

Role of the EU Building Stock Observatory in Evaluation of the Buildings Policies

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Abstract

Good governance and policy making requires monitoring and periodic evaluation of the impact of building policies and strategies. During 2016, EU legislation on buildings, including the Energy Performance of Buildings Directive (EPBD), Energy Efficiency Directive (EED), and Renewable Energy Sources Directive (RED) are undergoing a review process. With this in mind, the European Commission decided to establish the European Union (EU) Building Stock Observatory to monitor the improvement in the energy performance of buildings. This public data portal, to be launched in the second quarter of 2016, shall provide a comprehensive knowledge resource for policy makers, investors, industry stakeholders, energy utilities, local and national authorities and researchers to underpin decision making, financial and long-term strategic support. The EU Building Stock Observatory will be the key tool to monitor the improvement of the energy performance of buildings and its impact on the actual energy consumption of the sector in member states. Buildings Performance Institute Europe (BPIE) leads a consortium consisting of the Energy Research Centre of the Netherlands (ECN), Enerdata, Ecofys, SEVEN and 20 national partners as well as a broad range of stakeholders which are creating the Observatory for the European Commission. The goal of the paper is to present the challenges and opportunities of setting up the Observatory. The EU Buildings Stock Observatory may become a very important tool that supports member states in drafting and implementing their long-term renovation strategies as required under Article 4 of the EED.

Introduction

To date, there is no official and centralised database on the European building stock and its energy performance. Data on buildings is collected by different institutions i.e. statistics offices, energy agencies, consultancy companies, research organisations and many others. Its quality and completeness varies significantly across member states.

As a part of the EPBD review process, the European Commission decided to establish the European Union (EU) Building Stock Observatory to monitor the improvement of the energy performance of buildings across Europe. This public data portal, to be launched in the third quarter of 2016, will be the key tool to monitor the implementation of EU building policies in member states.

In this paper the authors address the following questions:

- Is there sufficient data on the Europe's building for monitoring energy performance improvements and the energy renovation process?
- Is available data sufficient to evaluate the implementation of the EPBD and EED at the member state level? Who is collecting data in Europe?
- Is there is a framework for a common data collection and the reporting procedures in the European member states? Is cross -country comparison possible?
- What at the main challenges in setting up the EU Building Stock Observatory? What are the opportunities?

The first part of the article introduces the policy context of the EPBD and EED review. In the second chapter, authors present the EU Building Stock Observatory in the context of existing strategies for buildings data collection at the EU-28 and national levels. A special attention is given to the data reported in of the long-term national renovation strategies submitted to the European Commission (under Art. 4, EED). Authors conclude with the challenges and opportunities of setting

up the EU Building Stock Observatory. They highlight the potential use of this tool by member states in preparing long-term building renovation strategies.

EU buildings policy review

In February 2015, the European Commission published a Framework Strategy for a Resilient Energy Union with a Forward-Looking Climate Change Policy (COM/2015/080 final). Increasing energy efficiency in buildings is among the main objectives of this strategy.

The communication on the Energy Union called for a review of the EU building legislation, including Directive 2010/31/EC on the Energy Performance of Buildings (EPBD) and Directive 2012/27/EC on Energy Efficiency (EED). The Commission will also work on the new Directive 2009/28/EC on the Promotion of Use of Energy for Renewable Sources (RED II) for the period after 2020. The process will be finalised by the end of 2016, see Figure 1.

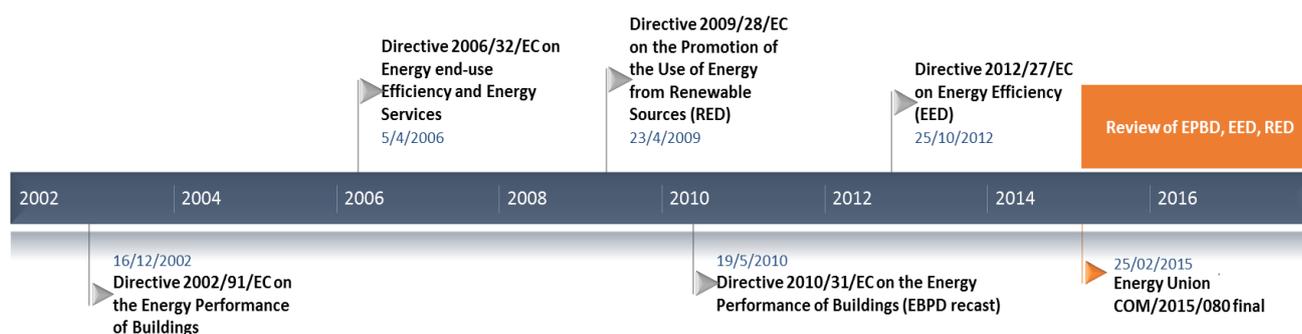


Figure 1 Timeline of the EU buildings legislation

For the review process, the European Commission conducted a public consultation on EU legislation, including:

