

Session 3 Quality assessment of the EPC database contents

Presenter: Ainhoa Mata (Catalan Institut for Energy, ICAEN)
Álvaro Sicilia (La Salle – URL)

14 March 2024



Introduction

EPC database
auditing

Quality
assessment of
EPC databases

Quality of EPC
in the register
of Catalonia

Introduction

EPC database
auditing

Quality
assessment of
EPC databases

Quality of EPC
in the register
of Catalonia

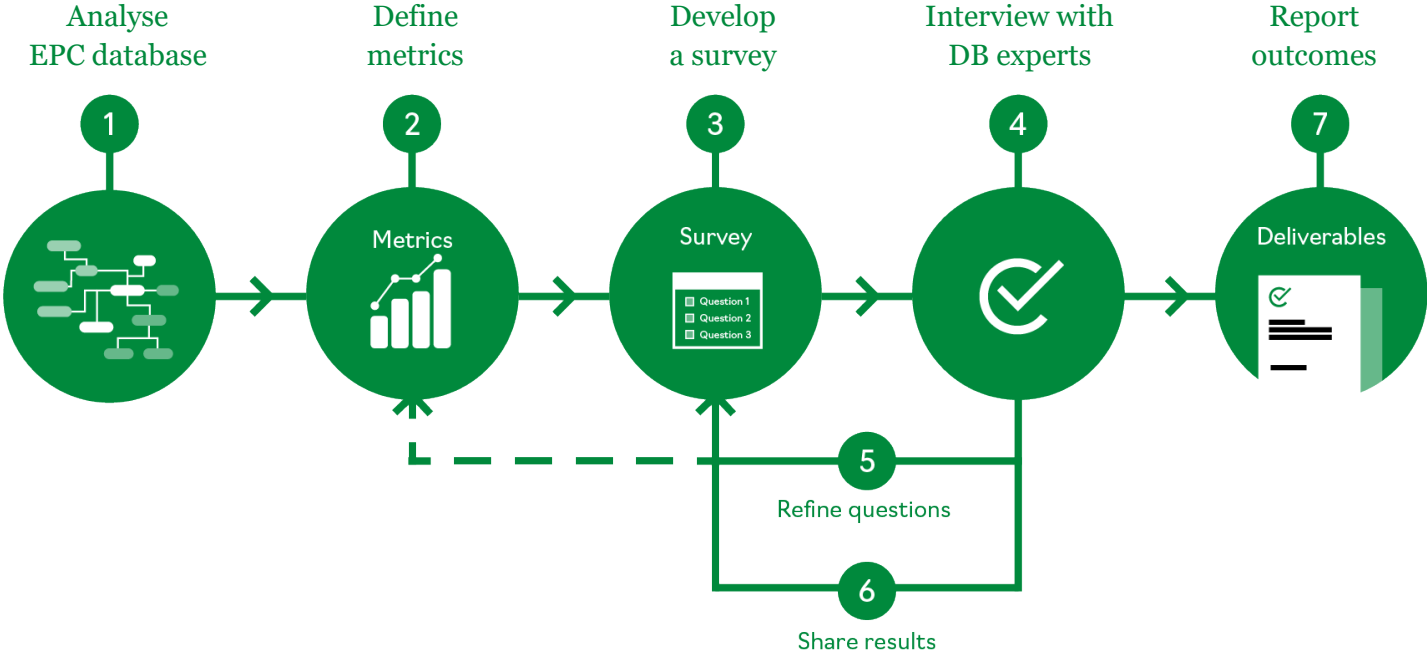
EPC Database auditing

Are our EPC databases ready for the EPBD recast?

EPC Database auditing

Are our EPC databases ready for the EPBD recast?

The TIMEPAC project aims to **identify potential barriers** that prevent the adoption of new EPC schemes and/or access to EPC data for citizens, professionals, technicians, and companies.



EPC Database auditing: Uses of EPC data

Understanding the possible uses of the EPC data can aid in identifying current limitations and future applications.

