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FINAL REPORT
MAY 2014

ABOUT THE PROJECT

About the Project

Buildings account for around 40% of EU energy requirements.

In the last five years, Social Housing Organizations have played an exemplary role in improving the energy efficiency of the housing sector. They have anticipated forthcoming national legislation and have punctually experimented with the construction of low-energy buildings and innovative energy refurbishment.

AFTER aimed to promote and continue this effort especially in light of the obstacles and challenges presented by the current economic situation.

The AFTER project enabled participating and non-participating Social Housing Institutions and Organizations all over Europe to improve the energy efficiency of their housing stock with cost optimal solutions. Its goal was to promote and develop existing European knowledge in the areas of energy saving strategies and encourage their implementation by companies in the housing sector.

AFTER asserted the importance of establishing energy efficiency as a major goal even after construction of the building. The project promoted measures adapted to a variety of investments and situations. A special emphasis was placed on the important contributions of operation maintenance and management in the energy performance of buildings.

COST OPTIMUM AND STANDARD SOLUTIONS FOT MAINTENANCE AND MANAGEMENT OF THE SOCIAL HOUSING STOCK

Co-funded by the Intelligent Energy Europe Programme of the European Union

Methodology

APPROACH

AFTER associated retrospective analysis, short-term proposals and long-term investment strategies.

The project proposes a step-by-step integrated process that can be broken down as follows :

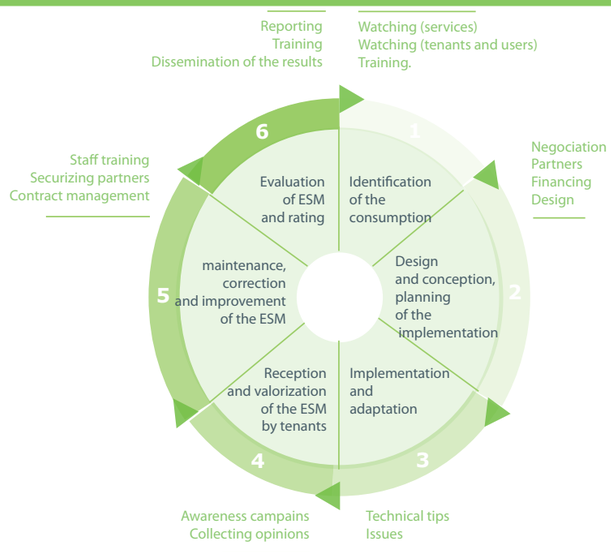
Performance assessment of technical solutions experimented over the last five years(performance, cost-optimal effectiveness, tenants' opinion, etc…).

Definition of new optimum economic, technical and social standards and measures focusing on the management and maintenance of buildings as well as the eco-empowerment of tenants.

Testing and final assessment of new energy saving measures on sites focusing on their future generalization.

Social Housing Organizations in 6 different countries (Czech Republic, Denmark, France, Germany, Italy, and Slovenia) and their partners -including National Housing Associations, Scientific Committee and National Tenants Associations- cooperated to promote the most efficient and adaptable solutions.

This diversity of the different AFTER stakeholders encouraged a better collaboration between all of the actors in the social housing sector with the shared goal of improving and consolidating their energy efficiency..



AFTER project followed a three steps approach

1 Retrospective analysis of the performance of experienced energy saving measures

The first steps consists in identifying innovative and best energy saving measures (ESM) that should be generalized. This objective will require a deep analysis of the overall and real performance of the measures already implemented by participating housing companies since last 5 years from economic, environmental and social points of view.
They will raise their awareness on new innovative solutions through the analysis of other SHO practices on a comparable and trustworthy basis.
We will then select best identified energy saving measures and optimize them through the improvement of the operation, maintenance and eco-empowerment of tenants. This will lead to the design of "optimal standard ESM"

2 Improvement and testing phase

During the second phase, AFTER project partners will test these optimized ESM "live" on sites. The impact of ESM implemented on testing sites will be monitored during at least on heating season

3 Evaluation and roll out of the measures

The third and last phase will consists in evaluating and improving the tested ESM and then starting to implement them in the whole housing stock of the participating companies. In this last phase, dissemination activities will also ensure that optimized ESM are known by European housing companies outside from the project consortium so they can follow AFTER project members' example.

