B | 1. | 4b | Emissions of CO2 equivalents | 135 | 0 |
| B | 1. | 5b | Use of renewable energy sources | 10 | 0 |
| B | 1. | 6b | Differentiated consumption recording and user training (MUST CRITERION) | 0 | 0 |
| **C** | | | **Health and comfort** | **max. 125** | **0** |
| **C** | **1.** | | **Thermal comfort** | **max. 75** | **0** |
| C | 1. | 1 | Thermal comfort in summer | 75 | 0 |
| **C** | **2.** | | **Indoor Air Quality** | **max. 70** | **0** |
| C | 2. | 1 | Measurement of indoor air quality | 70 | 0 |
| **D** | | | **Building materials and construction** | **max. 195** | **0** |
| D | 1. | | Avoidance of critical substances | max. 30 | 0 |
| D | 1. | 1 | Avoidance of PVC | max. 30 | 0 |
| D | 2. | | Ecology of building materials and constructions | max. 175 | 0 |
| D | 2. | 1 | $OI3_{BG3,\ BZF}$ ecological index of the total mass of the building | 140 | 0 |
| C | 2. | 2 | Disposal indicator (EI) | 50 | 0 |
| | | | **Total** | **max. 1000** | |

*Figure 12: An overview of the first page of the KGA lable [12]*

#### 2.1.1.2 Coverage

Regional to the state of Vorarlberg

#### 2.1.1.3 Norm used to energy calculation

OIB 6 and DIN V 18599 if calculated with Passive House Planning Package PHPP

#### 2.1.1.4 Type of buildings that can be certified with the system

Applies only to newly built and completely renovated public buildings for the building types municipal office buildings, compulsory schools incl. multi-purpose and gymnasiums, cultural halls, kindergartens, childcare facilities and nursing homes for which an energy certificate is required according to the currently valid building regulations.

### 2.1.2 Germany

In July of 2021 the German government introduced the Qualitätssiegel Nachhaltiges Gebäude –QNG (Sustainable building quality seal) as part of its national sustainable development strategy and climate protection plan 2030. The QNG is an umbrella seal for all nationally accredited sustainability certification systems. The QNG seal of quality is awarded by independent certification bodies on behalf of the Federal Ministry of Construction. The QNG quality seal is awarded either as "PLUS" or "PREMIUM" as per the final rating of the building. At the moment there are three recognized and accredited sustainably certification systems that can be used exclusively for newly built residential buildings which are:

A. The DGNB System Version 2018 (NWO18) and DGNB Neubau Kleine Wohngebäude (NKW 13.2)
B. The Qualitätssiegel Nachhaltiger Wohnungsbau (NaWoh V3.1)
C. Bewertungssystem Nachhaltiger Kleinwohnhausbau (BNK_V1.0) that is limited for small residential buildings that do not exceed 6 dwellings

The use of any of the above systems for achieving QNG requirements qualify the owner to benefit from the newly introduced federal funding scheme (NH Class) which is offered by the national KFW bank. The NH-class funding program provides building owners with a cash subsidy up to 33.750 Euro per dwelling or Repayment subsidy of up to 22.5% of a maximum loan amount of 150,000 euros per dwelling. However, it must be noted that the three systems are not harmonized with each other and cannot be directly compared. As general rule, the QNG demands that any of certification systems must cover the following main points to be considered for QNG recognition:

| Ecological dimension | Economic dimension | Socio-cultural dimension |
|---|---|---|
| **Protection of the ecosystem** | Reduction of the life cycle costs | Maintaining health, safety and comfort |
| **Protection of natural resources** | Improvement of profitability | Participation in all areas of life |
| | Receiving capital | Guarantee of functionality |
| | | Assurance of the design and urban development quality |

It is expected the application of the QNG in 2022 will include other non-residential buildings. At the moment the federal government has committed itself to the use the Bewertungssystem Nachhaltiges Bauen - BNB (Assessment System for Sustainable Building) to certify all newly built or renovated federal public buildings, the cost over 2 Mil €

For the purpose of the following analysis, we are to take only the Bewertungssystem Nachhaltiger Kleinwohnhausbau BNK (BNK_V1.0) and BNB Bewertungssystem Nachhaltiges Bauen (BNB-BN-Neubau V2015) system into consideration. The DGNB system for non-residential buildings is not considered as it is use not yet mandatory or allow for receiving governmental financing benefits.

#### *2.1.2.1 Coverage*

National

#### *2.1.2.2 Norm used to energy calculation*

DIN V 18599

#### *2.1.2.3 Overview of the label(s) used*

| | | |
|---|---|---|
| The QNG label indicating the rating level achieved in words (premium or plus)[13] | The Label obtained at the end of the certification process is represented by a coloured BNB logo (Gold, Silver and Bronze) as per the achieved score[14] | The Label obtained at the end of the certification process is represented by single green coloured BNK logo. The final score is indicated in writing as per the obtained score[15]. |



The Label obtained at the end of the certification process is represented by a coloured DGNB logo according to the score obtained (Platinum, Gold, Silver) Bronze can be awarded for In-use buildings only[16].

| | Platinum | Gold | Silver | Bronze* |
|---|---|---|---|---|
| Total performance index | 80% and higher | 65% and higher | 50% and higher | 35% and higher |
| Minimum performance index | 65% | 50% | 35% | -- % |

#### *2.1.2.4 Type of buildings that require certification*

For newly built small residential buildings with ≤ 5 dwellings the following systems can be used:

- DGNB NKW 13.2
- BNK_V1.0

For other newly built residential with more than 5 dwellings the following can be used:

- NaWoh V3.1
- DGNB NWO18

The Bewertungssystem Nachhaltiges Bauen - BNB system can be used without amendment to for the following building type: Offices, educational, laboratories and for the outdoor spaces attached to the buildings. For other building types the system can be used on case by case basis after applying some amendments.

### 2.1.3 France

The sustainability assessment system Haute Qualité Environnementale (HQE) is in use in France since 2005 after a validation by an ad-hoc committee and formal approval of AFNOR Certification. AFNOR Certification

(body of French Association for Standardisation) is the owner of NF mark, which is a collective certification mark offering quality and security guaranties on products and services. HQE certification is governed by the consumer code: it is drawn up in consultation with professionals and consumer representatives, to provide an objective benchmark of quality and to ensure that the project is carried out in the best possible conditions. For Residential buildings the CERQUAL Qualitel Certification NF habitat can be used. CERQUAL Qualitel Certification has issued since September 15, 2015 and is associated with the HQE. For non-residential buildings the Certivéa label is used, Certivéa is a subsidiary of the public institution CSTB (Scientific and Technical research for Buildings).

### *2.1.3.1 Overview of the label used*


*Figure 13: A sample of the Certivéa certification[17]*

### *2.1.3.2 Coverage*

National and international

### *2.1.3.3 Norm used to energy calculation*

RE2020

### *2.1.3.4 Type of buildings that require certification*

Residential buildings, commercial buildings, administrative or service buildings under construction, buildings in operation and urban planning and development projects.

### 2.1.4 Italy

Protocollo ITACA is the Italian assessment system for certifying the level of environmental sustainability of buildings with different intended uses (residential, commercial, office, school, sport/recreation). It has been approved on January 15, 2004 by the Conference of Regions and Autonomous Provinces. At national level Protocollo ITACA is managed by ITACA (Institute for Innovation and Transparency of Procurement and Environmental Compatibility - Technical body of the Conference of Regions and Autonomous Provinces).

iiSBE Italia Association (International Initiative for a Sustainable Built Environment) is the ITACA technical partner for the development/update of the Protocollo ITACA assessment system.

Protocollo ITACA is configured as a set of regional contextualized assessment systems characterized by a common methodology and technical-scientific requirements. The idea is in fact to share a common standard but to allow a variation at the local level. To date, numerous Regions have adopted the Protocollo ITACA as a support tool for their local policies. There are regional versions of the protocol in: Piedmont, Ligurian, Aosta Valley, Friuli Venezia Giulia, Marche, Tuscany, Lazio, Puglia, Umbria, Basilicata and Calabria.

#### *2.1.4.1 Overview of the label used*

The Label obtained at the end of the certification process is represented by a five-pointed star coloured in relation to the score obtained.


*Figure 14: A sample of the obtained by the certification Protocollo ITACA process[18]*

#### *2.1.4.2 Coverage*

National and Regional

#### *2.1.4.3 Norm used to energy calculation*

DM 26/05/2015: Inter-ministerial Decree of 26 June 2015 - Application of the methodologies for calculating energy performance and defining the prescriptions and minimum requirements for buildings.

UNI EN 13790:2008, UNI EN 15603:2008 , UNI 11300:2014, UNI 15193-1 :2017

#### *2.1.4.4 Type of buildings that require certification*

Residential, commercial, offices, schools, sport/recreation, hospitals, rural buildings, hotels, cultural buildings (libraries, cinemas, conference centres, etc)

### 2.1.5 Ireland

In Ireland, the Home Performance Index (HPI) Certification is Ireland's first national voluntary certification for new homes. The HPI is similar to certification for commercial development like LEED and BREEAM, except that it's specifically designed for residential development and aligns to Irish building regulations; EU CEN standards and international WELL certification for communities to avoid duplication. The HPI is developed by the Irish Green Building Council and was brought to market in 2016. To develop HPI, IGBC studied existing sustainability assessment systems, as well as the results of the EU FP7 research projects such as OPENHOUSE and SuperBuilding. Based on that analysis, the selection set of criteria that most suitable for Ireland were selected. As a result, HPI certification contains 30 indicators some of which are mandatory and other optional. The HPI indicators are divided into five categories: Environment, Economic, Health and Wellbeing, Quality Assurance and Sustainable Location. There are three levels of certification:

• CERTIFIED signifies that a basic set of criteria that go beyond building regulations are met;

• SILVER demonstrates that additional voluntary criteria are met;

• GOLD shows real leadership, going well above the minimum criteria.

#### *2.1.5.1 Overview of the label used*

The Label awarded at the end of the certification process is represented by the logo of the HPI and is coloured in relation to the score obtained. HPI certified (≥ 35%), Silver (≥ 50%), Gold (≥ 70%)


*Figure 15: A sample of the three coloured label used by the HPI[19]*

#### *2.1.5.2 Coverage*

National

#### *2.1.5.3 Norm used to energy calculation*

IS EN 13790

#### *2.1.5.4 Type of buildings that require certification*

The HPI system is designed for new housing only. However, it is the intention that the HPI could be developed for existing housing to provide a way of measuring and improving the quality and sustainability of the existing stock.

## 2.2 A cross-analysis comparison of the quality aspects of the sustainability certification across the pilot MS

This chapter represent an in-depth analysis of the various aspects related to the quality assurance and quality control mechanisms implemented in by the national sustainability certification bodies among the EUB SuperHub consortium countries. The analysis presented in this section cover aspects such as the quality control of SCs and auditors, the auditing process, the sustainability domains covered by the SCs , the classification of the rating systems, the performance requirements as well as the incorporation of other topics such smart system, user wellbeing and climate change in the national SCs.

### 2.2.1 Quality control process

The analysis of the quality control process used in the analysed sustainability rating systems reveal a great similarity in the process that contain the manual verification of each submitted certificate by a third party that is either employed at or appointed by the system operator.

| MS | Label | Quality control process |
|---|---|---|
| A (Vbg) | KGA | Parallel to the first cost estimate, a draft for the municipal building certificate ("target KGA") is created. Throughout the entire planning and construction process, the costs and the desired qualities are adjusted again and again. The municipal building certificate, which after completion serves as proof for the distribution of the additional subsidy in Vorarlberg, has quality-assuring tasks during the construction process. |
| FR | CERQUAL | A Control of Conformity to the Reference System (CCR) is mandatory at the end of the certification process (building delivery) and it is realized by the certification assessor. The CCR involves on-site verification of the requirements of the NF Habitat HQE standard, to ensure that the equipment, processes, materials and construction provisions implemented comply with the certification. |
| | Certivéa | The project's performance is checked through "full third-party" audits conducted by an independent auditor who is appointed and paid by Certivéa. |
| DE | BNK – DGNB-NaWoh | Each Certificate is independently verified via a certification authority usually, the system operator. The certification authority must be accredited by the Deutschen Akkreditierungsstelle (DAkkS) and approved by the Federal Ministry of the Interior, Building and Community |
| IT | Protocollo ITACA | At national level Protocollo ITACA is managed by ITACA (Institute for Innovation and Transparency of Procurement and Environmental Compatibility - Technical body of the Conference of Regions and Autonomous Provinces).<br>iiSBE Italia Association (International Initiative for a Sustainable Built Environment) is the ITACA technical partner |

| | | |
|---|---|---|
| | | for the development/update of the Protocollo ITACA assessment system.<br>Protocollo ITACA is configured as a set of regional contextualized assessment systems characterized by a common methodology and technical-scientific requirements. The idea is in fact to share a common standard but to allow a variation at the local level. Protocollo ITACA process foreseen a third-party certification that involves the checking – by impartial experts appointed by the Certification Body – of the assessment of a project/building made by a Protocollo ITACA Assessor to ensure that it meets the quality and performance standards of the Protocollo ITACA scheme. |
| IE | HPI | The Irish Green Building Council (IGBC) validate the assessments before issuing HPI certification |

### 2.2.2 Auditing process

The analysis of the auditing process adopted by the analysed rating systems show a high level of similarity between the systems. In general, each certificate is developed a qualified suitability expert (auditor) that is recognized by system operator. The auditor develops the draft certificate and submits to the system operator to issue the final certificate. In Some case the system operator offers the possibility of issuing pre-certification during the early design phases of the project.