M1.1 Number of uses

	Austria	Croatia	Cyprus	Italy	Slovenia	Spain
Quality control	Green	Green	White	Green	Green	Green
Creation of statistics	Green	Green	White	Green	Green	Green
Policy making	Green	Green	White	Green	Green	Green
Research purposes	Green	Green	Green	White	Green	Green
Production of results	Green	Green	White	Green	Green	White
To share the contents as open data	White	Green	White	Green	Green	Green
monitoring current status	Green	Green	White	White	Green	Green
Issuing of EPC	White	Green	White	White	White	White
Public information for citizens	White	White	Green	White	Green	White

✓ In most EPC databases, the stored data is utilized for a variety of purposes.

EPC Database auditing: Data sources

Incorporating data from external sources into an EPC repository enhances its reliability, particularly when the sources are official.

M2.1 Number of linked data sources

	Austria	Croatia	Cyprus	Italy	Slovenia	Spain
Cadastral database				■	■	■
Geographical database					■	
...						

M2.2 Number of data sources from which some data are obtained

	Austria	Croatia	Cyprus	Italy	Slovenia	Spain
Cadastral database	■	■		■	■	■
Geographical database	■			■	■	
Regional or national database	■		■	■		
...						

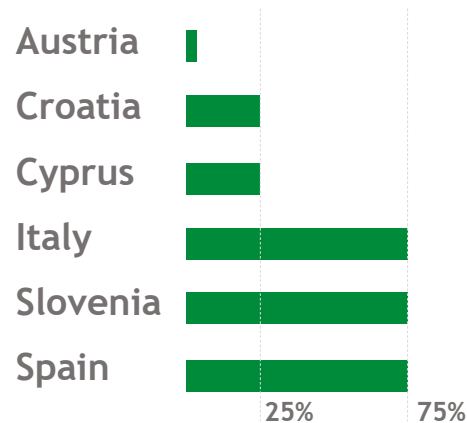


EPC repositories are getting data from land registry databases, but not data from other databases like BIM, statistics, and building inspection databases

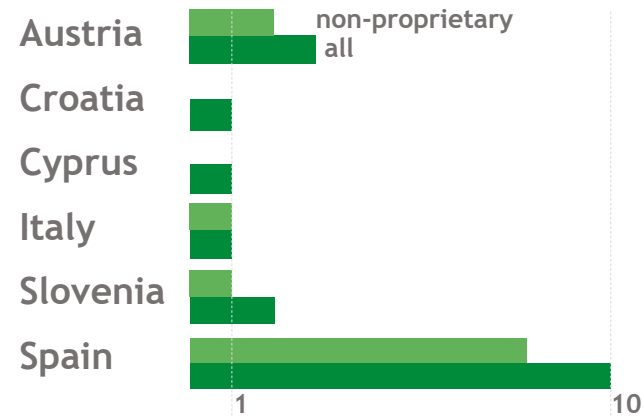
EPC Database auditing: Data access

For EPC data to be useful for various stakeholders (citizens, experts, consultants, agencies, etc.), it must be easily accessible.

M3.2 Level of published data



M3.3 Number of formats



✓ The inadequate sharing of EPC data in terms of quantity and the way it is shared limits the scientific community, citizenship, and third parties in their use and analysis of them and hinders the creation of new services based on EPC data.

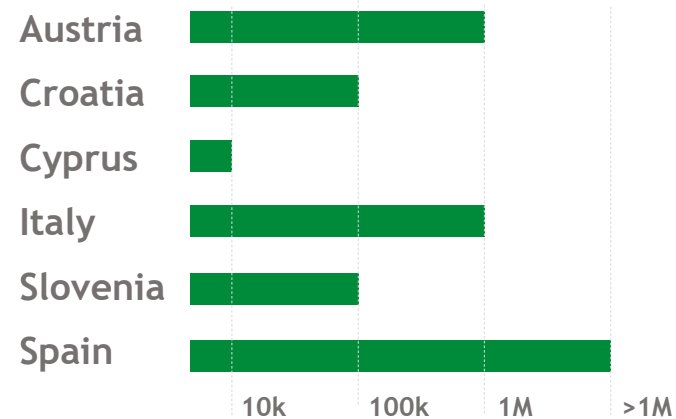
EPC Database auditing: Scope

Identifying scope and the size of the EPC databases

M4.1 Market scope

Austria	Regional
Croatia	National
Cyprus	National
Italy	Regional
Slovenia	National
Spain	Regional

