

ENERGY PERFORMANCE CERTIFICATES ACROSS THE EU



A MAPPING OF NATIONAL APPROACHES



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EXECUTIVE SUMMARY

Energy Performance Certificates (EPCs), an integral part of the Energy Performance of Buildings Directive (2002/31/EC¹; 2010/91/EU²), are an important instrument to enhance the energy performance of buildings.

The main aim of the EPC is to serve as an information tool for building owners, occupiers and real estate actors. Therefore, EPCs can be a powerful market tool to create demand for energy efficiency in buildings by targeting such improvements as a decision-making criterion in real-estate transactions, and by providing recommendations for the cost-effective or cost-optimal upgrading of the energy performance.

As confirmed by BPIE Surveys (2011, 2013), EPCs are currently among the most important sources of information on the energy performance of the EU's building stock. The improvements in the quality assurance processes and better compliance with the EPBD requirements at national level shall further enhance the EPC credibility and market impact. Additionally, EPCs have the potential to become effective instruments to track buildings' energy performance and the impact of building policies over time as well as to support the implementation of minimum energy requirements within the regulatory process.

To achieve the anticipated benefits of the EPC scheme, proper implementation of the EPBD requirements is essential. With the EPBD recast (2010), Member States (MS) were asked to revise their national legislation regarding the EPC schemes in place and to further improve them on a broad range of aspects, including:

- Introduction of an independent EPC control system (art. 18);
- Assuring the competence of the certifiers in the accreditation procedure (art. 17);
- Introduction of penalties for non-compliance, including for poor quality of the EPCs (art. 27);
- Increasing the availability of EPCs in sale and rent transactions and the visibility of the energy label in commercial advertisement (art. 13);

This study aims to evaluate the implementation status of the EU legislation in EU-28 and Norway by focusing on the quality, availability and usability of EPC data and providing examples of good practices. Based on this in-depth assessment, policy recommendations are provided to further exploit the potential benefits from having a well-implemented quality assurance system and centralised EPC registers.

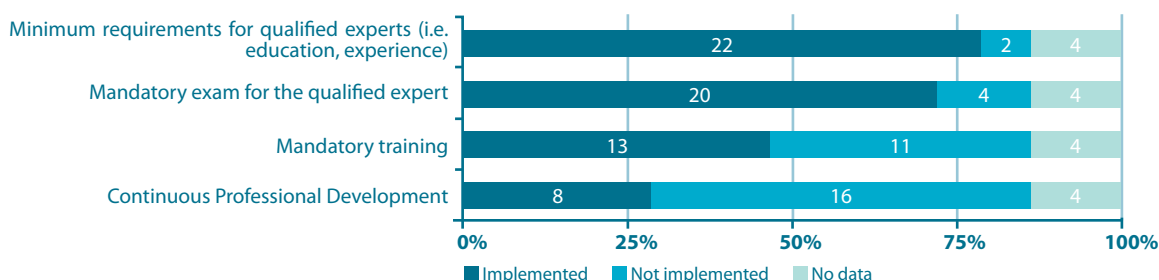
Independent control systems and penalties for non-compliance with the EPBD are central but not the only elements of the quality assurance process for an energy certification scheme. The quality of EPCs additionally depends on a broad range of implementation aspects, including qualifications of the certifiers, the methodological framework and software tools, approach to the collection of input data, etc. The study examines to what extent the above-mentioned elements have been implemented across Europe.

The competence of the certifier is considered among the most influential factors affecting the quality and cost of the certificates [CA EPBD 2011b]. Member States have flexibility in designing the system of training and/or accreditation of qualified experts. In 20 out of 28 Member States, a compulsory exam to check the certifiers' skills is recognised as a best practice. Mandatory training is required in only 14 out of 28 Member States and, in some countries, only when there is a lack of education and professional experience. In an increasing number of countries, relatively new measures were implemented such as programmes for a continuous professional development of the certifiers and obligation for a periodic renewal of the licence.

¹ Directive 2002/91/EC of the European Parliament and of the Council of 16 December 2002 on the energy performance of buildings

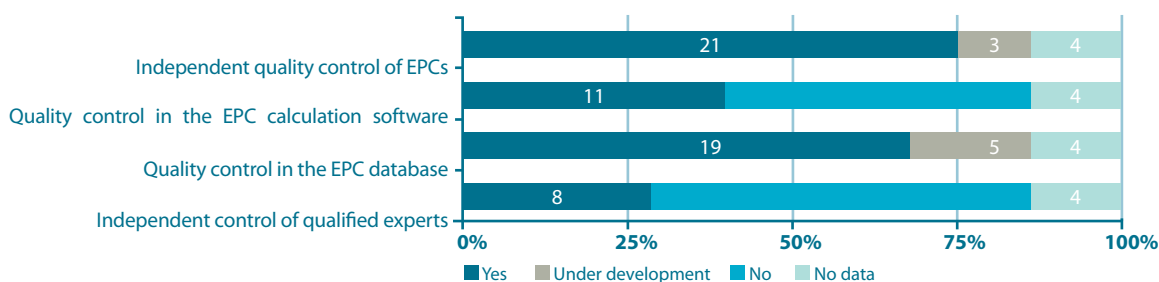
² Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings (recast)

Fig. 1 Requirements for the qualification of certifiers across EU-28



To date, independent control systems for EPCs have been formally established in all EU Member States and Norway. The official deadline for the implementation of an independent control system was set in the EPBD for 9 January 2013. In a number of countries, e.g. Greece, Hungary, Latvia, Czech Republic, Croatia, Germany, Poland, Romania and Slovenia, this only happened in 2013-2014. Thus, it is still in the early implementation stage. For example, in Poland, Latvia and the Czech Republic³ the rules for EPCs quality control are only being defined now.

Fig. 2 Independent quality control of EPCs across EU-28



Although Annex II of the EPBD gives guidance on the measures to verify the energy performance certification, the approaches vary between Member States. For instance, in Belgium (Wallonia, Flanders), France, Portugal, Romania⁴, The Netherlands and Scotland, the statistically significant percentage of all energy performance certificates is based on a random sample of the EPCs issued per energy assessor; unlike other countries where the random sampling is based on all EPC issued.

Results of BPIE's Survey indicated that in 11 Member States, the first quality control of input data is performed in the calculation software (i.e. plausibility check). In addition, the quality control of input parameters is performed in the central EPC register in 19 Member States. In Ireland and Latvia, on top of the independent control system of EPCs, there is a control system of the qualified experts, who may receive penalty points in case of wrong certification. A certain number of points lead to corrective training or suspension of licence.

Not all Member States require the physical presence of the certifier on-site to gather the technical information to issue the EPC (for existing buildings). On-site inspection may spot additional buildings' problems that could not be identified remotely and therefore provides better reliability of the EPC issued and allows for more effective tailor-made recommendations. This is not the case for the EPCs issued on the basis of information provided by the building's owner through mail, though the cost of the EPC may be lower in this case.

In nearly all Member States, the penalties for non-compliance with the EPBD have been transposed into national legislation. In 12 countries a monetary fine can be imposed, however the enforcement level is still

³ In Czech Republic, rules for independent EPCs for new buildings are in place. Currently the system for existing buildings is under development.

⁴ In Romania, the quality control started in 2014; to date no official results are available.

very low. To date, the most common penalty imposed is an administrative one such as a formal warning, recertification or suspension of the certifier's licence. Lack of enforcement of the penalty system may considerably dilute the quality, credibility and usefulness of the EPC schemes.

While this is not specifically requested by the EPBD, 24 Member States and Norway have to date established centralised EPC registers. These measures have mostly been undertaken in the context of monitoring and quality controls of the energy certification processes (i.e. random sampling). These registers vary in regards to the scope (type of data collected), format and procedure of the data upload, acquisition and sharing. In 12 countries, public access to the EPC information is provided either via direct access to the database and/or aggregated results, however 9 countries do not allow public access.

The report presents case studies of the implementation of EPC registers in Ireland, Portugal, Hungary, Sweden, Slovakia and the United Kingdom. It also shows practical aspects of making use of EPC data for policy makers, real estate agents, commercial and research organisations as well as others.

The implementation of the EPC schemes at MS level is still ongoing and struggles with challenges such as public acceptance and market-uptake. The EPC schemes are not fully implemented in all Member States nor sufficiently enforced yet. Therefore, the quality, credibility and usefulness of the EPCs vary greatly among the Member States, and there is still a need to further support and set guidelines for the implementation of the EPC schemes at the national level. The potential to change the status quo lies in the effective implementation of the new requirements of the EPBD recast (2010/91/EU), such as establishing a well-functioning system for independent control of EPCs and enforcement of penalties for non-compliance.

Based on the current status of EPC implementation across Europe, the following recommendations can be made:

- **There is a need to consistently improve the enforcement of the EPC schemes in Member States and strengthen the monitoring of their compliance both at Member State and European levels.**
For an effective implementation of the EPC schemes, Member States shall secure the adequate administrative, institutional, financial and human resources. The responsibilities should be shared appropriately between public administration and other bodies for some specific processes such as training and accreditation schemes for certifiers, independent quality control of the EPCs, enforcement of the penalty for non-compliance, etc. Political support is in this regard critical to achieve long-term benefits from the EPC schemes and to transform the real-estate markets towards the EU 2050 climate and energy goals. In addition, there is a stringent need to strengthen the monitoring of EPC scheme compliance (both at Member State and European level), especially in regard to independent control systems and enforcement of the penalties for non-compliance.
- **There is a need to strengthen the role of EPCs in the context of national legislation, especially for renovation policies and programmes.**
EPCs not only serve as valuable sources of information regarding cost-effective measures, but can also be an important tool to evaluate and monitor renovation rates of the building stock. Embedding the role of EPC and EPC registers into national refurbishment policies will be the best driver to improve and sustain the EPC system over time.

As also highlighted in the report on financing energy renovation of buildings [DG Energy 2014], national governments should include EPCs as a requirement to access public (both national and European) funds for buildings refurbishment. In the Cohesion Policy Programme 2014-2020, a significant proportion of the 23 billion euros⁵ could be absorbed through the development of large-scale renovation projects.

⁵ DG Energy (2014) *Financing the energy renovation of buildings with Cohesion Policy funding*

The design of the financing scheme shall take into account relatively higher support for properties with lower energy labels (where the energy saving potential is greater). In addition EPCs, shall serve as “an individual building renovation roadmap” that shows a step-by-step approach to a long-term renovation; not only to introduce cost-effective measures, but also to support building owners in prioritising and optimising the actions (and investment) to be taken over the years.

- **There is a need to introduce further quality assurance measures, especially during the early stages of the certification process, as follows:**
 - **The requirements for qualified and/or accredited experts strengthened and harmonised across Member States.** The competence and work of the certifier should be a subject of the independent control system. In addition, Member States should offer continuous development programs for the certifiers, to motivate their professional development and increase their expertise. In some countries, a certifier needs to periodically pass mandatory exams or participate in training programs to extend the licence.
 - **The certifier needs to be physically present onsite** (for existing buildings) to gather the technical information required for the certification process. On-site inspection may influence better quality and reliability of the EPCs and allows for more effective tailor-made recommendations.
 - **Digital tools for quality checks of the EPC data should be used, such as plausibility check in the calculation software and/or the EPC registers.** Errors in the input data are among the most typical factors that influence the quality of the EPCs. With the use of digital solutions and tools, this is possible to optimise the process of issuing, validating and verifying the EPC. Thus, limited human and financial resources are needed.
 - **There is a need for further enforcement and harmonisation of the EPCs quality checks across Member States.** An important step has been made with the introduction of an independent control system in the scope of the EPBD recast. Nevertheless, the approaches vary between countries, especially when coming to random selection of the “statistically representative sample”. An independent quality control system should take into account a full check of all parameters presented in the EPC, and a re-certification should be done by an independent expert in the process of verification.
- **There is need for guidance in the development of centralised EPC registries, not only to support the independent control system, but as a tool to map and monitor the national building stock.** Therefore, the European Commission should provide further recommendations and enable the exchange of best practices towards functional EPC databases (i.e. methods for data collection and analysis).
- **There is a need to promote the effective use of the EPC data.** A well-functioning EPC system accompanied by an EPC database provides a ready-to-use source of information on the building stock. There is an increasing number of best practices across Europe that demonstrate the added value of EPC data for policy making (e.g. to inform relevant renovation strategies) and monitoring, as well as market and research analysis. For example, Bulgaria used the EPC register to set its national renovation strategy (Art. 4, EED⁶).
- **Finally, there is a need for independent evaluation of the effectiveness of the EPC scheme.** There is still a great need to identify current failures of EPC schemes to achieve credibility and importance in a given market and to estimate the future impact of the EPCs on the market.

⁶ Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency, amending Directives 2009/125/EC and 2010/30/EU and repealing Directives 2004/8/EC and 2006/32/EC Text with EEA relevance.

1 INTRODUCTION

The improvement of the energy performance of buildings is among the major objectives of the EU's energy and climate policy. The building sector plays a critical role in the European Commission's proposal for an energy saving target of 30% by 2030⁷. The Energy Performance of Buildings Directive, introduced in 2002 (EPBD 2002/91/EC)⁸ and revised in 2010 (EPBD recast 2010/31/EU)⁹, is the key instrument to increase the energy performance of buildings across the European Union. The energy savings resulting potentially from (a proper) implementation of the Directive are assessed to be at least 60 Mtoe by 2020. The European Commission has estimated¹⁰ that additional ambitious renovation policies can lead to up to 46% energy savings between 2021 and 2030.

The Energy Performance Certificates (EPCs), an integral part of the EPBD, are an important instrument that should contribute to enhance the energy performance of buildings. The main aim of the EPCs is to serve as an information tool for building owners, occupiers and the property actors when a building or building unit is sold or rented. Therefore, EPCs may be a powerful market tool to create demand for energy efficiency in buildings by targeting such improvements as a decision-making criterion in real-estate transactions, and by providing recommendations for the cost-effective or cost-optimal upgrading of the energy performance.

Additionally, as also confirmed by several studies and BPIE surveys in 2011 and 2013, EPCs have the potential to be important sources of information on the energy performance of the EU building stock and impact of renovation measures. Consequently, EPCs may be more than an information tool and become an effective instrument to map the energy performance of a country's building stock, to monitor the impact of building policies or even to support minimum energy requirements within the regulatory process.

However, to achieve the anticipated benefits, EPC systems at the MS level have to be properly implemented and endorsed, supported by well-functioning management, control and monitoring mechanisms. Only in this way will the EPCs increase the market value of energy efficiency in buildings and effectively support the transition of the real-estate sector towards low-energy build.

This study aims to evaluate the implementation status of EPC schemes across Europe by taking into account the various elements of the quality assurance and methodologies for storing EPC data in central or regional EPC registers. Another aim of the study is to identify good practices in making EPC data **reliable, accessible** and **re-usable** by the buildings community (i.e. real estate, buildings owners, tenants, experts, policy makers, etc.). Based on the findings, the study elaborates recommendations for Member States to maximise the benefits from the EPC schemes and beyond EPBD requirements by making them an effective instrument for market transformation and data mapping of the EU building stock.

This study is based on an extensive BPIE survey (also reflected in BPIE's Data Hub, www.buildingsdata.eu) and on BPIE's past studies on EPC schemes [BPIE 2010, BPIE 2011]. Vital input to this study has been provided by experts from 23 Member States and Norway, who kindly agreed to share their knowledge and participate in the interviews targeting the current status of implementation of the EPC scheme¹¹. Additionally, a significant amount of information was obtained through the assessment of existing

⁷ Communication from the Commission to the European Parliament and the Council on Energy Efficiency and its contribution to energy security and the 2030 Framework for climate and energy policy COM(2014) 520 final.

⁸ Directive 2002/91/EC of the European Parliament and of the Council of 16 December 2002 on the energy performance of buildings.

⁹ Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings (recast).

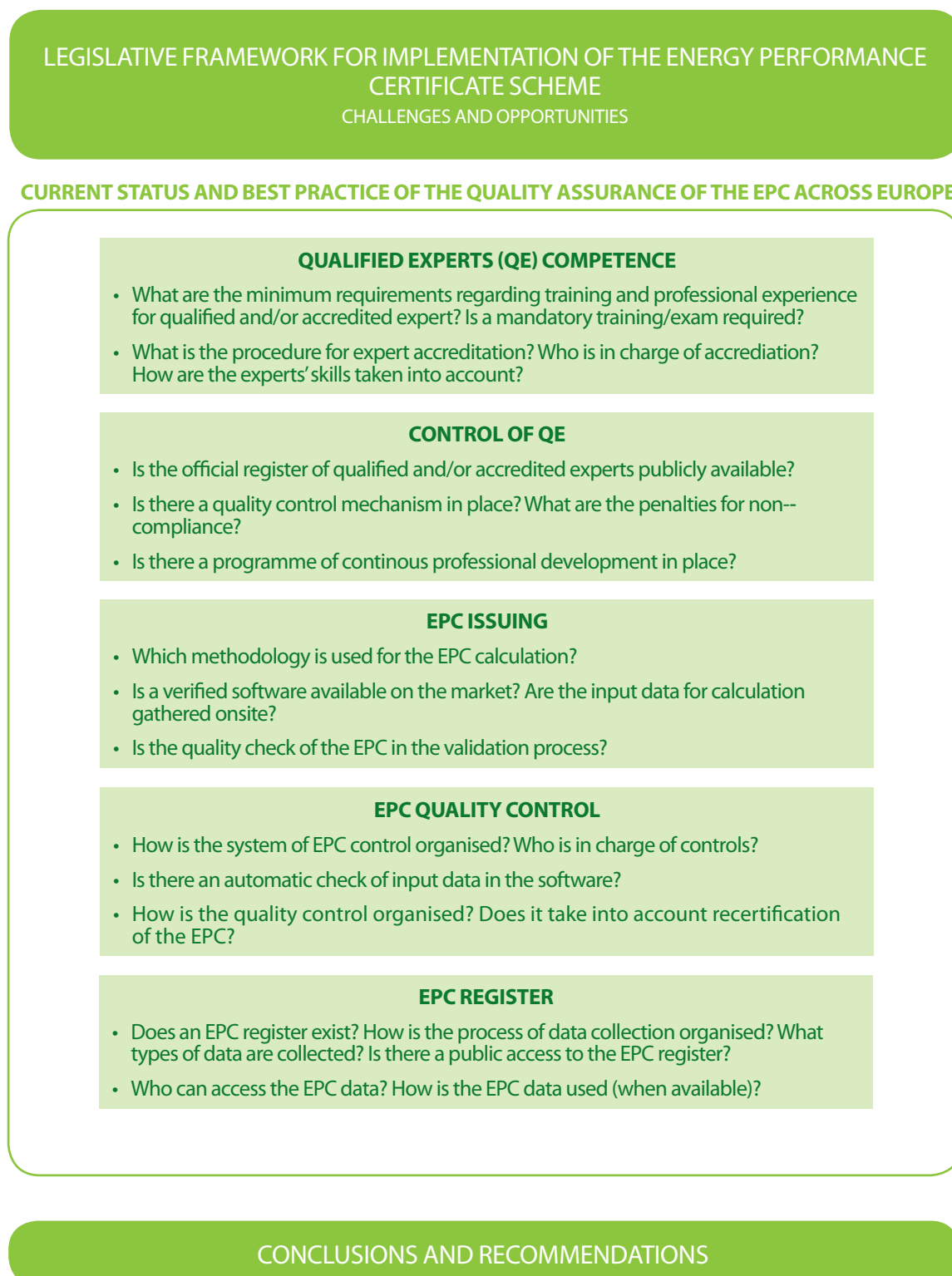
¹⁰ SWD(2014) 255 final Communication from the Commission to the European Parliament and the Council on Energy Efficiency and its contribution to energy security and the 2030 Framework for climate and energy policy COM(2014) 520 final.

¹¹ Unfortunately, it was not possible to gather first-hand information from Malta, Luxembourg, Cyprus, Finland and Denmark.

literature and especially from the EPBD Concerted Action analysis as well as reports that gave a good overview of the functioning of the EPC system in every Member State [CA EPBD 2011a, CA EPBD 2011b, CA EPBD 2013].

The structure of the study is presented in Fig.1-1

Fig. 1-1 Structure of the study



2 ENERGY PERFORMANCE CERTIFICATES: FROM DESIGN TO IMPLEMENTATION

Energy Performance Certificates are a powerful mechanism and “a key policy instrument that can assist government in reducing energy consumption in the building sector” [IEA, 2010]. They are also an important element of Europe’s energy and climate policies.

Energy Performance Certificates and the first EPBD (2002/91/EC)¹²

The ultimate goal of EPCs is to create a demand-driven market for energy efficiency in the building sector. Providing owners and occupiers with objective information to assess, compare and improve their properties’ energy performance may not only add a new dimension to the decision-making process, it might also transform the real estate market. The greater the tenant’s interest, the greater is the incentive for the owner to improve the energy efficiency of the building. Thus, EPCs can potentially influence builders and real estate owners to invest in greater energy performance, both in new buildings and renovation works.

When Energy Performance Certifications were introduced in the framework of European legislation for the first time in 2002, expectations were very high. Following the requirements of the first EPBD (2002/91/EC)¹³, all Member States had to introduce, at the latest by 4 January 2009¹⁴, an effective certification scheme for:

- All buildings or building units which are newly constructed or undergo major renovation;
- All buildings or building units sold or rented out to a new tenant; and
- All buildings where a total useful floor area over 1,000 m² is occupied by a public authority and frequently visited by the public; this threshold has been further lowered with the recast EPBD¹⁵ to 500 m² from 9 January 2013, and to 250 m² from 9 July 2015.