Energy Saving Measures (ESM)

TYPES OF ESM

AFTER's aim was to identify and to promote innovative and relevant experiences across the European social housing building stock.

Several Energy Saving Measures have been developed in the last five years with the goal of improving the all around energy performance of Social Housing Companies. AFTER partners have aggregated different kinds of Energy Saving Measures and created a common framework for evaluating them and sharing information.

As a whole, 18 Energy Savings Measures have been assessed and optimized, during the 3 years of the project.

The AFTER classification system distinguished 5 main categories of Energy Saving Measures:

OPERATING MANAGEMENT
"Operating management" gathers ESM that are non-technical and do not require direct investment. AFTER espacially investigated measures related Contractual relations with heating providers, facility management companies and end users such as tenants or inhabitants

RUNNING MAINTENANCE
"Running Maintenance" gathers technical Energy Saving Measure that do not necessarily require direct investment . These low cost measures usually offer a short-term return on investment and can be highly profitable.

REPLACEMENT OF SYSTEMS
This category is specifically dedicated to the analysis and optimisation of ventilation, central heating and water heating systems that have been changed in the 5 last years.

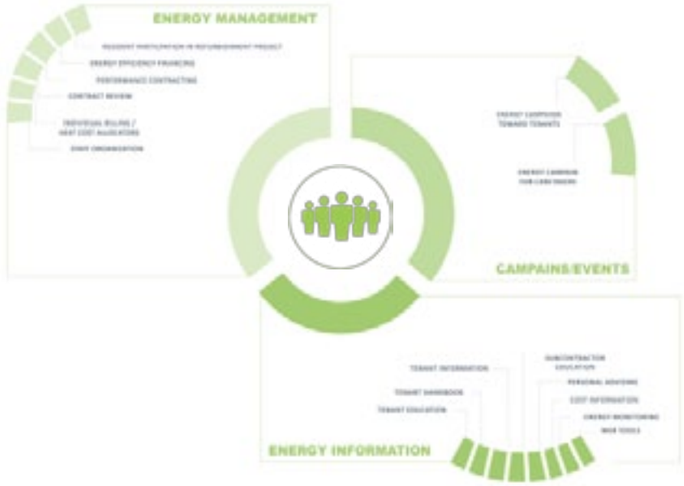
RECENTLY REFURBISHED BUILDINGS
This category is specifically dedicated the past interventions on existing buildings Global retrofitting (intervention on the shell and on the systems) and punctual interventions on the shell (replacement of the windows, partial insulation...) are considered even if the project focuses on the most recent interventions (less than 5 years old).

RECENT LOW ENERGY BUILDING
The category examines the environmental, economic and social performance of the operating management and the running maintenance implemented on recent new low energy constructions (less than 5 years old).

These were divided into sub-categories that offer further specifications about the different varieties of ESMs.

Despite their quantity and their differences, AFTER managed to evaluate the different ESMs according to the same conceptual framework.

OPERATING MANAGEMENT



#1 : RAMEAUX- FR
ENERGY CONTRACT REVIEW

ESM: Review of an existing energy supply and maintenance contract with an energy provider. The new version of the contract includes a profit-sharing system between the Social Housing Organization and the energy provider based on performance objectives regarding energy consumptions.

OPTIMIZATION: Assessment of the benefits induced by the profit-sharing contract for the tenants and the SHO with the identification of the energy savings obtained thanks to the regular follow-up of the maintenance interventions made by the energy supplier.

#2: JABURKOVE - CZ
WEB TOOL FOR ENERGY INFORMATION

ESM: Web portal and smart metering system implemented in order to increase the awareness of the tenants regarding the management of their domestic hot/cold water and heating energy consumptions.
OPTIMIZATION: Improvement of the functionality for the web portal and empowerment process for the tenants including: new introduction webpage, complementary distribution of hard copy for the consumptions reviews, benchmarking actions and complementary personal advising.

#3: HERNING -DK
TENANTS INFORMATION IN AN UNIVERSITY PASSIVE RESIDENCE.

ESM: First Social Passive Housing building in Denmark. Tenant information about heating system and tips/motivation in written form has been delivered. H2O College is a university residence, with students' tenants meaning frequent transfers, some period of vacancy in the dwellings and other characteristics regarding the use of the building and its equipment.