M4.2 Number of certificates

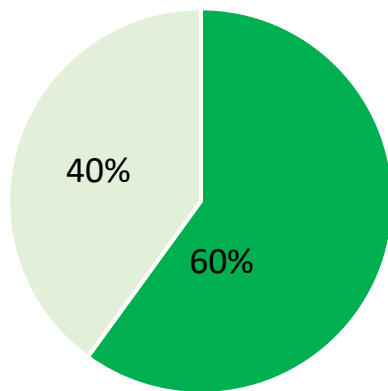


✓ Countries with federal structures with different EPC schemes poses a challenge for national policy formulation and for accessing and comparing EPCs issued in different parts of the country. The same problem arises at the national-to-European level

EPC Database auditing: Data updating

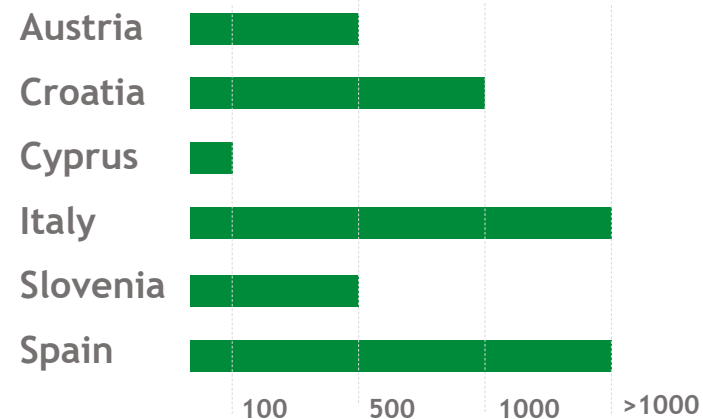
Identifying which EPC databases are updated with automated processes and which load they have each month.

M5.1 Percentage of EPCs automatically uploaded into the databases



■ Automatically ■ No

M5.2 Number of EPCs uploaded per month



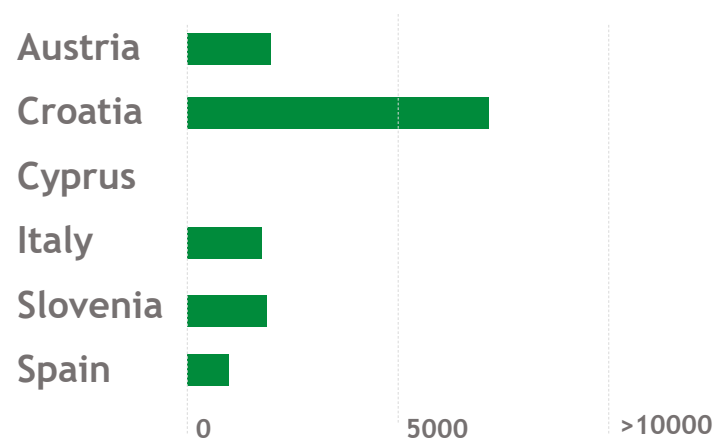
✓ There are still EPC databases whose data is loaded manually.

✓ Automated processes can reduce errors

EPC Database auditing: Technology

The simplified database complexity index of most of EPC databases indicates that their level of complexity can be considered reasonable for EPC data storage

M6.1: Simplified database complexity index (SDCI)



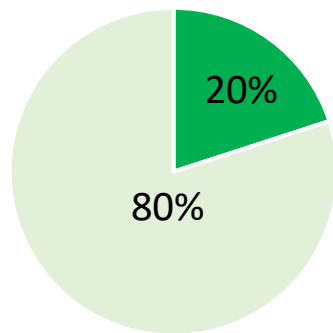
✓ Most of pilots use a relational database management system (RDBMS) to store and handle their EPC data.

✓ SDCI helps to measure the difficulty to adapt the EPC database to the EPBD recast (new indicators, instruments...)