In a few Member States (i.e. the Netherlands, Denmark, and some regions of Austria), systems similar to Energy Performance Certifications were operational before the implementation of the EPBD. Nevertheless, the mechanism was new for the majority of countries and needed to be designed from scratch.

The design and effective implementation of an EPC scheme is a complex and demanding task. It requires a multi-dimensional approach taking into account technical, political and socio-economic aspects [BPIE, 2010]. When the EPBD recast (2010/31/EU)¹⁶ was introduced in 2010, 8 out of 28 countries still had not implemented EPCs for all types of buildings, see Fig. 2-1.

¹² Directive 2002/91/EC of the European Parliament and of the Council of 16 December 2002 on the energy performance of buildings.

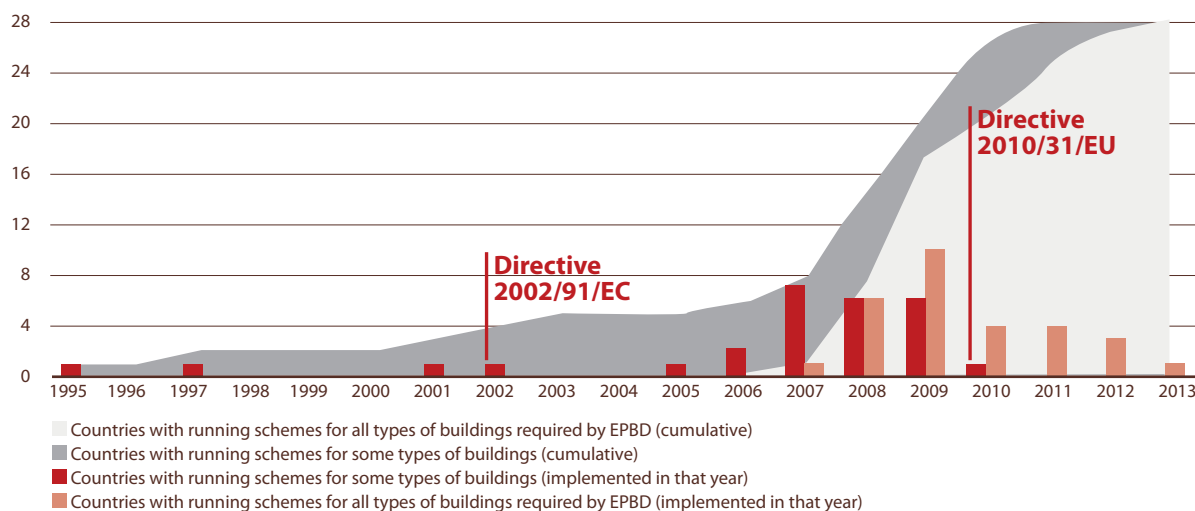
¹³ Ibidem.

¹⁴ The initial date for the EPBD implementation was by 4 January 2006, but MS could opt for an extension period up to 4 January 2009.

¹⁵ Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings (recast).

¹⁶ Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings (recast).

Fig. 2-1 Current implementation status of the EPC systems across Europe



To date, all 28 Member States have formally implemented the EPBD requirements for EPCs in their national legislation; only minor changes are still expected: for Hungary where voluntary EPCs for rented buildings will be replaced by mandatory ones in 2015, and for Slovakia where the mandatory certification of building units will come in force in 2016. In Belgium's Flemish Region, energy performance certification for non-residential and non-public buildings is foreseen for 2015, while the Walloon Region will start the certification of existing non-residential buildings the same year.

Requirements of the EPBD recast (2010/31/EU)

The first EPBD (2002/91/EC)¹⁷ set the framework for implementation of the EPC schemes at Member State level. The revision of the EPBD in 2010 was a unique opportunity to evaluate the effectiveness and impacts of EPCs¹⁸. The EPBD recast (2010/31/EU)¹⁹ introduced a set of additional requirements to improve the Energy Performance Certification scheme.

In addition to the EPBD scope, a voluntary certification scheme for non-residential buildings was proposed. This EU-wide mechanism will be based on CEN standards and is expected to be released in 2016.

Quality assurance

The introduction of the energy performance certification system in the first EPBD (2002/91/EC)²⁰, was not sufficiently supported by quality assurance requirements. Member States were obliged to introduce an independent system to issue the certificates by qualified and/or independent experts²¹, but quality control was not foreseen. The EPBD recast strengthened the requirements in this area, creating a great opportunity to improve the quality of EPCs.

In order to ensure high quality of energy performance certifications, an **independent control system** was introduced in the EPBD recast (Art. 18). Annex II of the Directive specifies the EPC verification options that need to be taken into account when designing the scheme, such as the validation of the input data, verification of results and recommendations, on-site visit of the building or other equivalent measures. Member States may delegate the responsibility to implement the control system to a third party, but the quality and independence of the system needs to be ensured.

¹⁷ Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings (recast).

¹⁸ An important input to the discussion of the EPC system after 2010 was concluded in the IDEAL-EPBD project (<http://www.ideal-epbd.eu/>) funded by the Intelligent Energy Europe programme. The results showed that there was room and urgent need to improve the EPC systems. Especially to make access to EPCs easier and providing more useful, meaningful and trustworthy information [ECN et al. 2011].

¹⁹ Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings (recast).

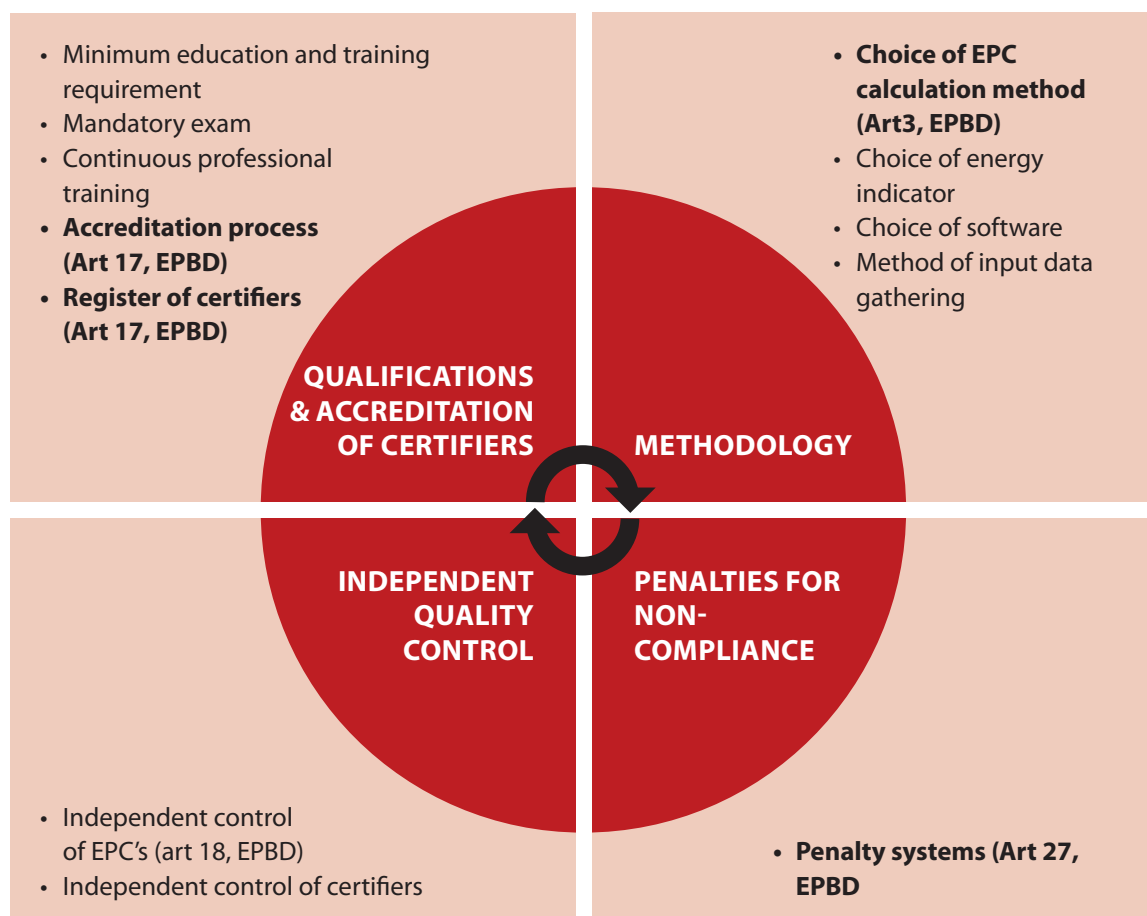
²⁰ Directive 2002/91/EC of the European Parliament and of the Council of 16 December 2002 on the energy performance of buildings.

²¹ Art 10. EPBD 2002/91/EC: Member States shall ensure that the certifications of buildings (...) are carried out in an independent manner by qualified and/or accredited experts, whether operating as sole traders or employed by public or private enterprise bodies.

The EPBD recast adds to the requirements regarding the **independent qualified and/or accredited experts** who are entitled to carry out the assessment of a building's energy performance. Member States should take into account the Directive 2005/36/EC²² on the recognition of professional qualifications in setting the rules for the training and accreditation of experts. According to the EPBD recast (Art.17), the expert's competence needs to be taken into account in the accreditation procedure. Moreover, Member States need to ensure that **lists of qualified and/or accredited experts** and companies that offer the services of such experts are made publicly available and regularly updated.

The new requirements introduced in the EPBD recast are important elements of the quality assurance of the EPCs (See Fig.2-2).

Fig. 2-2 Elements of the quality assurance of EPC systems



Availability

The first EPBD introduced the general conditions to make an EPC available to a buyer and tenant, once the building is sold or rented out. The recast further specified this rule with the requirement that **the energy performance certificate or its copy needs to be handed over to the new tenant or buyer** (Art.12). Moreover, displaying the energy performance indicator in any advertisement in commercial media is made mandatory (Art.12). These new elements of the EPBD recast create a real opportunity for the EPC to play an active role on the real estate market.

²² Directive 2005/36/EC of the European Parliament and of the Council of 7 September 2005 on the recognition of professional qualifications.

The revision of the Directive strengthens the rules for the **display of EPCs** in buildings occupied by public authorities and frequently visited by the public. All those buildings with a floor area over 500 m² (and as from 9 July 2015 over 250m²) need to show the EPC in a prominent place and it must be clearly visible to the public (Art.13).

To improve the functioning of the EPC system, the EPBD recast introduced mandatory penalties for **non-compliance**²³ (Art. 27). An effective, proportionate and dissuasive penalty may be issued to the building owner or qualified expert in the event of infringement.

For example:

- An EPC is not issued for a new building or major renovation.
- An EPC is not handed over during a sale or rental transaction.
- An EPC indicator is not displayed in advertisements in commercial media.
- The EPC quality is poor,
- and many others.

Usability of EPC information

As stated in the first EPBD, *“the energy performance certificate for buildings shall include reference values such as current legal standards and benchmarks in order to make it possible for consumers to compare and assess the energy performance of the building (...) and shall be accompanied by recommendations for the cost-effective improvement of the energy performance”*.

In order to increase the usability of the EPCs information (for building owners and tenants), additional requirements and recommendations regarding the scope of the certificates were introduced in the EPBD recast (Art. 11):

- EPCs shall include recommendations for the cost-effective or cost-optimal improvement of the energy performance of a building or building unit unless there is no reasonable potential for such improvement compared to the energy performance requirements in force (obligation).
- Recommendations included in the EPC shall be technically feasible for the specific building (obligation).
- EPCs shall provide an indication as to where the owner or tenant can receive more detailed information (obligation).
- EPCs may include additional information, such as the annual energy consumption for non-residential buildings and the percentage of energy from renewable sources in the total energy consumption (recommendation).
- EPCs may include additional information, such as the actual impact of heating and cooling on the energy needs of the building, on its primary consumption and the carbon dioxide emissions (recommendation).
- EPCs may provide an estimate for the range of payback periods or cost-benefits over its economic lifecycle, as well as incentives of a financial or other nature, as well as financing possibilities (recommendation).

²³ The system of penalties needs to take into account all aspects of non-compliance with the legislation introduced at the national level to implement the EPBD. The Energy Performance Certificates system is only one element.

Even though the recast EPBD does not stipulate the creation of central/regional registers, they have the potential to yield a comprehensive data repository on the energy performance of buildings and support the quality control process.

BPIE Surveys (2011, 2013) confirmed that EPCs are currently among the most important sources of information on the energy performance of EU's building stock. The EPC information (including the energy performance of the building's envelope, use of technical installations, primary energy consumption and many others) can be used for various purposes by a wide range of stakeholders. Public administrations use them for policy monitoring and decision-support planning and commercial applications to define the market potential of renovating, as well as technology uptake, etc. EPC registers play an important role in supporting the quality control process.

One of the first studies that investigated the benefits of the centralised EPC registers in Europe was done in the DATAMINE project²⁴ run between 2006 and 2008 by a research consortium led by the *Institut für Wohnen und Umwelt* and funded by the Intelligent Energy Europe programme. The goal of the project was to make use of EPC data to improve knowledge about the energy performance of the building stock in Europe. The research provided recommendations regarding the creation of central EPC registers and highlighted multiple benefits from making use of EPC data for different stakeholder groups.

In addition, investment in energy efficiency refurbishments is a central topic of the Energy Efficiency Financial Institutions Group (EEFIG), which identifies the importance of EPCs in making financial decisions including loan making (EEFIG 2014). The EEFIG group identifies operational EPC databases with shared data standards and collection protocols as a unique opportunity to obtain better information from financial institutions and industry stakeholders.

²⁴ Results of the DATAMINE project ("Collecting DATA from Energy Certification to Monitor Performance Indicators for New and Existing Buildings") can be found at: <http://www.meteo.noa.gr/datamine/>

3 QUALITY ASSURANCE OF THE EPC

In this chapter, an overview of the main elements of the quality assurance system across Europe is presented. The following issues are addressed:

- National requirements regarding qualified experts training and/or accreditation.
- Methodology and software used for the calculation of the energy performance of buildings.
- Independent systems for the quality control of energy performance certificates.
- Penalties for non-compliance.

Requirements for qualified and/or accredited experts²⁵

Member States have flexibility in designing the system of training and/or accreditation of qualified experts. To guarantee an appropriate level of qualification and to take into account the expert's competence in the accreditation process, there are a variety of requirements applied at the national (or regional²⁶) level, such as: minimum requirements regarding a certain level of education and professional experience, a mandatory training programme and mandatory exam, an accreditation procedure and others, such as introducing a programme of Continued Professional Development (CPD).

The EPBD recast was an opportunity for a number of Member States to revise the existing national regulations and increase the qualification of experts entitled to issue Energy Performance Certificates.²⁷ Annex I presents an overview of the "state-of-the-art" minimum requirements for qualified experts (physical persons) and accreditation procedures across Europe.

In most Member States, the expert skills are differentiated according to the type of building evaluated; the more complicated the energy audit is (e.g. for non-residential buildings and/or buildings with advanced technical systems), the more expertise is required. Typically qualified experts who carry out the energy performance assessment can issue a certificate for specific building types. For example:

- **Residential and non-residential and/or public buildings**, e.g. Austria, Bulgaria, Cyprus, Denmark, Estonia, Romania, Ireland, Portugal, Sweden and the United Kingdom.
- **Buildings with simple technical systems and more complex ones**, e.g. Croatia, Denmark, Finland, Greece, Slovakia, Portugal, Sweden and the United Kingdom.
- **New and existing buildings**, e.g. Belgium, Bulgaria, Germany, the Netherlands, Luxembourg.
- **Others**, such as temporary certification for new buildings e.g. Latvia; and self-certification for existing residential buildings e.g. Norway.

The qualified and/or accredited experts can operate "in a self-employed capacity or be employed by public bodies or private enterprises" (Art 17, EPBD). So far, Denmark is the only country restricting to enterprises (that are accredited) the issuing of the energy performance declaration. A similar system was implemented in Sweden, but at the beginning of 2014 it was changed to the personal responsibility of a certified expert²⁸.

²⁵ Please note that the rules for qualification and/or accreditation of the independent inspectors of heating and AC systems (according to Art 15-17, EPBD Directive) are not in the scope of the following report.

²⁶ The regional approach is followed by: Belgium, Italy, Spain and the United Kingdom.

²⁷ For example, since June 2013, in Finland, only qualified experts can issue the energy certificates, as opposed to the system that allowed for example building managers and energy auditors.

²⁸ It is expected that the change in the legislation will cause a decrease in the EPC cost, which is currently relatively high (~1000 euro according to the CA EPBD 2013).

Minimum requirements for education and/or professional experience

Minimum requirements for the level of education are applied in 25 countries and Norway and requirements for professional experience in 17 Member States and Norway.

In most countries a technical university degree is required to be a certifier (i.e. mechanical, civil and electrical engineering, architecture) or a training that integrates the aspects related to energy performance in buildings. Depending on the country, relevant professional experience might be required- typically between 2 to 6 years- and depends on the type of energy certifier and his/her education level.

Training programmes

Officially recognised, compulsory training courses for qualified experts are required in 14 out of 28 countries; in some cases they are only required under specific circumstances as, for example, when there is a lack of professional experience.

In most countries, the training is provided by a variety of institutions (including third-party bodies or private training organisations). The scope of the training is typically regulated by the government and may vary for different types of certifiers. Typical elements of the training taken into account are: regulations on the energy performance of buildings, aspects of building physics and technical installations, methodology, procedures and tools for the assessment of buildings' energy performance, basics of a cost-effective recommendation for performance improvements and other related aspects such as RES integration, comfort issues.

The duration and cost of training vary across Member States, but also at the national level. Here are some examples of the costs to train the certifiers (residential buildings):

- *Voluntary training:* Austria ca. 1200 euros (for 5.5 days), Portugal ca. 850 euros (for 50 hours), the Netherlands ca. 750 euro, Cyprus – free training programmes;
- *Mandatory training:* Estonia ca. 1600 euros (for 10 days), Lithuania ca. 350 euros, Greece ca. 300 euros, Poland ca. 500 euro, Bulgaria ca. 800 euros (including price of software);

Mandatory exam

A mandatory exam is required in 20 out of 28 Member States, while in countries with a regional approach, the exam is only required in selected regions.

In most countries, the examination is conducted by authorised examination bodies, often the same that carry out the mandatory training. The exam is typically a combination of written and oral sections and it may consist of both theoretical and practical knowledge (e.g. France, Malta).

The implementation of the recast EPBD resulted in the introduction in a few Member States of a mandatory examination for qualified experts (e.g. France since 2012, Belgium-Flanders since 2013²⁹ and Greece since 2014). At the same time, the newly introduced legislation in Poland (July 2014) and Portugal (December 2013) suspended the mandatory training and exam for the experts, in order to provide broader access to the profession of certifier.

²⁹ In Flanders, the introduction of a mandatory examination is considered a "milestone in the quality assurance of the certification scheme"; CA EPBD 2013, EPBD implementation in Belgium Flemish Region, 2013

Continuous Professional Development

In a growing number of countries, currently 8 out of 28 countries, there is a mandatory requirement for a periodic renewal of the licence of qualified experts. This is a critical element to keep qualified experts up to date (e.g. on legislation, tools, etc.) and improve their knowledge.

Qualified experts need to pass a mandatory exam in Ireland (every two years), Bulgaria (every three years) and Lithuania (every 5 years). Attendance to mandatory training is required in the Czech Republic (every three years), France (every five years) and Croatia (every year). In Romania, to renew the licence, qualified experts need to prove their experience (e.g. number of EPCs issued).

In England and Wales, Accreditation Scheme operators are required to work with their members to develop plans that meet the requirements of the individual energy assessor. Schemes should require a minimum of 10 hours of Continuous Professional Development (CPD) per year. Where an assessor is accredited in more than one strand, they should undertake an additional 5 hours CPD per year. In Scotland assessors must also undertake relevant training to update their knowledge on ongoing development of EPC services.

In Belgium (Flemish and Walloon regions) support for assessors is available by email or phone and aims at advising assessors regarding software, methodology, etc. Additionally there is a list of FAQ available online, as well as a periodic newsletter.

Accreditation procedure

Although the certifiers' accreditation is voluntary according to the EPBD, it is carried out in the majority of Member States.

In 12 out of 28 Member States, the accreditation process is conducted by the **government bodies** (i.e. relevant Ministry or its agencies) based on the recognition of the results of the mandatory exam. In some countries (e.g. Croatia, Poland and Belgium-Walloon Region), the qualified experts need to prove their liability insurance to complete the accreditation procedure. In other countries (e.g. Luxembourg, Poland, Romania³⁰) accreditation by a governmental body requires the qualified experts to be members of recognised professional associations (i.e. chambers of architects, engineers etc.).

In Denmark, accreditation is carried out by the Danish Accreditation Agency³¹. Only companies³² that follow the ISO 9001 can be accredited for the energy performance certification according to the national standards. Quality Assurance systems and all other requirements that companies must meet are verified on an annual basis by the accreditation body. The accreditation of small buildings' certifiers is conducted by professional associations.

In Sweden, the bodies that carry out the accreditation of the qualified experts are in turn accredited by the Swedish Board for Accreditation and Conformity Assessment (SWEDAC). The same board was, up to end of 2013, also responsible for accreditation of companies who were entitled to issue energy performance certificates. The system has been changed to the personal responsibility of a certified expert.