| MS | Label | Auditing process |
|---|---|---|
| A (Vbg) | KGA | 4 eyes double check for ecological products and building services, product control at building ground, air measurements |
| FR | CERQUAL | 3 audits along the project phases: 1 pre-project audit (optional) – 1 design audit – 1 execution audit. The contracting authority can realise an execution audit without others audits. This process covers all residential building project phases: before execution, during design and execution. |
| | Certivéa | The certification body, that is CSTB, assigns an auditor in order to audit the management system and to check the environmental performances of the building. This occurs at three key steps of the project: at the end of the brief phase, at the end of the design phase, and at the end of the construction phase. |
| DE | BNK – DGNB-NaWoh-BNB | Each certificate is to be developed and audited by a qualified suitability expert (auditor) that is registered at label operator. The auditor is develops the draft certificate and submitted to the label operator or certification body. The certification body audit, validate the submitted certificate and issue the final certificate. The development of the certification can be done with or without a site visit from the label operator (certification body) |

| | | |
|---|---|---|
| IT | Protocollo ITACA | The Protocollo ITACA certification process consists of 2 mandatory phases plus an optional preliminary phase:<br>1. Project phase<br>The assessment is applied to an executive project. The client appoints a professional (Protocollo ITACA Assessor) who has to support the project team in applying the Protocollo ITACA certification process. He/she has the task of interacting with the Certification Body, calculating the Protocollo ITACA indicators, drafting the Assessment Report and coordinating the preparation of the required documentation. During this phase the Protocollo ITACA Assessor, in collaboration with the project team, carries out the calculation of the value of the indicators, determines the score by using the calculation tool and drafts the Assessment Report to be sent to the Certification Body.<br>The Certification Body checks and validates the Assessment Report and issues the Project Certificate.<br>2. Construction phase<br>The validation activity in the Construction Phase aims to check the compliance of the construction with the executive project defined in Phase 1 and the related Assessment Report.<br>The Client appoints the Responsible for Compliance, who may be the Director of Works, the Protocollo ITACA Assessor appointed during the Project Phase or another qualified professional. Based on the Assessment Report provided in phase 1, The Certification Body compile a Compliance Checklist to be used by the Responsible for Compliance to draft the Conformity Report. One or more on-site inspection visits are carried out by the Certification Body to check the factual compliance with what declared in the Conformity Report. Before issuing the final certification, the Certification Body carries out a final overall check including the results of all the on-site inspection visits.<br>A preliminary and optional Pre-Assessment phase can be included in the Protocollo ITACA auditing process. It is applicable to a preliminary project. The Pre-Assessment produces an indicative score of the performance achieved by the construction.<br>The Pre-assessment allows to verify in advance, in terms of performance, alternative design choices and to orient the executive design accordingly. |
| IE | HPI | HPI assessments are submitted to Irish Green Building Council for validation & certification. On-site inspection may be carried out |

### 2.2.3 Compliance/ enforcement method

As the use of the sustainability rating system is voluntary, there is no direct enforcement method. However, most of the MSs offer additional funding to the certified building to encourage the use of the sustainability rating

system. Therefore, projects that do not obtain the certificate are denied the funding.

| MS | Label | Enforcement method |
|---|---|---|
| A (Vbg) | KGA | Additional funding won't be released without a KGA certificate |
| FR | CERQUAL | It is a voluntary process. |
| | Certivéa | |
| DE | BNK – DGNB-NaWoh | The building won't qualify for additional funding if no QNG approved certificate is available |
| IT | Protocollo ITACA | Inability to receive public regional economical and/or volumetric incentives if the building does not reach the required minimum Protocollo ITACA score. In any case, there are different cases in the different Regions and according to the type of building. In Piedmont Region, commercial buildings with an area > 4500 m2 do not obtain authorization to start a commercial activity if they do not reach a minimum score defined according to the building features. In Calabria Region the financial incentives are not provided if the building does not reach the minimum score defined according to the type of building. |
| IE | HPI | It is a voluntary process. |

### 2.2.4 Qualification of assessor

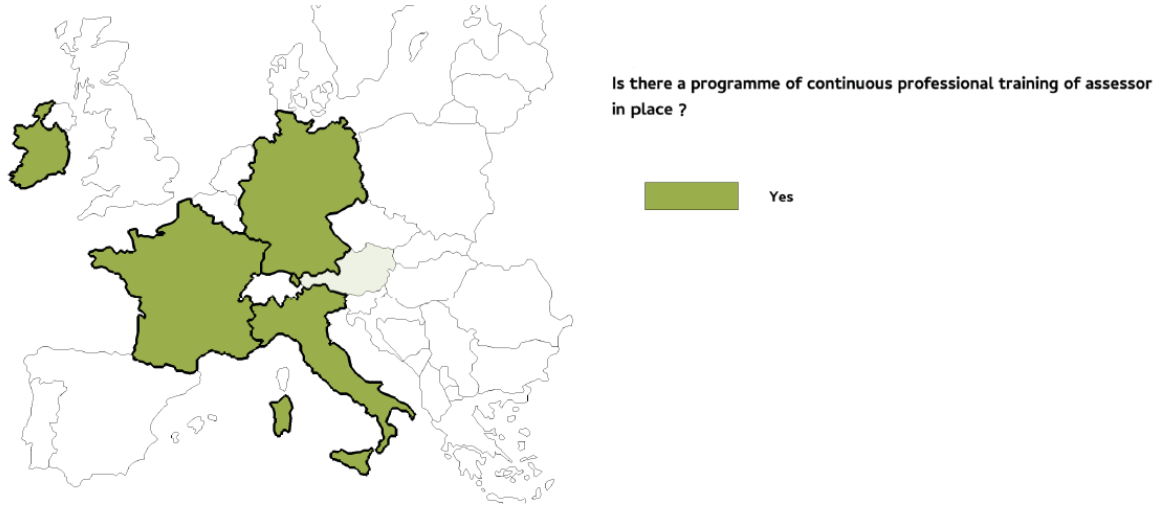
In comparison to the EPC assessor qualification requirements, the qualification requirements for a sustainability auditor are more demanding and require a specialized training and experience.

| MS | Label | Qualification of assessor |
|---|---|---|
| A (Vbg) | KGA | Persons in building physics offices or civil engineering offices. Moreover, the persons must have professional experience in accompanying public buildings with the KGA and regularly participate in the annual retreats. |
| FR | CERQUAL | Assessors must have a solid experience in the field of building energy performance directives and certification. They must follow a training course organised by CERQUAL and pass a test in order to obtain the qualification. |
| | Certivéa | Assessors must own a degree in Architecture or Engineering and/or must prove a solid experience in the field of building performance certification (at least 2 years of experience). They must follow a training course organised by French Scientific and Technical research for Buildings (CSTB) and pass a test on the certification standards. |
| DE | BNK | Degree in architecture or engineering, or proved experiences in disciplines related to the construction sector. To become an auditor the person must have at least two years for holder of |

| | | |
|---|---|---|
| | | Bachelor degree in architecture, for other disciplines, a five year of experience in building related work in required. Moreover, the auditor must enrol and successfully complete a specific training program |
| | BNB | Degree in architecture or engineering, or proved experiences in disciplines related to the construction sector in addition to eight years of professional experience in planning, site management or site supervision. Moreover, the auditor must enrol and successfully complete a specific training program |
| IT | Protocollo ITACA | The Protocollo ITACA Assessor is a professional (architect-engineer-surveyor) enrolled in the professional provincial Register.<br>In general, no further compulsory qualification, obtained through training courses, is required. However, since 2010 specific courses on the application of Protocollo ITACA have been provided for professionals (lasting about 32 hours). Courses are organized in collaboration with concerned Professional Chambers. Participation in the courses is voluntary.<br>Only one Region is currently doing an exception: Calabria Region, where the Protocollo ITACA Assessor must obtain a mandatory qualification by attending a course, taking an exam and so being registered in the Regional Register of Protocollo ITACA Assessors |
| IE | HPI | A A suitably qualified assessor is a construction professional who meets the following criteria:<br>• Is a registered architect, engineer or surveyor<br>• Has successfully completed the required training in the HPI system or is deemed competent by IGBC to carry out the assessment. |

### 2.2.5 Is there a programme of continuous professional training of assessor in place?

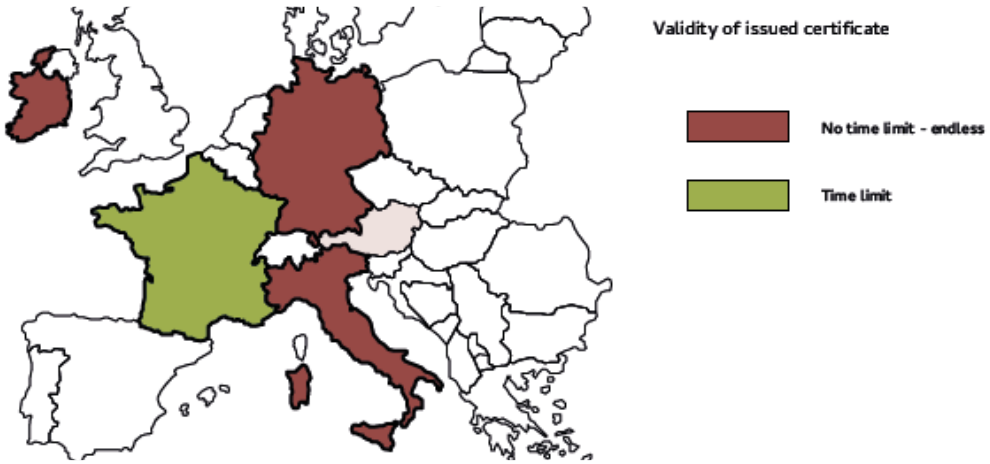
Similar to the case with the EPC assessors, a continuous professional training for sustainability auditor is compulsory to maintain and renew their licence in the majority of MSs. The training workshops are usually organized by the certification bodies and designed to deepen the auditor's knowledge about existing system or to update them about the release of the new version of the sustainability rating system.




| MS | Label | continuous professional training for assessor |
|---|---|---|
| A (Vbg) | KGA | Yes (mandatory) |
| FR | CERQUAL | Yes |
| | Certivéa | |
| DE | BNK | Yes (mandatory) |
| | BNB | Yes |
| IT | Protocollo ITACA | Yes |
| IE | HPI | Yes |

### 2.2.6 Validity of issued certificate

Most notational sustainability rating system does not constrain the validity of an issued sustainability certificate to certain time-limit. In France, however, the sustainability certificate is valid to 3 to 5 years depending on the rating system used and the building is audited annually to ensure the to ensure continuous compliance with the rating requirements.



| MS | Label | Validity of issued certificate |
|---|---|---|
| A (Vbg) | KGA | No time limit – endless |
| FR | CERQUAL | The certification is valid for 3 years, but building values are verified every year (evaluations by sampling and on-site inspections) |
| | Certivéa | A certification cycle lasts 5 years. During this period, interventions are carried out annually to ensure continuous compliance with the requirements of the Standards: 1 admission audit, 4 follow-up interventions alternating on-site audit and remote documentary verification. This first certification cycle can be renewed via a renewal audit. |
| DE | BNK | No time limit – endless |
| | BNB | No time limit – endless |
| IT | Protocollo ITACA | No time limit – endless |
| IE | HPI | No time limit – endless |

### 2.2.7 Physical boundary definition

In contrast to the case of defining the physical boundary of the real estate in the EPCs apply, the analysis show that all the sustainability rating system use very similar definition to define the Physical boundary of the certified property.

| MS | Label | Physical boundary definition of certified object |
|---|---|---|
| A (Vbg) | KGA | Property on which construction or redevelopment is taking place. |
| FR | CERQUAL | Building and the parcel on which the building is located. |
| | Certivéa | |
| DE | BNK | The building footprint only |
| | BNB | The building footprint only. The building site can be assessed using a an additional system |
| IT | Protocollo ITACA | The physical limit of residential building area of relevance |
| IE | HPI | Building and the parcel on which the building is located |

### 2.2.8 Performance rating scale and label classes

Similar to the wide array of label classes and performance rating scales used in the EPC, the performance rating scale and the label class used in the sustainability rating system varies greatly as well. Some systems follow the Olympic medals example of gold, silver and bronze, other use a numerical rating system and in some cases, star-based system is used. This lack of

harmonization among the rating scales and label classes makes the comparability of issued sustainability certificates a very complicated task.

| MS | Label | Performance rating scale and label classes |
|---|---|---|
| A (Vbg) | KGA | A score between 0 to 1000 points |
| FR | CERQUAL | A HQE score with 2 stars on each commitment corresponds to an operation that meets all "basic" NF Habitat requirements (all of these requirements worth 1 point). More ambitious requirements worth 2 or 3 points. For each commitment, if the 40% of ambitious requirements is achieved, the 3rd star is obtained, if 80% is achieved, the projects obtain the 4th star. |
| | Certivéa | Four rankings are possible according to the overall score achieved from the sum of stars obtained on each of the 4 themes:<br>- HQE GOOD<br>- HQE VERY GOOD<br>- HQE EXCELLENT<br>- HQE EXCEPTIONAL |
| DE | BNK | Good ≥ 50%, Very good ≥ 65%, Excellent ≥ 80% |
| | BNB | Bronze ≥ 50%, Silver ≥ 65%, Gold ≥ 80% |
| IT | Protocollo ITACA | Negative: -1 points, Sufficient: 0 point, Good: 3 points, Excellent: 5 points |
| IE | HPI | HPI certified (≥ 35%), Silver (≥ 50%), Gold (≥ 70%) |

### 2.2.9 Categories covered by the rating system

The analysed systems cover the main three domains of sustainably i.e. ecology, economy and sociocultural. However, most of them cover additional domains related to the building process and or the building location. Moreover, the weighting of these issues and the indicators used differs greatly between the systems. These facts make the label results incomparable to each other.

| MS | Label | Label categories |
|---|---|---|
| A (Vbg) | KGA | Process and planning quality (23%), Energy and supply (45%), Health and comfort (12.5%), Building materials and construction (19.5%) |
| FR | CERQUAL | Responsible management, Quality of life, Respect of the environment, and Economic performance |
| | Certivéa | Eco-construction, Eco-management, Comfort and Health |
| DE | BNK | Sociocultural a functional quality (25%), Economic quality (25%), Environmental quality (25%) and Process quality (25%) |
| | BNB | Sociocultural and functional quality (22.5%), Economic quality (22.5%), Technical quality (22.5%) Environmental quality (22.5%), |

| | | |
|---|---|---|
| | | Process quality (10%) and Site quality (is evaluated but not included in the final score) |
| IT | Protocollo ITACA | Quality of the site, Resource consumption, Environmental loads; Indoor environmental quality, Service quality (weighting depends on local priorities) |
| IE | HPI | Environment (36%), Health & Wellbeing (16.5%), Economic (14%), Quality Assurance (21%), Sustainable Location (12%) |

### 2.2.10 Minimum allowed performance values/ knock-out criterion

All the analysed systems, beside the Protocollo ITACA incorporate a set of minimum performance values or criterion that the building must adhere to in order to be considered for the certification.

| MS | Label | Minimum allowed performance values/ knock-out criterion |
|---|---|---|
| A (Vbg) | KGA | Differentiated consumption recording must be implemented. Building cannot be certified if this indicator is not fulfilled |
| FR | CERQUAL | 2 stars on each commitment correspond to the minimum allowed score. |
| | Certivéa | At least 1 star in order to obtain the HQE Good certification. |
| DE | BNK | For each criterion the minimum quality of 1 point must be achieved. Moreover, it is required to achieve the maximum of 10 points for sub-criterion: indoor air hygiene. Building failing to achieve the above mentioned cannot be certified |
| | BNB | For each criterion the minimum quality of 10 points must be achieved. Moreover, it is required to achieve the minimum requirements for sub-criterion indoor air hygiene and barrier free design |
| IT | Protocollo ITACA | None |
| IE | HPI | All mandatory indicators must be assessed in order to obtain the certificate, moreover, To receive HPI certification, a new home must achieve a BER A2<br>rating and also for each of the following indicators the minimum quality of level 1 must be demonstrated:<br>EN 1.0: Land use<br>EN 2.0: Residential density<br>EN 4.0: Water consumption<br>EN 13.0: Local air & ground pollution from combustion of fuels,<br>HW 1.0: Indoor air quality<br>HW 2.0: Daylighting<br>EC 1.0: Net space heat demand<br>QA 1.0: Quality of building shell – air infiltration<br>QA 2.0: Quality of building shell – thermal bridging<br>QA 3.0: Construction team skills<br>QA 4.0: Design team skills<br>SL 3.0: Risk at site – flooding |