- Public consultation on the review of EPBD and buildings-related articles of EED ([link](#))
- Public consultation on the review of the EED ([link](#))
- Public consultation on the RED II ([link](#))

The final synthesis report from the EPBD public consultation (Boermans et al. 2015), points out the delayed implementation, slow uptake of measures and poor compliance with the EPBD provisions in member states. Stakeholders call for the adequate compliance monitoring both in national legislation and on EU level; Strengthening of the directive through more ambition requirements and better enforcement are the key arguments.

To further support the review, European Commission published a compliance study on EPBD requirements. The results (Jamieson 2015) summarise on-the-ground compliance with the current national regulatory frameworks across the EU-28. It also highlights a very poor quality and quantity of available data with regards to actual compliance, as at the EPBD does not require member states to monitor and report on compliance rates.

The EU Building Stock Observatory

As a part of the EPBD review process, the European Commission published a service tender for support in setting up the EU Building Stock Observatory (BLDS Observatory) to monitor the improvement of the energy performance of buildings across Europe (ENER/C3/2014-543). The goal is to provide the European Commission with a tool showing a comprehensive snapshot of building stock characteristics in the EU member states, together with a clearly defined methodology for a

continuous monitoring of future progress.

Buildings Performance Institute Europe (BPIE) leads a consortium consisting of ECN, Enerdata, Ecofys, Seven and 20 national partners which are developing the Observatory for the European Commission. The project started in February 2015 and will end in July 2016.

The purpose of the project¹ is to:

- Establish a methodological framework for the monitoring of the EU-28 building stock in the context of building energy efficiency policies; including a set of quantitative indicators, guidance for data collection and analysis; as well as strategies to address the data gaps;
- Conduct a data collection exercise across EU-28 and provide a snapshot of the current status of the energy performance of the European building stock;
- Disseminate the results through a dedicated publicly available portal
- Set up a methodology for the continuous monitoring of the building stock and maintain the website as well as other communication tools.

The main areas of focus of the Observatory are the building stock and its energy needs; building energy performance and refurbishment, integration of renewable energy technologies and the resulting or attainable energy savings. Besides quantitative data on the building stock, the Observatory will also monitor relevant qualitative information on policies including finance, energy poverty, other social issues, indoor air quality and thermal comfort.

There are over 250 indicators included in the framework of the Observatory that are grouped in 10 thematic areas (Figure 2). Defining the list of indicators for the EU Building Stock Observatory was achieved after a consultation with a broad range of stakeholders, including industry associations, business, building owners associations and many others, before receiving the approval of the European Commission.

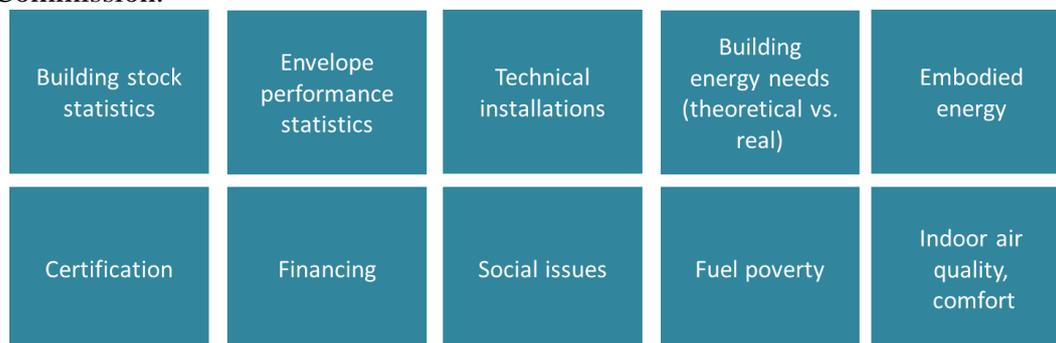


Figure 2 Thematic areas of the EU Building Stock Observatory

Data collection for the EU Building Stock Observatory has now been completed; the process took into account the following steps:

- The first steps of data gathering were based on collecting information from international and European projects, reports and publications. Eurostat, JRC and EU-funded projects were among the key sources for so-called horizontal data collection.
- The second step of the data collection process was conducted by the consortium partners in collaboration with 20 national partners in order to gather data available from the national data sources across member states. The templates for national data collection have been prefilled with the horizontal results;
- In addition, the consortium contacted a number of stakeholders with a request to support the data collection process. Several industry associations have supported the process and shared some of their data on technical systems, etc.