In Hungary and Greece a mandatory exam is carried out by the **professional associations**, which are also responsible for the accreditation procedure. In Estonia, members of the engineering chamber are part of the examination committee. In Austria, where no mandatory exam for qualified experts is required, the accreditation procedure is based on the trade licence of experts (and follows relevant rules and regulations). Revisions to the accreditation process are planned to improve the evidence of experts' qualification according to the requirements of the EPBD recast.

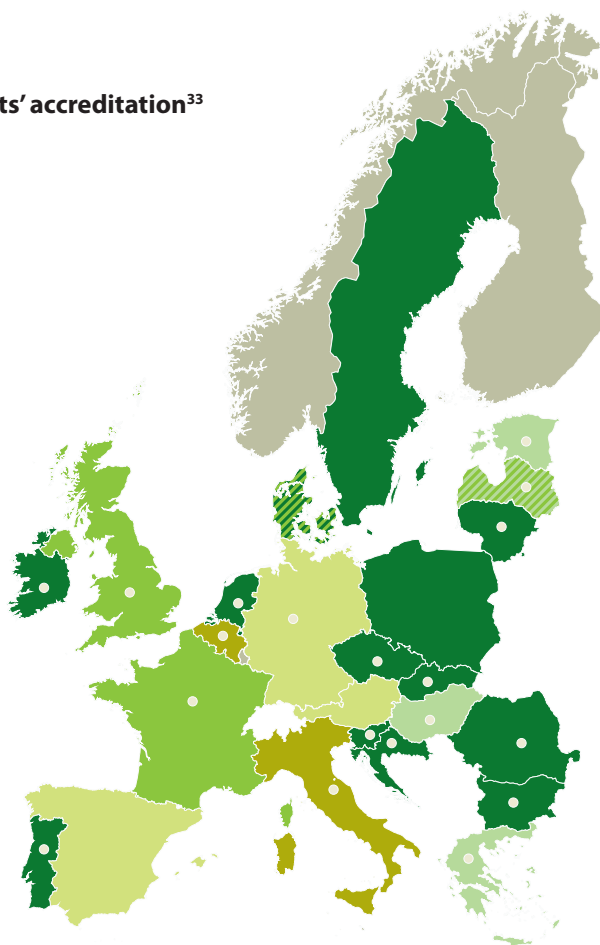
³⁰ In Romania, this is mandatory to present a written recommendation from a relevant professional association.

³¹ The Danish Accreditation Agency (DANAK) is appointed as the national accreditation body in the national legislation. DANAK has a contract with the Danish authority Sikkerhedsstyrelsen to undertake accreditation tasks as the Danish accreditation body.

³² In Denmark only accredited companies are entitled to issue Energy Performance Certificates.

Fig 3-1 Bodies in charge of qualified experts' accreditation³³

- Governmental body
- Third body
- Professional associations
- Depends on the region
- No accreditation scheme
- Unknown
- Both governmental and third bodies
- Both third bodies and professional associations
- Mandatory examination



In 3 out of 28 countries, the bodies responsible for the accreditation procedures are **third-party bodies** (i.e. institutions / companies) that have an agreement with the government:

- In France, the French accreditation committee (COFRAC) is responsible for the accreditation of Certification Bodies (private companies or public institutions) which are in charge of the qualification of experts. These Certification Bodies are also responsible for the update of the list of experts.
- In Latvia, the accreditation procedure can be conducted both by third-party bodies (Ltd "ABC konsultāciju centrs") and professional associations (i.e. Latvian Heat, Gas and Water Technology Engineers and other).
- In the United Kingdom, energy assessors are required to demonstrate competence, either by having a recognised qualification from an awarding body by the government or Accreditation of Prior and Experiential Learning (APEL), in accordance with national standards.

In Germany, there is no official accreditation procedure; nevertheless, qualified experts can voluntarily get an accreditation via professional associations and third-party bodies. Those organisations have internal rules and requirements for accreditation (e.g. KfW certifiers). The qualified experts take personal responsibility for the quality of the certification results (under risk of penalties).

Italy, Belgium and Spain follow a regional approach for the certification procedure. The qualified experts in this case are accredited by the regional governmental bodies (for Belgium) and professional associations.

³³ Note for Italy, an exam is required only in some regions; in the United Kingdom, a mandatory exam is not required in Scotland.

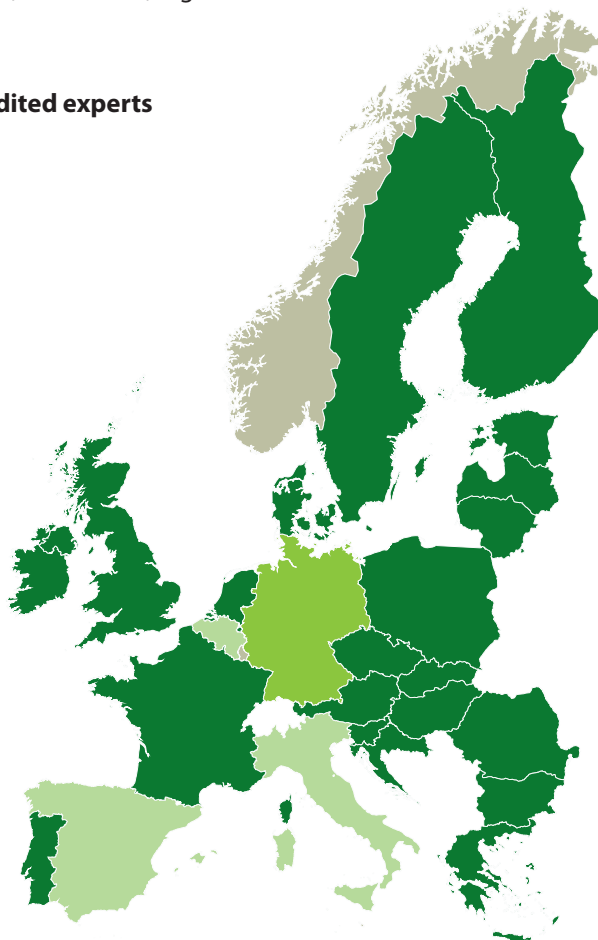
The list of certifiers

According to Art. 17 of EPBD, “Member States shall ensure that either regularly updated lists of qualified and/or accredited experts or regularly updated lists of accredited companies which offer the services of such experts are made available to the public”.

Most Member States successfully fulfilled this obligation and made publicly available the list of qualified and/or accredited experts and organisations for the assessment of the energy performance of buildings. In Germany, instead of one central list (register), there are multiple voluntary databases of the certifiers. In Spain and Italy there are no central registers, but smaller, regional ones instead³⁴.

Fig. 3-2 Registers of qualified and/or accredited experts

- Mandatory register
- Voluntary registers
- Regional registers
- Unknown



EPC methodology and tools

Methodology

The EPBD recast (Art.3) provides guidance for Member States regarding the EPC calculation methodology, in accordance with EU standards. Annex I to the EPBD states that the energy performance of buildings can be evaluated on the basis of the calculated (known as asset rating) or actual energy consumption (known as operational rating). At the same time, the rating needs to reflect the energy needs associated with a typical use.

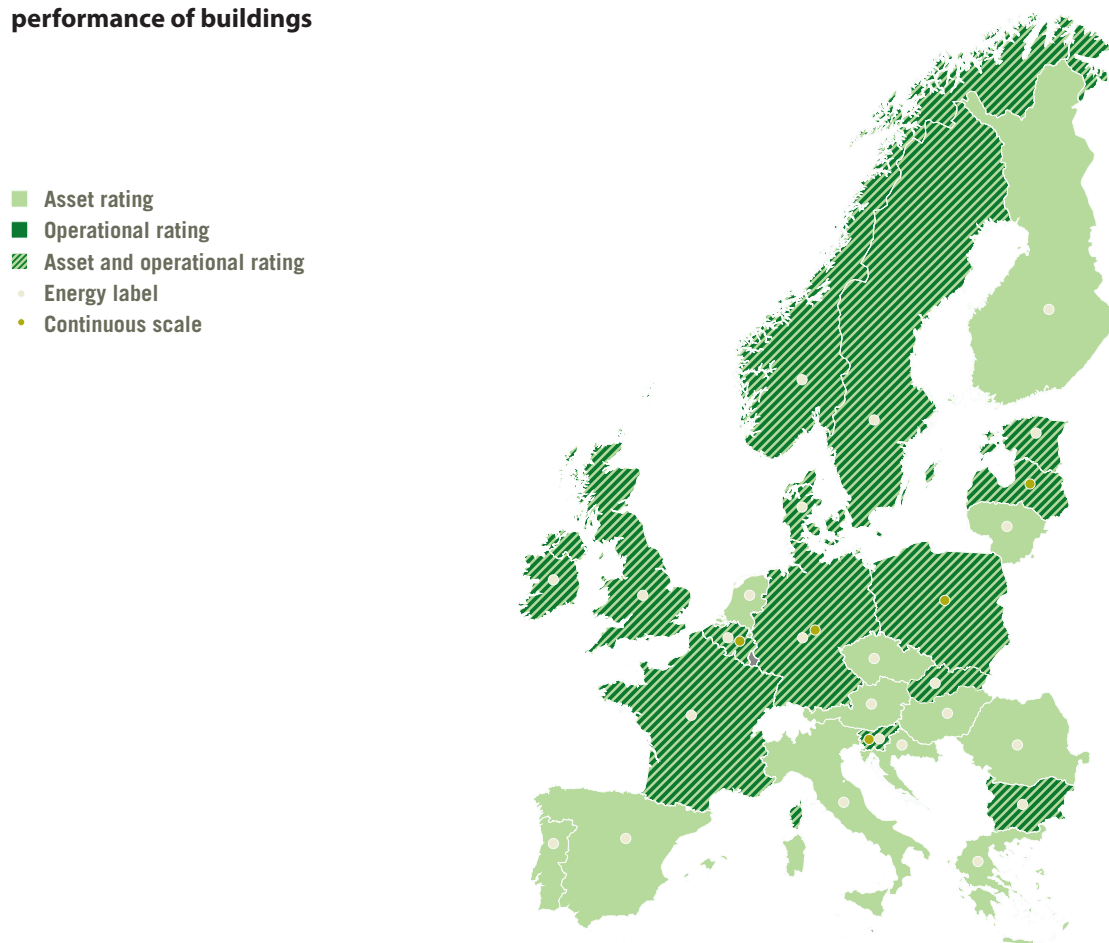
³⁴ In Spain, the regions have to create a certifiers' list according to the Royal Decree 235. In Italy the realisation of a system for the transparent recognition of the certifiers is only suggested to the regions.

While the methodology based on asset rating takes into account the primary energy needs of the buildings without taking into account all the losses derived from the production of energy, the methodology focused on actual energy consumption is generally based on the energy delivered to the buildings and therefore includes users' behaviours and the potential malfunctioning of some equipment (thus might not necessary reflect the typical use). An operational rating may be appropriate for existing buildings, including both public and commercial buildings, in which a change of users is infrequent, and user behaviour is, therefore, quite stable. The European Commission is currently undertaking a study on the technical compliance of national calculation methodologies.

Among the 28 EU countries, 14 have adopted the methodology exclusively based on calculated energy consumption. In other countries, both the actual and calculated energy consumptions are foreseen, depending mainly on the building type or building age.

For some countries, the actual energy performance methodology applies only for non-residential (e.g. Slovenia) or other specific type of buildings (e.g. England and Wales³⁵); in others (e.g. Estonia, Latvia³⁶) the evaluation of the actual energy consumption is extended to all the existing buildings while, for new builds, the energy consumption is calculated. In Sweden, an asset rating is performed before the construction of a new building, and this is compulsory to issue an EPC based on measured energy consumption when completed. In England and Wales energy performance is based on the fabric of the building and its services.

Fig 3-3 Overview of the methodologies used in European countries for the evaluation of the energy performance of buildings



³⁵ The operational certificates apply only for large publicly and privately owned buildings over 500m², frequently visited by the public.

³⁶ In Latvia for new buildings asset rating, if measured data are not available.

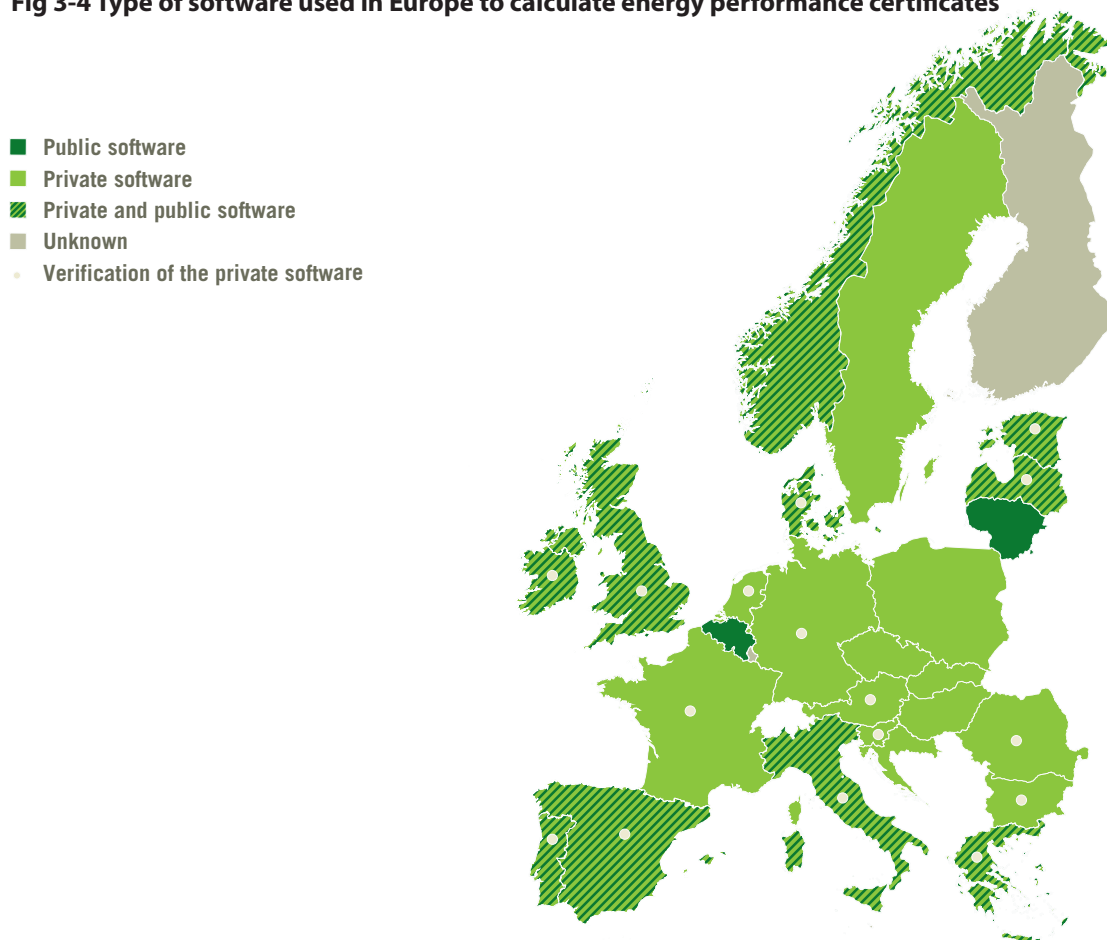
The choice of methodology and the energy performance indicator (i.e. energy label; continuous scale) to be presented on the energy performance certificate determine to a large extent the credibility, (acceptable) reproducibility³⁷ and the cost of the EPC [BPIE, 2010].

In most countries, the energy performance indication is introduced in the form of the energy label while in others (Belgium- Flanders, Germany, Latvia, Luxembourg, Poland and Slovenia), a continuous scale is used. For instance, in Germany and Slovenia, typically the continuous scale is used, but for residential buildings energy labels are provided in addition since 2014. In Luxembourg a continuous scale is used for non-residential buildings, while an energy label is used for residential buildings.

Software

To support the calculation process, the methodology implemented in most countries is in the form of a software tool. In four countries (Luxembourg, Belgium, Malta and Lithuania) only the public software can be used for the calculation of the energy indicators. In 12 countries, both public and commercial softwares (that in most cases are approved by the government) are accepted. Therefore, qualified experts may have a choice according to the purpose, preferences, availability (i.e. price) and quality of the software. Most typically the commercial software is tested³⁸ to comply with the national algorithm and standards. In 12 countries only a commercial software is provided, for which, in 5 countries (Sweden, Slovakia, Czech Republic, Hungary and Croatia), validation is not requested.

Fig 3-4 Type of software used in Europe to calculate energy performance certificates



³⁷ Acceptable reproducibility refers to the level of reproducibility for which the deviation between the assessments of a particular building made by two or more experts using the same methodology is relatively small [based on BPIE 2010].

³⁸ The software is tested by the accredited body providing the same input and checking if the deviation from the expected results is within a specified margin.

In Italy, the calculation of the EPCs at the regional level is possible using commercial software that is certified according to compliance with the national algorithm and technical standards. For existing residential buildings (in some regions), simplified public software can be used [CTI 2013].

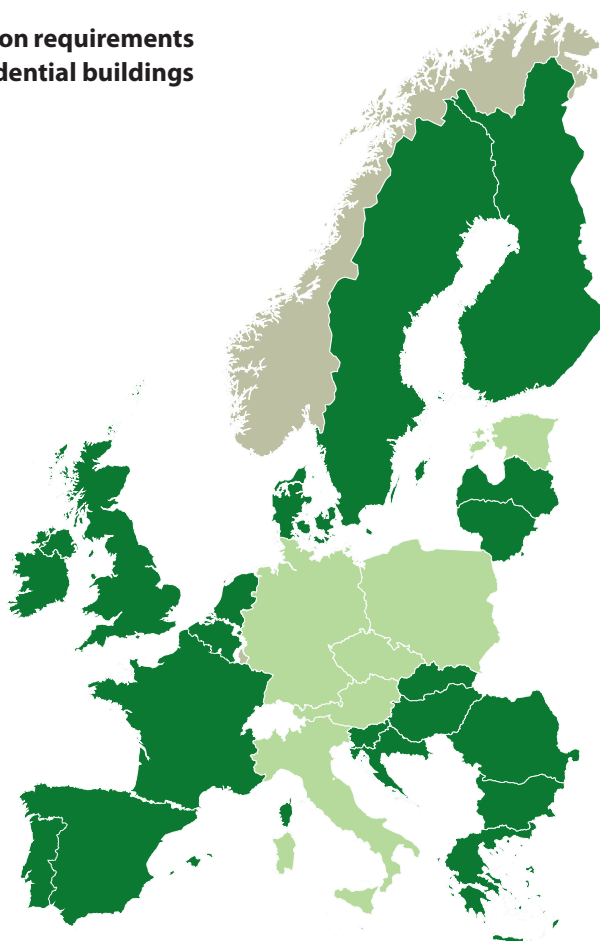
Input data

The quality of input data for the calculation process is an important determinant of the quality of the results [BPIE, 2010]. To obtain sufficient information to calculate energy performance levels (i.e. asset rating methodology), a qualified expert needs to have access to at least the full project documentation and/or conduct an on-site inspection of the buildings (when possible).

In 19 of 28 Member States, the on-site visit is a mandatory requirement to issue an energy performance certificate (for existing buildings). However, it is not the case for six countries (Austria, Czech Republic, Estonia, Italy, Poland and Germany). The presence of sufficient data (e.g. full project documentation) is considered satisfactory to evaluate the energy performance of buildings without an on-site visit. Often the main burden is the cost of the on-site visits, as this method of data gathering takes time and is more cost-intensive.

Fig 3-5 Overview of on-site visit or inspection requirements to issue an EPC in the case of existing residential buildings

- Required
- Not Required
- Unknown



In some countries the certification process of new buildings requires proof of compliance with energy efficiency requirements (e.g. Brussels Capital Region, Walloon Region, Bulgaria, Finland³⁹, France⁴⁰, Portugal, Slovenia and Spain); in such cases the qualified expert may be involved during the on-site work and have direct access to the building and systems data.

³⁹ For Finland, the EPC is associated with the building permit.