EPC Database auditing: Content

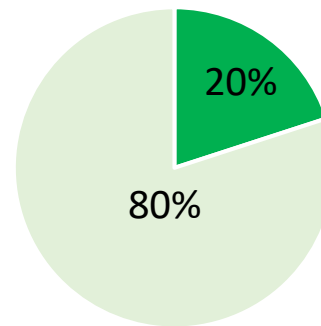
Identifying which EPC databases are already storing monitoring and renovation passport data

M7.1: Store monitoring data



■ Monitoring Data ■ No

M7.2: Store Renovation Passport data



■ BRP ■ No

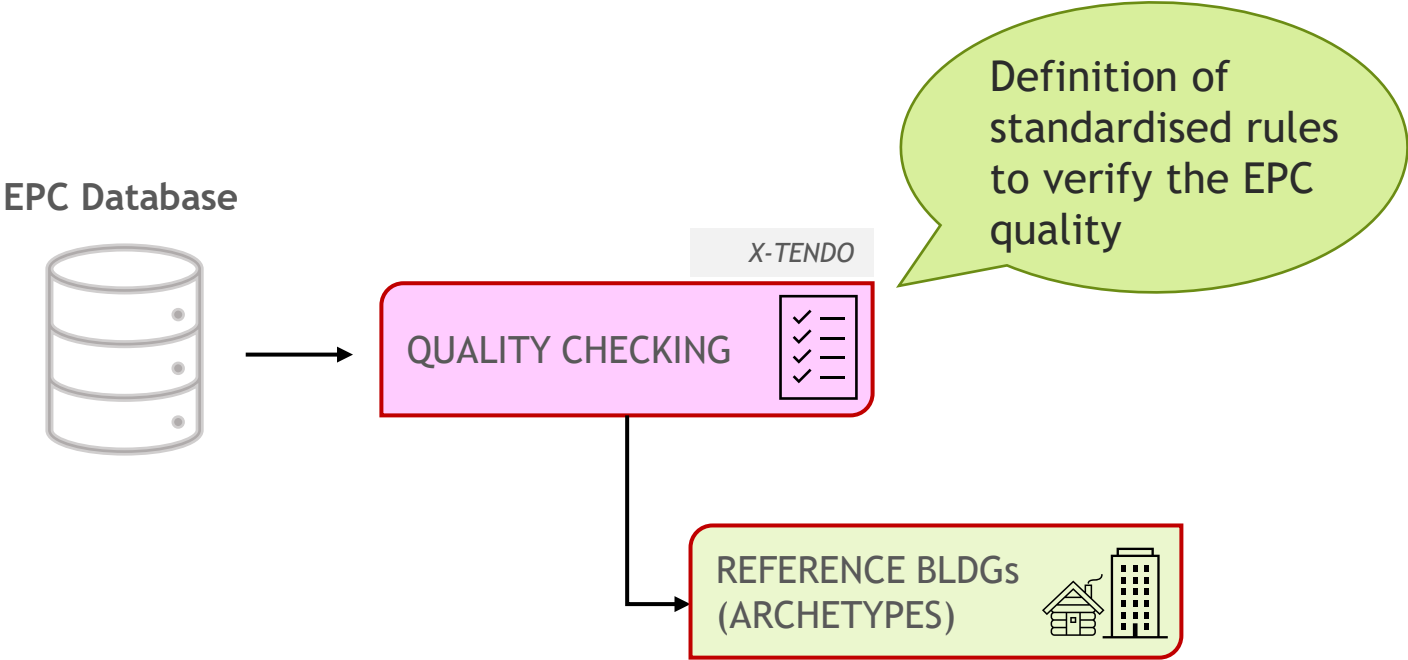
✔ EPC databases can be expanded to include monitoring data about the energy consumption (electricity, gas, water) of a dwelling every certain period (hour, week, month)

EPC database
auditing

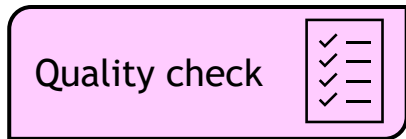
Quality
assessment of
EPC databases

Quality of EPC
in the register
of Catalonia

Quality assessment of the EPC database contents



Quality assessment of the EPC database contents



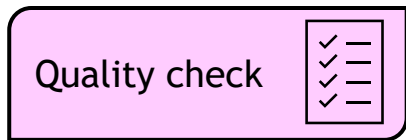
Validity rules are defined to check:

- Data type **T**
- Physical impossibilities **F**
- Consistencies **C**

Critical parameters:

- building use **T** **C**
- Year of construction **T** **F** **C**
- Heated volume **T** **F** **C**
- Refrigerated volume **T** **F** **C**
- Demand heating **T** **F** **C**
- epr consumption **T** **F**
- performance **T** **F**
- ventilation **T** **F**

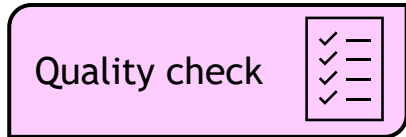
Quality assessment of the EPC database contents



Heated volume rule: If the building is heated then, check that the heating surface and volume have been set and if the height of the heated space is greater than 2.5.

```
CASE
  WHEN (
    (heating = 'No' AND heating_area = 0 AND heating_volume = 0) OR
    (heating = 'No' AND (heating_area is null OR heating_volume is null)) OR
    (heating = 'No' AND heating_area = 0 AND heating_volume is null) OR
    (heating = 'No' AND heating_area is null AND heating_volume = 0) )
  THEN 0.0
  WHEN (
    (heating = 'Yes' AND heating_area is not null AND heating_area > 0 AND heating_volume / (heating_area) >= 2.5) OR
    (heating = 'No' AND (heating_volume is null OR heating_volume = 0)))
  THEN 0.0
  ELSE 1.0 -- In this case is a critical error
END AS heating_volume_rule
```


Quality assessment of the EPC database contents



Heated efficiency rule: If the building is heated then, the heating efficiency should be greater than 0 and not null. In the opposite case, the efficiency should be 0 or null.

```
CASE
  WHEN heating = 'Yes' AND heating_effi > 0 AND heating_effi IS NOT NULL THEN 0.0
  WHEN heating = 'No' AND (ting_effi = 0 OR heating_effi ISN NULL) THEN 0.0
ELSE 0.0434 -- In this case is non a critical error
END AS heating_efficiency_rule
```

Quality assessment of the EPC database contents



Results

Us	CP1	CP2	CP3	CP4	CP5	CP6
	≤ 1900	1901-1936	1937-1960	1961-1980	1981-2006	> 2007
Terciari	34%	23%	20%	21%	27%	18%
Unifamiliar	19%	23%	21%	24%	29%	27%
Plurifamiliar	24%	27%	24%	25%	35%	39%

Period of construction: Buildings before the period 1981 - 2006 have more invalid EPCs in all building types.

Use: Multi-family buildings have more invalid EPCs.

General trend: There is a slight increase in the percentage of invalid EPCs over time.

Quality assessment of the EPC database contents

REFERENCE BLDGS
(ARCHETYPES)



- **Building Archetype (BA)** reflects the **most common** geometrical **characteristics**, **technical specifications** of the building envelope, and technical building system typology, representing the **average situation** in a market segment.
- **Library** of **regional** or **national virtual residential** and **non-residential BAs** generated by the EPC data to fully reproduce the **representativeness of building stock** clusters.

Data	Units
Compactness ratio	m ⁻¹
Thermally heated gross volume	m ³
Thermally heated floor area	m ²
Transparent thermal envelope area on thermal envelope area	%
Mean thermal transmittance of opaque building envelope	W/(m ² ·K)
Mean thermal transmittance of transparent building envelope	W/(m ² ·K)
Energy carrier per space heating	
Energy carrier per space cooling	
Energy carrier per domestic hot water	
Mean seasonal efficiency of the heating generation sub-system (energy carrier 1)	–
Mean seasonal efficiency of the heating generation sub-system (energy carrier 2)	–
Utilisation energy efficiency	–

Data	Units
Energy need for space heating	kWh/m ²
Energy need for space cooling	kWh/m ²
Energy need for domestic hot water	kWh/m ²
Seasonal space heating energy efficiency	–
Seasonal space cooling energy efficiency	–
Seasonal domestic hot water energy efficiency	–
Non-renewable energy performance per space heating	kWh/m ²
Non-renewable energy performance per space cooling	kWh/m ²
Non-renewable energy performance per domestic hot water	kWh/m ²
Overall non-renewable energy performance	kWh/m ²
Overall renewable energy performance	kWh/m ²
Renewable Energy Ratio	%

Quality assessment of the EPC database contents

REFERENCE BLDGs
(ARCHETYPES)

Segmentation of the built park according to:

Building use

- Single-family house
- Multi-family house
- Tertiary

Construction periods

- CP1: - 1900
- CP2: 1901 - 1936
- CP3: 1937 - 1960
- CP4: 1961 - 1980
- CP5: 1981 - 2006
- CP6: 2007 -

Climate zone

- B3
- C2
- C3
- D2
- D3

	CP1	CP2	CP3	CP4	CP5	CP6
	≤ 1900	1901-1936	1937-1960	1961-1980	1981-2006	> 2007
B3	3.215	1.520	3.442	23.453	30.208	9.103
C2	55.396	65.325	94.429	411.425	245.289	69.024
C3	3.351	1.261	2.752	20.136	31.077	9.117
D2	1.750	1.955	5.016	16.247	18.490	7.597
D3	1.895	1.245	4.147	12.869	14.004	7.930

Number of CEE by construction period and climate zone

Quality assessment of the EPC database contents

REFERENCE BLDGs
(ARCHETYPES)

Characterization

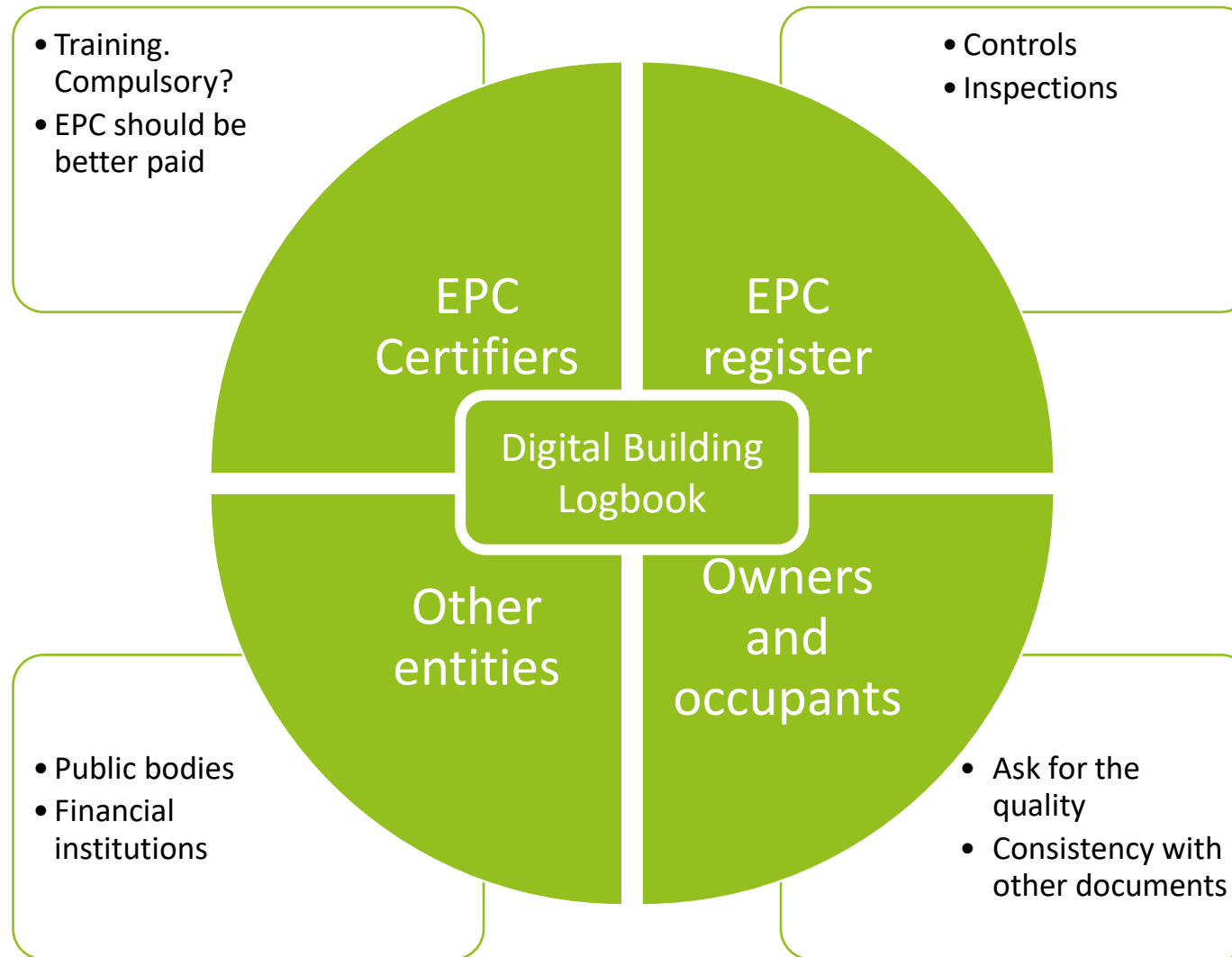
	CP2	CP3	CP4	CP5	CP6
	1901-1936	1937-1960	1961-1980	1981-2006	> 2007
Compactness ratio	2,85	2,93	2,96	2,76	2,76
Thermally heated gross volume	201	202	198	209	190
Thermally heated floor area	70	73	75	80	73
Transparent thermal envelope area on thermal envelope area	18	16	20	18	18
Mean thermal transmittance of opaque building envelope	1,66	1,61	1,54	1,04	0,51
Mean thermal transmittance of transparent building envelope	4,52	4,64	4,64	3,78	3,58
Mean seasonal efficiency of the heating generation sub-system (natural gas)	0,78	0,77	0,77	0,77	0,98
Energy need for space heating	94,1	91	92,2	77,2	53,8
Energy need for space cooling	5,4	5,3	5,3	4,6	5
Energy need for domestic hot water	80	87,1	100	84	84
Non-renewable energy performance per space heating	130,8	129,4	132,6	115,4	74,7
Overall non-renewable energy performance	187,9	258,6	274,9	228	131,7