### 2.2.11 Inclusion of smart systems, life cycle analysis and interaction with other buildings

The topics related to the inclusion of smart systems, life cycle analysis and interaction with other surrounding are a not always considered in the analysed certification systems.

| MS | Label | Indicators for Smart system | LCA approach used | LCC approach used | Interaction with the surrounding |
|---|---|---|---|---|---|
| A (Vbg) | KGA | No | Yes | No | Yes, green design of the outer space |
| FR | CERQUAL | Yes | Yes | Yes | Only shading |
| | Certivéa | Yes | Yes | Yes | Only shading |
| DE | BNK | Yes | Yes | Yes | No |
| | BNB | Yes | Yes | Yes | Yes |
| IT | Protocollo ITACA | Yes | No | No | No |
| IE | HPI | Yes | Yes | No | Yes |

### 2.2.12 Inclusion of use comfort, health and wellbeing indicators

In contrast to the topics related to the inclusion of smart systems, life cycle analysis and interaction with other surrounding. The analysis show that the topics related to the user comfort and wellbeing are almost always although not equally considered in the analysed national certification systems.

| MS | Label | Barrier free indicator | Air quality indicator | Thermal comfort | Water quality |
|---|---|---|---|---|---|
| A (Vbg) | KGA | No | Yes | Only summer | No |
| FR | CERQUAL | Yes | Yes | Yes | Yes |
| | Certivéa | Yes | Yes | Yes | Yes |
| DE | BNK | Yes | Yes | Only summer | Yes |
| | BNB | Yes | Yes | Yes | Yes |
| IT | Protocollo ITACA | Yes | Yes | Yes | Yes |
| IE | HPI | Yes | Yes | Yes | Yes |

### 2.2.13 Inclusion of Climate change and natural risks indicators

Sustainability system promotes building process and actions that contribute to the climate change mitigation and adaptation effort and to the risks

related to the climate change and nature. The analysis show that the topics related to the climate change and natural risk are almost always although not equally considered in the analysed national certification systems

| MS | Label | Climate change indicators | Natural risks indicators |
|---|---|---|---|
| A (Vbg) | KGA | Yes | No |
| FR | CERQUAL | Yes | Yes |
| | Certivéa | Yes | Yes |
| DE | BNK | Yes | No |
| | BNB | Yes | Yes |
| IT | Protocollo ITACA | No | No |
| IE | HPI | Yes | Yes |

## 2.3 A cross-analysis comparison of the visibility aspects of the sustainability certification across the pilot MS

This chapter represent an in depth analysis of the various mechanisms used by analysed national sustainability certification systems that promote the, acceptance and understanding of the sustainability certificate by a wide audience. Hence, the analysis in this chapter looks at the type of information contained in the sustainability label and how the label rating score is presented. Moreover, it investigates about the availability of an open public database of issued SCs and SCs auditors as well as best practices databases. Furthermore, the study looks at the use of SCs in the real-estate advertisement and the availability of active promotional campaigns and workshops to promote the use of SCs.

### 2.3.1 Key information contained in the label

The good and clear communication of the SCs results a key for its wide utilization and acceptance by serval user groups. Generally, the clearer and easier to understand the information that the SC provide the better the end user is able to make an educated judgment on the condition of the real-estate. The analysis shows that other than some general information about the building and final rating score, no other information is usually presented in the label.

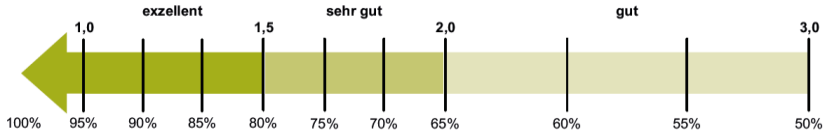
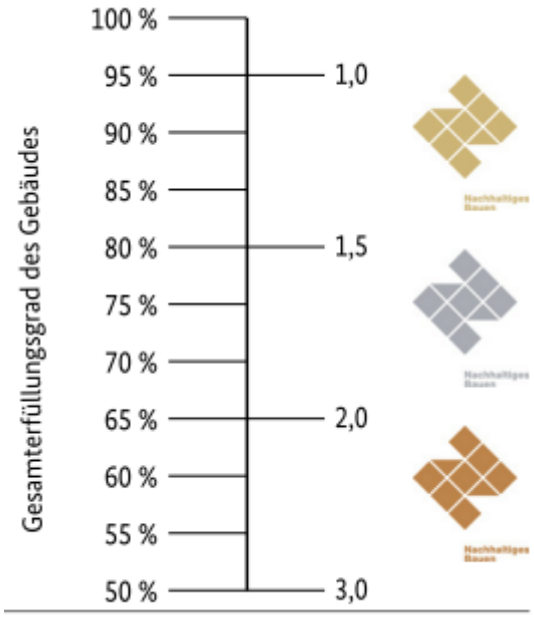
| MS | Label | information contained in the label |
|---|---|---|
| A (Vbg) | KGA | Project name, type of certification, 20 criteria, maximal points and reached points as well as the total score |
| FR | CERQUAL | Reference of the HQE certification, issue and expiry date, building address and type, name and address of the building |

| | | |
|---|---|---|
| | | owner, the number of stars obtained for each of the 3 commitments (quality of life, Respect for the environment, Economic performance), information about the assessor. |
| | Certivéa | Reference of the HQE certification, issue and expiry date, building address type, and use name and address of the building owner, the number of stars obtained for each of the 4 themes (eco-management, life quality, respect of the environment and economic performance), information about the assessor. |
| DE | BNK | The rating score, and class, the version of the rating system used, the name and address of the evaluated building, the name of the auditor and planner, the project reference number at the certification centre, the date of awarding the certificate and the name and signature of the CEO of the awarding institute |
| | BNB | The rating class, the version of the rating system used, the name and address of the evaluated building, the date of the project compilation, the name of the owner, auditor, planner, architect and MEP engineer the project reference number at the certification centre, the date of awarding the certificate and the name and signature of the CEO of the awarding institute |
| IT | Protocollo ITACA | Logo of the Region requesting the Certification, Logo of the Validation Institution, Type of Protocollo ITACA applied, Sustainability Level reached by the building, Score reached for the site localization, Score reached for the quality of the building, Construction year, Evaluation areas and related scores, Usable area of the building, Applicant name, Building CO2 emission m2/year,<br>Energy Class of the building, Signature of the President of the Validation Institution, Signature of the responsible for certifying, The name and the address of the building |
| IE | HPI | N/a |

### 2.3.2 Presentation of the achieved rating

Several design approaches are used by the SCs to present the rating class of the building. This ranges from using a clear numerical score to the use of several visual symbols such as starts of colours to indicate the achieved rating class of the building or the combination of both.

| MS | Label | Label achieved rating |
|---|---|---|
| A (Vbg) | KGA | Numerical, maximal points and reached points |
| FR | CERQUAL | The number of stars obtained for all the commitments allows the HQE profile of the operation to be qualified:<br>- Very good: 6 stars (corresponding to the NF Habitat HQE entry level).<br>- Excellent: 7 to 9 stars.<br>- Exceptional: 10 to 12 stars. |
| | Certivéa | Thought the use of starts: |

<table>
<tr><td></td><td></td><td>Between 1 and 4 stars: HQE Good<br>Between 5 and 8 stars: HQE Very Good<br>9 to 11 stars: HQE Excellent</td></tr>
<tr><td rowspan="2">DE</td><td>BNK</td><td>Sliding (right to left) coloured scale with range from good ≥50%, very good ≥65% and excellent ≥80 %<br> 
</td></tr>
<tr><td>BNB</td><td>Via the use of Three level vertical scale ranging from bronze ≥50%, silver ≥65% and gold ≥80 %<br> 
</td></tr>
<tr><td>IT</td><td>Protocollo ITACA</td><td>Protocollo ITACA label classes is represented by a five-pointed star whose coloring depends on the certification score obtained.<br>
<table>
<tr><th>Rating</th><th>Overall score for sustainability level</th><th>Label</th></tr>
<tr><td>SUFFICIENT</td><td>≥ 1,0 - < 1,5</td><td></td></tr>
<tr><td>DISCREET</td><td>≥ 1,5 - < 2,0</td><td></td></tr>
<tr><td>PASS</td><td>≥ 2,0 - < 2,5</td><td></td></tr>
<tr><td>GOOD</td><td>≥ 2,5 - < 3,0</td><td></td></tr>
<tr><td>VERY GOOD</td><td>≥ 3,0 - < 3,5</td><td></td></tr>
<tr><td>EXCELLENT</td><td>≥ 3,5</td><td></td></tr>
</table></td></tr>
<tr><td>IE</td><td>HPI</td><td>The achived rating is represented by the colord logo of HPI idicateding the achived preformance level</td></tr>
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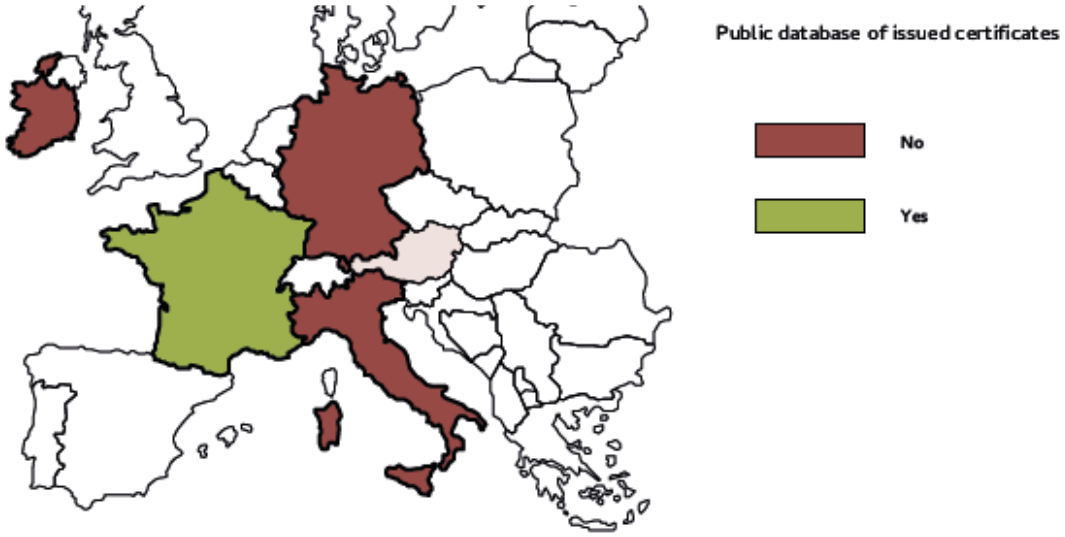
|---|---|---|
| | |  |

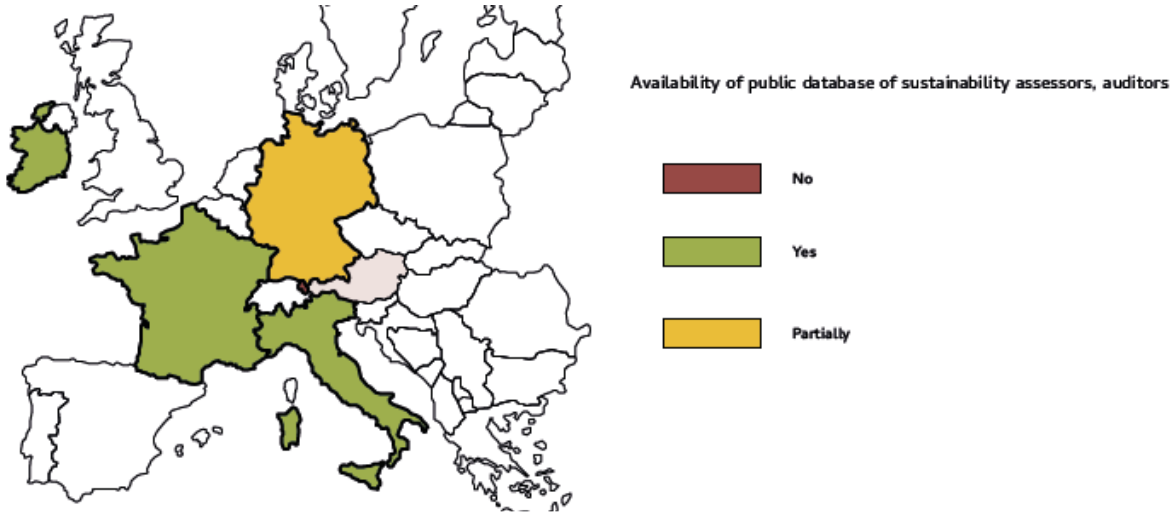
### 2.3.3 Availability of public database of issued certificates




| MS | Label | Public database of issued certificates |
|---|---|---|
| A (Vbg) | KGA | No |
| FR | CERQUAL | No |
| | Certivéa | Yes Certimap (certivea.fr)) |
| DE | BNK | No |
| | BNB | No |
| IT | Protocollo ITACA | No |
| IE | HPI | No |

### 2.3.4 Availability of public database of sustainability assessors, auditors

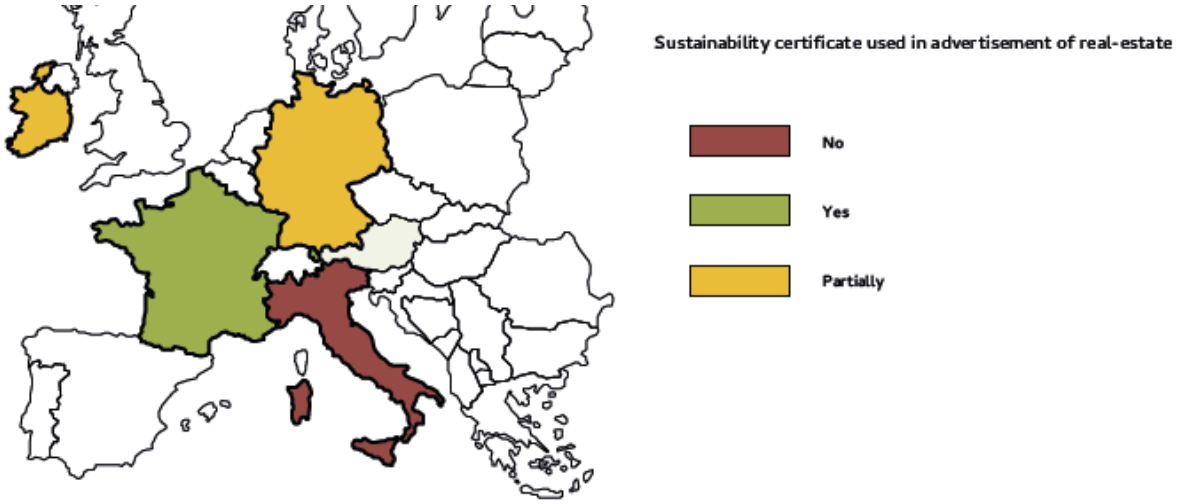
The analysis across the EUB SuperHub partners shows that most national sustainability certification systems do maintain a public database of issued SCs. However, the amount of information that can be retrieved from these databases is usually limited to some key information such as the building rating class, address, auditor name and the validity of the SCs.




