Making European Buildings Data Useful for Policy-Making Process

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Abstract

As the energy- and climate-related discussion evolves and becomes more complex, policy makers need more and better data to design and evaluate policies and programmes. The significance of data input determines the quality of decisions taken. Data are also the key element that allows making comparisons and establishing the monitoring systems to track the progress and impact of various policies. Currently, there is no official and centralized database on the European buildings stock. The buildings data are collected by different institutions (i.e. statistics offices, energy agencies, consultancy companies, research organisation, others) mainly on the member state level; its quality, availability and completeness varies significantly between the different countries.

One of the key challenges for the European buildings data collection is the issue of data harmonisation. Currently, even though various data are available from different sources (both official and unofficial) their cross-country comparison is very hard to conduct. Moreover, there is a need to better use of existing tools for data collection (i.e. central engineering, procurement and construction (EPC) and renovation registers), and also use of new, smart tools for data collection (especially for non-residential sector) and sharing.

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2.1 The Need for Buildings Data

People spend more than 90% of their lifetime in buildings; these are our homes, schools, hospitals and governments, and are places to work and spend leisure time. We spend not only our time in buildings but also our money on buildings. It is no surprise that we (building owners, tenants) would like to know more about buildings and their impacts.

One of the most interesting building-related aspects is energy consumption. It is directly linked to comfort and health; it influences the size of our wallets and has an impact on the environment. The existing building stock corresponds to roughly 40% of the total primary energy use and more than 36% of the total energy-related greenhouse gas emissions. The building sector has the highest potential for energy efficiency improvements (in comparison to other sectors of economy) and occupies a central place in the political debate on a low-carbon future.

As the energy- and climate-related discussion evolves and becomes more complex, policy makers need more and better data to design and evaluate policies and programmes. The significance of data input determines the quality of decisions taken. Data are also the key elements that allow making comparisons and establishing the monitoring systems to track the progress and impact of various policies.

The need for credible buildings data is not only limited to policy makers, regulators and standards developers. As the construction sector is one of the key drivers of the European economy, buildings data have a great value for the market. They are the reference point in the business strategies for various parties including real estate agents, manufacturers, design professionals, etc.

2.2 The Current Status of the European Buildings Data

In 2013, the Global Buildings Performance Network published a comparative study on the buildings data robustness in the EU, China, India and the USA [1]. The authors of the report investigated and compared the quality and availability of the buildings data for the residential and non-residential sector. The results indicate that there is a room for improvement for European buildings data.

Currently, there is no official and centralized database on the European buildings stock. The buildings data are collected by different institutions (i.e. statistics offices, energy agencies, consultancy companies, research organisation, others) mainly on the member state (MS) level; its quality, availability and completeness varies significantly between the different countries. There are only a few building indicators (e.g. construction rates, final energy consumption in household and services sector) that are collected and harmonised by the official European Statists Office, the Eurostat [2, 3].

In 2010, the Buildings Performance Institute Europe (BPIE) decided to launch an ambitious and a long-term research project aiming at the harmonisation of European buildings data. The first step was to learn about existing data sources, data providers and most

importantly data needs. In 2010/2011, an extensive survey was conducted to collect in-depth statists and policy information for 29 European countries (EU 27+CH, NO). Results have been published in the report entitled Europe's buildings under the microscope [2] and at the BPIE data hub, an online portal on the European buildings data (www.buildingsdata.com). In the second part of 2013, BPIE decided to extend the scope and update the available information on the portal. In November (for the first anniversary of the data hub), the first survey 2013 has been launched. The BPIE work on data collection (Survey 2011, 2013) allows drawing conclusions on the current status of buildings data across Europe (see Fig. 2.1).

The most reliable data are available for the buildings stock statistics for the residential sector (i.e. floor area, total number of buildings/dwellings/units, owner occupancy profile, etc.). This information is based mainly on the population and housing census data (conducted every 10 years in every MS on the basis of the Regulation (EC) No. 763/2008). Official buildings stock statistics for the non-residential buildings (especially for commercial buildings) are limited and available only in some of the EU countries.