In the current phase of the project (status: February 2016), data validation and quality check is

¹ See also tenders specification of the service contract *ENER/C3/2014-54*: [link](#)

being performed. The consortium works on the data gap management strategies, as well as on the appropriate representation of data on the Buildings Observatory website.

The public domain of the EU Building Observatory, to be launched as part of the Directorate-General for Energy website (<https://ec.europa.eu/energy>) in the third quarter of 2016, will serve as a comprehensive knowledge resource for policy makers, investors, industry stakeholders, energy utilities, local and national authorities and researchers to underpin decision making, financial and long-term strategic support.

Buildings data availability

To date, information on the European building stock and its energy performance is dispersed; there is no one official and centralised database. Data is collected by different institutions i.e. statistics offices, energy agencies, industry, research organisations and many others. Its quality and completeness varies significantly across member states.

On the national level, the key source of information on building characteristics are the population and housing censuses, conducted every 10 years in every member state on the basis of the Regulation No [763/2008](#) (EC). These provide a good overview on the households (i.e. floor area, total number of buildings/dwellings/units, owner occupancy profile, etc.). Official statistics for non-residential buildings are limited and available only in a few EU countries, as also showed in the evaluation of the renovation strategies (JRC, 2016) (BPIE, 2014).

The framework document that sets the rules for data collection on energy consumption of buildings is Regulation No. [1099/2008](#) (EC) on energy statistics. Its amendment from April 2014 ([No 431/2014](#)), introduced a mandatory reporting of the annual national statistics on energy consumption for households as of 2016.

According to the Eurostat manual (Eurostat 2013) even more than 75% of available energy consumption data is based on the results of surveys and modelling exercises; the use of administrative data (such as Cadastres, Energy Performance Certificate registers) and in-situ measurements are still limited.

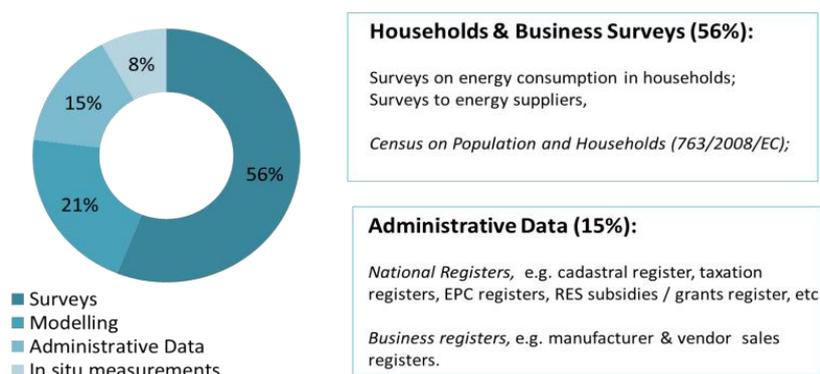


Figure 3 Energy performance data acquisition in Europe (Eurostat 2013)

Other sources of information on buildings' energy performance are EU-funded projects, for example:

- **ODYSSEE-MURE project** (<http://www.odyssee-mure.eu/>); Databases of energy efficiency indicators and policies in the EU. Figures on building stock, equipment penetration rate and efficiency, existing regulations and policies and energy efficiency trends are presented for both households and service sectors.
- **ENTRANZE project** (www.entranze.eu); Database on the EU building stock, energy performance, heating energy consumption, country reports on building policies and

decision criteria as well as a cost-optimal and cost data tools for several energy efficient materials and equipment.

- **EPISCOPE project** (<http://episcope.eu/>); Database and web data tool on building typologies in several EU countries, methodology for data collection and energy performance indicators.
- **ZEBRA 2020 project** (<http://zebra2020.eu/>); Database on EU building stock including renovation and construction activities, EPCs monitoring, nZEB construction and renovation activities, technology sales data, value of property, etc.
- **INSPIRE FP7 project** (<http://www.inspirefp7.eu/>); Database on the energy needs and architectural features of the EU building stock, including building types, age, ownership and energy use within the residential and office sectors; policies that affect the retrofit of buildings and incentives that apply specifically to retrofit.
- **EurObserv'ER project** (<http://www.eurobserv-er.org/>); Database on annual stock and sales for main renewable energy technologies across the EU MS.
- **TransparensE project** (<http://www.transparensE.eu/>); Database providing an overview of European EPC markets through specific information about ESCOs, their associations, EPC models and existing initiatives promoting EPCs.

