

Pilot Project description

CETA – Centro di Ecologia Teorica ed Applicata

The EPBD (Directive 2012/27/EC) art 4 invites Member States to establish a long-term strategy for mobilization of investments in the renovation of the national stock of residential and commercial buildings, both public and private. The pilot focuses on the first two steps of the strategy:

To give an overview of the regional building stock based on statistical sampling and to identify cost-effective approaches to renovation relevant to the building type and climatic zone.

An evidence-based estimation of expected energy savings can be given based on the analysis energy efficiency issues for different building typologies and the assessment of the feasibility and potential of suitable energy saving measures.

Analysis of the residential building stock in the Friuli Venezia Giulia region

The analysis is based on the data of the 14th Population and Housing Census which gathers information about the number and structural characteristics of residential buildings. The most representative regional building typologies have been selected from a matrix of typologies and construction periods. The main typologies are

- Single-family detached houses
- Duplex or semi-detached houses.
- Attached Single-unit or double-unit housing
- Apartment block or apartment building.

The archetype buildings are described by geometric values, thermal envelope data, heating and hot water supply system (which is added from the TABULA project database).

Assessment of potential energy efficiency in private and public residential buildings through renovation or user habits

The estimation of energy consumption for each building type has been calculated according to the Italian standard UNI TS 11300 which is based on EN ISO 13790 and EN 15316.

For the assessment of potential energy savings different packages of energy conservation measures have been defined and calculated. The measures selected for the upgrading of the thermal envelope and the heat supply reflects the national requirements for renovation of the building stock.

The corresponding energy consumption, energy saving (in heating and hot water supply) and deployment costs have been calculated for each measure which allows a comparison of different measures.

Guidelines for energy efficiency improvement

Based on the thorough analysis of the building stock and different energy efficiency measures it was possible to create guidelines for the deployment of energy savings for individual citizens and also for the whole region of Friuli Venetia Giulia through a prediction of the overall potential through energy saving measures. According policies and measures, accompanied by forward-looking investment perspective could be set by policy decision makers on this basis.

Verification through on site monitoring samples

To verify the results of the study and especially the foreseen energy efficiency measures a sample of existing buildings have been monitored and analyzed.

Innovative suggestion for a retrofitting of buildings

A concept design of an innovative hybrid system, combining an adaptable solar façade system and a heat pump system controlled by a building management system has been elaborated.

The external skin is composed by a self-adaptive system inspired by biomimetic. During heating periods, movable blinds allow the passage of the solar radiation into a solar absorber. During cooling periods, the movable reflective blinds block the solar radiation to prevent overheating and maintaining the solar collector in shade. The solar heat can be collected through solar air collectors that also include a PCM-storage-system (Phase Changing Materials).

The heat pump system reduces many of the disadvantages that each technology would have when operated separately. For example, during winter conditions the energy collected by the solar collectors would be too low to be used for direct heating, but can be used as a heat source for the heat pump which would increase the heat pumps efficiency a lot.

The integrated Building Management System controls the system in relation to the outdoor conditions and user behavior.

Further Information

A summary report is available in German and Italian language and the full study is available in Italian language on the project and CETA websites.