



## Housing Stock – its part in developing a sustainable energy future

In this third Newsletter from the INSMART project we focus on how the project has developed a better understanding of the four cities' housing stock. Due to our innovative modelling method we can now better forecast energy consumption and carbon emissions when looking at options for retrofitting housing and other energy saving measures in our four cities.

### Why is housing important to Sustainable Energy Action Plans?

Buildings are responsible for around 40% of a city's energy consumption, with domestic housing alone accounting for about 25%. Understanding the impact that a city's buildings have on energy demand is a fundamental factor when developing a SEAP.



### What do we know now that we didn't know before?

For each city we now have more data on...

- their building stock categorised in building typologies and their characteristics
- building populations per building typology
- the locations and frequency of different typologies across the city.

This all allows for more realistic energy demand and consumption data for the cities' housing stock, and the opportunity to map this consumption across the cities.

### The INSMART cities - their energy challenges

**Trikala:** The city's unplanned urban development from the 1960's to the 1980's lead to a variety of mixed construction for public, commercial and residential sectors. Moreover, the typical typology of the Greek country semi-detached house which first appeared during the 1980's is the most popular house type in Trikala, this house type appears in multiple variations across Trikala's districts.



**Cesena:** Old buildings which have unique building envelope characteristics such as brick layers for bearing structure and walls account for most of the city's buildings across the districts. These characteristics bear an architectural heritage for the city; there is resistance to using common energy efficiency measures as they don't allow for maintaining the heritage aesthetic.





**Nottingham:** Nottingham has a diverse housing stock with a high proportion of older buildings, almost half of the stock was built before 1945 and over a fifth are over a century old. Many of the properties have low levels of insulation despite local and national schemes encouraging households to improve energy efficiency. Most of the older Victorian era properties are considered as 'hard to treat' buildings where improvements to their energy efficiency are either costly or restricted due to conservation concerns.



**Evora:** While the majority of the city's building were constructed between 1946- 1990 the city retains its historical heritage and architectural design. The most common typology by far is terraced properties built between 1946 and 1990. Homes are largely uninsulated and heating and cooling systems are not widely prevalent throughout the stock.



3. National energy data for each country was analysed and applied at local level using the outputs of the local surveys.
4. All this allowed for the development of an energy model for each city which can take into account variables such as occupancy levels, user behaviour, energy efficiency works already under taken etc. The building types identified can now have their energy demands simulated and the impact of potential upgrades analysed.

### Project legacy for our cities

InSMART has given each city a richer and more detailed view of its housing stock and associated energy demands. The InSMART building surveys provide a platform from which each municipality can more accurately assess housing characteristics including occupancy and energy usage patterns. This will allow intelligent targeting of housing improvements to benefit citizen's household comfort and help reduce their energy bills.



### The modelling method for buildings



1. Each city's housing stock was first classified into typologies based on the construction period and building type.
2. Energy surveys were then carried out on representative samples of the city's houses. These surveys revealed the unique architectural styles and building characteristics (both structural and social) of each city.

### Making cities a better place to live

For citizens saving money on their energy bills is a key priority, the INSMART project recommends the following interventions for housing in each city.

City	Money saving intervention
Nottingham	Insulation
Evora	Solar Panels
Cesena	Ground Source Heat Pump
Trikala	Ground Source Heat Pump

### Project Channels

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