Another example is the BPIE Data Hub, an independent online portal on energy performance in buildings; launched in 2011, with private funds; and today supported through EU-funding stream (namely EPISCOPE, CommONEnergy, ZEBRA 2020 projects).

Member States' notifications under Article 4 of the Directive on Energy Efficiency

The current EU legislation does not require member states to monitor and report on compliance rates. There is however a requirement under Article 4 of the Directive on Energy Efficiency (EED), that obliges national governmental to report on the status of the national building stock; Member states “shall establish a long-term strategy for mobilising investment in the renovation of the national stock of residential and commercial buildings, both public and private, that shall encompass:

- 4a. an overview of the national building stock based, as appropriate, on statistical sampling;
- 4b. identification of cost-effective approaches to renovations relevant to the building type and climatic zone;
- 4c. policies and measures to stimulate cost-effective deep renovations of buildings, including staged deep renovations;
- 4d. a forward-looking perspective to guide investment decisions of individuals, the construction industry and financial institutions;
- 4e. an evidence-based estimate of expected energy savings and wider benefits.”

In addition, the European Commission provided guidance for the preparation of National Energy Efficiency Action Plans (NEEAPs) ([SWD\(2013\)189 final](#)), that offers an overview on the type of information to be reported under Article 4 and its sub-paragraphs (see: Guidance 57). The deadline for submission of the first version of the strategy was the 30th of April 2014; the strategy should be updated every three years and submitted to the Commission as part of the NEEAP.

In January 2016, the JRC published a report on the assessment of national building renovation strategies under Article 4, EED (JRC 2016). The evaluation follows the structure and provisions of the directive, as well as the recommendations from the Commission's guidance. The overall assessment is based on previous studies, from a scale from 0-5, where: 0 = missing; 1 = unsatisfactory; 2 = inadequate or partially compliant; 3 = adequate; 4 = good; 5 = excellent.