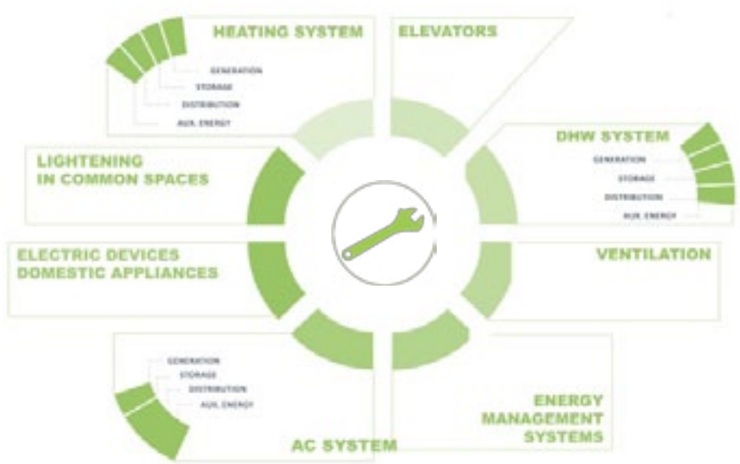
OPTIMIZATION: Existing energy data shows an unacceptable difference between highest and lowest energy consumptions among tenants. A more precise knowledge of the energy behaviors and a complementary tenants' awareness campaign in the building is needed to improve its efficiency. This process will include a survey regarding the tenants behaviors and patterns of energy consumptions delivered thanks to personal interviews, online/postal questionnaires and the implementation of an additional individual sub-metering system

RUNNING MAINTENANCE

#1 : UZAVRENA - CZ
HYDRAULIC BALANCING OF THE HEATING SYSTEM

ESM: Regulation of flow and pressure of the heating system in the building including e.g.: installation of valves on the radiators, implementation of a manual regulation valve in the basement, setting of valves to control the flow rate in the supply network, etc.

OPTIMIZATION: Control of the balanced heating system scheme and technical inspection during the operating period including a recalculation of the heating curve and adjustment of the temperature gradient.



#2: RIESI- IT
CHANGE OF BOILER

ESM: In 2009-2010, a completely new heating system including three condensing boilers in cascade has been implemented, replacing an obsolete boiler with high-energy consumptions.

OPTIMIZATION: Implementation of a smart metering system with an automatic maintenance and regulation of the new heating system (including regulation of the temperature settings and the calibration of the heating curves).

#3: TR16 - SL
HYDRAULIC BALANCING OF THE HEATING SYSTEM

ESM: Hydraulic balancing implemented in the building including connectingvalves on return flow line, additional balancing valves. In all apartments, radiator valves were switched for new thermostatic valves with additional fine regulation.

OPTIMIZATION: According to the assessment from an energy expert, the heating system of the building is over-dimensioned by factor 4; a tuning of the heating curves and conversion to low-temperature heating water in the system is implemented reducing heating power of radiators to 1/3. An additional tenants survey is implemented to follow up the evolution of the tenants' comfort.

REPLACEMENT OF SYSTEMS

#1 : BERGSON - FR
REPLACEMENT OF A VENTILATION SYSTEM IN A REFURBISHED BUILDING

ESM: Using its past experience, Auvergne Habitat has identified that traditional mechanically-controlled ventilation systems are often costly in terms of electric consumptions and create potential thermic loses in highly insulated buildings. The Social Housing Organization is testing a new hybrid ventilation system (that combines natural ventilation with a punctual mechanical help).

OPTIMIZATION: Comparative monitoring between two ventilation columns in the building (one with traditional mechanical ventilation system and one with hybrid ventilation system) and adaption of the regulation for the hybrid ventilation system (working hours, control parameters, etc.).

#2 : PASSONI - IT
REPLACEMENT OF A HEATING SYSTEM

ESM: Substitution of two old twin boilers (power: 98 kW each) with one new condensing boiler (power: 92 kW) using natural gas. This boiler only provides heating; tenants are equipped with single boilers for the production of the domestic hot water in their apartments.

OPTIMIZATION: Implementation of an additional insulation cap on the heat exchanger of the condensing boiler. This insulation cap will reduce the thermic loses and improve the energy efficiency of the system (cf. thermography before and after). Additional Monitoring of the temperatures in several dwellings is implemented in order to better understand the differences between the tenants and resolve the complaints.