| MS | Label | Public database of Auditors |
|---|---|---|
| A (Vbg) | KGA | Access to list via community association |
| FR | CERQUAL | Yes |
| | Certivéa | Yes |
| DE | BNK | No |
| | BNB | Partially (not in every federal state) |
| IT | Protocollo ITACA | Yes |
| IE | HPI | Yes |

### 2.3.5 Use of sustainability Certificate in advertisement of real-estate

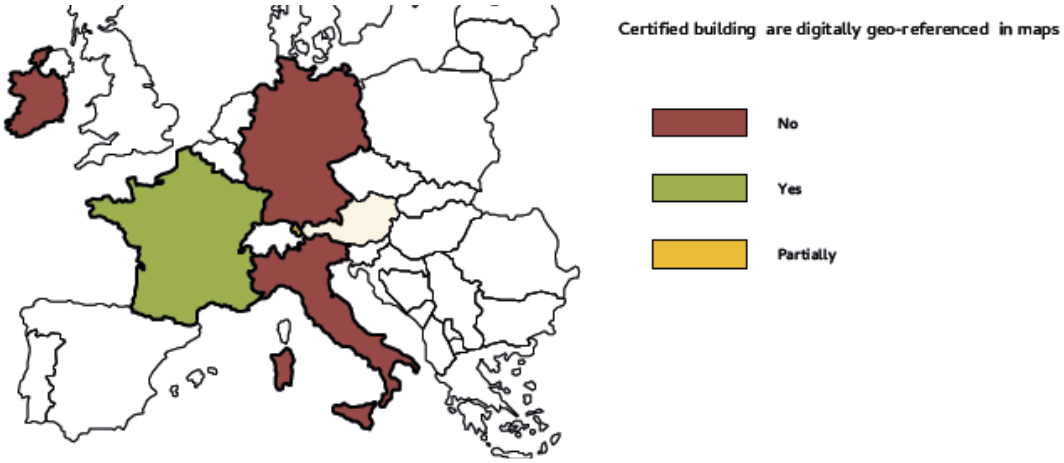
In contrast to the use of EPCs in real estate advertisement that is required by the law and is widely adopted. The analysis shows that information about the SCs is not always available in the real-estate advertisement. This can be attributed to the fact that a very limited number of real-estate has SC and to the fact that most SCs are awarded to newly built and not in-use buildings.

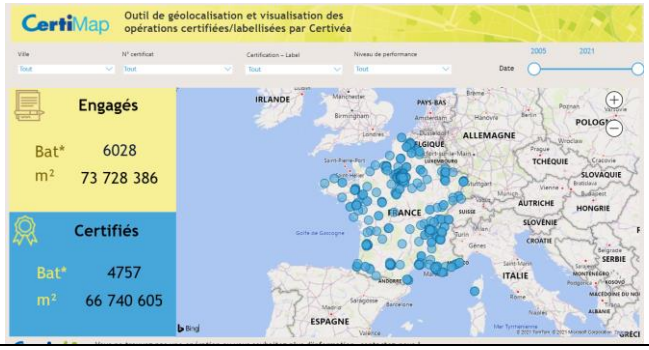



| MS | Label | sustainability certificate used in advertisement of real-estate |
|---|---|---|
| A (Vbg) | KGA | Yes, used for advertisement in the community |
| FR | CERQUAL | Yes |
| | Certivéa | Yes |
| DE | BNK | Due to small number of certified buildings (aprox. 150) it is not yet possible to answer |
| | BNB | No |
| IT | Protocollo ITACA | No |
| IE | HPI | Due to small number of certified buildings it is not yet possible to answer |

### 2.3.6 Availability of digitally geo-referenced maps of certified buildings?

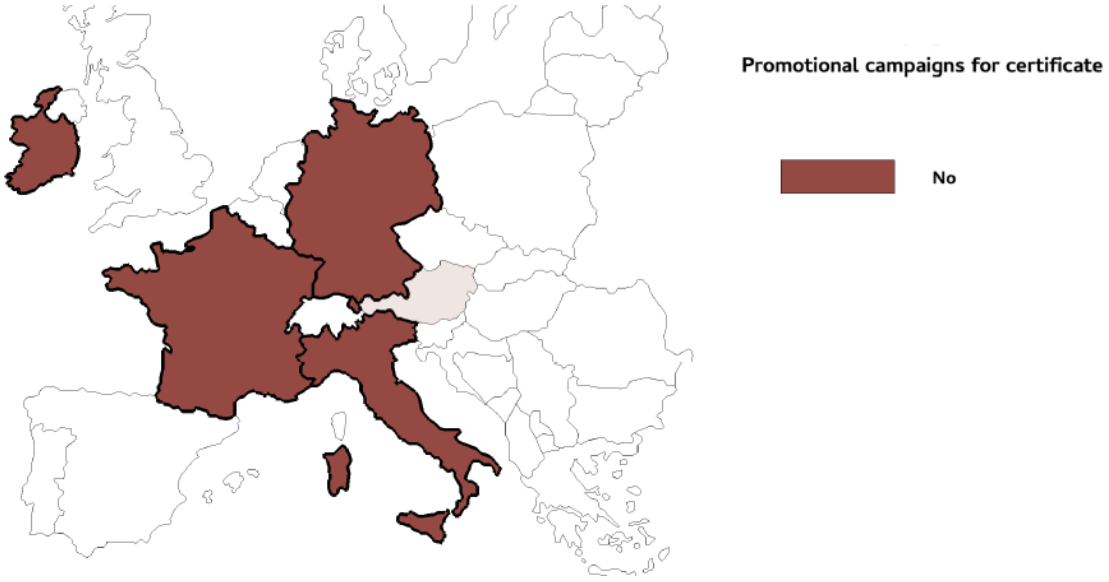
Linking the SCs database to a digital GIS map can be a good tool to attract real estate investors, increase the exposer of the SCS market and can be used to develop targeted local sustainability policy's a. Although, most SC contains the exact address of the certified buildings, among the EUB SuperHub analysed sustainability system, a dedicated GIS map server is available in France only.




| MS | Label | Certified building are digitally geo-referenced in maps |
|---|---|---|
| A (Vbg) | KGA | To promote the public buildings with their ratings, there are excursion guides with overview maps according to which the buildings can be visited via georeferenced points. Each building is explained with text, pictures and fact box in it. |
| FR | CERQUAL | Yes |
| | Certivéa | Yes   |
| DE | BNK | No |
| | BNB | No |
| IT | Protocollo ITACA | No |
| IE | HPI | No |

### 2.3.7 Promotional campaigns for certificate

Despite the great importance and overall benefits of having a wide utilization of building sustainability certification system, the analysis shows that there no active national promotional campaigns that promote the use of the sustainability rating systems in the construction sector.




| MS | Label | Promotional campaigns for certificate |
|---|---|---|
| A (Vbg) | KGA | No |
| FR | CERQUAL | No |
| | Certivéa | No |
| DE | BNK | No |
| | BNB | No |
| IT | Protocollo ITACA | No |
| IE | HPI | No |

### 2.3.8 Events and workshops on for sustainable building certification

| MS | Label | Events and workshops on for sustainable building certification |
|---|---|---|
| A (Vbg) | KGA | Yes, regularly at the EIV (Energieinstitut Vorarlberg) |
| FR | CERQUAL | No |
| | Certivéa | No |
| DE | BNK | Occasionally in building exhibitions and conferences |
| | BNB | No |
| IT | Protocollo ITACA | Occasionally |
| IE | HPI | N/a |

### 2.3.9 Use of electronic certificate or digital application

In the digital age, the use of an electronic application to verify, issue and monitor issued SCs can improve the trust in them and make their use more convenient and secure taking into consideration their long validity of the. However, the analysis shows that there no national rating system among the EUB SuperHub offer such a service

| MS | Label | Digital certificate |
|---|---|---|
| A (Vbg) | KGA | No |
| FR | CERQUAL | No |
| | Certivéa | No |
| DE | BNK | No |
| | BNB | Partially: An eBNB application was developed in 2014 but it doesn't seem to be active any more |
| IT | Protocollo ITACA | no |
| IE | HPI | No |

### 2.3.10 Availability of best practice database

A Best Practice Database present a valuable information resource for both the sustainability auditor and the owners as it's provided them with inspirations and examples about novel technology and construction methods that can be used in their projects. The analysis shows that an increasing number of countries among the EUB SuperHub partners have recognized the importance of databases and actively using them


| MS | Label | Best practice database |
|---|---|---|
| A (Vbg) | KGA | Yes, downloadable at the EIV Homepage |
| FR | CERQUAL | No |
| | Certivéa | No |
| DE | BNK | No |
| | BNB | a very limited version with project examples and simple descriptions available in BNB website |
| IT | Protocollo ITACA | Occasionally |
| IE | HPI | a very limited version with project examples and simple descriptions available in HPI website |

## 2.4 A cross-analysis comparison of the usability aspects of the sustainability certification across the pilot MS

This chapter looks at various mechanisms used by the national sustainability certification system among the EUB SuperHub consortium countries that contribute to the usability of SCs by the end user and help them make better informed decision and triggers actions. This is done in this chapter by studying topics such as the cost of issuing an SC and how the SC impact the design and construction cost, the amount and quality of recommendation that the SC provide, the domains the SCs recommendation cover and whether a decision support mechanism that support the property owner in finding the best strategy is available or not.

### 2.4.1 Cost to issue the sustainability certificate

The cost of issuing the SC is regulated by the national certification bodies. The analysis shows that cost of issuing an SC varies greatly based on the building usage (residential and non-Residential) and size. Based on the analysis made across the EUB SuperHub countries it is safe to say that the cost of issuing an SC is considerably higher in comparison to the cost of issuing an EPCs

| MS | Label | Cost of issuing a certificate |
|---|---|---|
| A (Vbg) | KGA | 1.800€ for the examination of the certificate, Process support costs approx. 0.5% of the construction costs |
| FR | CERQUAL | N/a |
| | Certivéa | The average cost per HQE non-residential certification in 2014 amounted to approximately €18000 per certified building. |
| DE | BNK | For the examination and registration of the certificate the price ranges from 595€ for single dwelling to 1.495€ for five dwellings. |
| | BNB | N/a |
| IT | Protocollo ITACA | Cost is related to the gross area of the building: for single or two-family buildings with a maximum gross area of 500 m² cost 600€. For multi-family buildings up to 2000 m² the certification cost 1800€, each additional m² cost 0.60€. For non-residential buildings the price is related to the gross area of the building starting from 3000€ for buildings with a maximum gross area of 2000 m², each additional m² cos 0.80 euro |
| IE | HPI | Registration fees depend on the number of homes to be certified and range from €120 for registering 1 to 5 homes up to a maximum of €250 for more than 100 homes. The certification fee also depend on the number of homes and design layouts as follows: Number of unit types x €100) + :<br>From 1 – 100 unit @ €50/unit, 101 – 500 unit @ €24/unit and 501 unit+ @ €16/unit. For example a development of 63 homes which contains 5 different design layouts is calculated as follows: (100 x 5) + (63 x 50) = € 3,650.00 |

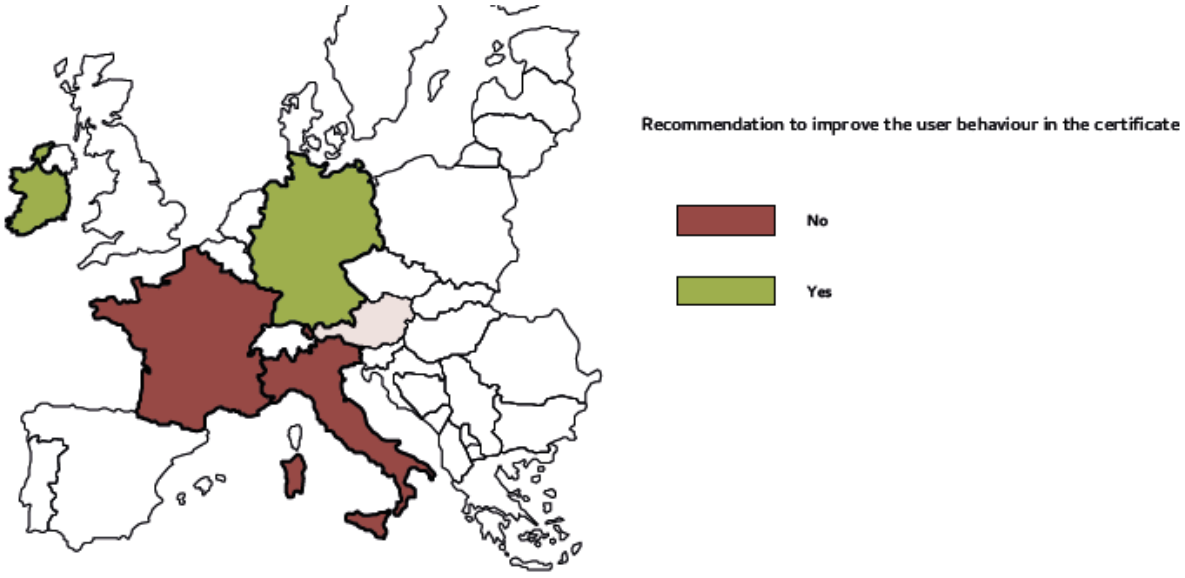
### 2.4.2 Increase in the design and construction cost of the building due to certification in %

The building performance requirements of a sustainable building are considerably higher and more demanding than the standard practice and standards, this in return make the initial the design and construction cost of a sustainable building higher than a traditional building. However, on the long run, the additional upfront investment of a sustainably building is usually paid back many times during the lifetime of the building. Estimating the increase in the design and construction cost of the building due to certification is a hard task as the cost increase varies greatly based on the building size, type, location, the local building regulations and the used certification system. The table below gives an initial approximation based on the author's experiences and available literature.

