Europe's Building Stock – A Comprehensive Study

To understand just what is needed to make Europe's buildings greener through innovative retrofitting, a detailed assessment and analysis of the EU-27's residential and office building stock was needed. UK-based BSRIA and EURAC in Italy, have just completed one of the largest studies ever as part of the iNSPiRe project.

A key element of the iNSPiRe project has been to provide a detailed assessment and analysis of Europe’s residential and office building stock within the EU-27. This work, which provides the foundation on which many of the project’s RTD and development decisions are made, was carried out by BSRIA and EURAC as part of WP2 and a full report detailing its findings was presented at the mid-term review meeting in Verona in March.

The full report presents information about the building stock in each country separately as well as an overall picture, and also includes a summary of the policies and incentives available in each country that have been designed to encourage energy-saving retrofit work in buildings. The report also summarises the principal barriers to this retrofitting work that also exist in each of the countries.

The report, which is one of the most comprehensive studies of European building stock ever undertaken, provides valuable information about the EU’s older buildings and will enable iNSPiRe to target its energy-saving envelope solutions to specific buildings with specific needs and requirements.

In this newsletter, we look at the key findings of the report detailing Europe’s residential building stock and how this data now feeds the buildings iNSPiRe will now look to target in the retrofit solutions it is devising. Next time, we will look at Europe’s office building stock.

Residential – Some key findings

There is approximately 17.6 billion m² of residential floor space available in the EU-
27, the vast majority of which (15 billion m²) is heated. Almost three quarters of this space is in Europe’s “big six” most populated countries – Spain, Italy, France, Germany, UK and Poland.

While that is a huge amount of available residential housing in Europe, the actual rate of construction of new-build homes has been steadily in decline since the post-war boom times of the 1950s and 1960s. The most dramatic decline in new-homes building has been since 2000. Of the existing European stock currently lived in, 53 per cent of it was built before 1971, 15-18 per cent between 1971 and 1980, 12-13 per cent up to 1990 and 12 per cent up to 2000. Only six per cent has been built since 2000.

The study also reveals some fascinating insight into the way people live in different European countries. The vast majority of families in Denmark, Ireland, UK and the Netherlands, for example, live in single family homes (over 70 per cent in all those countries), while only 40 per cent of families in Estonia, Spain and Latvia live in these homes, the majority living in larger properties with multiple occupancy. This statistic has particular relevance for iNSPiRe due to the fact that multiple family homes are more suitable for retrofitting with energy-efficient solutions and improvements because their exteriors are more uniform, making them easier to improve. Meanwhile, they have the added benefit in that any improvements and subsequent efficiency and comfort gains due to a single improvement project will benefit more people – while working with one building owner is often more straightforward than working with many different owners of single dwellings.

In terms of residential building ownership, BSRIA concludes that the level of owner-occupation in EU-27 is high. In 17 of the 27 countries, owner occupation rates are over 70 per cent, while in Bulgaria, Lithuania and Romania, the rate is over 90 per cent. Again this has relevance for iNSPiRe and the improvement of older buildings in that one of the main barriers to retrofitting projects is the fact that landlords are often reluctant to pay for improvements that reduce energy consumption because such improvements benefit the tenants and not the landlord, despite the landlord having to carry the costs.

Energy usage in Europe’s homes varies greatly depending on a number of factors, including climate, fuel used and the size of the population. The annual residential energy consumption for heating and domestic hot water preparation across the EU-27 is around 2700TWh. On top of that, around 26TWh of electricity are used for cooling purposes, and 97TWh for lighting.

This equals to an average consumption for heating and domestic hot water preparation of 180kWh per m² of heated floor area and per year. Additionally, 20kWh of electricity per m² of heated floor area and per year are used for cooling and lighting the buildings.

Countries with the largest energy use are those which are both large and are totally or partially in the colder climates, such as France, Germany, Italy, Netherlands, Poland, UK.

Meanwhile, the fuels used for domestic energy vary widely across Europe. Some countries are highly dependent on one particular fuel, such as Hungary, Netherlands
and the UK, where gas accounts for over half the fuel used, while countries like Austria, Finland, Ireland, Portugal and Spain have a more balanced use of three or four fuels.

Finally, the thermal performance of buildings has improved in all EU-27 countries since 1945, with the most dramatic improvements generally taking place since 2000. Clearly some countries in the coldest climates have always had good thermal insulation, while counties in the hottest climates used to have poor thermal insulation.

With all these factors considered, the report concludes that in terms of targeting buildings to improve through fabric retrofit measures, older dwellings have greater potential for improvement – and with over half the residential stock in the EU-27 countries being built before 1970, this is a fact iNSPiRe is well-placed to exploit.

How iNSPiRe will use this information

The information presented in the above mentioned reports is based solely on statistics and other information collected during the literature survey. Not all the desired information related to the building stock was gathered from literature, mainly because the data was missing or unreliable. These “gaps” have been filled in using simulation work, which is covered in report D2.1c which is available on the website. Reference buildings representing “average” buildings have been modeled primarily from looking at the statistics and identifying the construction types which are typical:

- In the key years (1945-1970 for residential and 1945-1980 in the office sector)
- In the six most populated countries
- For the key typologies

Reference buildings’ performance, in terms of heating and cooling demand, has been simulated to derive “average” values for the seven climate areas and six periods of construction defined within the project. Moreover, by identifying these buildings and categorizing them in terms of their representative aspects, iNSPiRe has been able to identify the buildings which should be focused on for retrofit activities, as these are likely to be the buildings that offer the biggest potential for making substantial energy savings.

Countries
Austria, Belgium, Bulgaria, Cyprus, Czechia, Germany, Denmark, Estonia, Greece, Spain, Finland, France, Hungary, Ireland, Italy, Lithuania, Luxembourg, Latvia, Malta, Netherlands, Poland, Portugal, Romania, Sweden, United Kingdom

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Contributed by
Insight Publishers
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Last update: 10 June 2014
Record number: 138853


European Union, 2023