An important part of the building's statistics is energy performance data. The key document that sets a framework for data collection on energy consumption on buildings is Regulation (EC) No. 1099/2008 on energy statistics. Even the European Commission is trying to stimulate the member states to collect detailed data on the final energy consumption in households (by using a direct survey: interviews, e-mail/web questionnaire) or to develop a model for estimating energy consumption in households, but the availability of disaggregated information (by end use, building type, age bands) is still very limited. In 2013, Eurostat published a manual for statistics on energy consumption in household that introduces the methodologies and best practices of data collection across Europe [4]. It show that even more than 75 % of the data available are based on the results of surveys and modelling exercises, there is a growing importance of administrative data (such as cadastre register, energy performance certificate registers) and in situ measurements (see Fig. 2.2).

An important source of information on energy-efficient trends in sector of households, tertiary, industry and transport is the ODYSSEE project, supported by the Intelligent Energy Europe Programme of the European Commission. The ODYSSEE database was been established in the 1990s, and among many others, it presents disaggregated information on energy consumption in the household sector by end use and by building type, as well as takes into account climatic correction of data. ODYSSEE is based on the network of national data providers (EU 28+Norway) who work together on data harmonisation and quality check. Free access to the full database is restricted to the EU policy makers and non-profit organisation (from the begging of 2014).

There are also other EU-funded projects that provide information on buildings' energy performance, such as ENTRANZE, TABULA or EPISCOPE. For example, in the EPISCOPE project (a continuation of the TABULA project), disaggregate information on energy consumption in residential buildings has been gathered (i.e. by building type and