| MS | Label | Increase in the design and construction cost of the building due to certification in % |
|---|---|---|
| A (Vbg) | KGA | Process support about 0,5%, certification 1.800€, material about 3% |
| FR | CERQUAL | N/a |
| | Certivéa | N/a |
| DE | BNK | N/a |
| | BNB | Increase the design cost:<br>• For objects up to 5 million€ an additional planning costs of approx. 20 - 25%<br>• For objects up to 5 - 40 million € an additional planning cost of approx. 10 - 20%<br>• For objects up to 40 - 100 million€ an additional planning cost of approx. 8 - 10%<br>• For objects over 100 million€ additional planning costs of approx. 5% Increase in construction cost:<br><br>The Increase construction cost of a building due to certification is very much dependant on the energy quality of the building. For building with marginal energy quality that barely meet the required EPC, the construction cost can increase by up to 15%. For zero or nearly zero energy buildings the cost increase in increase construction cost can be as low as 1% |
| IT | Protocollo ITACA | The additional cost for the Protocollo Itacal Assessor can reach a maximum of 5% of the design cost. The additional costs for the Responsible for Compliance can reach a maximum of 2% of the construction management costs. |
| IE | HPI | N/a |

### 2.4.3 Inclusion of recommendation to improve the user behaviour in the certificate

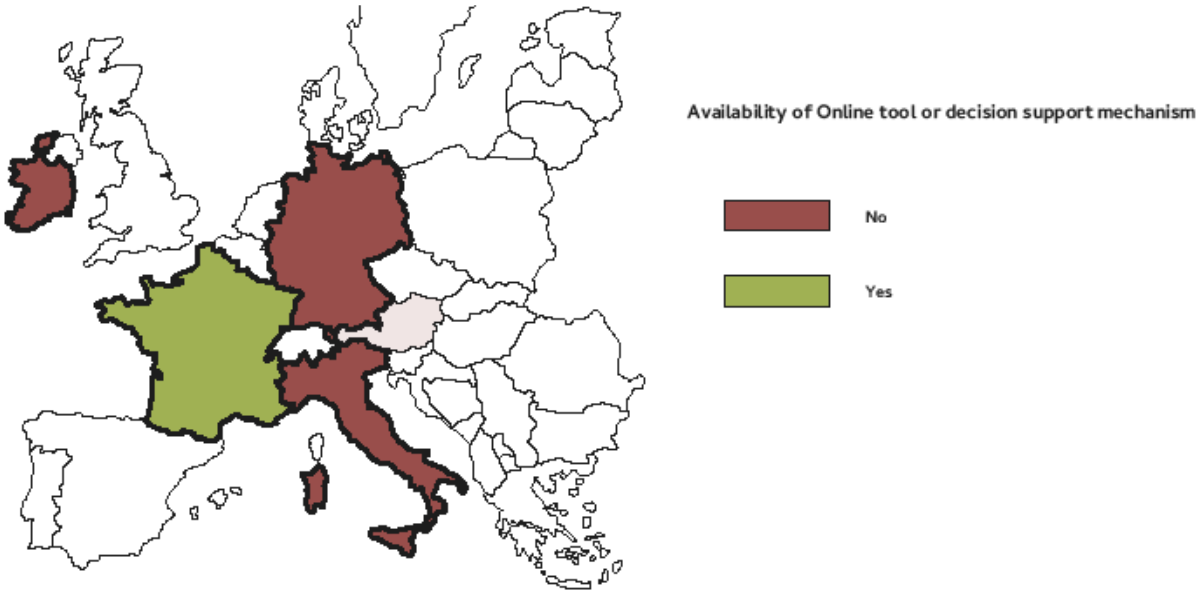
The user behaviour and their level of awareness and correct user of the building passive and active systems can have a high impact on the energy consumption values and overall performance of the building. A considerable saving in the energy consumption can be achieved though the correct use of the installed systems. The analysis show has a recommendation to improve the user behaviour in the SCs issued among EUB SuperHub countries is not provided. However, as stated earlier, it is anticipated that the inclusion of user behaviour recommendation will become more widely adopted with introduction of the smart readiness rating in the EPC as envisioned in Annex IA of EPBD.




| MS | Label | recommendation to improve the user behaviour in the certificate |
|---|---|---|
| A (Vbg) | KGA | No |
| FR | CERQUAL | No |
| | Certivéa | No |
| DE | BNK | Yes |
| | BNB | Yes |
| IT | Protocollo ITACA | No |
| IE | HPI | Yes |

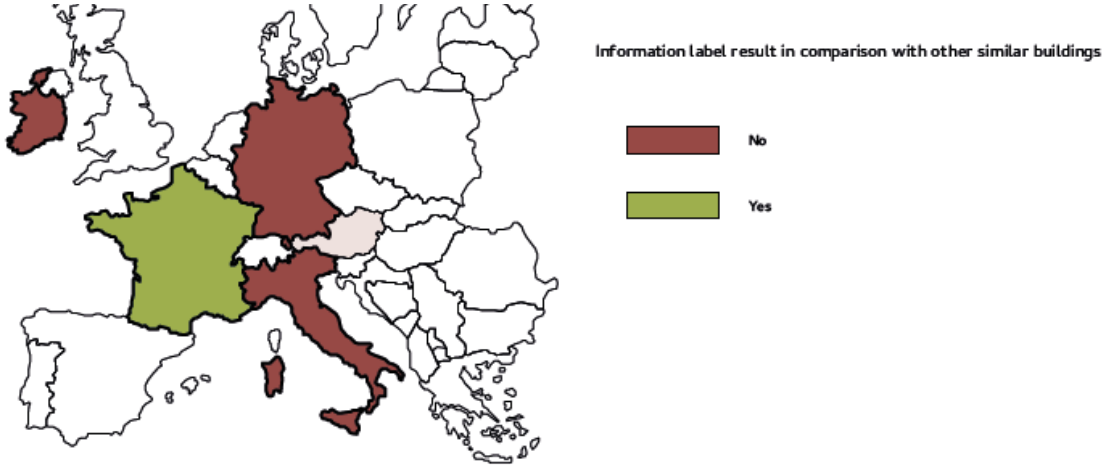
### 2.4.4 Availability of Online tool or decision support mechanism

A Decision Support Mechanism (DSM) is usually presented as online based, interactive, tool that guides the user through a series of questions to assists them in making the most appropriate design decision for their property based on the desired rating. The analysis made here show that the availability of DSMs for SCs is present only in France.




| MS | Label | Online tool or decision support mechanism |
|---|---|---|
| A (Vbg) | KGA | No |
| FR | CERQUAL | Yes |
| | Certivéa | Yes |
| DE | BNK | No |
| | BNB | No |
| IT | Protocollo ITACA | No |
| IE | HPI | No |

### 2.4.5 Information label result in comparison with other similar buildings




| MS | Label | Information label result in comparison with other similar buildings |
|---|---|---|
| A (Vbg) | KGA | No |
| FR | CERQUAL | Yes |
| | Certivéa | Yes |
| DE | BNK | No |
| | BNB | No |
| IT | Protocollo ITACA | No |
| IE | HPI | No |

# 3 Stakeholder's level of trust in EPCs and sustainability certificates and their role in purchasing decisions

The introduction of the EPCs was supposed to transform the real estate market by creating a demand-driven market for energy efficiency in the building sector this was to be achieved via the use of a combination of financial incentives and clear energy performance targets. In retrospect, the EPCs are still far from of achieving the anticipated market transformation and energy consumption reduction. Moreover, the existing EPCs data gaps, low reliability and low public acceptance are preventing Member States from exploiting the full potential of the EPC and sustainability schemes. This led to the energy labels not attaining a significant role in the decision-making process once the building is sold or rented and becoming an administrative burden more than market enabler. The EUB SuperHub project intended to make the next generation of EPCs to reach its market disruptive potential by leveraging on the powers of the 4.0 era and the digital twin technology and to promote the use of user friendly, harmonised common energy and sustainability indicators that will increase the stakeholders trust in the issued certification and create a demand driven market for sustainably and efficient buildings across the EU. In order to achieve these goals and it is important to gain a more comprehensive overview about the level of trust perceived by stakeholders towards EPCs and Sustainability Certificates and of course, to understand how much they play a role in purchasing decisions by stakeholders. Therefore, the project partners (PPs) organized several Focus Groups meeting in their countries and regions covering a wide array of stakeholders.

The Focus Group meetings are quite informal working group that are useful to get valuable feedback from participants, being that the outcomes of the project need their point of views and suggestions. Stakeholders involved come from both the public and private sectors, they are heterogeneous but they are all involved, directly or indirectly, in the building certification process, each for its own prerogatives and competences. Private Citizens have been also involved in the Focus Group with the role of home owners or tenants; their opinion, as "first real-life users of the building", has been crucial for this project activity. Stakeholders involved belong to different working categories, among which: real-estate investor, energy department officer, economist, association of building constructors, energy certifier, architect, engineer, executive manager, manager of energy certifications, homeowner, tenant, etc.

*Figure 16: Image of the focus group meeting held in Croatia*

Reading the just mentioned list of professional invited to attend the Focus Group, it is clear that the attendance heterogeneity was not a random choice and it has been an added value which has allowed us to evaluate the EPC and Sustainability Certificate aspects from many points of view.

In some cases, PPs have performed also B2B meetings due to the difficulty to bring together different participants in the period of August which is, for many, a holiday period. B2B meetings have given the possibility to establish date and time of the conference call individually, ensuring flexibility on both sides.

Thanks to these meetings, a strong cooperation will be established with the stakeholders interested in the activities of EUB SuperHub project, which will be active also beyond the project lifetime to exchange, disseminate and secure developments in the thematic field of building certification process. Actually, the activity of the Focus Group has allowed to make known EUB SuperHub project since the beginning, working also as communication activity.

### 3.1 Focus Group Toolkit

From an organizational point of view, **common material** has been produced in order to ensure a homogeneity of the information to be investigated and a comparability of the results obtained. The **Focus Group Toolkit** contains:

- The Participant Information Briefing Document;
- The Consent Form to be filled by the participants;
- The Focus Group Questions.

The aims and contents of the material contained in the Focus Group Toolkit is summarized below.

### 3.1.1 Participant Information Briefing Document

This document has been produced by the project partner UCC with the aim to briefly illustrate EUB SuperHub project objectives related to the next generation of energy performance assessments and certificates and the activity planned about that.

The Participant Information Briefing Document has been sent to the stakeholders identified as interesting subjects for the Focus Group activity. Within the document are specified all the conditions for the participation, the right to withdraw, the anonymity of the contributions provided, the usage of data collected and their storage security and it is of course mentioned the project website to find any further information about the project.

**Participant Information Briefing Document** used to perform the EUB SuperHub Focus Group is provided in the annex of this document.

### 3.1.2 Consent Form

A consent form is a document signed by persons of interest to confirm that they agree with an activity that will happen and that they are aware of the risks or costs that may come with it. The main purpose of the informed consent process is to protect both the privacy of the stakeholder involved in the activity and the interest of the provider. A consent form is a legal document that ensures the respect of the privacy and of the activity by both parties as per the GDPR. The project partners UNI, UCC and HM elaborated an in-depth consent form which has been translated to the local language of and sent to the Focus Group participants to be signed and returned. A copy of the Consent Form used to perform the EUB SuperHub Focus Group is provided in annex 3 of this document.

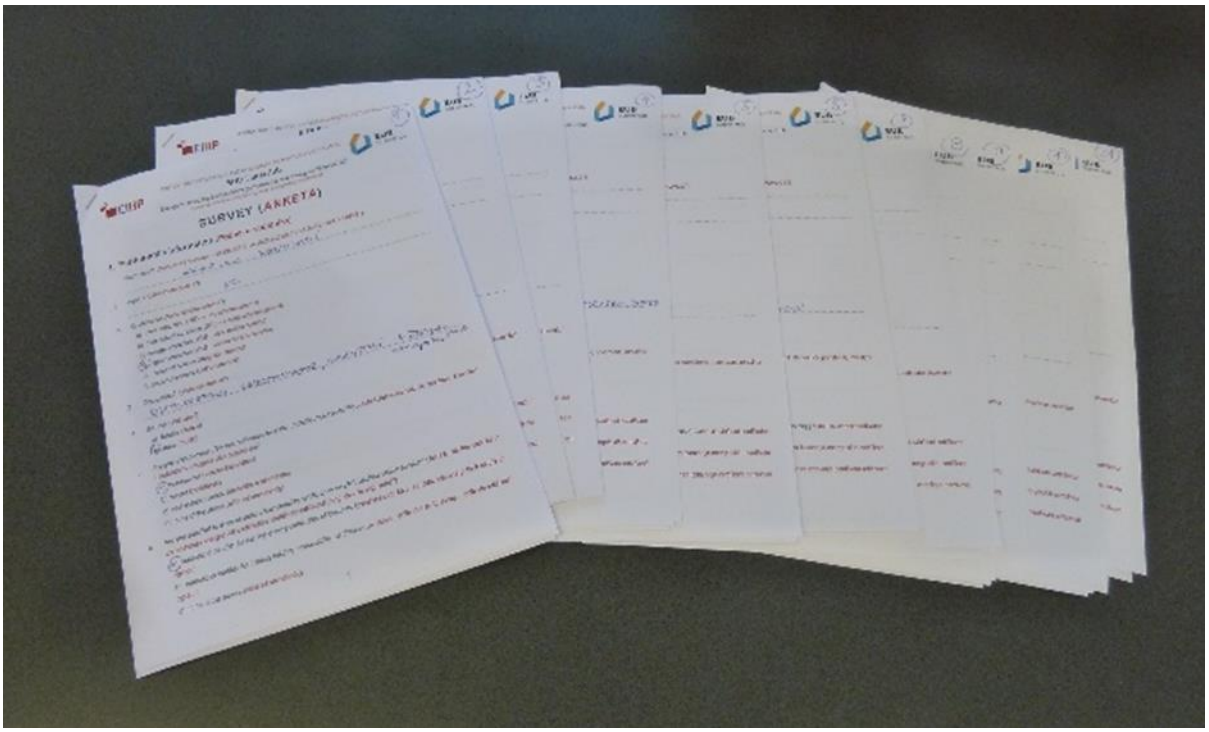



*Figure 17: Image of toolkit distributed on the Focus group meeting participants*

### 3.1.3 Focus Group Questions

This is the key guiding document elaborated by UNI, UCC and HM with the goal of the questions is to gain an in depth understating to how the different stakeholders view the effectiveness and impact of the EPCs and Sustainability Certifications on the real estate market. The Questions were designed to help the facilitator to guide the participants in the meeting discussions and were not intended as fix set of questions that the facilitator is obliged to ask. Therefore, the reader will notice that results of the national Focus Groups performed by PPs are quite different from each other. The document outlining the meeting questions is divided in five main parts as illustrated below:

1. The first part of the document is designed to collect relevant general information about the participants (ex. Age, gender, qualification, occupation, etc.) always guaranteeing the anonymity of the stakeholder involved in the activity as per the GDPR regulations

EUB SuperHub

This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement No. 101033916

Task: 1.1

Mapping of EPCs and sustainability certifications effectiveness and impact on the real estate market

| Name of Facilitator(s): | Email | Affiliation | Date |
|---|---|---|---|
| | | | |
| **Number of participants** | **Focus group venue** | **Duration** | **Other** |
| | | | |

1. Participants' information

| Participant number | Age | Qualification (if relevant) | Occupation | Gender |
|---|---|---|---|---|
| 1 | | | | |
| 2 | | | | |
| 3 | | | | |
| 4 | | | | |
| 5 | | | | |
| 6 | | | | |
| 7 | | | | |
| 8 | | | | |

| Participant number | Are you a Homeowner, Tenant, real-estate Investor: (multiple choice possible) | Are you qualified to issue or audit a Sustainability certificate or an EPC (multiple choice possible) |
|---|---|---|
| 1 | | |
| 2 | | |
| 3 | | |
| 4 | | |
| 5 | | |
| 6 | | |
| 7 | | |
| 8 | | |

*Figure 18: An image of the first part of the focus group guiding questions document*

2. The second part of the document contains a group of questions that are designed to collect information about the participant's general awareness regarding national sustainability targets related to buildings. The questions are designed to gauge the participant's familiarity with Energy Performance Certificates (EPCs) and Building Sustainability Certificates. These questions were used to help the meeting facilitator understand the participant's level of awareness and familiarity with the local energy and sustainability issues in the real estate market.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement No. 101033916

## 2. General Information (optional)

1. Are you aware of national targets for building energy savings (or reduction of GHG emissions)?
2. Are you aware of national sustainability targets related to buildings?
3. Are you aware of any instruments (like incentives) implemented in your country to achieve these objectives?
4. Are you familiar with Energy Performance Certificates (EPCs)?
5. Are you familiar with Building Sustainability Certificates?
6. Have you ever evaluated / had a professional evaluate the energy consumption of the building you want to sell/renovate/ rent/ Buy? And how?
7. Have you ever evaluated/ had a professional evaluate the sustainability performance of the building you want to sell/renovate/ rent/ Buy? And how?