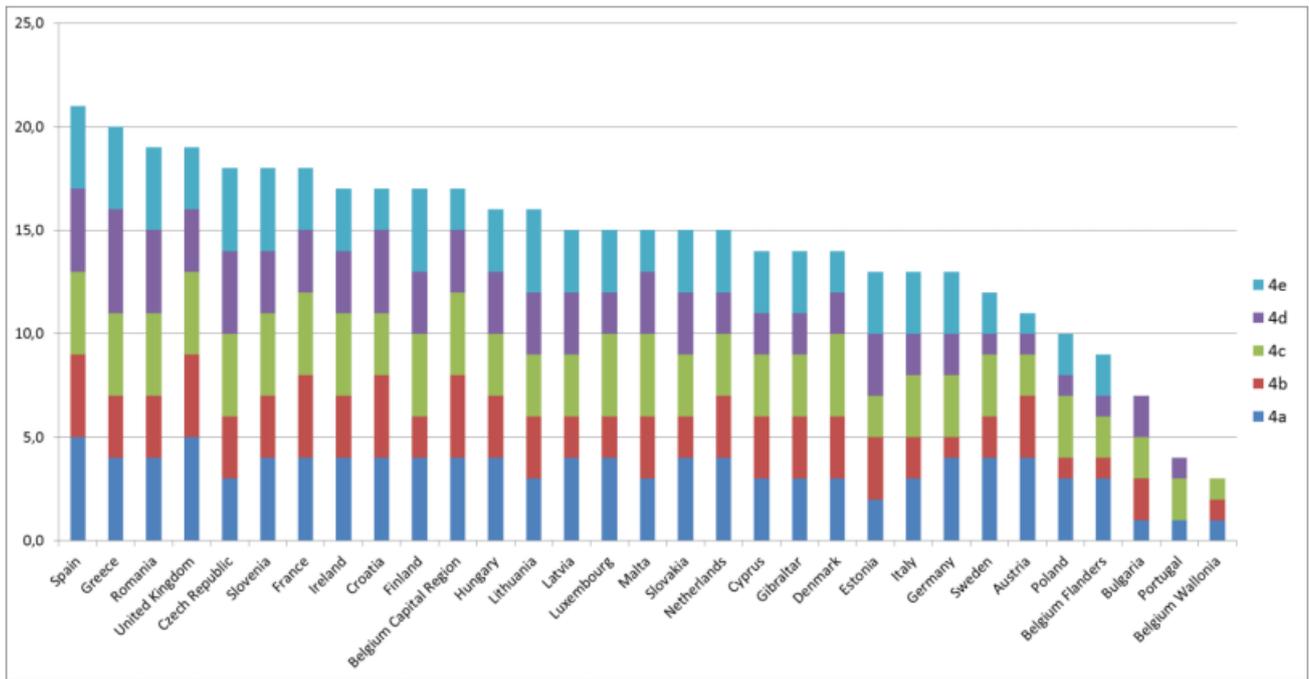


Figure 4 Comparison of the scores of the 31 evaluations of member States notifications (JRC 2016)

The reported availability of data on the national building stock (under Art. 4a, EED) is presented in Figure 4. On average, member states provided a reasonably detailed description of their building stock. Compared to other elements of the strategy, this part received the highest average score (3.4 out of 5).

Member states reported more information on the residential building stock compared to the non-residential building stock. In general, the building stock has been well described though the different building categories and age bands (A-B), while the information on climatic zones ownerships and tenure status (C-F) is missing in the majority of the cases. Data on the energy performance of buildings (G) is made available in less than 1/3 of member states (See: Figure 4).

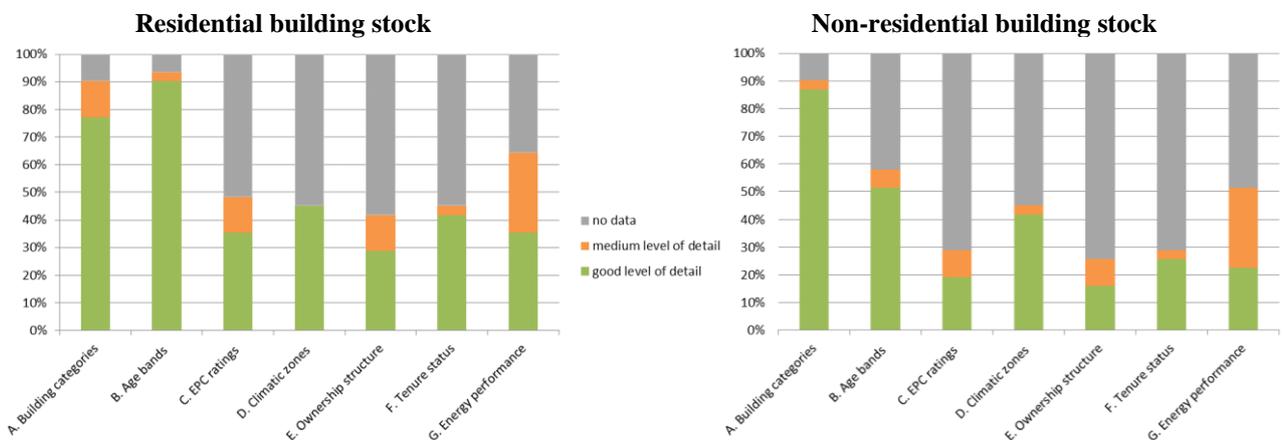


Figure 5 Information provided on the building stock in the member states notifications on Art. 4, EED (JRC 2016)

A good knowledge of the national building stock is a prerequisite for the development of an effective building renovation strategy. The information requested in the scope of the NEEAP is an absolute minimum to calculate the potential for energy savings, analyse renovation scenarios and its impacts. The European Commission should include additional indicators in the scope of the NEEAP's guidelines, such as: information on technical systems installed in the buildings, renovation rates, and renovation measures undertaken, as well as many others.

Challenges & opportunities in setting the EU Building Stock Observatory

The European Commission estimates [Ferreira V.2016] that around 14 million euros have been spent on collecting buildings' data and analysis (this appraisal includes budgets of EU-funded projects: IEE and FP7). The [ODYSSEE-MURE project](#), is a good example of the data gathering initiative that has been supported from European Commission funds for over 20 year now.

There is a common understating of a need for reliable facts and figures to support strategic decision making. More and more effort is made to gather buildings' data, and to share it in a transparent manner. A good example may be a new initiative of Eurostat to collect annual statistics on energy consumption in the households' sector on a mandatory basis (as of 2016).

There are excellent examples of national data collection initiatives, for instance: English Housing Survey, Energy Performance Certification databases, public buildings' registers, such as in Denmark, (Boligejer.Dk) and many others. There are numerous studies that compare the national approach for data collection and recommend the best ones; such as the Eurostat manual for statistics on energy consumption in households (Eurostat 2013).