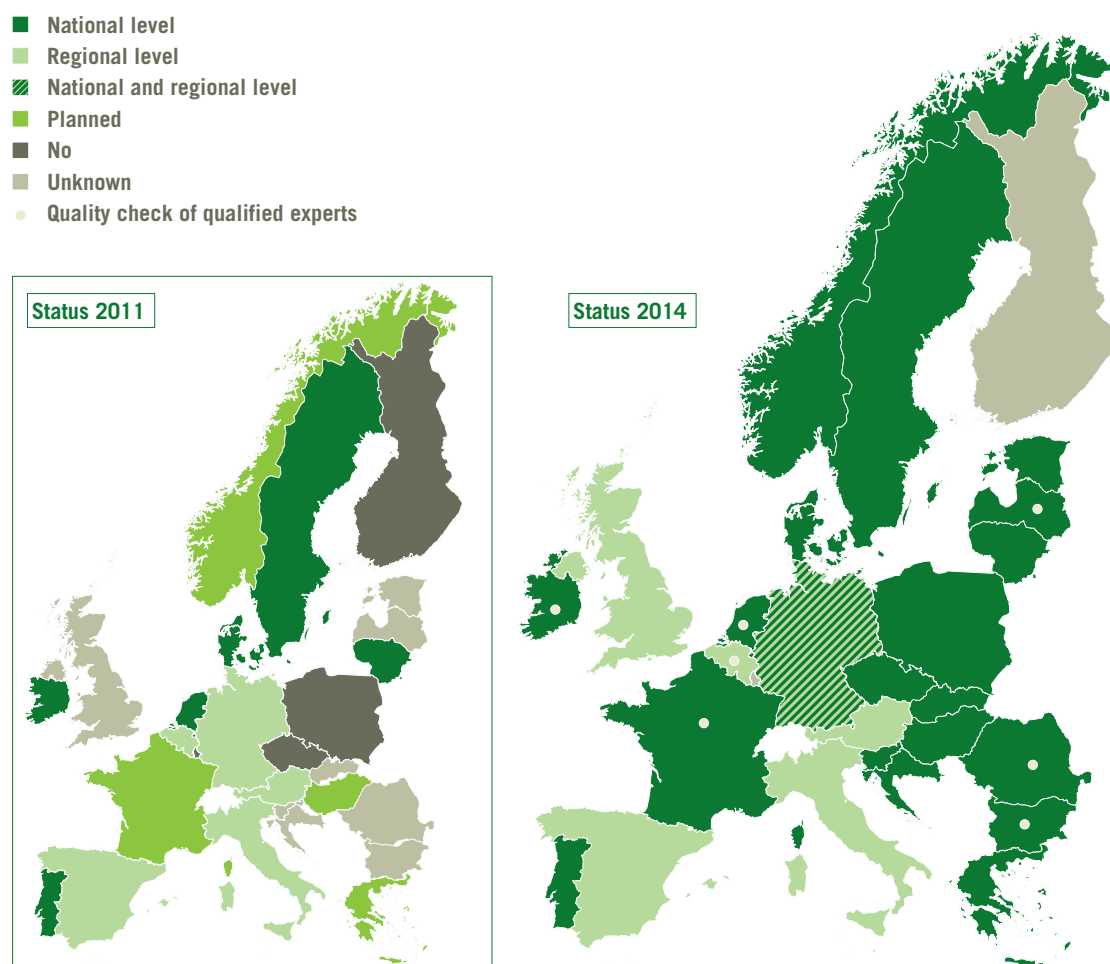
⁴⁰ In France, the final check may consist in the verification of the planned installation of systems.

Independent control systems for energy performance certificates

The control system for the energy certification scheme is one of the key aspects that have been improved with the EPBD recast (Article 18)⁴¹. Following the Directive, Member States shall establish an independent control system and verify “a random selection of at least a statistically significant percentage of all the energy performance certificates issued annually”. The rules for verification, which are specified in Annex II, are:

- a. Validity check of the *input data* of the building used to issue the energy performance certificate and the *results* stated in the certificate,
- b. Check of the *input data* and verification of the results, including the *recommendations* made,
- c. Full check of the *input data and the results*, including the *recommendations* to improve the energy performance of the building or building unit, and *on-site* visit of the building, if possible, to check correspondence between specifications given in the energy performance certificate and the building certified or other **equivalent measures**.

Fig 3-6 Existing and planned quality control schemes



⁴¹ Please note that rules to establish an independent quality control system for the inspection reports for heating and AC systems (according to Art 18, EPBD) are not in the scope of the following report.

The quality control system is conducted most typically in two phases: a simple audit of the input data and results (following option A from the Annex II, EPBD) and a detailed audit that takes into account a comprehensive verification of the inputs, results and recommendations, including a check of the project documentation and an on-site visit (following options B and C from Annex II of the EPBD).

The deadline for the implementation of the independent quality control systems was set in the EPBD for 9 January 2013. Most Member States have formally transposed the objectives of EPBD's Article 18 into national legislation (see: Fig. 3-6). In a number of countries, e.g. Greece, Hungary, Latvia, Czech Republic, Croatia, Germany, Romania and Slovenia, the system has been introduced or revised only in 2013-2014. Thus, it is still in the early stages of implementation. For example, in Latvia and Czech Republic (for existing buildings) the rules for the quality control of EPCs are now being defined. In Italy, the system of control systems is now being revised and the responsibility is planned to change from the regional to a national level. In Poland, the legislative framework for a control system was agreed in June 2014; the system will be designed and implemented in the coming months.

On 21 March 2014, the European Commission services requested Member States to report on the 2013 activity of independent control systems using a common template. To date, 19 Member States have responded to the Commission's request. The results are presented in Tab. 3-1.

Tab 3-1 Quality check on the EPC in 2013 across Europe

	Country	Total EPC issued in 2013	Size of the sample for EPC verification	Option A	Option B	Option C	Other checks
1	Austria	40 220	13.2%	9.5%	10.8%	1.0%	14.3%
2	Belgium: Flanders	142 208					1.5%
	Wallonia	67 193	17.5 %	17.5 %	4.5%	0.3%	
	Brussels	32 075	1%*1			0.4%	0.6%
3	Bulgaria	694	63.1%	63.1%	32.1%	5.0%	0%
4	Croatia	13 000	Quality control system not yet performed				
5	Cyprus	3 851	24.2%	3.6%	0.5%	20.1%	
6	Czech Republic	21 711*2	5.2%				
7	Denmark	57 151	1.2%	0.5%	0.5%	0.2%	0.0%
8	Estonia	1 614	0.6%				15.5%
9	France	850 000*3	1%				
10	Germany	The independent quality control has been introduced on 1 May 2014					
11	Greece	228 837	0.5%	0.0%	0.5%	0.01%	1.1%
12	Hungary	91 912	100%	100%	2.5%	0.5%	
13	Italy (11 regions)	419 650	6.4%	6.3%	1.0%	0.1%	0.3%
14	Ireland	104 785	0.3%				0.4%
15	Latvia	1 000	Independent control of EPC will be performed from 2014				
16	Lithuania	39 995	100%	98.4%	1.4%	0.0%	0.0%
17	Luxembourg	43	100%			100%	
18	Slovakia	14 019	0.7%	0.40%	0.4%		100%
19	Sweden	59 000	Independent control of EPC will be performed from 2014				

*1 From January to March: 142 EPCs issued, from March 2013: 28 EPCs issued per month.

*2 Only certificates registered in EPC database.

*3 From April 2013 to March 2014.

⁴⁶ In Romania, quality control started in 2014; to date no official results are available.

Random sampling

The EPBD recast does not provide a precise definition and/or methodology for sampling a “statistically significant percentage” of energy performance certificates to be verified. In 2008, when the EPBD recast was discussed, the European Commission proposed⁴² requiring Member States: “to perform quality check for at least 0.5% of the issued certificates”. This proposal was not included in the final text of the Directive.

The methodology of random sampling process varies between Member States; the main approaches are the following:

- Selection of a statistically significant percentage of all energy performance certificates based on a **random sample from all EPCs issued**;
- Selection of a statistically significant percentage of all the energy performance certificates based on the **random sample of the EPC issued per energy assessor**.

The EPC registers play a key role in the design of the quality control systems across Europe. Establishing the EPC registers, which is recommended, but not compulsory under the EPBD, was justified in many countries by the need for an independent control system. EPC registers support the sampling process and ensure that all the EPCs issued have an equal chance of being selected for the quality control.

A “statistically significant” sample of the EPC taken into account for the quality control varies between Member States, depending on the tools used and the level of the quality check performed (see: Annex II). In addition to the **random sampling** and/or check of EPC with “**out of range values**”⁴³, a targeted audit is performed for specific building types, such as publicly subsidised buildings (e.g. Austria, Greece), buildings with high energy performance indicators (e.g. Lithuania) and others. Most countries also conduct an additional audit of the EPC in case of client complaints.

In 15 out of 28 Member States a **simple audit** of the EPC quality is performed based on information gathered in the EPC database with no additional input from the qualified experts. It is performed both automatically (i.e. plausibility check of the extreme values) and manually by a qualified person. In a few countries e.g. Ireland, the United Kingdom, Hungary and Slovakia, the initial data validation process of certain data fields is conducted prior to submitting the EPC within the calculation software and/or EPC database (i.e. digital data protocol). A similar approach is currently being developed in Slovenia⁴⁴ and Latvia⁴⁵.

Germany introduced an independent control system in 2014. A statistically significant sample of certificates will be randomly selected from the EPC register, which consists inter alia of the EPC’s identification number and the contact details of the EPC assessors. Checks at all levels can only be performed after the responsible assessor of the selected EPC has provided additional input. Therefore, experts are required to store all relevant data for at least two years after the EPC has been issued.

A **detailed audit** of the EPC certificates aims to verify input data, results and recommendations. It is performed on the basis of the additional information received from qualified experts such as project documentation and on-site visits. In some cases (i.e. Denmark, Ireland, the United Kingdom, Bulgaria), a detailed audit takes into account the process of re-certification. In re-certification, an energy auditor will attempt to recreate an EPC using the data collected during the assessment process.

In most countries, detailed quality checks are performed for the certificates that show inconsistencies in the first phase of the quality control. Otherwise, the check is based on random sampling of typically up to 0.5% of the EPC issued. An on-site visit is not always a mandatory procedure for the detailed audit; in some Member States (e.g. Estonia, Greece) it might be only required in exceptional circumstances.

⁴² European Commission Communication Staff Working Document: COM(2008) 780 final; SEC (2008) 2865; Proposal for recast of the Energy Performance Directive (2002/91/EC) Impact assessment.

⁴³ The EPCs with that show inconsistencies (e.g. resulting from the plausibility check) are selected for a more detailed check.

⁴⁴ The Government of Slovenia is working on the detailed data protocol to allow automatic quality control of data in the EPC database.

⁴⁵ Ministry of Economics of the Republic of Latvia is currently developing the software for collection and automatic check of the EPC data

In Austria, on-site visits will be made mandatory in the future for a significant percentage of the building stock controlled by an independent body (proposal is 0.5 %, but there is no final decision, and the share might differ in the regions).

In Belgium (Wallonia, Flanders), France, Portugal, Romania⁴⁶, the Netherlands and Scotland, the quality control of EPCs is based on the check by qualified experts. Although the sampling method differs, the number of the certificates per assessor to be verified every year needs to be statistically representative. In several countries (i.e. Ireland, Latvia) the quality control of certified assessors is performed in parallel to the independent control system of the energy performance certificates.

Tab 3-2 Quality control system based on the check of the qualified experts.

FRANCE	The certification body has to check at least 8 reports, representative of the expert's work during the first three years of the qualified expert's activity (detailed desk audit); and at least one EPC with an on-site visit of the building for each certification cycle (5 years) of all experts. Total number of the EPC checked on annual basis is ca. 1% of all EPC issued.
THE NETHERLANDS	The control system is performed under the BRL9500 guideline and includes the check of a certain number of the EPCs issued by qualified assessors (detailed check of documentation, site visit). Check is performed for 2% of EPCs issued for residential and 5% for non-residential buildings per assessor.
SCOTLAND	Approved organisations have to audit 2% of all the EPCs created by their registered assessors.
PORTUGAL	The control of qualified experts is undertaken by ADENE, who also manages the central register. That control focuses on the first EPCs issued by the experts, on-site visits (accompanying qualified expert during first on-site visit or after the EPC is issued by replicating his/her work and comparing it to the original EPC), and random selection of EPCs in order to check procedures and supplied information. No minimum number of EPCs to check, although it can vary from 0.5% to 4.0% according to the level of assessment.

Bodies in charge of EPC quality control

According to the EPBD (Article 18), Member States can delegate the responsibility for the implementation of a quality control system; nevertheless they need to satisfy the criteria of being "independent" and in compliance with the requirements regarding the verification process (specified in Annex II).

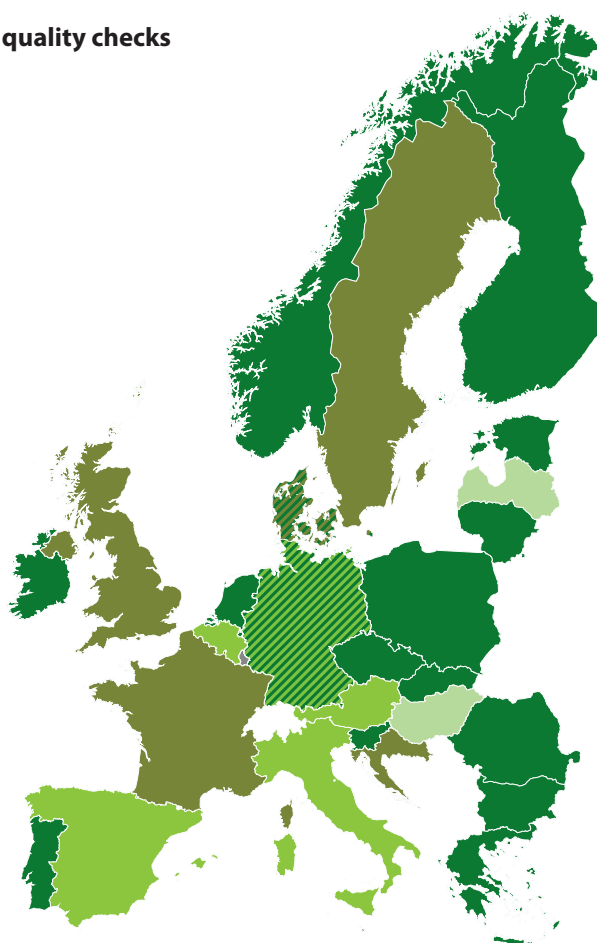
There are four countries (i.e. Italy, Spain, Austria and the United Kingdom) which follow a regional approach regarding the quality check of energy performance certificates. Thus, responsibility for the control system lies with the regional government. In Germany, the first level of control is conducted at the central level by the German Institute for Building Technology (DIBt); detailed control is the responsibility of regional governments.

In 14 out of 28 Member States the responsibility to perform the checks on energy performance certificates is the competence of the **central governmental body**; it might be performed by the relevant ministerial body or its Executive Agency (e.g. Bulgaria, Denmark, Finland, Greece, Ireland, Portugal, Romania and the Netherlands), the State Inspection Body (e.g. Czech Republic, Estonia, Germany and Slovakia) and/or supported by an energy expert appointed by the Ministry (e.g. Slovenia, Norway).

⁴⁶ In Romania, quality control started in 2014; to date no official results are available.

Fig 3-7 Bodies responsible for performing quality checks on energy performance certificates

- Central governmental body
- Regional governmental body
- ▨ Central and regional governmental bodies
- Professional association
- Third party body
- ▨ Central governmental body and third party body



In Hungary and Latvia⁴⁷, the competence for quality control of EPCs is in the hands of the organisation that performs the accreditation of the qualified experts; that being, in both cases, the professional association of engineers and architects.

In 5 out of 28 Member States there is a third-party body responsible for quality checks. In the United Kingdom⁴⁸, France and Sweden those are the bodies responsible for the accreditation of qualified experts. In Denmark, in parallel to the quality control system performed by the government body, accredited companies follow an internal quality assurance system based on DS/EN ISO 9001.

Penalties for qualified experts

Achieving more effective implementation, the EPBD recast (Article 27) requires that ***“Member States shall lay down the rules on penalties applicable to infringements of the regulation. Member States shall take all measures necessary to ensure that effective, proportionate and dissuasive penalties are implemented”***.

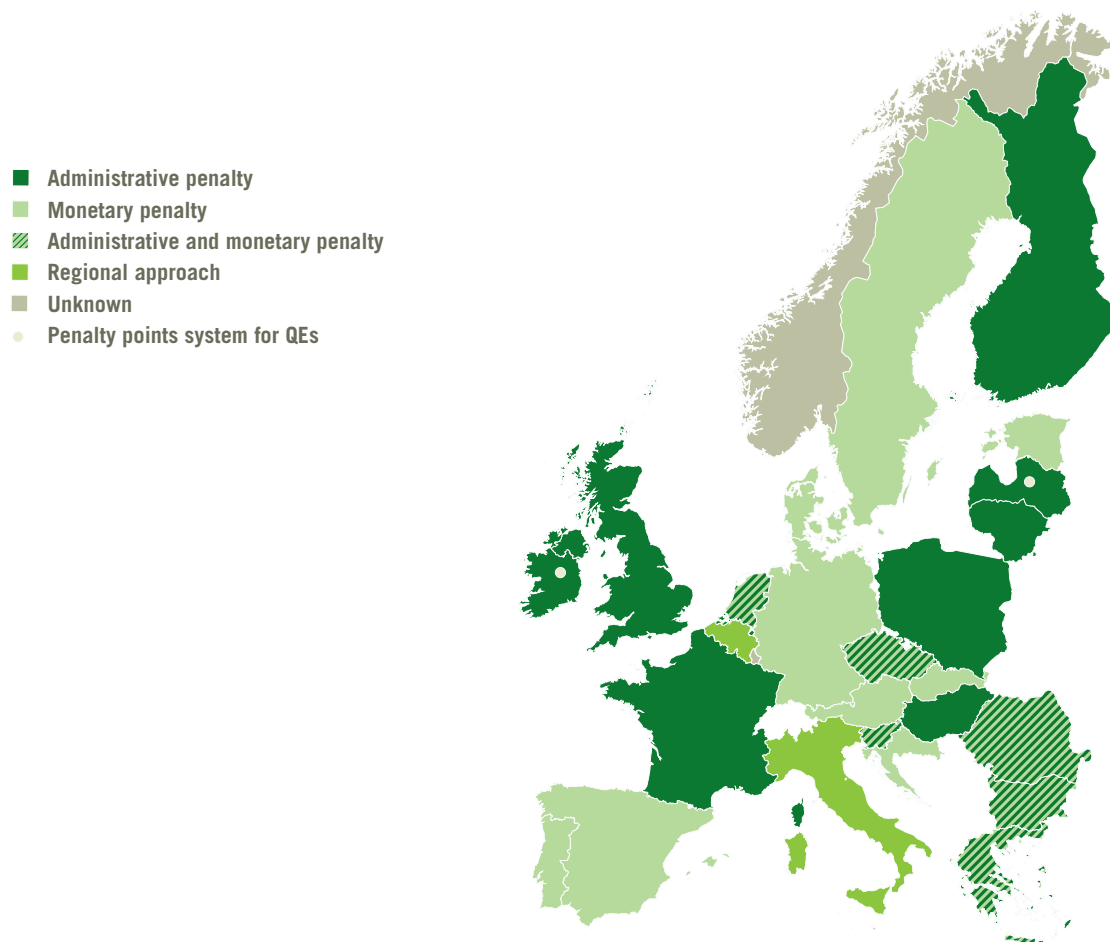
In the following part of the report, only the penalties for qualified experts for non-compliance with the EPBD are considered. Those result from: low quality detected in the EPC check, low reproducibility of energy performance certificate information, or the submission of false information in respect to the energy performance certificate.

The introduction of penalties for qualified and/or accredited experts followed the implementation of quality control systems in the national legislation.

⁴⁷ In Latvia, the quality checks are to be done by certification bodies of independent experts: SIA “ABC konsultāciju Centrs”, Latvian Heat, Gas and Water Technology Engineers, Latvian Association of Civil Engineers, Latvian Association of Architects.

⁴⁸ UK Accreditation Schemes are responsible for carrying out specified levels of quality assurance monitoring, the outcome of which is reported to DCLG on a monthly basis.

Fig 3-8 Penalty system for qualified experts and/or companies for poor quality of EPC issued



In some countries the penalty system is defined by national legislation, but the implementation process is regional. In Italy, for example, some regional bodies refer directly to the national approach; others have defined their own rules (in principle more restrictive than the national ones) [CTI 2013].

Administrative penalties

In 15 out of 28 Member States, administrative penalties are foreseen for qualified and/or accredited experts/companies for non-compliance with the EPBD. That may include: a warning procedure (Finland), mandatory training (e.g. Belgium-Wallonia), periodic suspension of licence (e.g. Greece and Hungary up to 3 years, Portugal up to 2 years), and loss of accreditation (e.g. France, Czech Republic, Cyprus, Lithuania, Poland). To date the most popular administrative penalty that is issued across MS is an official warning to the qualified experts and re-certification.

In Ireland and Latvia⁴⁹, a penalty point system for non-compliance has been introduced. Qualified experts receive penalty points in case of wrong certification. A certain number of points lead to corrective training or suspension of licence.

⁴⁹ The penalty points system in Latvia was introduced in 2013 (Regulation N. 382, 9 July 2013). Fines have not been imposed so far.

In Ireland, the penalty points assigned to the EPC experts (after audit) are valid for 2 years; if 10 or more points are accumulated in a period of 2 years, the assessor's licence may be suspended (for a period of 3 to 12 months) or terminated (at a second or subsequent offence). In Latvia, the licence is terminated for 6 months if the expert has received 7 or more penalty points and for 12 months if more than 10 points have been accumulated.

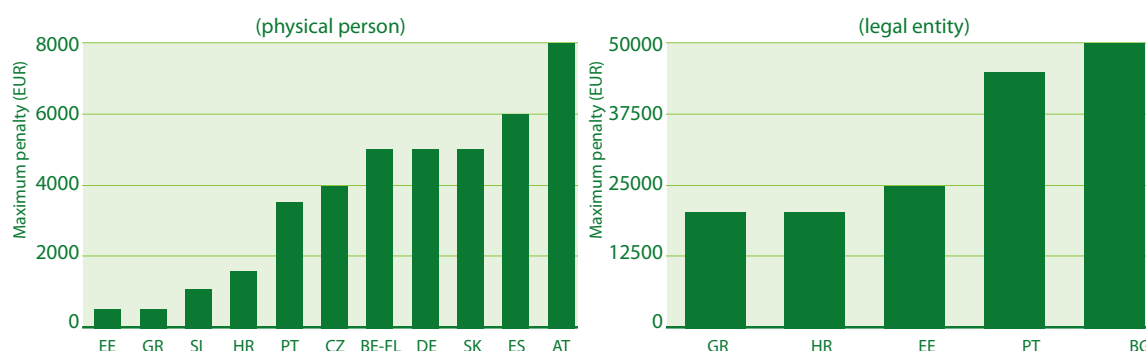
Tab 3-3 The penalty point system in Ireland (CA EPBD, 2013)

SEVERITY 1	Cases with high potential to compromise the fundamental integrity of the BER scheme, to damage public confidence or otherwise negatively impact the reputation of the scheme.	Three penalty points
SEVERITY 2	A significant breach but, while not an acceptable procedure, it is unlikely to affect the reputation of the BER scheme.	Two penalty points
SEVERITY 3	A less significant breach that would not affect the reputation of the BER scheme	One penalty point

Monetary penalties

In 12 out of 28 countries, monetary penalties might be imposed on the qualified experts for non-compliance with the EPBD. The maximum penalty can vary between different Member States, as well as for individual experts (physical persons) and legal entities (see: Fig 3-9).