*Figure 19: An image of the 2nd part of the focus group guiding questions document*

3. The third part of the questions is related to understating the role of the EPC and sustainability certification in the purchasing decisions and it is divided into two sections: the first one is devoted to the analysis of the EPCs and the second to the Building Sustainability Certificates. Questions are differentiated according to the role of the stakeholder involved and they try to be all-encompassing on the issues addressed.

EUB SuperHub

This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement No. 101033916

3. Focus group questions for discussion (Purchasing decisions related)

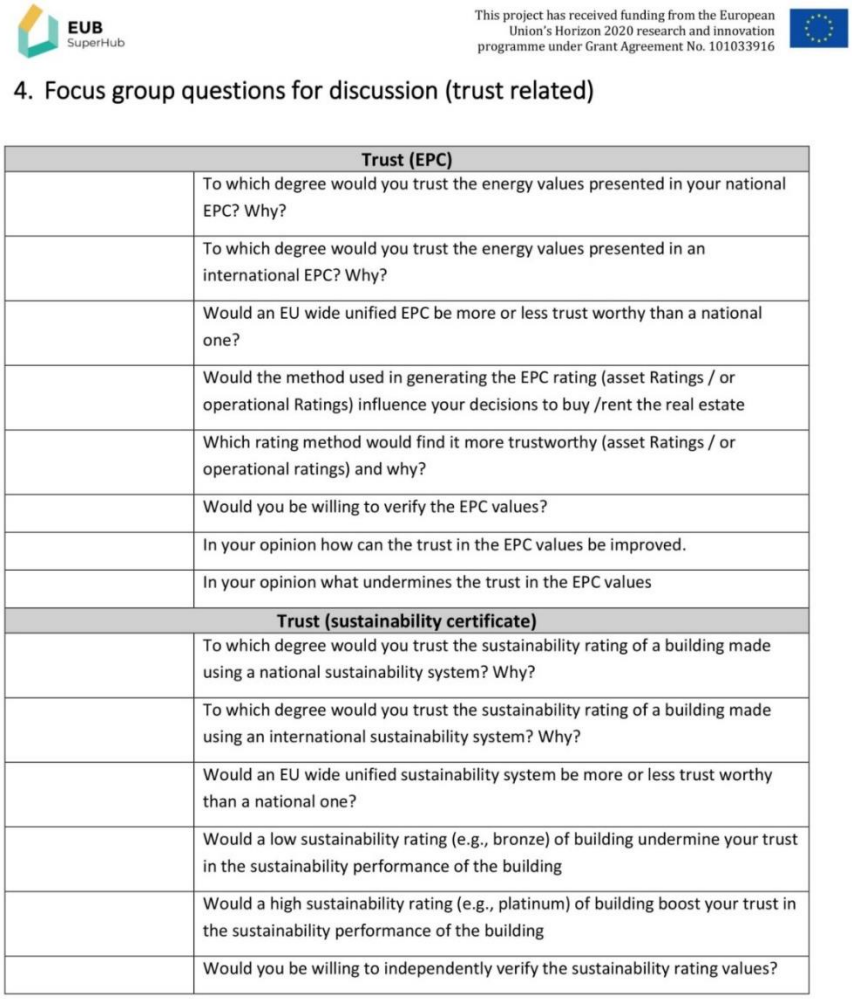
| Purchasing decisions (EPC) | |
|---|---|
| | Was the energy rating of your exiting dwelling an important factor in your decision to rent/buy the dwelling? Why? |
| | Imagine you want to buy/ move to a new a real estate (residential/ non-residential); would you consider the energy label important? How? |
| | Would you consider changing / selling/ renovating your real estate based on its energy rating? Why? |
| | Would you use energy label as a parameter to compare different advertisements? |
| | Would you be willing to spend more for a building with a higher energy efficiency? If yes, how much in % over market price? |
| | Would you be willing to invest in an energy certificate for your building in order to increase its value? If yes, how much in % of real estate value? |
| | How important do you think the energy label is for the value of the building to be restructured/sold? |

| Purchasing decisions (sustainability certificate) | |
|---|---|
| | Was the sustainability rating (if any) of your exiting dwelling an important factor in your decision to rent/buy the dwelling? Why? |
| | Imagine you want to buy/ move to a new a real estate (residential/ non-residential); would you consider the sustainability label important? How? |
| | Would you consider changing / selling/ renovating your real estate based on its sustainability rating? Why? |
| | Would you use sustainability label as a parameter to compare different advertisements? |
| | Would you be willing to spend more for a building with a higher sustainability rating? If yes, how much in % over market price? |
| | Would you be willing to invest in a sustainability certificate for your building in order to increase its value? If yes, how much in % of real estate value? |

*Figure 20: An image of the 3rd part of the focus group guiding questions document*

4. The fourth part of the Focus Group questions is designed to measure the stakeholder's level of trust in the EPCs and sustainability certificate schemes. As above, also this part is divided into the two key sections; participants are asked to comment on trust in the energy values presented in their EPCs and in the sustainability rating of a building made using national or international Sustainability Certificate. Other questions ask stakeholders to comment about the possibility of using

an EU wide unified EPC and the same for the sustainability system, about the rating method they consider more trustworthy, about the possibility to improve EPC values, etc.



EUB SuperHub

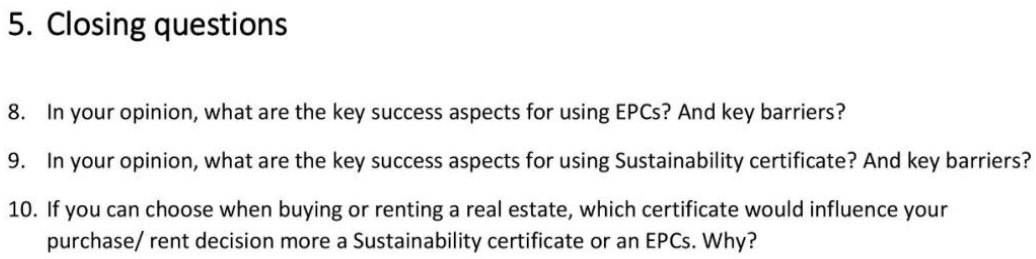
This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement No. 101033916

4. Focus group questions for discussion (trust related)

| | |
|---|---|
| **Trust (EPC)** | |
| | To which degree would you trust the energy values presented in your national EPC? Why? |
| | To which degree would you trust the energy values presented in an international EPC? Why? |
| | Would an EU wide unified EPC be more or less trust worthy than a national one? |
| | Would the method used in generating the EPC rating (asset Ratings / or operational Ratings) influence your decisions to buy /rent the real estate |
| | Which rating method would find it more trustworthy (asset Ratings / or operational ratings) and why? |
| | Would you be willing to verify the EPC values? |
| | In your opinion how can the trust in the EPC values be improved. |
| | In your opinion what undermines the trust in the EPC values |
| **Trust (sustainability certificate)** | |
| | To which degree would you trust the sustainability rating of a building made using a national sustainability system? Why? |
| | To which degree would you trust the sustainability rating of a building made using an international sustainability system? Why? |
| | Would an EU wide unified sustainability system be more or less trust worthy than a national one? |
| | Would a low sustainability rating (e.g., bronze) of building undermine your trust in the sustainability performance of the building |
| | Would a high sustainability rating (e.g., platinum) of building boost your trust in the sustainability performance of the building |
| | Would you be willing to independently verify the sustainability rating values? |

*Figure 21: An image of the 4th part of the focus group guiding questions document*

5. The fifth and final part of the document contains a number of the closing questions. The questions ask the participants about their opinions regarding main success factors and barriers facing both EPCs and Sustainability Certificates and whether the SC result or the EPC result would influence the final sale, rent or purchase decision.



5. Closing questions

8. In your opinion, what are the key success aspects for using EPCs? And key barriers?
9. In your opinion, what are the key success aspects for using Sustainability certificate? And key barriers?
10. If you can choose when buying or renting a real estate, which certificate would influence your purchase/ rent decision more a Sustainability certificate or an EPCs. Why?

*Figure 22: An image of the 5th part of the focus group guiding questions document*

## 3.2 Comparative analysis among national results

### 3.2.1 Participants Information

Focus Group activities performed by PPs have involved a **total of 56 stakeholders**. The **gender distribution** points out the participation of more males than females, but not as predominant: 25 females have participated compared to 31 males. Although the number of participants was not particularly high, it has been however relevant to understand **the age distribution** of the stakeholders involved. The age is a key parameter to relate to the answers given by participants on the key issues of this deliverable. The importance and sensitivity given to the building Energy Performance Certificates and to the Sustainability Certificates could also be affected by age. Since not all the participants have provided the precise age value, four age classes have been identified, as follow: age < 30 years; age from 30 up to 40 years; age from 41 up to 60 years and age >60 years.

The age distribution was not heterogeneous; more than half of the participants involved (54%) are between 41 to 60 years old, the 27% is represented by participants with age ranging from 30 to 40 years old while, only the 12% and the 7% are represented respectively by the younger people which are less than 30 years old and stakeholders with more than 60 years old.

The table below shows the number of the stakeholders involved in each national Focus Group meetings divided per gender and age range.

*Table 1: Table with the gender and age distribution of the participants per country*

| MS | N° of participants | Gender | | Age group distribution | | | |
|---|---|---|---|---|---|---|---|
| | | Male | Female | < 30 yr | 30 to 40 yr | 41 to 60 yr | > 60 yr |
| A (Vbg) | 9 | 5 | 4 | 3 | 2 | 4 | |
| HR | 11 | 6 | 5 | 3 | 3 | 5 | |
| FR | 5 | 4 | 1 | | 3 | 2 | |
| DE | 4 | 2 | 2 | 1 | 2 | 1 | |
| HU | 3 | 1 | 2 | | 3 | | |
| IT | 19 | 5 | 14 | | | 15 | 4 |
| IE | 5 | 2 | 3 | | 2 | 3 | |
| Total | 56 | 25 | 31 | 7 | 15 | 30 | 4 |

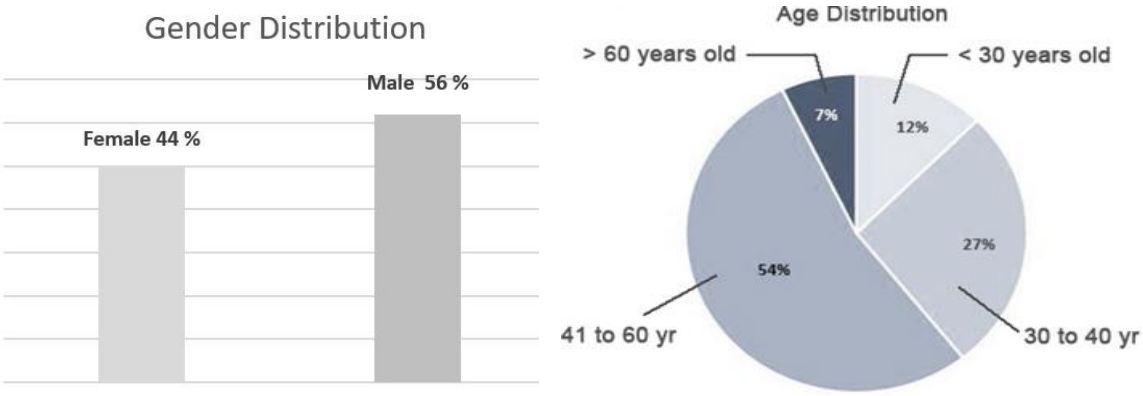



*Figure 23: Graph showing the gender and age distribution of the participants*

Concerning the **occupation** of the stakeholders involved in Focus Groups, **many job categories have been represented** and this is an added value for the research because, opinions of people with different job and life-experiences have been taken into account. The work heterogeneity of the participants has been summed up through a **grouping by category of employment** (professional– researcher – project manager – public administration – housing association/tenant – real-estate manager – building constructor - student - other), as shown in the graph below.

Just for the sake of clarity, under the category named "*professional*" are covered all the jobs related to the managing of the energy efficiency and the

technical roles covered by architects, engineers, etc. while category named "*others*", it considers specific job categories covered by some of the participants, like for example the economist, the safety expert, the lawyer, the geographer, etc.