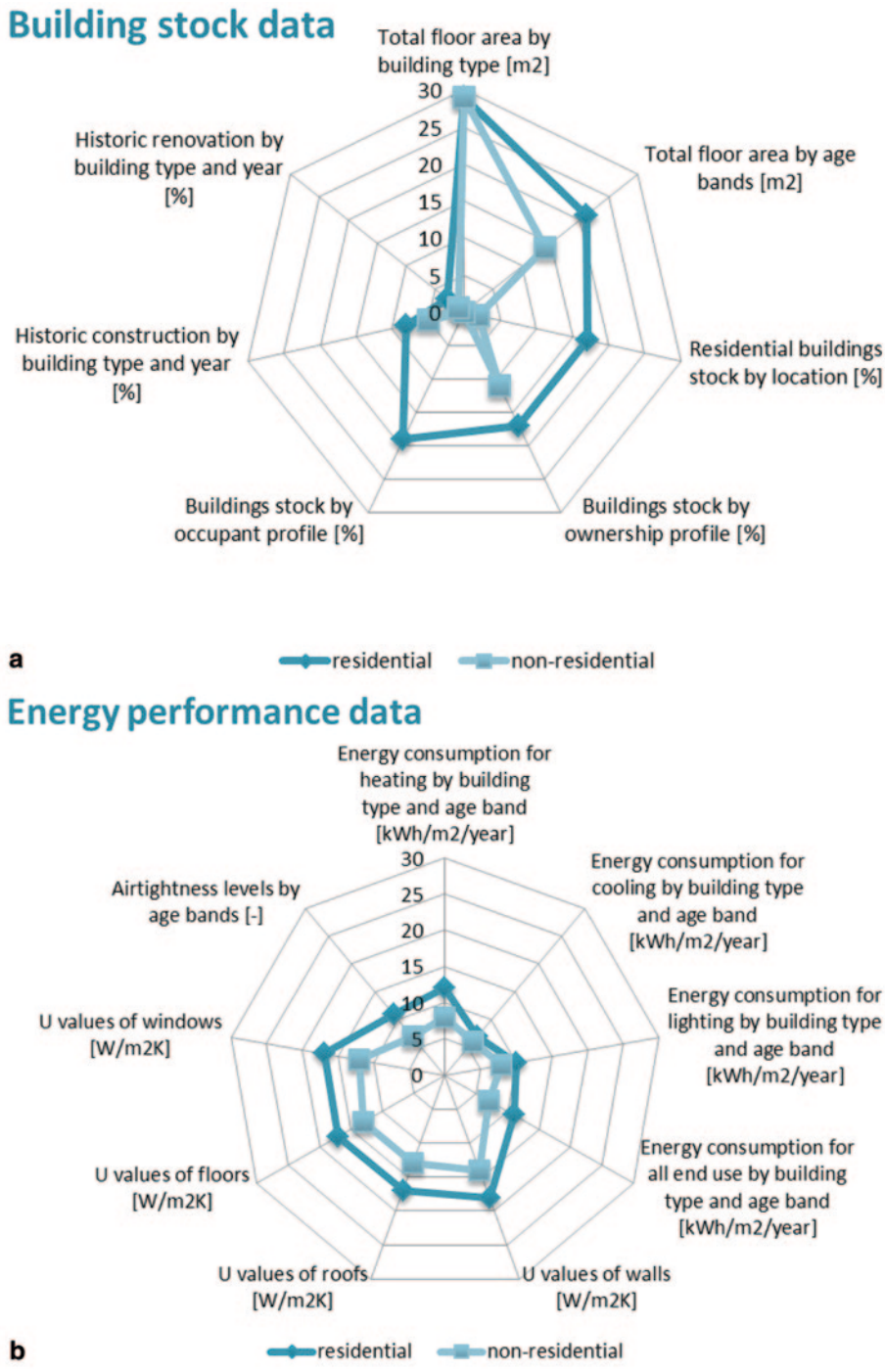

Fig. 2.1 The European buildings data availability for residential and non-residential buildings

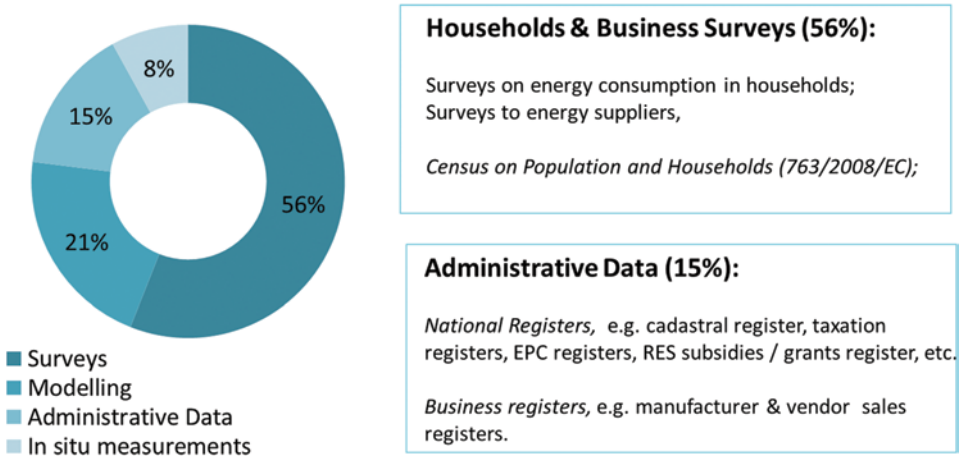

Fig. 2.2 Energy performance data acquisition in Europe [4]

by age band). Moreover, average *U*-values for the building components are estimated (i.e. by age band and by building type).

Besides the statistical information on the European buildings stock, there is a need to collect policy-related information. In this field, there is a high dynamic of information change which requires suitable methods of the data collection and verification. In recent years, the growing importance to disseminate policy-related information on buildings was the Concerned Action group that supports the technical, legal and administrative framework for the Energy Performance of Buildings Directive (EPBD). One of the activities of the group is to provide an overview on current status of the EPBD implementation across Europe [5, 6].

Comprehensive information on the building-related policy information (i.e. building codes, framework for the energy performance certificate system, economic and market-support instruments) is available at the BPIE data hub. At the portal, information can be searched in customised manner and compared across the countries. Another source is the Mesures d'Utilisation Rationnelle de l'Energie (MURE) database that presents a wide range of the energy efficiency policy measures for the household and service sectors.

2.3 The Challenges and Opportunities of the Buildings Data Collection in Europe

Over the past year, as a consequence of the political discussion on the EPBD recast and Energy Efficiency Directives (EED), increased attention has been given to buildings data. Comparing the results of the BPIE survey of 2010 and 2013, it can be concluded that both availability and quality of buildings data have increased. Nevertheless, on the European buildings data map, there are still major gaps that need to be addressed in the coming years.