The experience of the EU Building Observatory project shows, however, that we still have a long way to go in the process of gathering reliable information on EU's building stock.

To date the type of data collected on the national level varies between countries; member states have not only different data collection strategies, but also different definitions and aggregation procedures. This makes it often impossible for cross-country comparison on the EU level.

Unlike for the residential building stock (i.e. housing and population census), there is no obligation for systematically data collection for non-residential building stock. Therefore, a comprehensive overview in this regards is only available in a few member states. In the scope of the Buildings Observatory project an effort was made to collect available data, identify and fill data gaps (to possible extend) .

While data on energy consumption per end use and per source is easy to access for the majority of member states, there is an issue with data on the technical systems installed in the existing building stock. This type of data is often collected by the private sector (i.e. business organisations), and have a high market value (thus are not publicly available). An opportunity to fill this data gap lies with the development of national EPC databases. There are a few examples of EPC databases (for example in Ireland, or in the Piemonte Region) that serve as a very useful source of data in this regards.

The biggest challenge for future data collection remains the monitoring of buildings' renovation (i.e. quality and quality) and the financial aspect of renovation. Existing data is not sufficient; often incomplete, not reliable or out-of-date. New data collection strategies would need to be implemented across Europe in order to fill the data gaps.

Conclusions

Establishing the EU Building Stock Observatory is an important step to support policy making processes both on the European and member states level. The Observatory will support monitoring of the implementation of EU directives at national and regional levels and will contribute to their review (such as the EPBD/EED/RED reviews in the coming months). An example presented in the Table 1 presented the link between the Buildings Observatory project and EU legislation.

Table 1 Linking BLDS Observatory project with EU legislation (i.e. EPBD)

Article(s)	Policy needs	Indicators included in the scope of the BLDS Observatory project
Article 6, EPBD	Minimum Energy performance requirements	National minimum energy performance requirement
		Achieved performance levels
		Achieved performance levels for envelope components (u value for

Article(s)	Policy needs	Indicators included in the scope of the BLDS Observatory project
		walls, windows, roof and floor)
Article 7, parag 3, EPBD	Building element requirements	National minimum energy performance requirement
		Average energy performance after energy renovation
		Airtightness requirements
		Feedback system for smart meters
		Individual or collective metering
		New buildings with shading devices
		Average U- value of floors
		Average U- value of roofs
		Average U-value of doors
		Average U-value of façades
		Average U-value of walls
		Average U-value of windows
Article 12 (1) a, EPBD	Issuing EPC if building is build, sold or rented out	Number of total buildings with EPC (cumulative number)
		Share of buildings with EPC registered
		Number of new buildings with EPC (cumulative number)
		Number of sold buildings with EPC (cumulative number)
		Number of rented out buildings with EPC (cumulative number)
		Distribution of existing buildings per energy class
		Distribution of new buildings per energy class
Article 12(2), EPBD	Handing out EPC to buyer or tenant	Share of buildings rented out where EPC's were handed out
		Share of buildings sold where EPC's were handed out
Article 11(4), EPBD	The EPC indication to more detailed information	Does EPC contain information on cost-effectiveness?
		Does EPC indicate were more detailed information can be received?
Article 13, EPBD	Public display of EPC	Share of public buildings (floor area >500 m ² ; >250 m ²) were EPC is displayed
Article 9, EPBD	nZEB	Number of new NZEBs by the end of 2020.
		Number of new public buildings nZEB by 2018

This comprehensive knowledge resource will be of use not only for decision makers, but also investors, industry stakeholders, energy utilities, local authorities and researchers to underpin decision making, and for long-term strategic support. Better access to data will contribute to the improvement of the way the building sector is being considered in economic modelling of energy efficiency policy options. Access to reliable information will also support effective decision making in the financial sector, which is crucial for buildings renovation.

The EU Building Stock Observatory will also be an important support tool for the member states reporting to the European Commission as required under the different articles of the EPBD and EED. As an example, when the time comes for MS to update their renovation strategies in 2017 – as required under Art. 4 of the EED – they will be able to use the data provided in the Observatory to assess the status of their national building stock. It will provide a comprehensive overview of the buildings stock, including indicators such as: available statistics on envelope performance, technical systems, renovations rates, and many others. Following the analysis of the current national renovation strategies (JRC 2016), an overview of the national building stock in the majority of member states' notifications is not sufficiently represented.

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