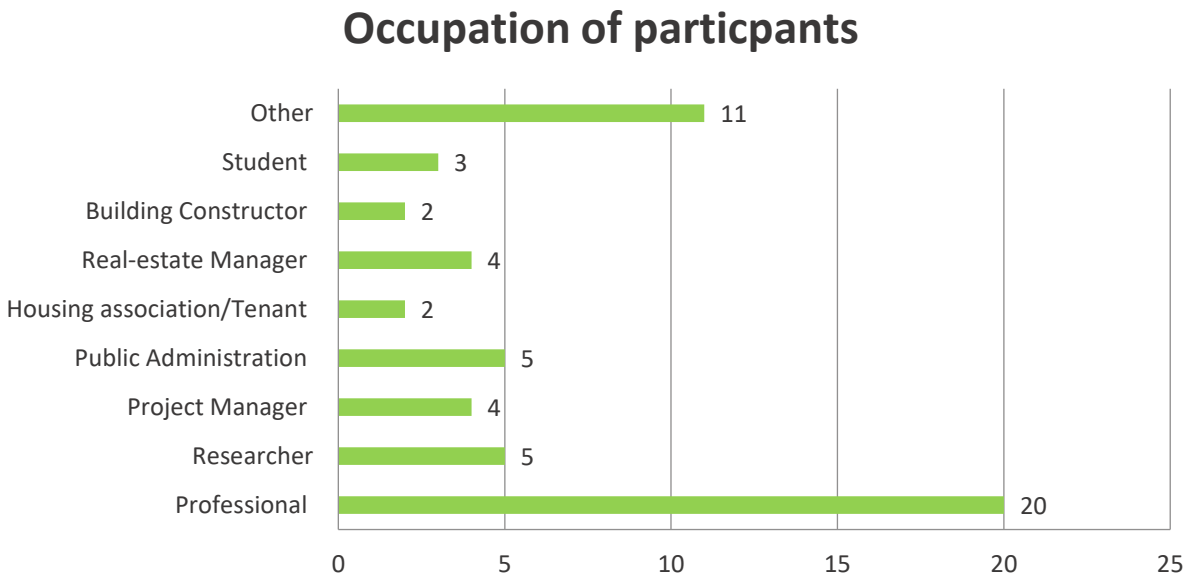



*Figure 24: A graph showing the occupation distribution of the participants*

During the Focus Group, some university students were also asked to give their opinion on the topics covered by the T1.1 project activity in order to receive suggestions by all the categories involved and make results more representative.

Starting from the previous point, what is important to evaluate is the numerical distribution among "**Qualified** in EPCs and Sustainability Certificate" and "**Non-Expert**". Qualified professionals are defined within the context of this survey as those ones competent and trained to issue or audit a Sustainability Certificate or an EPC, non-experts are represented by those ones which are not familiar with the issuing or auditing of EPCs and Sustainability Certificates.

The chart below also shows a further distinction between "Expert in EPCs" and "Expert in Sustainability Certificate", a very useful consideration for the activity of EUB SuperHub project.

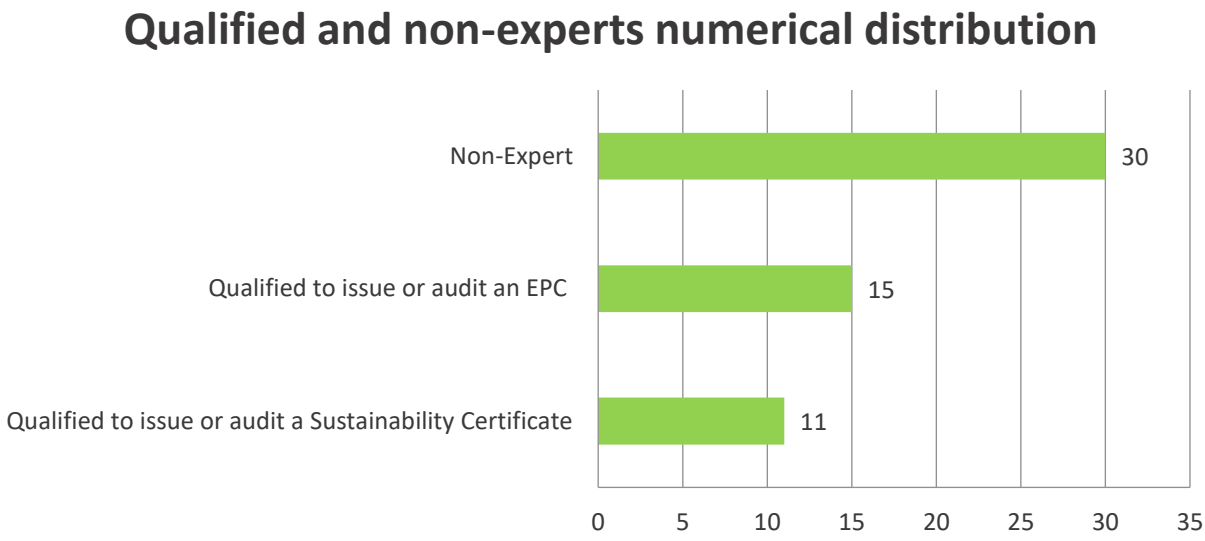



*Figure 25: A graph showing the number of qualified and non-expert participants in the focus group meetings*

In absolute terms, it can be said that the distribution between "qualified" and "non-expert" stakeholders involved by PPs in Focus Group activities occurred in a homogeneous way. In fact, almost half of the subjects involved are non-experts in the energetic and sustainability fields while the other half it is.

The other important distinction was made between professionals qualified to issue or audit an EPC and those who are qualified to issue a Sustainability Certificate. The predominant representation is covered by professionals qualified to issue EPC; this data is not surprising because EPCs are much more common than the Sustainability Certificates and consequently also professionals able to draft them.

### 3.2.2 General Information

The following represent a summary of the focus group meetings by the PPs in each country. The summary synthesizes the key information from each national context, trying to highlight the key elements and views shared by the participants.

- *Are you aware of national targets for building energy savings (or reduction of GHG emissions)?*

Almost **all "Qualified" participants are aware of national targets for building energy saving** as it is part of daily job. On the other hand, in some cases **"non-Expert" participants** involved in Focus Groups **have less knowledge of the subject**.

- *Are you aware of national sustainability targets related to buildings?*

**National sustainability targets are**, in general, **less known than the energy ones** mentioned in the previous questions. Many stakeholders involved, both qualified and non-expert, are not so familiar with Building Sustainability Certificates; in some cases, it depends on the fact that has not yet been developed a national sustainability system and consequently, there is not an obligation to have a building sustainability certificate in place.

- *Are you aware of any instruments (like incentives) implemented in your country to achieve these objectives?*

**National economic incentives and governing legislation are not so known by most of the respondents**. Incentives and this type of instruments are better understood by those who work exploiting them but little known by non-expert. The answers given during all the Focus Group meetings performed are very closely aligned with each other and they all agree on the fact that, incentives are often referred to the buildings renovation and they are well known by those who need to use them. Specifically, non-expert people are interested in the subject only when it touches their interests, such as when renovating their home.

- *Are you familiar with Energy Performance Certificates (EPCs)?*

On the basis of all the responses analysed, it can be stated that **EPCs are fairly well known by both qualified participants and non-expert participants**. Naturally, the qualified participants are familiar with EPC as they part of their work, in other cases they have to deal with EPC for sale or rent reasons. The non-expert participants are also quite familiar with EPCs because it is mandatory to have an EPC in case of renting or buying a property.

- *Are you familiar with Building Sustainability Certificates?*

Building Sustainability Certificates **are less known among all the** involved participants of the Focus Group activity. This can be explained by the fact that in most cases Sustainability Certificates are not obligated by law. Furthermore, it became apparent that Sustainability Certificates are not widely promoted at national level. Moreover, a national Sustainability Assessment system for buildings is not available across all the EUB SuperHub involved countries.

- *Have you ever evaluated / had a professional evaluate the energy consumption of the building you want to sell/renovate/ rent/ Buy? And how?*

As per the EPBD it is mandatory by law to have the EPC of the building you want to sell, buy or rent thus, almost all the participants have either hired an energy assessor or as in the case of the qualified stakeholders involved in the Focus Group activities have evaluated the building energy consumption as a part of their daily job. In some cases, professionals also performed the energy simulation of the building in order to make renovation suggestions.

- *Have you ever evaluated/ had a professional evaluate the sustainability performance of the building you want to sell/renovate/ rent/ Buy? And how?*

It is not surprising that none of the non-Expert stakeholders involved in the survey has ever had a professional evaluate the sustainability performance of a building. As mentioned before, national Sustainability Certificates are not compulsory, and they are well known only to those professionals that are involved in issuing sustainability building assessment.

### 3.2.3 Summary of the participant's response on the role of EPC in purchasing decisions

Almost all respondents agree on the fact that there are more important factors besides the energy rating of the building when renting or buying a property. These factors are related to the location of the building, its proximity to schools, kindergartens and its general accessibility. Some participants mentioned that they would rather buy a property with low energy rating which they could renovate to their standards than to buy a home specifically because it has a good energy rating. They would be willing to invest money in renovating the home to the comfort levels they desire.

The energy rating of the dwellings seem to be to have a higher value at the younger non-expert participants which consider the energy rating of a building an important factor in case of renting/buying the dwelling. According to qualified participants they pointed out that in their experience that  The role energy performance certificate rating appear to be not significate  most elderly buyers (over 55 years old) and is instead taken very much into consideration by the younger buyer, who gives priority to the energy aspects and is more aware of the issue

**The role of the EPC rating in purchasing decisions appear of less important to most elderly buyers (over 55 years old) in contrast to younger buyer that show more interest in EPC rating into  when purchasing a property.**

Despite the energy rating is considered not a primary factor in rent/buying decisions, from a visual-graphic point of view the **energy national label is considered a clear distinctive feature of the energy performances of a building** and more in general, it is taken into account mainly in case of the purchase of a property. Participants agreed that when buying a dwelling the energy rating might be more important factor than when renting. Label refers to building energy consumption so, it is directly linked both to the **reduction of pollutant emissions** caused by buildings heating and to the **cost of the heating bills**. The better the energy rating of the building, the lower the energy consumption and the more comfortable living in the building. In any case, most of the respondents underlined the fact that **the overall sustainability of the dwelling should be considered much more than the energy aspects**.

Some stakeholders involved have however made some considerations in reference to the understanding of the methodologies used to achieve that energy class because it can be that, a dwelling that is rated as an "A" house today can be rated as "D" in 20 years. Therefore, it is more important to have a more holistic overview about the **technologies and materials used to achieve the energy rating than the end rating itself.**

**A dwelling that is rated as "A" house today can be rated as "D" in 20 years. Therefore, it is more important to have a more holistic overview about the technologies and materials used to achieve the energy rating than the end rating itself.**

Energy label is not considered, for most of the "non-expert" respondents, as a useful parameter to compare different advertisements; when people are interested in new dwellings, the approach is similar to what one may have when buying a car: you look at how many accessories it has and not at what they really are useful at. It is not the content of the certification that matters, but the fact that there exists one or not. This is because **the energy label is mostly perceived as a qualitative instrument** and there is not a direct evaluation of what it means in terms of dwelling's energy consumption. In any case, this approach strictly depends **on people awareness and sensitivity to energy and sustainability issues**. It is also true that, most non-expert people in the field of building energy efficiency, they cannot interpret some part of the EPCs contents and consequently they consider energy label negligible.

Considering the real estate market, national situations differ from country to country and of course from person-to-person, but in general "non-expert" **participants interviewed would be willing to spend more on a building with higher energy efficiency.** They are willing to pay approximately between 5 and 20 % maximum over the market price for a building with higher energy efficiency. It is however important to specify that, in some cases, the choices in the real estate market are very limited and are hardly affordable, hence a person can only purchase what is available and affordable. Real estate prices are in some country so high that energy price takes a lesser role. However, this view was not shared by the involved **"qualified" participants**. Many of **"qualified"** that manage and issue energy certifications in the different countries involved in the survey, stated that **they would not be so willing to spend more for building declared "high energy efficient" through the EPC values. This is because they know that what is declared in the EPC does not always correspond to the reality**. Where there are few quality controls, the risk is to produce EPCs only for compulsory reasons. For that reason, energy certification is a powerful tool but **the intrinsic limit it presents is related to the certifying subject**, as some professionals see it only as a mandatory bureaucratic fulfilment. Furthermore, if **there is no adequate organization of the offices responsible for revising and checking the contents declared in the EPCs**, the risk is that some professionals fill it out in a decidedly hasty manner.

**It is possible that what is declared in the EPC does not always correspond to the reality. Where there are few quality controls, the risk is to produce EPCs only for bureaucratic compulsory reasons g itself.**

For "qualified" stakeholders involved in Focus Group meetings, as the energy rating covers only one of many aspects of the sustainability of a building, they do not consider it viable to invest in the building to improve its energy performance. EPC provides a partial view about the state of the building and not the full picture. This view was also shared by the non-experts' participants as they view the EPC as an extra bureaucratic obligation for the seller or renter of the building.

*Figure 26: Part of the discussion taking place during the focus group meeting*

### 3.2.4 Summary of Participant's response to the role of Sustainability Certificate in purchasing decisions

As mentioned previously, very few participants are familiar with Building Sustainability Certificates. It is therefore not surprising that **only "qualified" stakeholders involved considered, in a conscious way, Sustainability Certificate as an important factor in their decision to rent/buy the dwelling**. "Non-experts" consider the sustainability performance of their existing dwelling to be important, but not a deciding factor in their decision for purchasing/renting a property.

Theoretically, all the participants agree that the overall sustainability of a building would be more important than just the only energy rating because it encompasses much more key sustainability aspects but in practice, **due to the fact that there are hardly any certified buildings with**

**Sustainability Certificates on the market, they couldn't take such an aspect into consideration**.

**The overall sustainability of a building would be more important than just the only energy rating because it encompasses all the key sustainability aspects**

Furthermore, almost all of the participants would **use sustainability label as a parameter to compare different advertisements**; and they agree that such a certification might play a relevant role in the purchase choice since it increases the value of the building.

It is worth mentioning that not all the country involved in the Focus Group meeting have a national sustainability assessment system. The participants of these countries that do not have national sustainability assessment system have casted doubt about the costs involved for the development of a national sustainability system despite that fact that they consider it of great utility and interest. Other participant where a national sustainability system is used has stressed the fact that **the type of indicators used in such a label is far more important than the label rating itself**.

**The type of indicators covered by a Sustainability rating system is considered far more important than the label rating itself.**

The Survey reviled that although Sustainability Certificates are seen as fundamental instrument for the evaluation of the overall sustainability of a building, they are less widespread than the EPC. The reasons for such low use sustainability Certificate different and differ from one country to the other but, in general, this lesser spread depends on the lack of knowledge by non-experts in the field and on the cost of the certification and its consequent financial impact on the market.

Yet again as mentioned previously, participants find it very difficult to spend extra money for a sustainability certificate given the current overprices real estate market condition.

### 3.2.5 Summary Participant's response to the level of trust in EPC

As mentioned in the paragraph related to the purchasing decisions for EPC, many managers of the Energy Performance Certificates from different participating countries, did not hide the fact that, in some case, **the quality of the drafting is not congruent to the reality and some EPCs have low quality contents due to the fact that there are few checks on content compliance**. Some have mentioned that they are aware of cases when professionals have issued an EPCs without on-site visits, despite such on-site visits are mandatory or anyway very important to obtain vital

information about the building to ensure a high-quality EPC. According to the opinion of many "qualified" participants**, the reason of this lack of accuracy of data lies in the extremely low cost to issue EPC**. Lower price to issue an EPC is mostly linked to low quality of results.