EPC database
auditing

Quality
assessment of
EPC databases

Quality of EPC
in the register
of Catalonia

Quality of Energy Performance Certificates (EPC)

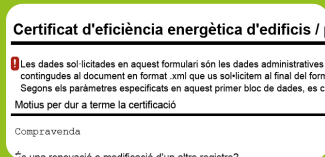


Quality of EPC in the register of Catalonia



Information in the website

- FAQs, document of common mistakes, procedures, transparency (Open Data)
- [Link](#)



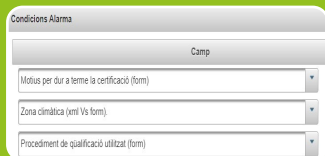
Alarms in the registration form

- To solve mistakes before the EPC is in the register
- Warning or mistake (cannot present in the register)



Specific amendment form

- To solve mistakes identified by EPC certifier, register or inspection
- Administrative or technical



Alarms in the back office of the register

- To control the data

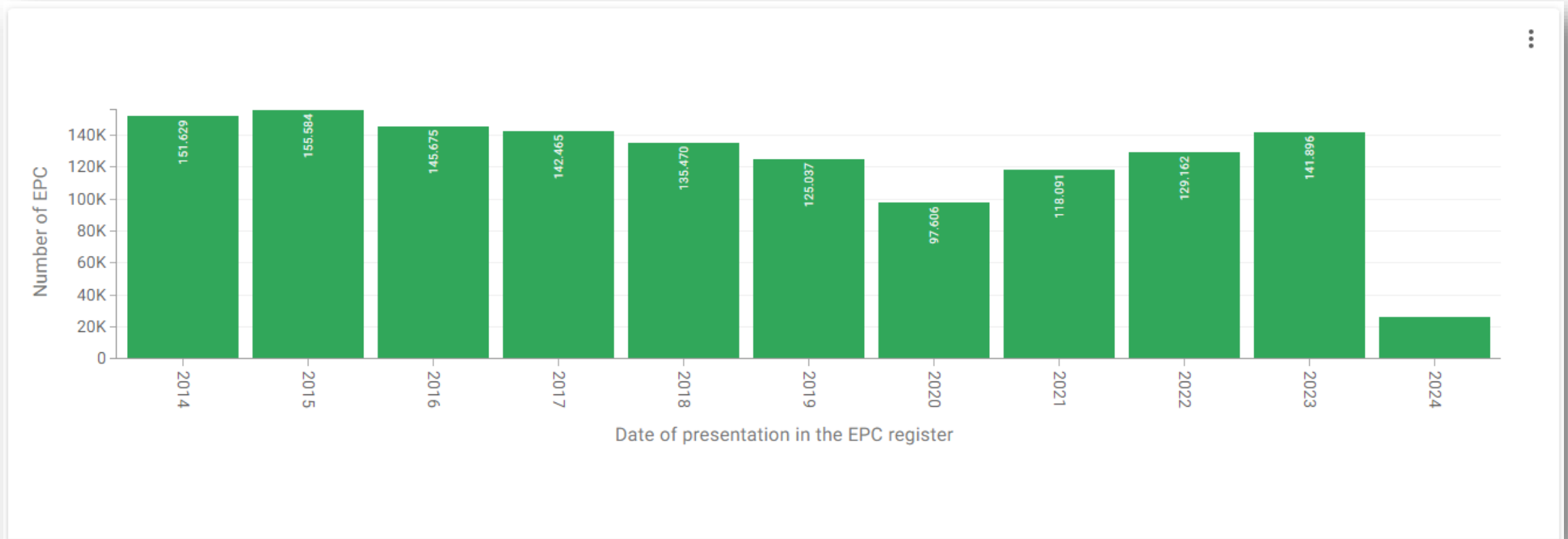


Inspections

- Inspection of the 1 % of the EPC registered

Number of EPC per year in the EPC register of Catalonia

- Total of EPC **1.368.791** (new and existing buildings. It does not include projects). Source: [Open Data](#)
- In 2023: **141.896** EPC, and **3.384** amendment forms (2,4 %).



Common requirements in the EPC register of Catalonia

Administrative information

- Address
- Cadastre

Regulation, procedure

- Existing – new buildings
- Extension of building
- Consistency between documents

Envelope and installations

- Air renewals
- Thermal bridges
- Heat pump
- Photovoltaic

EPC tools

- Specific doubts

Type of alarms in the EPC register of Catalonia

- Around 80 alarms in the back office of the register

Administrative information	Regulation, procedure	Consistency between form and XML	Building	Envelope and facilities
<ul style="list-style-type: none">• Address – existing address (in the form)	<ul style="list-style-type: none">• Existing – new buildings• Extension of building• Version of the tool	<ul style="list-style-type: none">• Type of building• Qualification• Area	<ul style="list-style-type: none">• Climate zone• Area, minimal end maximum• Height of the spaces• Compactness• Air renewals	<ul style="list-style-type: none">• U values• Thermal bridges• Performance of facilities• Illumination• Solar thermal• Photovoltaic