Fig 3-9 Maximum monetary penalty for qualified experts and/or companies for non-compliance (for a physical person and legal entity)



The penalties for qualified experts are a rather new mechanism (introduced after 2012) in most Member States; thus in a number of countries fines are not imposed in practice (i.e. Bulgaria, Czech Republic, Hungary, Croatia, Slovenia, etc.). The qualified experts receive a warning and/or request to correct the EPC at their own expense. This situation is expected to change in the coming years, when a mature system will be in place⁵⁰.

So far there are only a few countries where fines are imposed e.g. Austria, Flanders, Portugal and the Netherlands. In Flanders, control of the qualified experts in 2011 resulted in 76 fines of 500 euros for experts. In the Netherlands, in 2012, 50 companies were penalised with administrative fines for the low quality of the EPC.

⁵⁰ In Hungary the penalty system was introduced in 2013. In the first year of operation only warnings were sent to qualified experts. From the beginning of 2014, the whole procedure will be implemented, including suspension of up to 3 years. A similar approach will be followed in Romania, where the monetary penalties were introduced in law in 2013.

4 AVAILABILITY AND USABILITY OF EPC DATA

In this chapter, an overview of how the EPC data is acquired in the central and regional register will be presented. The following issues are addressed:

- Status of implementation
- Scope of the EPC information collected
- Mechanisms for EPC data upload
- Management of the registers
- Public access to the data

EPC REGISTERS ACROSS EUROPE

Status of implementation

While it is not compulsory under EU law to set up a central/regional EPC register, almost all Member States have moved further than the obligations and set up a system to collect EPC data voluntarily. In most cases, it was established in the context of the monitoring and quality control of the energy certification processes (required by the EPBD).

The first Member States to have set up a database for EPCs were Austria (in some regions from 2005), Bulgaria (2005)⁵¹, Denmark (2006), and Belgium–Flanders (2006). The country that most recently introduced a central register is Germany (2014). In 2011, there were 15 Member States with an operational central/regional EPC register. By June 2014, the number had increased to 24 countries, with Norway, Poland, Latvia, Luxembourg and the Czech Republic preparing to launch their EPC registers.

There are four Member States (i.e. Italy, the UK, Spain, Austria and Belgium) which follow a regional approach to EPC registers. The existence of separate databases at the regional level⁵² might create challenges for data analysis at the national level. Thus, in Austria a new central and mandatory database for all EPCs (residential and non-residential buildings) is under development⁵³; a similar database is currently being planned in Spain and is foreseen in the medium-long term for Italy. In a few countries there are separate databases by building type, such as for new and existing buildings (Belgium–Flanders) and for residential and non-residential buildings in the United Kingdom.

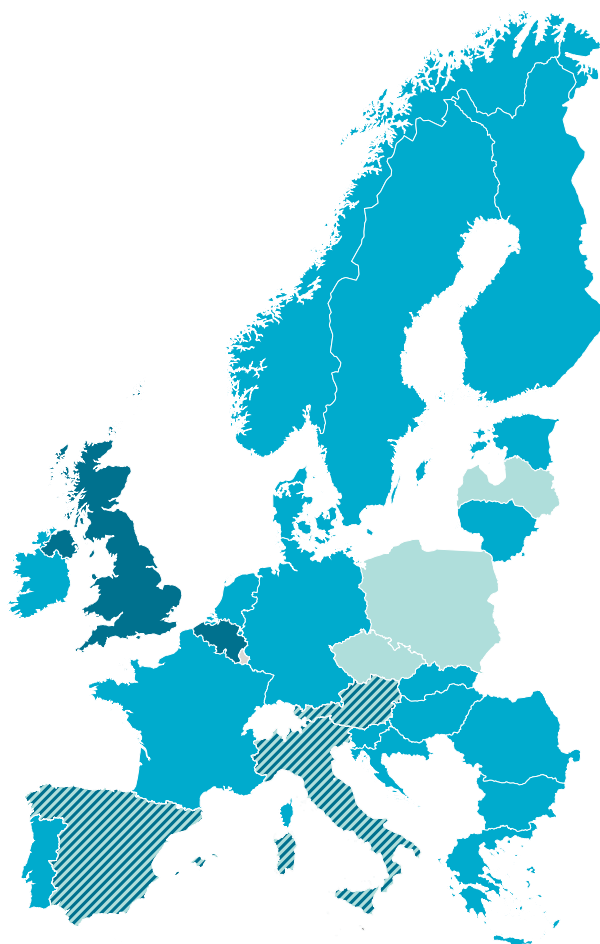
⁵¹ Bulgaria established an EPC register only in 2005; it initially operated in the xls format, and was updated in 2010 to MySQL format.

⁵² For Italy and Spain the databases are only available in selected regions.

⁵³ This so-called Buildings and Residences Register (GWR) is managed by the Central Statistics Office in Austria. It has been established and will start to operate before summer 2015.

Fig 4-1 EPC registers across Europe

- Central EPC register
- Regional EPC register
- Planned
- ▨ Regional and planned on central level
- Unknown



Scope of the EPC register

The lack of requirements and guidelines to establish the EPC register have given Member States freedom in developing EPC registers, resulting in a wide spectrum of examples. The databases vary in respect to the scope (type of data collected), but also format and procedure of data acquisition and processing.

In most countries with operational databases, information gathered consists of key indicators presented in the EPC, including⁵⁴:

- **Reference information** e.g. registration number, building type, name of the owner, year built.
- **Buildings geometry** e.g. useful floor area, heated floor area.
- **Type of EPC**, i.e. calculated or measured, period of validity.
- **Energy performance information** e.g. energy label, annual energy consumption per end-use.
- **Recommendations** and expected energy savings.
- **Other** e.g. GHG emissions, share of RES, energy losses, the transaction price, etc.
- **Energy assessor details** e.g. name, registration number.

The only register that does not collect specific information regarding the energy performance of buildings was established in Germany. This register consists only of the identification number of the EPC, the building type, the EPC (asset or operational rating), the region where the building is located and the responsible assessor (who needs to provide detailed information when requested).

⁵⁴ The scope of EPCs varies between different Member States and might also depend on the building type.

Tab 4-1 Example of data collected in the EPC database.

	Building's General Information	Energy Performance Data	Recommendations	Qualified Expert details	Calculation input	Comment
GERMANY	✓	✗	✗	✓	✗	Only registration number of the EPC, the building type, the EPC (asset or operational rating), region where the building is located
ROMANIA	✓	✓	✓	✓	✗	Electronic copy of the EPC, all data provided in the EPC
SLOVAKIA	✓	✓	✓	✓	✗	All data provided in the EPC
LITHUANIA	✓	✓	✓	✓	✓	All input to calculation software, all data provided in the EPC
GREECE	✓	✓	✓	✓	✓	All input to EPC calculation, all data provided in the EPC, xlm and PDF version of EPC is stored in the database
PORTUGAL	✓	✓	✓	✓	✓	The system requires ~250 inputs; all data provided in the EPC; qualitative/quantitative information for benchmark
HUNGARY	✓	✓	✓	✓	✓	The system requires 80 inputs; all data provided in the EPC and more
FRANCE	✓	✓	✓	✓	✓	The system requires 105 inputs; all data provided in the EPC and more
IRELAND	✓	✓	✓	✓	✓	All input to calculation software; all data provided in the EPC, background of the certifier

In some countries (e.g. Lithuania, Greece, Hungary, France, Ireland and the UK), besides data provided in the EPC, additional information is requested in the database. Usually this data is necessary to reproduce (re-calculate) the EPC results and additional information regarding the auditor. In several countries (e.g. UK, Ireland, France, Portugal, Netherlands, Sweden, Greece, Croatia, Estonia) a digital data protocol has been developed for EPC data collection. This protocol, after being filled with EPC data, can be automatically uploaded to the database system.

The register format varies between Member States from a simple folder structure with an electronic copy of the EPC (e.g. Romania) to advanced SQL databases (e.g. Ireland, Norway, Portugal, France). Some countries use an Excel spreadsheet format to gather EPC data; for example, Hungary has developed an advanced system based on Excel with a user interface; in Bulgaria, the first stage of the implementation was conducted in the Excel format and was afterwards replaced with the MySQL database.

Upload of EPC data

Uploading the EPC information in the database is exclusively the responsibility of the qualified expert in almost all Member States. Possible ways of uploading the EPC to the register are:

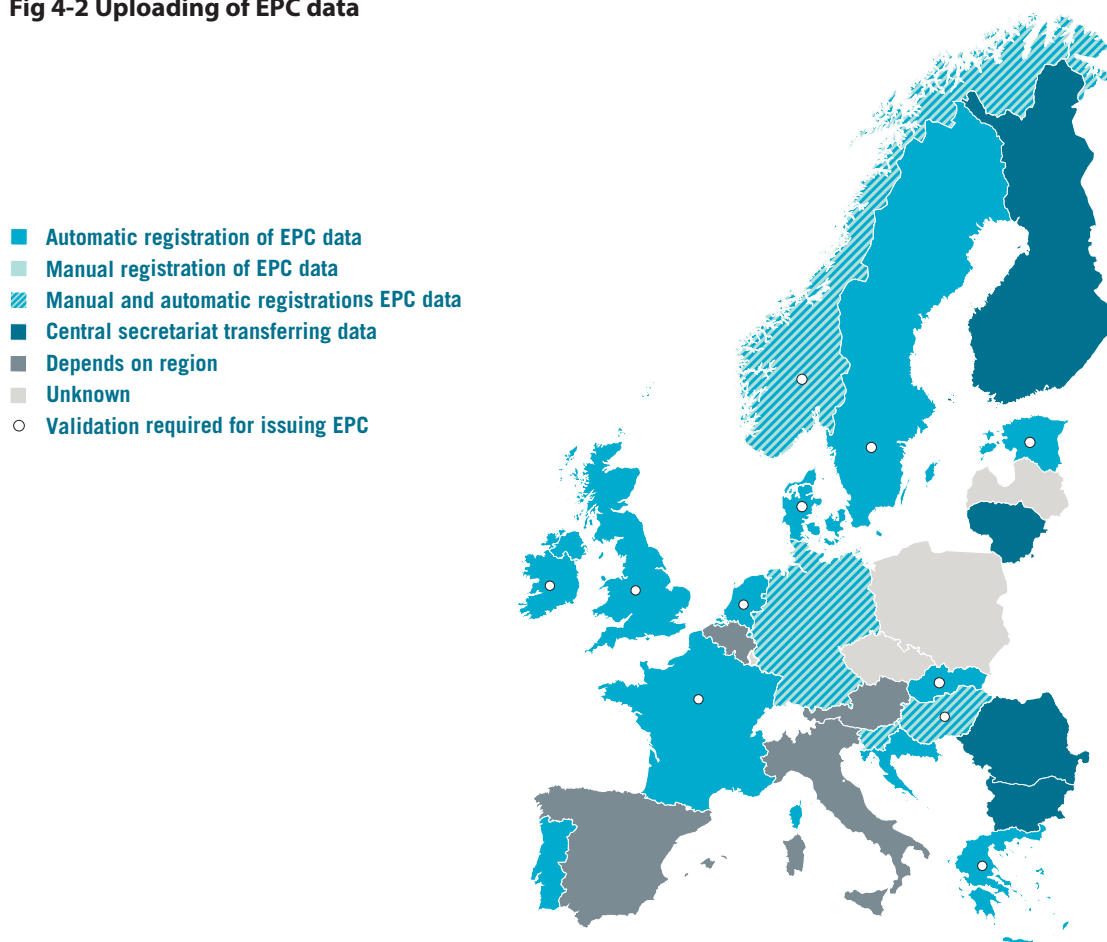
- **An automatic upload of EPC data** through standardised data protocol (e.g. XML, editable PDF) which can take place either before⁵⁵ or after⁵⁶ issuing the certificate.

⁵⁵ When the calculation software is directly linked with the register, input data and the results of calculation are directly stored in the EPC database.

⁵⁶ When qualified expert needs to upload the standardised data protocol of the EPC data into the database.

- **A manual upload of EPC data** conducted (usually) through an input form on the online platform. In this case, the expert needs to manually retype the results of the EPC to the input forms.
- **An electronic copy of the EPC** is sent to the Central Secretariat, which is responsible for storing and/or transferring information to the EPC database.

Fig 4-2 Uploading of EPC data



In some countries, there are multiple ways of uploading the EPC data; for example in Hungary experts might either upload the standardised data protocol directly to the database or manually type the data in the online platform (in case the software used does not provide the results in the standardised format). In Slovenia, all EPCs are electronically stored in the beta version of the registry, but in parallel the Ministry also collects a hard copy of EPC.

In some countries, in order to issue an EPC, it must be sent / uploaded to the EPC database to be officially validated / approved. This can happen automatically if the software is directly connected to the EPC register (e.g. France, Wallonia region in Belgium), or the validation process may require the upload of a standardised data protocol into the database⁵⁷ (e.g. Malta, Greece, Norway, Ireland, Sweden). In some countries, the validation process includes the digital analysis of data quality (e.g. Denmark), before obtaining a validation code.

⁵⁷ Depending on the country, the single information may be provided together through a single standardised format (e.g. XML) or each single parameter has to be uploaded manually.

Management of the EPC registers

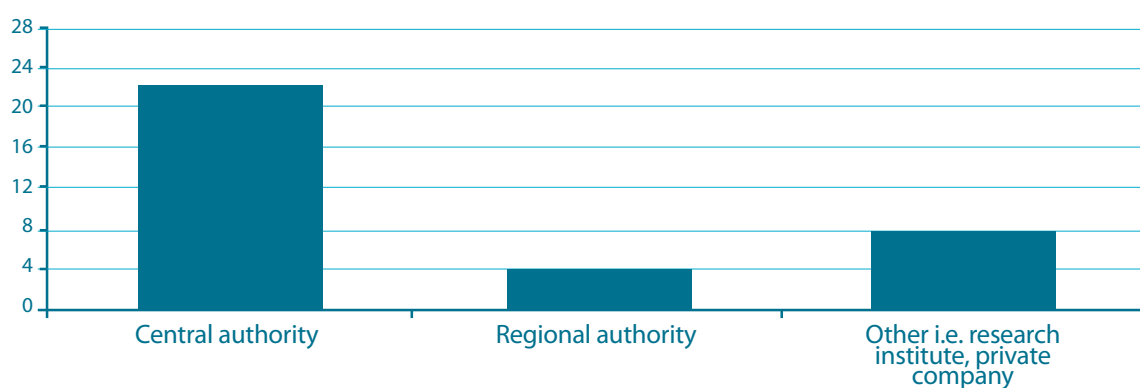
The responsibility to manage the databases in most Member States (22 out of 28) lies with the **central and/or regional government bodies**. Otherwise, the task of management is given to organisations that have structural ties with the public bodies, as is the case in Norway, Greece, Lithuania, Germany and some regions in Italy.

Hungary is the only country where the database is managed by a **professional association** (Hungarian Chamber of Architects) that is also responsible for the accreditation of qualified experts.

In UK regions (England, Wales and Northern Ireland) the EPC registers are run by a **third-party body** (Landmark), which was awarded the contract to operate the registers following open competitions.

In Scotland, management of the database has been delegated to the Energy Savings Trust.

Fig 4-3 Management of EPC registers across Europe



In most Member States, the databases are run by a relatively small team of people, usually 2 to 5, and their responsibilities are *inter alia* to maintain the database, to manage the information, to extract statistics and to assist with the quality assurance process.

The cost of establishing and developing the registry and the associated system components, and the annual costs for a country to run a database are not always easy to determine. This information sometimes eludes database managers. However, BPIE managed to gather indicative annual costs of the databases in 7 countries; the operation of the system varies by an order of magnitude among Member States with costs running annually between 20,000 and 600,000 euros.

The funding for databases is usually provided by the State with the exception of the UK, where the registers in England, Wales and Northern Ireland, managed by Landmark, are funded through concession contracts. In some countries, the registry budget is supported through the fees for lodging EPCs; for example, in the UK a fee of approximately 2 euros for residential and 12 euros for non-residential buildings applies, in Germany 3 euros to 6 euros, in Lithuania 6 euros, in Ireland 25 euros for residential and 50 euros for non-residential buildings, with the most expensive being Malta where the cost of registering an EPC is 75 euros. In most Member States, there is no fee to register an EPC.

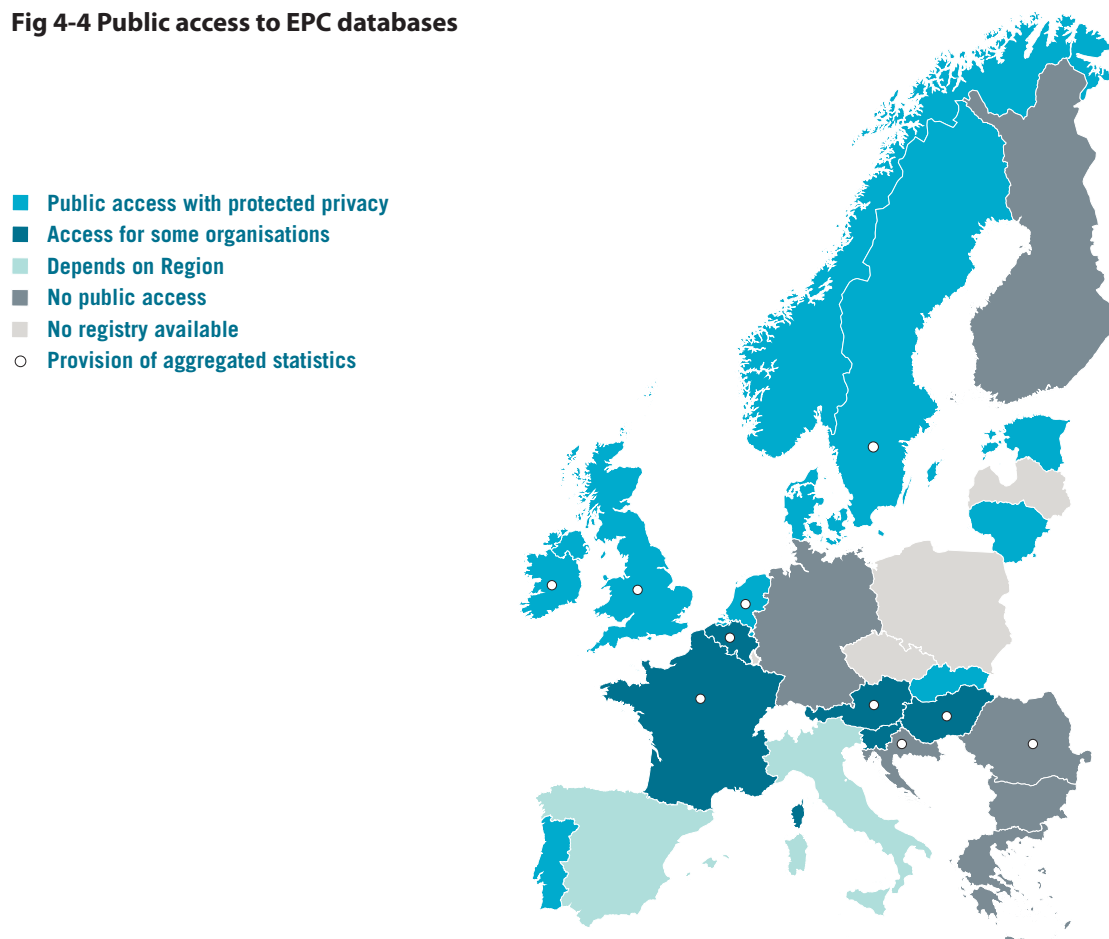
Public access to EPC data

The level of publicly available information in EPC databases varies between Member States. In some cases open access to selected EPC information is provided directly from the database (in Denmark, Estonia, Hungary, Ireland, Lithuania, the Netherlands, Portugal, Sweden, parts of the United Kingdom - England and Wales and Norway); whereas in others, only aggregated results are made publicly available (Belgium-Flanders, Greece, Cyprus, Croatia, Hungary, Romania).

In several countries access to EPC information is provided to third-party organisations upon request, mainly for research and (sometimes) commercial purposes. In some countries (i.e. Bulgaria, Germany, Finland, Malta and Cyprus) there is no public access to the EPC database.

Complete access to the core of the database, meaning access to all raw data, is not provided by any MS due to private data protection issues⁵⁸. With growing experience of managing a database, additional functionalities are developed to improve transparency and tackle the issue of data privacy.

Fig 4-4 Public access to EPC databases



Denmark, Sweden, Hungary, Estonia, Lithuania, Slovakia, Portugal and the Netherlands offer access to basic EPC data, such as energy class or energy performance, for any building in the database searchable by its address (see example below). Greece, Norway and Ireland offer this search functionality only by EPC identification number (that is known only to the building's owner). In addition, in England, Wales and Northern Ireland, there is also a feature to search by EPC identification number, postcode, street name and post town.