**The fact that the EPC is considered as an obligation, many prefer to save money and opt to choose the professionals that offer the lowest possible price to issue the EPC, which in turn, might affect the quality of issued certificates.**

Consequently, the participants think that the EPC needs to be redesigned from a regulatory point of view: today the EPC remain as black box for the end user who have little knowledge about how and with which data was the EPC created. Hence, they have little to no ability to judge the quality of the issued certificates. This lack of transparency undermines the trust of the EPC and its role in the real estate market and consequently the credibility of these certificates. Other experts stated that the trust in the EPC values can be improved through the improving of algorithms for data transfer from software used to issue the certificate into the national EPC database; this would facilitate also the national quality control.

**The existing EPCs lack transparency undermines the trust in its credibility. Moreover, the EPC does not give the end user a clear view about the state of the building envelope, technical system and their possible future maintenance requirement.**

Furthermore, in some national contexts "non-experts" involved have highlighted the fact that **EPC are not so easy to read and to be understood** in term of contents; for that reason, it could be useful to make the EPC more user friendly for a wide number of users. They also agreed that the value represented in the EPC does **not give the end user a clear view about the state of the building envelope** or the used technical system and **their possible future maintenance requirements**.

To increase the trust in EPC, according to some participants, it is important **to review the criteria used in the certifications:** the EPC was designed as an instrument to increase the dwelling value under the principle "the better the energy performance, the higher the market value". So, it is important to **understand which variables that determine an increase in the value** of the dwelling and redesigning the certifications accordingly. This would help final users to take a decision (buy, rent, restructure…), while boosting the credibility and consequently the use of these instruments on the market.

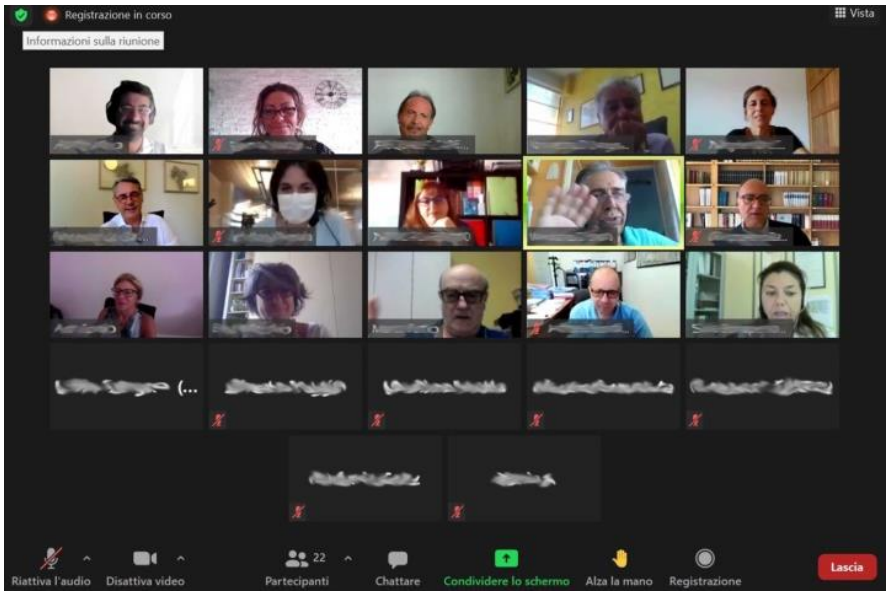



*Figure 27: A Screen shot of the online focus group meeting taking place in Italy*

Greater credibility of EPC contents would be ensured if values reported were calculated using **calculation method closer to the operational phase of the building**, in order to show the **real energy consumption** of the building in operation and not those estimated.

According to the opinion of some stakeholders involved in the Focus Group meetings, the promotion of the fiscal incentives for renovating the building could increase the trust in EPC**. Tax incentives for energy saving allow, in many cases, to raise awareness among "non-experts" about building energy consumption and production allowing them to learn more about these issues**.

Concerning the possibility to **create an EU wide unified EPC**, many participants find that having a unified EPC is generally a good idea, however, they think that their trust in such a unified system is not going to be very high because an EU wide EPC **would be based on small number of common denominators that fail to represent the national context.**

**Having an EU wide unified EPC is viewed with scepticism as its feared that unified EU EPC would be based on small number of common denominators that fail to represent the distinctive feature of national contexts.**

### 3.2.6 Summary Participant's response to the level of trust Sustainability Certificates

A high level of market trust in Sustainability Certificates is a necessary condition for their effective implementation. The vast majority of participants involved agree on the fact that **it is important to go towards a**

**holistic view of the dwellings**, considering not just the energy performance, but also sustainability, connectivity, smart building, wellness, comfort, air quality, all aspects that have been included in the European Commission Renovation Wave Communication.

**It is important to go towards a holistic view of the dwellings, considering the overall sustainability, connectivity, smartness, wellness, comfort, air quality as communicated in the European Commission Renovation Wave Communication**

The participants consider that there are many factors that can boost or undermine the credibility of sustainability certificates', first among them is the **professionals' expertise and the buyer awareness** which can have a key impact on Sustainability Certificates credibility. Moreover, ensuring a **proper training for professionals** issuing Sustainability Certificates, including practice classes in universities and vocational institutes with more examples from real-life situations, would ensure greater quality and accuracy in the creation of the certification, hence improving its credibility. Furthermore, the participants consider think that having **a national or a European register for certified professionals that share a harmonised methods and contents** can improve that trust in Sustainability Certificates.

**Professionals' expertise has a key impact on Sustainability Certificates credibility. It may help to have a common European register for certified professionals that share a harmonised processing methods and contents.**

As mentioned earlier, Sustainability Certificates are less widespread than the EPC. The participants find it important to have a wide communication campaign to explain benefits of investing in building sustainability. Such campaigns would ensure greater dissemination of these concepts and consequently, a wider adaption and usage in the real estate market.

Another factor that impacts the credibility of the sustainability certificates' is related to the type **of institution issuing such certificate**; public trust in such systems would improve if the used certification systems are adopted by the state and that the state is supporting the use of such sustainability system by providing incentives to the real estate owners based on achieved sustainably rating.

Furthermore, having a **national unified sustainability certification assessment system would make much easier for the end user to understand the system and trust on it;** on the contrary, having many certification systems in the market would very much undermine the trust in such labels.

**A single national unified sustainability certification assessment system would make improve the trust on the system used; on the contrary, having many certification systems in the market can undermine the trust in such labels.**

Consequently, for those respondents, **an EU wide unified sustainability system could be a good idea,** it depends on how much the rating is clear and on how many themes are analysed in the system, **but it must always be backed with national ones**.

Other "qualified" participants have argued **an EU wide unified sustainability system would be more trustworthy than a national one** because they are well thought and developed.

### 3.2.7 Conclusion: key success factors and barriers for EPCs

Below is summary of the key success factors and the key barriers facing the EPCs as identified by the participant's during the Focus Group activity performed by the PPs.

| EPCs | |
|---|---|
| **KEY SUCCESS** | **KEY BARRIERS** |
| **EPC is** regulated by law **and in many national contexts it is** mandatory in case of sale or renting **of individual houses, collective buildings, dwellings located in collective buildings and non-residential buildings** | **Lack of quality control of the EPC's content compliance**. Checks on the energy certifications issued are very little and, in the absence of controls, the tool is consequently used in a very simplified way, sometimes even losing credibility, usefulness and reliability |
| **EPC allows the end user** to make an informed decision about the real estate energy demand and possible running costs and future renovations | The **extremely low cost for issuing EPC**. Lower price to issue an EPC is mostly linked to low quality of results |
| EPC labels are**, in most cases, expressed with a coloured scale** is easy to read **and end user can relate to similar scales used in the domestic appliances** | **Administrative decentralization** that took place at national level for the issuing of the EPCs |
| **EPC ratings can be** used as part of the design requirement for newly built building and renovation project **in which the building energy demand can be defined** | **Matter of mindset** because, in several cases, the energy certification **is seen as a mandatory element not as an added value,** only necessary for the purchase and sale of a property, |

| | |
|---|---|
| | basically by making sure that it simply exists but without deepening its own peculiarities and the prerogatives of the building |
| **Well prepared** educational programs for energy assessors and for citizens | **The intrinsic limit is related to the certifying subject**, as some professionals see it only as a mandatory bureaucratic fulfilment and fill out EPC in a decidedly hasty manner |
| **EPC contribute to have** a more transparent real estate market | **Lack of an adequate organization of the offices responsible for revising and checking the contents declared** in the EPCs |
| | **EPC results do not give the end user a holistic vision** of the building state and doesn't provide the end user with detailed renovation about the used HVAC technologies and building materials |
| | **EPC does not give the end user a clear view about the state of the building envelope** or the used technical system and their possible future maintenance requirements |
| | **Ignorance of the EPC contents** and lack of know-how of non-experts in energy field |

### 3.2.8 Conclusion: key success and key barriers for Sustainability Certificates

Below is summary of the key success factors and the key barriers facing the Sustainability Certificates as identified by the participant's during the Focus Group activity performed by the PPs.

| **SUSTAINABILITY CERTIFICATES** | |
|---|---|
| **KEY SUCCESS** | **KEY BARRIERS** |
| **The** holistic approach **of the Sustainability Certificates** | Sustainability Certificates are, in most cases, **not yet required by law** |
| Building Sustainability Certificates can highlight aspects that EPCs are not able to do**, as the resilience, life cycle of materials, operating costs of the** | The **high cost of the Sustainability Certification**. Buildings in possess of the sustainability certifications have, for obvious reasons, a higher cost on the |

| | |
|---|---|
| **building, adaptation to natural hazards, static and seismic risk, etc. raising awareness to both the seller and the buyer** | market than those without them; in this regard, the **future buyer or tenant should be aware of the benefit in terms of living and economic comfort which he will enjoy over time despite having initially invested a greater amount of money**, motivated by the intrinsic quality of that property |
| **Sustainability Certificates** consider economic and social parameters too, **and not just environmental protection** | **Absence of a significant awareness campaign and customer's cultural approach.** It should be carried out among the future users of the buildings to raise their awareness about Sustainability Certificates |
| | **Lack of state incentives** for issuing a building Sustainability Certificate |
| | **Lack of market demand** |
| | **Sustainability topics are complicated** and not easily understandable by the end user |

# 4 Final remarks

The results of the cross analysis made in the first part of this deliverable, confirmed the initial assumption about the fragmented nature of EPCs and SCs in the EU. Which is a clear and major obstacle facing the creation of harmonized and comparable EPC for the EU. Moreover, the study showed that it might be now the time to shift the scope of the EPCs from covering energy aspects into a more holistic sustainability certification which look at buildings from an environmentally and end user conscious perspective where the building technology, the operation and end-of-life is considered equally for contributing to a more sustainable future.

Indeed, the need for such a shift toward a sustainability certification was reflected in the results of the focus group meetings that showed that a building sustainability certificate have greater influence on the purchasing decisions than the EPCs. The participant's highlighted the fact that existing EPCs lack transparency, which undermines the trust in its credibility. Moreover, they find that EPCs does not give the end user a clear view about the state of the building envelope, technical system and their possible future maintenance requirement. Therefore, the participant's found that the overall sustainability of a building would be more important than just the only energy rating because it encompasses all the key sustainability aspects. Moreover, the results of the focus group meetings showed that the stakeholders prefer to have a single national unified sustainability certification assessment system instead of many systems, as it helps to improve the trust on the system. However, the participant's agreed that the type of indicators covered by a sustainability rating system is more important than the label rating itself.

# Annex I - Participant Information Briefing Document


This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement No. 101033916

## Focus Group
## Participant Briefing Document

**Project Overview**:

European Building Sustainability Performance and Energy Certification Hub – EUB SuperHub is a research project funded by the EU's Horizon 2020 research and innovation programme.

The next generation of energy performance assessments and certificates ought to address the transformation into an era where an increasing amount data are available on the operational use of buildings, and the buildings can be observed with ever increasing details via a larger number of stakeholders.

The EUB SuperHub project will support the evolvement of the certification process in the EU by development of a scalable methodology to view, assess and monitor the buildings through their lifecycle including in terms of embedded energy, whole life carbon, costs, *etc.*

**Potential involvement**

The project team wish to engage with building certification stakeholders to develop a better understanding of the energy performance certificates (EPCs) and sustainability certification systems operating in the participating countries.

**What does it mean for me?**

- Participation in the study is entirely voluntary and nobody 'has to take part'. Participants should be over 18 years of age.
- Contributions will be anonymised if this is participants' wish.
- Participants retain the right to withdraw from the study at any time in the process.
    - where data can be linked to specific an individual participant, participants can withdraw consent at any time during and up to two weeks after the collection of the data – in which case the material will be deleted;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  - where data has been gathered collectively (*e.g.,* focus groups) participants can withdraw any time, but the data collected up to that point will be retained;
  - where data has been gathered anonymously participants can withdraw any time until the data is collected by the researchers.

- Data collected will be used only for this project and follow-on studies. It will be stored securely and not made available to anybody outside of the research team. Security will include: password protection of audio and video recordings; encryption of laptops; non-use of USB memory keys; and use of secure network file storage for long-term storage.
- Any physical documents will be stored in locked cabinets in the offices of the research team. The data will be securely stored for a period of ten years before disposal.

*Further information about the project*: https://eubsuperhub.eu

*Contact about the proposed engagement:*

Include contact details of local project representative

# Annex II - Consent Form used in performed Focus Group meetings

EUB SuperHub

## Consent Form – Focus Group

I _____ (Print Name) agree to participate in the EUB SuperHub research project.

- The purpose and nature of the study has been explained to me in writing.
- I confirm that I am over 18 years of age and that I am participating voluntarily.
- I give permission for my focus group with the researchers to be audio-recorded.
- I understand that I can withdraw from the study, without repercussions, at any time, whether before it starts or while I am participating.
- I understand that I can withdraw permission to use data within two weeks of data collection, in which case the material will be deleted.
- I understand that I can request that my identity be disguised in the write-up and any future publication

  Please select one box:
  - ❑ anonymity waived
  - ❑ anonymity requested

- I understand that extracts from my contributions to the focus group may be quoted any subsequent publications if I give permission below:

  Please select one box:
  - ❑ quotation of extracts permitted
  - ❑ quotation of anonymised extracts permitted
  - ❑ quotation of extracts not permitted

Signed: ..... Date: .....

If signature is not possible (*e.g.,* due to remote contact) verbal consent should be obtained and witnessed below (this should be backed up by alternative means *e.g.,* recording, email, *etc.*)

Signed: ..... Date: .....

Witness of consent

This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement No. 101033916

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