the Energy Performance of Buildings (EPBD recast)

Analysis of the final compromise text with a view to agreement

Annex VI INDEPENDENT CONTROL SYSTEMS FOR ENERGY PERFORMANCE CERTIFICATES

- The **independent control system** shall ensure at least **90%** of valid issued EPC with a statistical confidence of **95%** for the evaluated period, **which shall not exceed one year**.
- Measures to ensure the **quality** of EPC may include:
 - additional **training** for independent experts,
 - targeted **sampling**,
 - obligation to **re-submit** energy performance certificates,
 - proportional **fin**es and temporary or
 - permanent **bans** for experts.
- Member States shall regularly publish, on the national database on EPC, at least this information on the **quality system**:
 - a) the **definition of quality** in EPC;
 - b) quality objectives for the EPC scheme;
 - c) **results of the quality assessment**, including **number of certificates evaluated** and relative size to the **total number of issued certificates** in the given period (per **typology**);
 - d) contingency **measures** to improve the **overall quality** of energy performance certificates.

[Link](#)

Take aways

- Our EPC databases should evolve to meet EPBD recast
 - To include new data (monitoring data, indicators)
 - To be linked to other databases and instruments (SRI, RP, National databases)
- Next challenges:
 - New regulation in Spain: compulsory training to be confirmed
 - More cooperation with other public bodies to improve quality
 - YouTube videos explaining requirements from ICAEN 😊
 - EPC more friendly and comprehensive.
 - Owners who comprehend the certificates and demand quality.
 - More control and inspections.

**If you would like more information,
please visit www.timepac.eu or contact us at**

alvaro.sicilia@salle.urle.edu

ainhoa.mata@gencat.cat

Thanks for your attention!