In Italy, the regions of Marche, Emilia Romagna, Sicily and Valle d'Aosta present some EPC information on their websites. In the region of Lombardy, a complete database is publicly available.

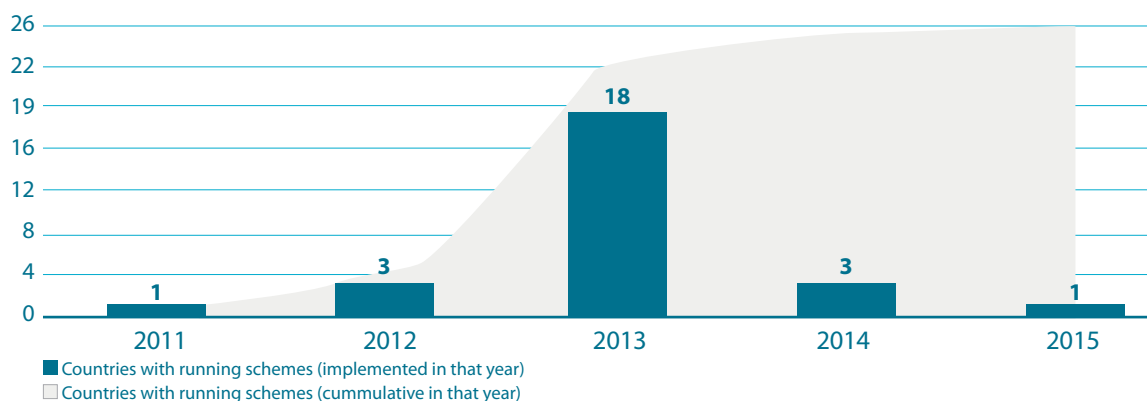
Currently, EPC data in most Member States feeds statistical analysis and reports issued by the database managers. Those reports usually provide aggregated results on the energy performance of the building stock per building category, per energy class, etc. In several Member States, official reports are issued periodically and made available to public (i.e. Belgium-Flanders, Portugal). In other countries, such as France, Slovakia, Hungary, Ireland and the Netherlands, aggregated results are presented on web portals that allow for data visualisation.

⁵⁸ A common underpinning of all databases is the safeguarding of property owners' personal information; the example of Norway where EPCs are issued for buildings and are not tied to their owners, is an interesting practice to be followed.

EPC label in public advertisements

The use of EPC in advertising is one of the most important drivers to increase the demand for energy efficient buildings. The EPBD recast requires that when a building (or building unit) is offered for sale or rent, the energy performance indicator has to be stated in commercial media (Art. 12, EPBD). France was the first country which implemented the advertisement requirements in 2011; while the Netherlands will be the last to implement it in national legislation on the 1st January 2015.⁵⁹

Fig 4-5 Implementation of the advertisement requirements in EU-28



The level of compliance with the requirement on advertisement (Art. 12, EED) is very low. To date there are only a few countries which have been evaluating enforcement (i.e. Flanders, Ireland and France). For example, in Belgium (Flanders) with the introduction of a relatively simple control mechanism in real-estate advertisements, the publication of the energy labels increased from 68% in 2010 to 95% in 2012.

EXAMPLES OF THE EPC DATABASES

Case study: Ireland⁶⁰

Ireland stands out as having one of the most well-established databases. It is maintained and operated by the issuing authority for EPCs, namely the Sustainable Energy Authority of Ireland (SEAI). Ireland had the political will in 2003 to create a working group to design an ambitious EPBD implementation. The design of the Building Energy Rating system was based on a number of studies drawing upon best practice examples from the Dutch and the Danish systems, which were operational at the time. A decade later the ambition has paid off with Ireland being hailed as exemplary in devising an integrated system and implementing a forward-looking action plan that makes use of an automated administrative and technical system for buildings certification. The parallel development of EPC-issuing software and database allowed for a harmonised operation of the EPC system that included the training of experts as well as quality checks.

Ireland, therefore, developed a National Administration System (NAS), whose interface is the SEAI website. The system incorporates the administrative, financial, BER (Building Energy Rating) database and quality assurance functionalities among others. Through it, building owners and users can receive information on BERs, find the registry of assessors to contact an expert and get information on improving the energy efficiency of their building. Assessors (also known as Qualified Experts) find the training providers and are later able to access the BER calculation software and the relevant procedures. The assessors can log into the registry and upload a certificate. Finally, the NAS enables the availability of energy statistics and assures the quality of the overall system by facilitating audits for the quality assurance of assessors and certificates.

⁵⁹ In the Netherlands the requirement was first introduced in the amendment of the Housing Act 33124 (in force from 1 January 2013) but it was lately removed.

⁶⁰ <https://ndber.seai.ie/BERResearchTool/Register/Register.aspx>

In terms of opening the availability of data, SEAI launched in 2012 a national research tool to give researchers access to statistical data from the Building Energy Rating scheme while safeguarding personal information. The public can access their certificate using its unique number or the electricity meter serial.

The benefits of having a central EPC register are obvious for building owners, the government, the commercial sector and the real estate market. The government has received substantiated policy impact assessments based on the gathered data, and thus future policies such as the planning for energy efficiency grant schemes are better informed and more effective. The public is therefore assisted in applying for grants and incentives for home retrofits.

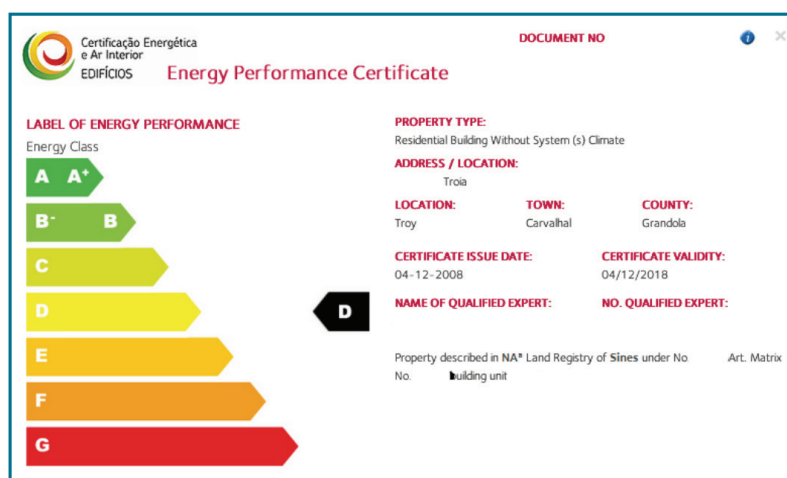
Finally, the system was designed so that it will be cost neutral and without the need to rely on national budgets. About 90% of the generated income is from market activity and the main sources of revenue are EPC expert registration and annual renewal fees. The registration levy for each EPC published is respectively 25 and 50 euros for every domestic and non-domestic certificate they are obliged to upload to the BER registry. The raised funds support the maintenance and development of the system as well as for the quality assurance needs and other information collection activities. Ireland has, therefore, built a self-sustaining and integrated system for issuing, storing, managing EPCs and built upon this information to improve the energy efficiency of its buildings stock.

Case study: Portugal⁶¹

Portugal established an EPC database and the central register in 2007, following the EPBD transposition. The system is managed by the Portuguese Energy Agency (ADENE) which designed and developed it with the support of an IT company. This became the sole national place to store EPC data, where registered qualified experts have access to enter EPC information. The system is maintained and updated through a contracted IT team under the supervision of ADENE.

Since then, the database of certified buildings has been fed with up-to-date information – from all certified buildings – which is useful to monitor the progress of different aspects such as the number of certified buildings and the impact assessment, including estimated savings. The database was also instrumental in providing information for the EPBD recast transposition, concerning the revision of the technical regulations, with an increased number of relevant variables and increased coverage of minimum requirements.

Fig 4-6 Public information from a random EPC through the ADENE website



⁶¹ <http://www.adene.pt/sce/micro/certificados-energeticos>

The database is in constant evolution. It was built from the beginning to be sufficiently agile and deal with large amounts of data. Although the EPC consists of a secured PDF, none of these are stored in the database. Only the raw data is stored, and whenever an EPC needs to be produced or downloaded, a single mask with the EPC layout is used and combined with the data corresponding to the assessed building. Other improvements relate to the ability to upload information via XML or the development of web services to communicate with other databases or entities.

Currently the system deals with around 250 inputs per EPC, a major part of which are considered for quality control, both in real-time, by checking introduced data, as well as in the back-office, doing detailed checking. More than 200 inputs are technical details and the rest are administrative fields such as address, type of building, ID codes, etc.

As the management body, only ADENE has direct access to the raw data, though some public access is allowed mainly associated with three target groups. The general public can search for the building energy label based on the address or unique EPC number; real-state agencies and other entities can have access to the same information via web services; research and public authorities (statistics institutes, for example) can have full access to data, but with privacy limitations, established under protocols.

During this period, ADENE has been compiling and publishing statistics based on the data stored in the central database, aiming to characterise different aspects related to the energy performance of the building stock. In this respect, it is expected to establish during 2014 a connection to link the building energy data to the information from the National Census through the creation of a GIS online-based information tool. Another ongoing mission is to work with the different market players in order to make use of their privileged data to foster implementation of energy efficiency measures.

Until the implementation of the EPBD recast (December 2013), the number of issued EPCs exceeded 600,000 certificates and there were more than 100,000 in the current year (until July 2014). A recent increase in the certification activity (150,000 certificates expected for 2014) is mainly due to the recast obligation of having an energy class when advertising a building for sale or rent. 90% of EPCs were issued for residential buildings and 10% for non-residential buildings. One of the main goals of having a robust and functional database is to use it to verify and improve the quality of the system, as well as supporting the development of public policies. In this sense, the database is used for quality control of the EPC and qualified experts, with around 14,000 quality assessments (2.2% of the total EPCs), related to the first period (2009-2013). The EPC databases were also used (in 2013) for the support of the Housing and Energy public policies, and well as for the Energy Efficiency Fund. It proved to be a useful tool to target incentives for thermal refurbishment activities.

Case study: Hungary⁶²

Hungary established an expert group in 2010 to focus on the EPBD recast. In an effort to increase the quality of the EPC system, a national central database was developed and became operational in 2013. The database, also known as the Electronic Submission System, is managed by LECHNER (previously named VATI), acting on behalf of the Ministry of Interior, which has overall responsibility for the EPC system. Among the significant changes since the launch of the new system, an EPC can be considered official only after it has been uploaded to the online system. The EPC can be uploaded to the system in two ways:

⁶² <https://www.e-epites.hu/entan/>

1. By manually inserting the set of input calculation data of the building and the predefined results (set of output data).
2. By exporting the calculation results into a pre-defined XML format by any software certification tool available on the market. In this case, the software developers have to build an exporting module into the software.

The estimation of the Energy Performance is made through one of the several calculation software packages developed on a commercial basis and manual calculations are not common.

Only the database management body (LECHNER) has access to the raw data as well as some departments of the central authority. Nevertheless, there is limited public access to the processed EPC; information on an EPC can be searched via the online database from any Internet browser using the building's address. Statistics are also displayed online, and a visualisation tool has been developed to better communicate the aggregated EPC information.

The way the database was set up has had a positive impact on the quality of the EPC system. The database is used for quality control of the EPC and qualified experts, as well as for statistical analysis to provide reports for the Ministry of Interior. In 2013, the number of EPCs issued was around 100,000 certificates, a higher number than all the EPCs issued up to 2013. The database has proven useful because before 2013 it was compulsory to issue EPCs, but there was little motivation to do so because of the lack of verification and because EPCs were not registered in the sale or rent contract.

The quality control system has been in operation since January 2013. It is managed by the Hungarian Chamber of Engineers. Quality checks are carried out by independent experts from the Chamber. During the check, 80 inputs are required in spreadsheet cells. More than 50 are technical details and the rest are administrative fields such as address, building, registry number, etc. Resulting from the quality checks in the database, some useful information has been extracted concerning policy implementation and compliance. Because quality checks started only after 2013, there is a concern about the quality of EPCs. Since then, there has been an information campaign about the quality controls, thus there are expectations that it should lead to improved quality. This has led to a suggestion that the Ministry amends the law and the calculation procedure, based on the findings from EPC monitoring.

Case study: Sweden⁶³

Sweden has had a functioning EPC database since 2007. Through the website of the database management authority, Boverket, all issued EPCs are accessible to everyone and searchable by building address. The access to the database cannot be restricted by the property owner. However, the information obtained is minimal as the only fields that are publicly available are the following: building address, ID-number of the EPC and the date when it was issued, the energy performance of the building given as a single value of specific energy consumption in kWh/m² per year and finally, information on whether radon measurement and control of the ventilation system have been executed.

In addition to the simple access for the general public, researchers and public authorities can have full access to data, but with privacy limitations. Direct access to the database, and how the information from the database can be used, is regulated. Direct access is only allowed for the building departments of the municipalities, the Swedish energy agency, certified energy experts (only for the buildings that they work on) and finally building owners.

⁶³ <http://www.boverket.se/Bygga-förvalta/Energideklaration/Sok-och-bestall-energideklaration/Bestall-energideklaration/>

The information found in the database can be used for statistics which are also published online, for research purposes, for the monitoring and evaluation of energy usage of the building stock, for control by the authorities for policy evaluation and other activities where information about buildings and their energy performance are a basis for assessments and decisions.

Commercial companies can have access to aggregated data while safeguarding the privacy of property owners. For direct commercial purposes, it is not permitted to share information about personal code number, house property designation, building designation, address, the building's energy performance, reference values, and measurements of radon.

Case study: Slovakia⁶⁴

In Slovakia, the responsibility of the EPC system and the database falls under the jurisdiction of the Ministry of Transport, Construction and Regional Development. Slovakia has had a national database since 2010 and has taken significant steps in the direction of developing a functional database with open content.

The data for newly issued certificates must first be uploaded by the qualified expert to the database in order to be approved and validated. Slovakia has implemented an online system which allows the registered assessors to directly access the database. The mandatory upload allows automatic quality controls at a basic level for all entered data and calculations. In addition to qualified experts, any user can view aggregated statistics by using the online tool. It is possible to view statistics for each year since 2009 for the total number of issued certificates in each of the country's provinces. An option to search for EPCs by entering some location characteristics is foreseen on the website. It also provides results for the year of EPC issuance, information about the energy class, building type, its exact address, as well as the name of the qualified assessor.

By the second quarter of 2014, the Slovakian database had about 44,000 certificates, consisting predominantly (92%) of residential buildings. The whole system seems to be very effectively setup, making use of a very modest annual budget of around 19,200 euros, significantly smaller compared to other Member States. However, the operation of the database, as well as quality checks of the EPCs, are financed by the government and the actual controls are realised by the Ministry of Transport, Construction and Regional Development and by the State Energy Inspection.

Case Study: UK - England and Wales⁶⁵

The UK follows a "regional" approach to the EPC registry spanning over three jurisdictions: one for England and Wales, one for Northern Ireland and one for Scotland.

The EPC register for England and Wales is operated by *Landmark Information Group*, which receives no government funding. It operates the register on behalf of the Secretary of State for the Department for Communities and Local Government. Landmark does not collect the data and is only required to accept submissions from approved energy assessor accreditation schemes. The contract operates on the basis that Landmark will recover all costs for establishing, operating and maintaining the registers by charging a lodgement fee for documents lodged on the registers. There are two sub-registers in England and Wales, a domestic register in operation since May 2007 and a non-domestic register in operation since December 2008. The registers are the only official place to store energy certificate data and only an ap-

⁶⁴ http://www.inforeg.sk/inforeg/ecb_statistika.aspx

⁶⁵ <https://www.epcregister.com/>

proved energy assessor can lodge data on to the register via their accreditation scheme. An EPC is only valid if it has been generated from data lodged on the register, and each set of data has been allocated a report reference number. If an EPC is not lodged, it is not valid and cannot be used when a building is sold or rented or when the construction of the building has been completed.

The energy assessor will lodge information about the building (a unique report reference number, the address of the building, age, construction method, materials, etc.), energy use, emissions and other calculated values as well as cost-effective recommendations. In addition to those, for non-domestic buildings, the energy assessor will also mention the heating services, lighting controls and information on the envelope of the building.

Energy performance certificates lodged on the registers were previously retrieved using a report reference number. From 2012, the feature to search for reports, without a report reference number by using a postcode or street name and post town, was introduced. EPCs retrieved from the registers are free of charge using both of these processes, allowing individuals to look up certificates online, allowing comparison of the energy performance of properties. However, anyone with an EPC can 'opt-out' of having their data made publicly available in a way that makes their property identifiable during data searches.

Registered data can also be provided as bulk data to authorised recipients as defined in the amended Energy Performance of Buildings (England and Wales) Regulations 2012. According to the Regulations, this data can be used for the following purposes:

- Promoting energy efficiency improvements;
- Conducting research, developing or analysing policy (or policy proposals) in relation to the energy efficiency of buildings, and the effectiveness or impact of energy efficiency improvements;
- Identifying geographic areas where the energy efficiency of buildings is low relative to other areas, or conducting research into the extent, causes or consequences of such low levels of efficiency;
- Promoting and marketing energy efficiency improvements that may be made pursuant to a green deal plan;
- Identifying and analysing the impact of carbon emissions on the environment resulting from buildings with low levels of energy efficiency;
- Determining whether energy efficiency improvements that may be made pursuant to a green deal plan have or have not been made in respect of a particular building or buildings.

The registers for England and Wales are currently the largest ones in Europe, holding the data of more than 12 million domestic and non-domestic EPCs up to May 2014.

5 THE FUTURE OF THE EPC SCHEME

CHALLENGES

Design and implementation of the EPC scheme

The design of the Energy Performance Certificate scheme is a demanding task that needs to take into consideration specific characteristics of the building stock, but also the know-how and everyday practice of the stakeholders involved with the market structure. The scheme should also fit in the existing legislative regime, including building codes and standards.

Choice and design of the assessment methodology is one of the major challenges of the EPC implementation process. It needs to take into account the differences between building types (new and existing, residential, commercial and public, large and small etc.) and the specific circumstances (function, occupancy levels), at the same time securing the comparability of the energy performance levels.

An asset (calculated) rating is considered a more expensive approach to obtaining energy performance information (due to the time and effort needed for data collection, especially if on-site), but it can be more useful for potential buyers and tenants of small buildings, as it tells more about the building's performance rather than the occupants' behaviour. The operational (measured) rating is more effective for large and complex buildings, and for those with less frequent user turnover [IEA 2013].

Following the EPBD the energy performance certificate shall include the energy performance of a building and reference values, as well as recommendations for the cost-optimal or cost-effective improvement of the energy performance of a building or building unit. The Directive does not exclude use of other useful parameters such as: the percentage of energy from renewable sources in the total energy consumption or actual energy consumption in particular for non-residential buildings. Other parameters that can be displayed are e.g. heat losses, solar gains or comfort and air quality issues. Another choice to be made is the decision on the manner in which energy performance rating is represented (i.e. energy level vs. continuous scale) as well as the type of recommendations (i.e. standardised vs. tailor-made). The final display of the EPC, including comprehensive and useful information in a friendly format may have critical importance for the uptake of the mechanism by the market.

Another aspect of the design of the EPC scheme is linked to quality assurance systems. For example, the choice of sampling and validation methodologies for the statistically significant percentage of EPCs for the quality check may vary (e.g. random sample from all EPCs issued; random sample of the certifiers, follow up with a check of their EPCs⁶⁶). Annex II of the EPBD provides recommendation on this matter, but the final decision needs to be made at the Member State level.

The design of the EPC scheme needs to consider the efficiency of the organisation and secure the necessary resources (i.e. administrative, technological, institutional and financial) for its further implementation; *"Establishing a certification scheme can take a long time, and it will succeed or fail depending on the approach taken in its early implementation"* [IEA 2010].

Compliance with national regulations

Once the certification scheme is formally implemented, Member States are challenged to ensure effective operation and compliance with national regulations. Experience with the first EPBD (2002/91/EC)⁶⁷

⁶⁶ This approach is following in a few Member States.

⁶⁷ Directive 2002/91/EC of the European Parliament and of the Council of 16 December 2002 on the energy performance of buildings.

showed that there is a large gap between formal and practical implementation. To bridge this gap, the EPBD recast in 2010 introduced a mandatory requirement regarding the penalties for non-compliance.

Compliance with the national regulation when the EPBD is implemented at Member State level is one of the topics of discussion within the Concerted Action (CA) EPBD⁶⁸. The challenges identified in this regard in the Member States are a lack of political support, lack of an effective system of penalties for non-compliance, lack of resources to enforce the system implementation, cultural issues and tradition of building regulations, foreseen costs of the enforcement system, etc. [CA EPBD, 2013].

The effective implementation of the energy performance certification scheme to a large extent depends on enforcement and monitoring mechanisms. Nevertheless, the success criterion lies in ensuring sufficient resources for the implementation process i.e. legislative, financial, technical and human. It is important to mobilise the capacities for professional experts (i.e. training programs) directly involved in the system operation.

In addition to proper implementation, the market requires incentives to cause EPCs to be regarded as a useful instrument that needs to accurately estimate a building's characteristics and not as an additional administrative burden. A strong lever for maximising their usefulness is the linking of EPCs to financial schemes, i.e. subsidised renovation loans, in order to increase the uptake of the recommendations provided by the qualified expert.

Public acceptance and market uptake of EPCs

There are several factors that influence the public acceptance of EPCs. For example, the actual use of EPCs in the retail market and the perceived value of the energy label information for the user [Atanasiu and Constantinescu, 2011]. The reliability of the information on the energy label has critical importance for the credibility of the whole system and therefore, for the acceptance and market uptake of the certification scheme [EC, 2013].