Table 2.1 Examples of useful floor area definition in various EU MSs [2]

Hungary	*Overall useful area surrounded by plastered or tiled walls, where the inner height exceeds 1.90 m. In multi-dwelling buildings, beside total area of flats, it comprises the area of public premises as well*
Lithuania	The sum of floor areas of all heated premises of a building, including floor areas of heated basements, stairwells, shared premises and other heated premises, as well as floor areas of premises, all walls of which are shared with heated premises
Poland	Useful floor area of a dwelling includes area of all rooms, kitchen, bathroom, etc
Portugal	The sum of the areas, measured from the inner perimeter of the walls of all compartments of a building unit of a building (based on the building drawing), including lobbies, corridors, internal sanitary facilities, storage and other interior compartments function similar cabinets and walls

2.3.1 Harmonisation of the European Buildings Data

One of the very important challenges for the European buildings data collection is the issue of data harmonisation. Currently, even though various data are available from different sources (both official and unofficial), their cross-country comparison is very hard to conduct. This is because the methodologies of data collection vary between countries. Member states have different buildings categories, age bands, but most importantly, different definitions are taken into account (e.g. definition of a useful floor area, see Table 2.1).

2.3.2 Better Use of Existing Tools for Data Collection (Central EPC and Renovation Registers)

The energy performance certification and inspection programmes, developed in the process of implementing the EPBD in 2002, have the potential to yield comprehensive data on the energy performance of buildings. Even though the recast of the EPBD in 2010 does not stipulate registers, central EPC registers are useful tools to implement the mandatory independent controls. In May 2014, 24 out of 28 MS had implemented central registers on national or regional ECP. These central databases vary in regards to scope, format and the accessibility rights.

The Portuguese case study [7] shows that the national databases of buildings energy certification registers can be extremely useful in obtaining statistically relevant insights on the energy performance of the existing buildings stock. They can also allow analysing the trends and verify to what extent the historical evolutions are justified by natural evolution or by the effects of regulations.

In the long-term perspective, it seems to be one of the most cost-effective solutions for the data collection. The key challenge for European buildings data is to address the

opportunity of systematic data collection via central EPC registers, and also to make data publicly available. The challenges and benefits of making EPC data publicly available were analysed among others by the decision makers in the UK [8].

An additional potential source of information on buildings is the long-term renovation strategies that MSs need to prepare by 30 April 2014 (on the basis Art 4 of the EED directive). The analysis of the current status quo of existing building stock and its performance is a starting point for this kind of strategic document.

2.3.3 Use of New Tools for Data Collection (Especially for Non-Residential Sector)

Taking into account the gaps in the European buildings data for the non-residential buildings, an innovative method of data collection should be designed. One good example that could be followed is the US initiative is called the Green Button. The project is based on cooperation between industry and the White House. Within its scope, energy utilities provide their (residential and commercial) customers with smart tools that allow access to the energy usage information. Users can monitor their energy consumption in the building, and at the same time, data are gathered in the central database. The critical success factors of the project are based on the well-constructed solution for the private data protection, good cooperation with energy utilities and the simplicity of the tool. It is enough to "click on the green button" and download the free software to benefit from knowing more on the real behaviour of the building.

2.4 How to Make European Buildings Data Useful

The process of collecting credible and comprehensive information on buildings is probably of utmost importance to respond to data needs. Nevertheless, it is not the only condition that must be satisfied for making buildings data useful (for policy makers, building owners, building professionals, etc.).

One of the most important criterion to increase data usefulness is to assure free access to data (i.e. licence free). Nowadays, the poor data availability is not necessarily resulting from data gaps, but rather from limited access to data (i.e. paid or restricted access for specific parties).

Another condition (once data are publicly available) that need to be satisfied is to make buildings data useful and reusable. This can be assuring with the standardised format of data representation; it is easy to imagine that e.g. "tables" are more user-friendly when given in "xls" (or "csv") file rather than a pdf format. Suitable formats are important both for data sharing and for data acquisition and notably machine readable formats for ease of automation.

★	Information is available on the Web (any format) under an open license
★★	Information is available as structured data (e.g. Excel instead of an image scan of a table)
★★★	Non-proprietary formats are used (e.g. CSV instead of Excel)
★★★★	URI identification is used so that people can point at individual data
★★★★★	Data is linked to other data to provide context

Fig. 2.3 Five starts model of LOD concept [9]

All issues mentioned above are supported with the Linked Open Data (LOD) concept [9], which, in my opinion, is the desirable architecture for the future of the European buildings data collection. The LOD principle is not only about assuring an open access to data but most importantly to allow an easy exchange, reuse and linked of data (see Fig. 2.3).

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