The implementation of effective systems of quality assurance is a demanding task. It needs to be considered at every stage of the certification process i.e. training and control of authors, quality check in the software, verification of the certificates issued. Member States need to introduce appropriate measures and tools, as well as provide necessary resources. At the same time, the cost of the system should be balanced in order to avoid a significant increase in the certificates' price.

Increasing trust and establishing a good reputation for the EPC systems among building owners, potential tenants and other market actors is a challenge that needs to be addressed. What might be helpful in this process is the implementation of the new EPBD requirements (2010/31/EU⁶⁹) regarding the EPCs in buildings that are occupied by public authorities and frequently visited by the public and the mandatory display of the energy label in commercial advertisements.

The energy label seems to be more important, yet still not fully motivating the building owners to improve the energy efficiency of their properties. They do not play a significant role in the decision-making process once the building is sold or rented [EC, 2013]. As long as EPCs remain mainly an administrative burden, the motivation to improve the system will remain low. EPCs need to become the starting point of individual improvement plans for each building, providing detailed, tailor-made recommendations. Improving the reliability and understanding among buyers and tenants of the benefits of having a better energy rating, in particular with regards to its impacts on energy bills, will influence the perceived usefulness of EPCs, together with the needed (political) push to improve the system.

⁶⁸ The Concerted Action (CA) EPBD was launched by the European Commission to promote dialogue and exchange of best practice between them. The key aim was to enhance the sharing of information and experiences from national adoption and implementation of this important European legislation. As an intensely active forum of national authorities from 29 countries, it focused on finding common approaches to the most effective implementation of this EU legislation.

⁶⁹ Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings (recast)

EPC prices

To a large extent, EPC prices are set on a market basis. Official regulation of the EPC price is a reality only in four Member States (Croatia, Denmark, Hungary and Slovenia). The price of the certificate is regulated in the aforementioned Member States as seen in Tab 5-1.

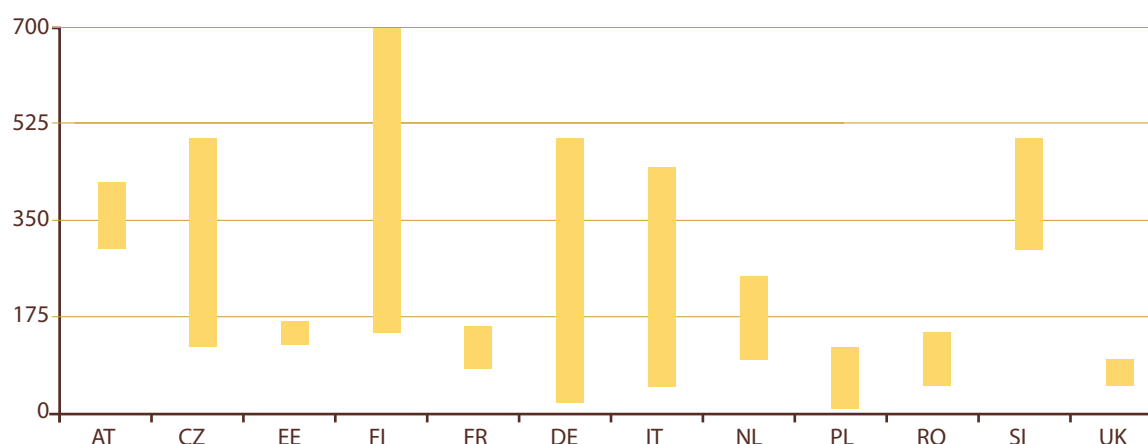
Tab 5-1 Regulated EPC prices

CROATIA	A cap on EPC prices at 1.5 euros / m ²
DENMARK	Cap at 730 euros for residential buildings of floor area of up to 100 m ²
	Cap at 800 euros for residential buildings of floor area of up to 200 m ²
	Cap at 875 euros for residential buildings of floor area of up to 299 m ²
HUNGARY	The price of EPCs is set exactly at 40 euros plus VAT
SLOVENIA ⁷⁰	1.5 euro/ m ² for residential buildings up to 220 m ²
	2 euros / m ² for residential buildings above 220 m ²
	1 to 4 euros / m ² for apartment buildings (between 5 and 51 dwellings respectively)

From the beginning of the EPC scheme, most Member States opted for allowing the market to set the EPC price. Countries that applied regulated prices (i.e. Greece) have shifted in recent years to a market-driven price. There is a drive to make EPCs affordable and Sweden offers a good policy example of reducing prices not by simply leaving it to the market, but by also targeting specific aspects of the system.

Until 2014, the experts in Sweden carrying out inspections had to be employed by a company accredited for the purpose of energy declaration or inspection. From the beginning of 2014, the Swedish system of accreditation has been replaced by the personal responsibility of a certified expert. As a result, transaction costs for the building owner have fallen from above 1,000 euros to about 500 euros for a single family house. Market forces have driven the price of EPCs to as low as 15 euros in Poland, a fact which raises questions on the quality of those certificates and on the ability of markets to function without properly regulating their border conditions, i.e. by requiring the physical presence of a qualified expert. Depending on country-specific situations, the market has driven down costs but has so far mostly failed to stabilise them since EPCs are offered at a wide range of prices as seen in Tab. 5-2.

Tab 5-2 Prices of the EPC for Single Family House (in euros)



⁷⁰ Energy Act (Official Gazette of RS, no. 27/07 - official consolidated text, 70/08, 22/10, 10/12 and 94/12 - ZDoh-2L), the Government of the Republic of Slovenia : <http://www.pisrs.si/Pis.web/pregledPredpisa?id=SKLE9972>

The EPBD Concerted Action report of 2011 [CA EPBD 2011b] concluded that EPC prices are dependent on attributes directly linked to the energy performance calculation such as the applied methodology, the building type and complexity and the software used, and above all the qualified expert's work and asking price. EPC prices in most Member States are governed by the market and the cost is also associated with the effort required to collect information on the building.

The EPC price reflects the cost of a certificate, but the value attributed to it is equally important. The value of EPCs is linked to their usefulness, reliability, public acceptance and thus their impact on market decisions. Essentially the criterion for successful market incorporation is for EPCs to be regarded as having a higher value than the cost of acquisition. Higher value is attributed to EPCs when they manage to indeed bring benefits, such as cost-saving renovations with short payback periods, or an increase in the selling value of a property and thereby be effective as a market transformation tool that is evidently in the interest of the person who acquires it.

OPPORTUNITIES

EU Policy agenda 2030

Europe's buildings are responsible for 38% of the total energy demand in EU-28. Therefore an improvement in energy efficiency in the building sector is among the key elements of the EU's climate and energy agenda.

The Energy Efficiency Directive (EED, 2012/27/EU)⁷¹ introduced binding measures to ensure the achievement of the target of increasing energy efficiency by 20% by 2020. In July 2014, the European Commission proposed increasing this goal to 30% by 2030. In the EC communication, the role of the Energy Performance Certificates was highlighted as crucial for *"identification, measurement, accounting for and valuation of the full benefits of energy efficiency investments"*. The concept of Energy Performance Certification and its potential impact in reducing energy consumption and greenhouse gas emissions in the building sector is also widely recognised at the Member State level [EC, 2013]. Therefore, the compliance of the EPC schemes across Europe should be supported both in the revisions of the EPBD and EED legislations.

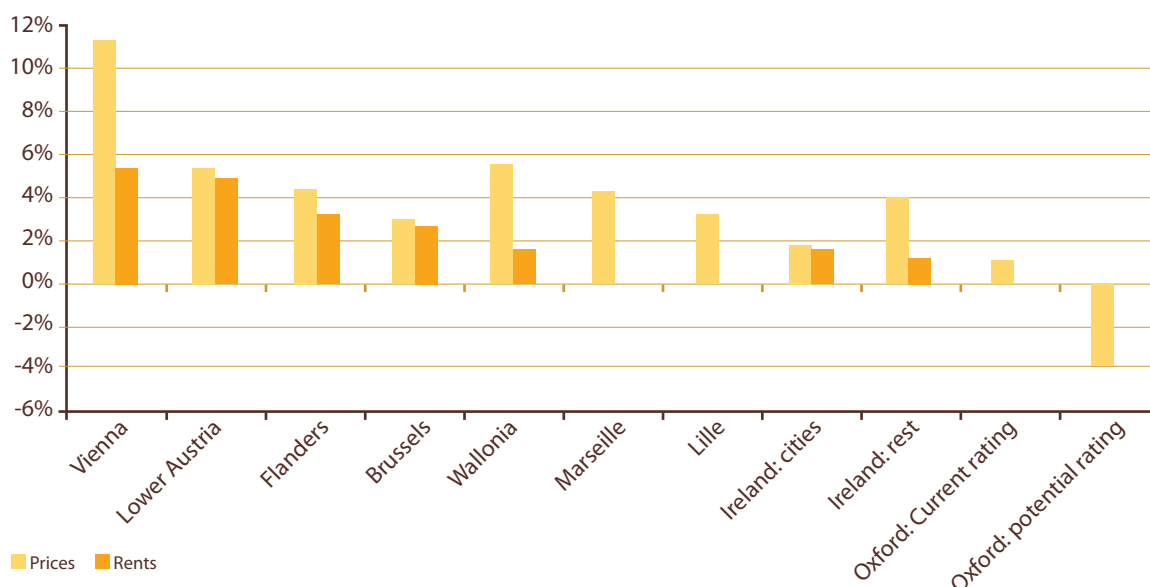
Moreover, EPCs have the potential to become "building passports" accompanying a building through its life cycle and include improvement proposals and energy renovation activities. Indeed, in order to become really useful in individual buildings' improvement plans, EPCs should evolve towards more comprehensive, dynamic tools accompanying a building over its lifetime.

Transformation of Europe's property market

The latest report of the European Commission on the market impact of the EPCs provides evidence that energy labels influence properties value in some of the European markets (EC, 2013). Although *"the full potential of the EPCs is not yet being reaped, and the results are limited to regions where the EPCs have a long history of implementation"*, a certification scheme is without doubt a key enabler in making energy performance count in the market. A European Commission study found positively correlated price signals with energy class rating increases in 8 out of 9 regions examined (see Fig. 5-1). The impact on the sale prices is relatively higher than on rent transactions.

⁷¹ Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency, amending Directives 2009/125/EC and 2010/30/EU and repealing Directives 2004/8/EC and 2006/32/EC Text with EEA relevance.

Fig 5-1 Effect of one-letter or equivalent improvement in EPC rating across a selection of European property markets (EC 2013)



EPC register should provide the basis for renovation strategies and programmes, and allow for monitoring of improvements.

EPC information can be also used to inform local authorities and policy makers, to analyse the housing stock quality, to improve subsidy programmes, make targeted investments and finally to promote support schemes. In France, database managers are providing input to policy makers during the development of the upcoming energy efficiency policies, while in Hungary and Portugal details in the calculation methodologies have changed following input from the databases. Subsidy schemes in Ireland, Greece and many more Member States are tied to an obligation to have a valid EPC and its input in the database allows for more effective management of the funds.

EPCs can also be an important tool to evaluate and monitor the renovation measures. Such a solution has been successfully implemented, for example, in Austria, where an EPC is required before and after renovation when the project is supported by public funds.

Real-estate

EPCs have the potential to become an important benchmarking tool for the energy performance of buildings. Therefore, it is expected to directly apply to the work of real estate agents, property owners, property managers, etc. Example evidence⁷² exists for the increased productivity potentials brought by energy efficient buildings in terms of mental function and memory, call processing, fewer sick leaves and so on. These facts will eventually inform investment decisions. The mandatory labelling is an important step towards informing the market and thus supporting the uptake of investments.

Energy efficient buildings provide compelling benefits. For the real estate lenders and the investment community those benefits are crucial information when reflected in monetary terms. Operating costs are expected to be lower than for conventional buildings and eventually pay back the price premium of acquiring property or engaging in renovations in a relatively short term. Asset value is a key consideration and according to the World Green Building Council (WGBC)⁷², *“buildings with better sustainability credentials enjoy increased marketability”* as they are able to secure tenants despite demanding price premiums. Moreover the same study supports the view that buildings with a lower rating may sell for less in markets where the mainstream is concerned with the impact of their buildings. Despite their apparent benefits, wide adoption requires action and proper policy coordination with market forces.

⁷² http://www.worldgbc.org/files/1513/6608/0674/Business_Case_For_Green_Building_Report_WEB_2013-04-11.PDF

An interesting example can be found in Portugal where several initiatives were made to boost the relevance of the EPC and building certification. A manual with voluntary advertisement guidelines⁷³ can be used by real estate agencies in order to harmonise displayed information. Additionally a web service was developed allowing those entities to get access to the EPC central register, using the unique single number of each EPC and retrieve useful information to complement advertisements.

The interest in potential usage of the EPC database for the business purposed is growing. In June 2014, an interesting real-estate initiative was launched to create a voluntary pan-European EPC database, called Energy Efficiency Performance of Properties Analysis (EPPA)⁷⁴. Its primary goal is to “*support real estate managers to target inefficient properties and benchmark the energy efficiency of their buildings*”; this proves that there is a high expectation among the real-estate industry for the EPC data to provide evidence for investments in energy efficiency in buildings across the European Union.

Research

Various research activities by universities and other research institutes actively use EPC data. Usually through registration or some form of authentication, researchers can access with relative ease the databases in Austria, Greece, Finland, Ireland, Italy (some regions), the Netherlands, Portugal and Slovakia. In the UK, access is provided to bulk EPC data but not to the databases itself.

One of the EU-funded projects, EPISCOPE (2013-2016)⁷⁵, makes use of the EPC database to compute the benchmark of the energy performance of the building stock. Among the project objectives is to set a bottom-up monitoring of the building refurbishment in selected European countries that are initialised in the pilot actions at national, regional and local level. In the Austrian case study, for example, the EPC database is used to examine whether the province of Salzburg is in line to meet goals to stabilise the energy demand at 2005 levels. Similarly, in the case study of the municipality of Sønderborg in Denmark, the aim is to examine how the energy savings mentioned in EPCs issued before and after refurbishment activities can be validated against energy consumption measurements. For Greece, an improved building stock model is being developed within the EPISCOPE project that makes use of EPC data from the official database and can be applied nation-wide. As a result the anticipated energy savings of the national “Energy Efficiency at Household Buildings” programme can be estimated and conclusions drawn on user’s behaviour compared to indoor thermal comfort. (See more at: www.episcope.eu)

Private sector

An interesting private initiative that takes advantage of the EPC database is Meer met Minder (More with Less)⁷⁶. This portal links the information from EPC database and the official Dutch cadastre; based on a statistical analysis and data extrapolation, it allows estimation of the energy consumption for almost every building in the Netherlands. The portal is acknowledged by the Dutch State as it enables calculation of the “simplified” EPC, which is used for information purposes⁷⁷. The result of this data openness is an online map of all residential properties in the Netherlands, freely available and colour coded to signify energy performance according to normal or simplified EPC methodologies⁷⁸. With the building owner’s input on specific building characteristics, the tool generates the recommendation regarding the energy efficiency measures, list of potential contractors to realise the improvements and the necessary information on relevant subsidies are provided.

In addition to that, the Netherlands is, through the website dateline.nl, linking databases bringing EPC data to local governments, industry organisations and energy network companies in order for it to be used for policy implementation, to overcome barriers and for consultancy services.

⁷³ Manual de Normas Gráficas para Publicitação de Imóveis: http://www.adene.pt/sites/default/files/normas_classe_energetica.PDF

⁷⁴ The summary introduction to EPPA initiative can be found at: <http://www.eepa.eu/reports/>

⁷⁵ EE EPISCOPE - project website: <http://episcope.eu>

⁷⁶ www.meermetminder.nl

⁷⁷ This “simplified EPC” is not official, and needs to be replaced by a certificate issued by a Qualified Expert when the apartment or building is sold.

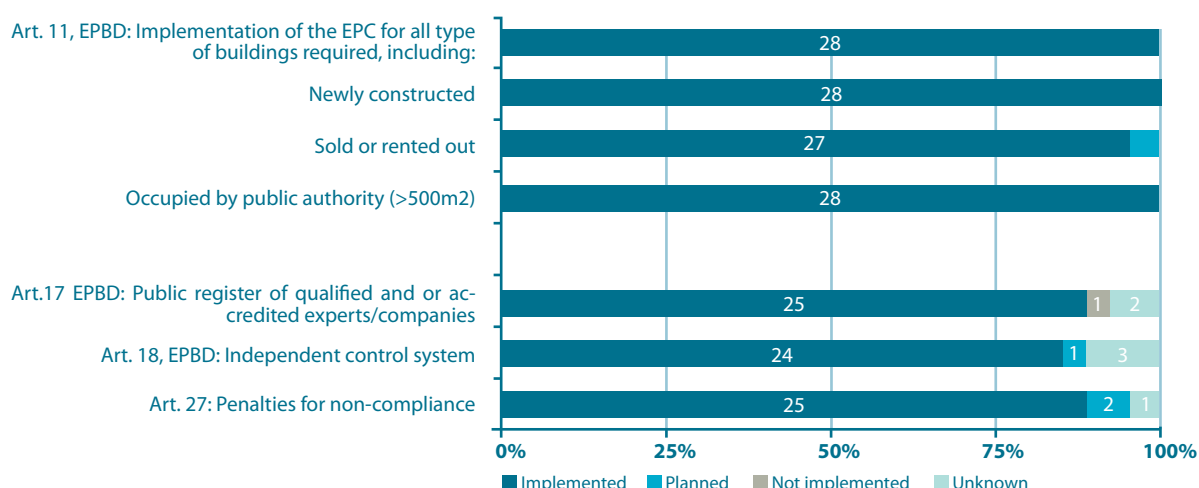
⁷⁸ <http://energielabelatlas.nl>

6 CONCLUSIONS AND RECOMMENDATIONS

The formal transposition of the EPBD (2010/91/EU)⁷⁹, including the requirements regarding the Energy Performance Certification, has now been finalised in most Member States (see: fig 6-1). The transposition process was largely delayed in relation to the official deadline set in the EPBD recast⁸⁰.

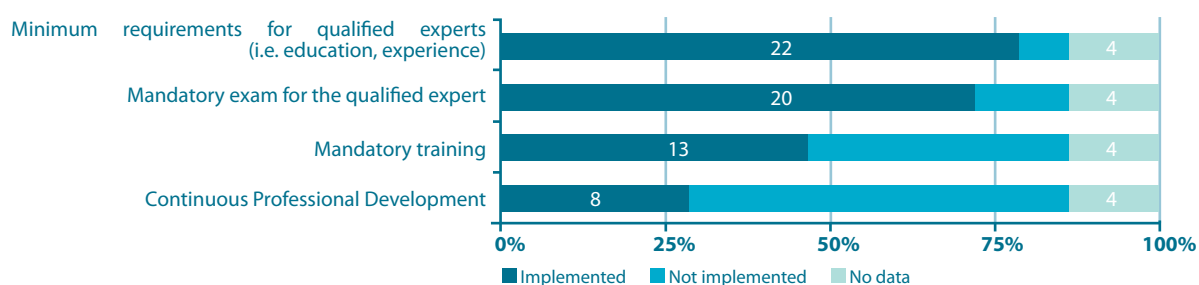
The level of implementation at MS level of the EPBD varies from country to country and depends to a large extent on the starting point, the political and legal contexts, available capacities to support the implementation, as well as the characteristics of the property market.

Fig 6-1 Formal transposition of the selected EPBD requirements (2010/31/EU) in the EU-28 countries



All EU MS have established rules for the training and accreditation of energy certifiers; nevertheless those systems differ largely in terms of the minimum requirements of basic education and professional experience, training programmes, accreditation and control procedures (See: Fig. 6-2). A mandatory exam is the most common practice to verify the competences of the certifiers in the accreditation process. The exams, as well as the training programmes (mandatory or voluntary), are conducted typically by approved third-party bodies that are obliged to follow official regulations in this respect.

Fig 6-2 Requirements for qualified and/or accredited expert (physical person) in EU-28



⁷⁹ Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings (recast)

⁸⁰ Member States had 2 years for formal transposition of the EPBD Directive requirements into national legislation;

Although the formal transposition of the Art 18., EPBD to the national legislation has been finalised in all Member States, the implementation of EPCs is still ongoing in many EU MS; in some of the countries the independent system for quality control of EPCs has not been established yet.

The design of the control systems follows the requirements and recommendation of the EPBD (Annex II), but differs from country to country regarding the size of the statically significant sample of EPCs issued and the method of verification. While the simple checking of the input data and the results are common practice across all Member States, the re-calculation of EPC is rare and performed only in a few countries.

In nearly all Member States, the penalties for non-compliance with the EPBD have been transposed into national legislation. In 12 countries a monetary fine can be imposed, however the enforcement level is still very low. To date, the most common penalty imposed is an administrative one such as a formal warning, recertification or suspension of the certifier's licence. Lack of enforcement of the penalty system may considerably dilute the quality, credibility and usefulness of the EPC schemes.

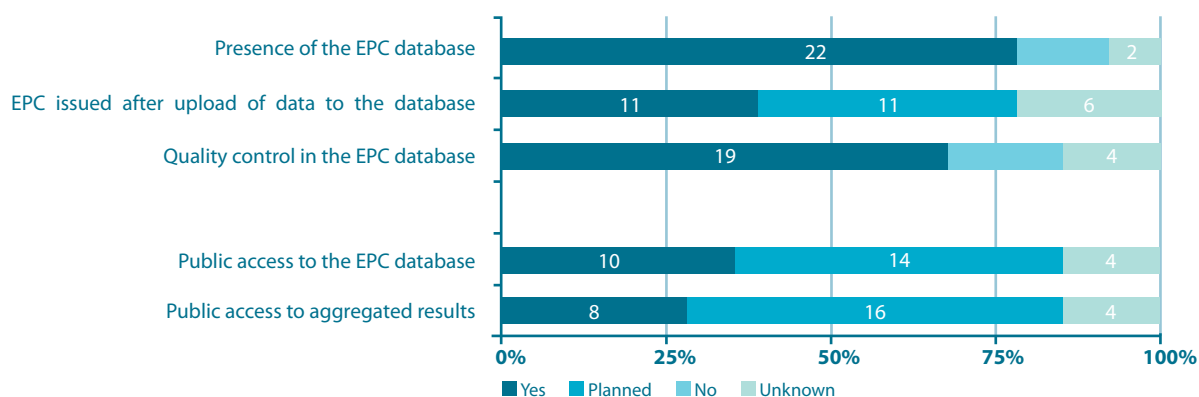
In 19 out of 28 Member States, only officially approved software can be used for the EPC calculation; in other Member States any software that in principle follows the national calculation methodology (but is not officially verified) can be used.

Not all Member States require the physical presence of the certifier on-site to gather the technical information to issue the EPC (for existing buildings). The on-site inspection supports better reliability of the EPC issued and allows for more effective tailor-made recommendations, which is not the case for the EPC issued based on information provided by the building's owner; while issuing an EPC in the latter manner can be cheaper.

Although it is not formally required by the EPBD, all MS have considered the establishment of the EPC registers (databases); in most countries a centralised system of data collection has been created at the national level while; in other Member States there are (also) regional systems according to the specific administrative organisation of the country (e.g. in federal states or in countries with larger autonomy at local level in respect to the implementation of buildings regulations). Lack of guidance on design and implementation of the EPC register resulted in a large variety of data available in the EPCs registers across Europe. The main differences are related to the type of data collected, format of data acquisition and storage and data management, including upload and sharing.

In 15 out of 28 MS, the EPC database is a central element for the quality control system, supporting random sampling and the first phase of data verification (i.e. plausibility check on input data). In 11 countries, mandatory upload of the EPCs is required as a condition for their official approval. In some Member States, a digital data protocol has been developed to allow easy and automatic transfer of data between calculation software and the EPC database.

Fig 6-3 EPC registers across EU-28



The EPC data is made publicly available (with respect to private data protection) either via direct access to the EPC database in 10 EU MS, or through statistical reports with aggregated results in 8 EU MS. In a few countries, direct access to the EPC database is provided after approval by some organisations (i.e. governmental agencies, etc.).

Energy performance certificates are tools to provide better information to building owners and real-estate market actors on possible improvements of the energy performance of buildings. Having understood the benefits, clear and reliable information can serve as an incentive to invest in energy efficiency in buildings. As a consequence of increased recognition of the EPCs in the property market, the value of properties with a higher energy class might increase. In some Member States, where the EPC schemes have a long tradition and their implementation is properly done, the positive impact of the EPC on the real estate market has been recorded.

There are now between 5 and 12 years of experience in implementing the Energy Performance Certification in Europe and an important lesson has been learnt through the enforcement of the first EPBD⁸¹. The EPBD recast⁸² introduced a set of new requirements (i.e. quality controls, penalty system, promotion of the EPC in the retail market and advertisements, etc.) that, once fully implemented at national levels, may deliver a significant improvement. Nevertheless, the EPC schemes are not yet fully implemented in all MS nor sufficiently enforced. Therefore the EPCs' quality, credibility and usefulness vary largely among Member States, and there is still a need to further support and set guidelines for the implementation of the EPC schemes at national level.

Based on the analysis of the current status of implementation of the Energy Performance Certification across Europe, a set of policy recommendations has been drawn up, as follows:

1. Need to consistently improve enforcement of the EPC schemes in Member States and strengthen the monitoring of EPC scheme compliance both at Member State and European levels.

The effective implementation of the EPC schemes requires securing the adequate administrative, institutional, and financial and human resources at Member State level. Political support is in this regard critical to achieve long-term benefits from EPC schemes and to transform real-estate markets towards 2050 climate and energy goals of the EU.

EPC systems require appropriate coordination and organisation at every stage of the process in order to achieve proper reliability, to maximise usefulness and to gain market credibility. For effective implementation, the responsibilities should be shared appropriately between public administration and other bodies for some specific processes such as training and accreditation schemes for certifiers, independent quality control of the EPCs, enforcement of the penalty for non-compliance, etc. Therefore, it is important to clearly define these shared responsibilities in a strict regulatory framework that can secure both the quality and independence criteria of the EPC schemes.

There is an urgent need to strengthen the monitoring of EPC scheme compliance (both at Member State and European level), especially in regard to independent control systems and enforcement of the

⁸¹ Directive 2002/91/EC of the European Parliament and of the Council of 16 December 2002 on the energy performance of buildings

⁸² Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings (recast)

penalties for non-compliance. For example, in Belgium (Flanders) the introduction of a relatively simple control mechanism for real-estate advertisements increased the availability of the EPC only for sale and renting transactions. In 2010, 68% of dwellings advertised in commercial media had an EPC, while in 2012 this stood at nearly 95%.

Lack of understanding for the benefits of the EPCs are among the key challenges that need to be addressed in the future. Although up-front investments to create the EPC scheme might be required, they should be considered as an investment with a high-return rate. Effective EPC schemes will support the improvement of the energy performance of the existing building stock at market level and provide very useful data for further monitoring and adjusting of buildings policies.

2. Need to strengthen the role of EPCs in the context of national legislation, especially for renovation policies and programmes

Practical and high quality EPC schemes are the prerequisite for any meaningful buildings policy, especially for existing buildings. The requirement for Member States to develop national renovation strategies, and the need to mainstream deep renovation approaches to tap higher savings, cannot be fulfilled unless EPCs are made more reliable and more accurate (including tailor-made recommendations). Embedding the role of EPC and EPC registers into national refurbishment policies will be the best driver to improve and sustain the EPC system over time.

EPCs are not only a valuable source of information for the building owner regarding cost-effective measures, they can also be an important tool to evaluate and monitor the renovation rate of the building stock. An inspiration for the future shape of EPCs could be *Sanierungsfahrplan*, a voluntary energy audit scheme implemented in the region of Baden-Württemberg in Germany. It serves as “an individual building renovation roadmap” that shows a step-by-step approach to a long-term renovation. It aims not only to introduce cost-effective measures, but support building owners in prioritising and optimising the actions (and cost) to be taken over the years.

Moreover, EPCs should become a requirement for more effective financing of renovations, especially through Cohesion Policy Funds (which was also a conclusion from the European Commission report on financing energy renovation [DG Energy 2014]). A significant proportion of the 23 billion euros allocated to sustainable energy in this period can be absorbed through the development of large-scale renovation projects between 2014 and 2020. Important steps in applying for funding shall be the identification of the energy saving potential (based on the best available building stock data) and the definition of eligible types of measures. The design of the financing scheme should take into account relatively higher support for the properties with the lower energy label (where the energy saving potential is the greatest). The compulsory consideration of the energy label in projects financed with public funds (i.e. national and EU funds, such as EU Structural and Cohesion Funds) has been already recognised across Europe. For example, an EPC is obligatory or is seen as a beneficial criterion in, for example, Austria, Belgium (Flanders), Bulgaria, Croatia, Portugal and Greece when applying for energy efficiency refurbishment subsidy programmes. In some countries, e.g. Austria (Salzburg), the EPC is required before and after the renovation is conducted, and serves as a valuable tool to monitor the renovation rates.

3. There is a need to introduce further quality assurance measures, especially during the early stage of the certification process. Member States should ensure that inter alia:

- **The requirements for the qualified experts should be harmonised across Member States.** Their competences should be verified and continuous development programs should be offered. The system implemented in Ireland serves as a best practice example in this field: it offers a check of the certifiers based on the penalty system points. In addition a certifier needs to pass mandatory exams every two years to extend the licence, while in Bulgaria every three years and Lithuania every five years. The qualification of certifiers is among the most influential factors on the quality of the EPC.
- **The certifier needs to be physically present onsite** (in the case of existing buildings) to gather the technical information required for the certification process. Data gathering for EPCs for new buildings should be combined with an onsite inspection during construction phases. This would help secure the quality of the energy performance assessment in new buildings, as well as for major renovations. The quality of input data for the calculation has a major impact on the quality of results. The on-site visit of the building supports the process of specifying the tailor-made recommendation regarding renovation measures.
- **Intelligent tools for the quality check of the EPC data should be used, such as plausibility check in the calculation software and/or the EPC registers. With the use of digital solutions and tools it is possible to optimise the process of issuing, validating and verifying the EPC. Thus, limited human and financial resources are needed.** Errors in the input data are among the most typical factors that influence the quality of the EPCs. For example, in Hungary and Ireland, the first plausibility check on EPC data is conducted before the certificate is officially issued. Another example is Lithuania, where the public software has been developed and checks for missing, incomplete or incorrect data and logical relations between entered information.
- **There is a need for further harmonisation of the quality check of the EPCs**, especially for random selection of the “statistically representative sample,” as well as including re-certification by an independent expert in the process of verification. An important step has been made with the introduction of an independent control system in the scope of the EPBD recast. Although Annex II provides recommendations regarding the EPC verification process, the process vary significantly across Member States. An independent quality control system should take into account full check of all parameters presented at the EPC, and re-certification by an independent expert in the process of verification.

4. Need for guidance in development of the centralised EPCs databases and digitalisation of the EPC process.

The centralised EPC registries proved to be an effective tool to support quality control systems. Therefore, the European Commission should provide further guidance and recommendations and enable exchange of best practices towards functional, interlinked, and automated service-providing databases. **The centralised EPC registries not only support the independent control system, but can be a useful tool to map and monitor the national building stock.**

Digitalisation of the process of EPC issuing, through the data protocol, is a best practice example implemented in several Member States. This protocol supports harmonisation of EPC data collection, enables automatic upload to a central registry and makes the statistical analysis of data simple from a

technical point of view. All EPC data are uploaded directly to the database by the qualified experts where they undergo an automatic quality assurance process in order to be officially issued through the system. Moreover, the assignment of the EPC database management to Landmark in the UK (England, Wales and Northern Ireland), provides an interesting case study of how a private entity can run the scheme at a profit.

5. There is a need to promote the effective use of the EPC data

A well-functioning EPC system accompanied by an EPC database provides a ready-to-use source of information on the building stock. There is an increasing number of the best practices across Europe that demonstrate the added value of EPC data for policy making (e.g. to inform relevant renovation strategies) and monitoring, as well as market and research analysis. For example, the monitoring of Art 5 of the current EED can be easily supported. In some countries, such as Bulgaria, there is a dedicated EPC register for public buildings and public procurement obligations. Those databases are available to the State for monitoring and reporting processes.

The European Commission should support Member States in the development and strengthening of central EPC registers, especially in the context of a solution to tackle the private data issues, and tools for data analysis. Standardised methodologies and formats of data gathering and sharing should be promoted.

There is a need to further promote the EPC schemes as a tool for mapping and monitoring the national and European building stock. Once properly implemented, it will allow assessment of real market needs and the potential for energy efficiency improvements in the building sector.

6. Finally, there is a need for independent evaluation of the effectiveness of the EPC scheme.

There is a lack of comprehensive analysis of the effectiveness of the EPC in the market across Europe; only limited information is available for several countries/regions. There is still a high need to assess the implementation status and, linked with the EPBD requirements, identify current failures of the EPC schemes in reaching credibility and importance in a given market, and to estimate the future impact of the EPCs on the market.

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ANNEXES

Annex I Minimum requirements for qualified and / or accredited experts (physical person).

MINIMUM REQUIREMENTS (I.E. RELEVANT DEGREE, PROFESSIONAL EXPERIENCE)			TRAINING	MANDATORY EXAM	CONTINUOUS PROFESSIONAL DEVELOPMENT	ACCREDITATION PROCEDURE
1	AT	Required technical education or relevant training	Voluntary training	No		No additional accreditation required ⁸³
2	BE	Required engineering degree or professional experience of at least two years: Wallonia & Flanders	Mandatory or voluntary training	Yes	Flanders and Wallonia: support for assessors (i.e. FAQ, phone line)	Accreditation based on exam results; In Wallonia proof of insurance is required.
		No minimum requirements: Brussels				
3	BG	Required technical education and the professional experience of 2-3 years	Mandatory training	Yes	Every three years assessor needs to pass the exam to renew the license	Accreditation based on exam results;
4	CZ	The professional experience of 3-6 years depending on the level of education	Voluntary training [4]	Yes	Mandatory training every three years after the license is issued	Accreditation based on exam results;
5	DE	Required technical education or relevant training [1] and at least two years of professional experience (if no engineering degree)	Mandatory training (if no engineering degree)	Yes (if no engineering degree)		Not in place (self-declaration of experts)
6	DK	Required engineering degree and the professional experience of at least 2-6 years [1]	Voluntary training	No		Required, only companies that follow EN ISO 9001 standards can be accredited
7	EE	Required engineering degree and the professional experience of at least two years	Mandatory training	Yes		Accreditation based on exam results;
8	ES	Required engineering degree (i.e. architect, engineer)	Voluntary training	No		Not required
9	FR	At least two years of initial educations in the relevant field	Mandatory training	Yes	Every five years assessor needs to attend the 3-days mandatory training to renew the license	Accreditation based on exam results;
10	GR	Required engineering degree (i.e. architect, engineer) and the professional experience of at least two years	Mandatory training	Yes	Every ten years assessor needs to renew the license with the proof of experience	Accreditation based on exam results or directly through professional association.
11	HR	Required engineering degree and/or professional experience of at least five years.	Mandatory training	Yes	every; three years assessor's licence needs to be renewed based on attendance in professional training every year	Accreditation based on exam results;
12	HU	Required higher degree education and at least one year of professional experience	Voluntary training	Yes	Not considered	Accreditation based on exam results;
13	IE	Required technical education or relevant training	Mandatory and voluntary training [1]	Yes	Every 2 years assessor needs to pass the exam to renew the license	Accreditation based on exam results;
14	IT	Required technical education or relevant training	Mandatory and voluntary training [2]	Yes [2]		Rules depend on the region
15	LV	Required technical training and at least two years of professional experience;	Voluntary training	Yes		Accreditation based on exam results
16	LT	Required engineering degree and the professional experience of at least three years	Mandatory training	Yes	Every five years assessor needs to pass the exam to renew the license	Accreditation based on exam results
17	NL	No minimum requirements	Voluntary training	Yes		Accreditation based on exam results
18	NO	Required bachelor degree and (in some cases) at least two years of relevant professional experience[1];	Voluntary training	No		Accreditation required only for some assessment
19	PL	Required engineering degree and/or relevant training	Voluntary training	No		Accreditation after approval of the competence
20	PT	Required architect or engineering degree and the professional experience of at least five years	Voluntary training	Yes		Accreditation based on exam results
21	RO	Required engineering degree and the professional experience of at least three years	Mandatory training	Yes	Every five years assessor needs to renew the license (i.e. proof of experience)	Accreditation based on exam results;
22	SK	Required engineering degree and the professional experience of at least three years	Voluntary training	Yes		Accreditation based on exam results
23	SI	Required engineering degree and/or at least two years of professional experience	Mandatory training	Yes		Accreditation based on exam results
24	SE	Required technical education and professional experience of at least five years	Voluntary training	Yes	Every five years assessor needs to pass the exam to renew the license	Required, after approval of the competence
25	UK	No minimum requirements	Mandatory training [2] [3] except for Scotland	Yes [2]	England and Wales: min. 5-10h of CPD per year; Scotland: periodic training	Accreditation procedure depends on the region

Source: BPIE Survey 2014 and CA EPBD 2013

Note: No data available for: Finland, Cyprus, Malta and Luxembourg;

Legend: [1] Depends on the type of accreditation and/or education background; [2] depends on region; [3] no training required if the qualification is recognised by an accreditation body (e.g. for certified building designers), [4] Mandatory training after the license is issued.

⁸³ Accreditation procedure is based on the trade license

Annex II Quality control systems across Europe.

STATUS			LEVEL	ORGANISATION/AGENCY IN CHARGE	QUALITY CHECK IN CALCULATION SOFTWARE	USE OF EPC DATABASE FOR INDEPENDENT QUALITY CHECK	METHOD OF QUALITY CONTROL
1	AT	Yes	Regional	Regional governmental body	Yes	Yes, in some regions	Depends on region; Desk audit for a certain percentage of EPC and all subsidised buildings: results and input data; on-site control for a limited number of EPCs; Central EPC database is to be used for the quality control system
2	BE	Yes	Regional	Governmental body (in the Flemish and Walloon Regions) or third party body (only in Brussels Region)	Yes, in some regions	Yes, in some regions	Depends on region; Desk audit of c.a. 1% of EPC issued: input data, results and recommendations; on-site visit for a limited number of EPCs
3	BG	Yes	Central	Governmental body	Yes	Yes	Desk audit of 100% of EPC issued: input and the results; on site visits: 4% planed in 2013
4	CZ	Yes	Central	Governmental body		Planned	Desk audit of 5-10% of EPC issued (random sampling): analysis of input data, results; in practice c.a. 1% of the EPCs is checked; all new built constructions are checked against project recommendations (via on-site visit); quality control system for existing buildings is currently being defined;
5	DE	Yes	Central / regional	Central/ regional governmental bodies	Yes, in some software	Yes	Desk audit of statistically significant sample of EPC (random sampling) based on the information provided by qualified expert; Detailed check of the EPC is implemented at regional level;
6	DK	Yes	Central	Governmental body and accredited		Yes	Desk audit of 5% of EPC (random sampling): input data and the results; a technical revision and re-certification for 0.5%; re-certification by a specially appointed expert for 0.25% of EPC issued
7	EE	Yes	Central	Governmental body		Yes	Desk audit of certain percentage of EPC (random sampling): input data and the results ;
8	EL	Yes	Central	Governmental body		Yes	Desk audit of 2% of EPC issued (random sampling): input data and the results; onsite visit only if considered necessary; the check are performed also: when the number of EPCs issued by an auditor is very high, when the energy class of existing buildings is B or higher;
9	ES	yes	Regional	Regional governmental bodies		Yes, in some regions	Depends on the region
10	FR	Yes	Central	Third party body		Yes	The certification body has to check at least 8 reports, representative of the expert's work, during the first three years of the qualified expert's activity (detailed desk audit); and at least one EPC with an on-site visit of the building for each certification cycle (5 years) of all experts
11	HR	Yes	Central	Third party body		Planned	Desk audit of 3% of EPC issued (random sampling by building type): input data, the results, and if relevant site visit.
12	HU	Yes	Central	Professional association	Yes	Yes	Desk audit of 2% of EPC issued (random sampling): input data and the results; on-site visits for 0.5% of the EPC issue (only the building's exterior is examined).
13	IE	Yes	Central	Third party body	Yes	Yes	Automatic quality check in the EPC database; Detailed desk audit of 0.5% EPC issued: comprehensive documentation and practice audits
14	IT	Yes	Regional	Regional governmental bodies		Yes, in some regions	In some regions automatic quality checks are performed in the EPC database, in others are adopted: random checks, or checks excluding values out of a reasonable range, or formal control of the information by third parties.
15	LV	Yes	Central	Central government/ Third party body	Yes	Planned	Some information will be checked automatically in EPC database, desk audits, onsite visits if necessary.
16	LT	Yes	Central	Governmental body	Yes	Yes	Automatic quality check in the EPC database; Desk audit of c.a. 0.5% EPC issued (random sampling); input data and results. on-site control for a limited number of EPCs; Detailed audit is 17performed when the results are out of range, the EPC has very high EP class, etc.
17	NL	Yes	Central	Governmental body		Yes	The control system is performed under the BRL9500 guideline and included the check of a certain number of EPCs issued by qualified assessors (detailed check of documentation, site visit). Check is performed for 2% EPC issued for residential and 5% for non-residential buildings per assessor.
18	PL	Yes	Central	Central government		Planned	Some information will be checked automatically in EPC database, desk audits, onsite visits if necessary.
19	PT	Yes	Central	Governmental body	Yes	Yes	Desk check of c.a. 2% EPC issued (random sampling based on EBP database): input and results (no additional information form the expert is needed); full data check and onsite visit for selected EPCs: input data, results and recommendations
20	RO	Yes	Central	Governmental body		Yes	Desk audit of statistically significant sample of EPC issued (random sampling starting with EPCs issued in the national rehabilitation program): input data, results and recommendations; not yet performed
21	SK	Yes	Central	Governmental body		Yes	Desk audit of statistically significant sample of EPC issued (random sampling): input data, results and recommendations
22	SI	Yes	Central	Governmental body	Yes	Planned	Desk audit of c.a.3% EPC issued: of EPC issued (random sampling): input data, results and recommendations; detailed data protocol for quality control is under development;
23	SE	Yes	Central	Governmental body		Yes	Automatic check of input and output data in the database, Detailed desk audit (Random checks; Checks for extreme values) of at least 1% EPC issued
24	UK	Yes	Regional	Third party body	Yes	Yes	Depends on region; Desk audit of 2% of EPC issued (random sampling): input data, results and recommendations.

Source: BPIE Survey 2014 and CA EPBD 2013;

Note: No data available for Finland, Cyprus, Malta and Luxembourg.



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