#3 : HEINHEMER - GE
REPLACEMENT OF A HEATING SYSTEM

ESM: Replacement of a central standard boiler from 1982 with a new natural gas central heating system including 3 gas calorific boilers working with a lower flow temperature.

OPTIMIZATION: Hydraulic balancing of heating pipeline through installation of modern thermostatic valves and adjustment of the volume flow and pump speed in order to ensure that each radiator will get the same amount of heat. Revision of the control technology of the heating system in order to achieve a longer running time for the burner.

RECENTLY REFURBISHED BUILDING

#1 : AIGUILLADE - FR

GLOBAL REFURBISHMENT

ESM: Refurbishment including: roof insulation, improvement of the ventilation system, external thermal insulation from no insulation to 120 mm of EPS (R = 2,43 m2.kW), windows replacement from wood simple-glazing to PVC carpentries with double-glazing.

The building is connected to a district heating system. The district heating system has been renovated in 2012; the new energy mix is now 80% wood-20% gas.

OPTIMIZATION: Review of the contract with the district heating manager in order to include the energy savings obtained thanks to the refurbishment in the renegotiation of the price for district heating connexion.

#2 : TOLSTEHO - CZ

GLOBAL REFURBISHMENT

ESM: Refurbishment including: external thermal insulation from no insulation to 140 mm of EPS, roof insulation, insulation of the ceiling above basement, windows replacement from wood simple-glazing to PVC carpentries (also implemented in the hallway).

OPTIMIZATION: Thermography and corrective actions implemented around the windows frames where thermal deficiencies have been identified.

#3 : MATHIDENSTRAßE - GE

GLOBAL REFURBISHMENT

ESM: Refurbishment including: new heating system with a low temperature central boiler, external thermal insulation, replacement of windows and repairs on balconies, insulation of the basement, ceiling and the roof. New ventilation system with supply air through the window frame and a central system in the cellar.

OPTIMIZATION: Specific control of the whole ESM (windows, visual integrity of the coat, review of the control for heating system and lowering of its characteristics, repair of the window in the basement).

#4 : PICCO - IT

GLOBAL REFURBISHMENT

ESM: Refurbishment including: external thermal insulation with 80 cm of EPS, existing single glazing has been substituted with high performance double glazing and aluminum frames, cellars windows on the ground floor made of iron with single glass. At the same time, the heating system was improved by the installation of new condensing boilers and solar panels for Domestic Hot Water.

OPTIMIZATION: Direct tenants' awareness campaign implemented in order to improve the energy efficiency of the building (identification of the most performing behaviors, education/training of tenants and monitoring of best practices, etc.).

#5 : LYSTRUP

COMPLETE REFURBISHMENT

ESM: Refurbishment for senior individual housing including: roof insulation, external carpentries and new windows with double heat protection glass, facades insulation with 140mm of mineral wool, solar panels mounted on the roof.

New heating system with district heating supply, shunt and thermostat regulated underfloor heating. Balanced mechanical ventilation with heating coil supplied by district heating network and heat recovery. Domestic Hot Water for the buildings is heated via a heat exchanger (direct connexion by district heating).

OPTIMIZATION: Separation between the heating coil in the ventilation system and the under-floor heating system. The control valve for the heating coil (ventilation system) was already there but non-functional as placed after the control valve for underfloor heating. The scheme has been modified and this valve is now autonomous improving its efficiency and the general thermal comfort in the dwellings.

#6 : TFF2a

EXTERNAL INSULATION

ESM: Refurbishment including: reinforced concrete building with 70mm insulation additionally insulated with external thermal insulation of 70mm (U=0,27W/m2K).

OPTIMIZATION: Thermography detection carried out in order to identify thermal bridges and eventual defects. Additional tenants' awareness campaign with individual meetings led by a specialized provider and diffusion of written notices with energy "tips".

RECENT LOW ENERGY BUILDINGS

#1 : MAARSLET - DK

NEW LOW-ENERGY HOUSING FOR SENIORS.

ESM: Roof insulation: 445mm. Walls Insulation: 330mm EPS. Windows with triple-glazing and aluminium frames and sun Protection (U=1,20 w/ m2*k incl. frame and sash). Solar panels on the roof. Balanced mechanical ventilation with heat recovery and by-pass function. Underfloor heating directly connected to district heating supply. Decentralized heat exchanger for Domestic Hot Water supplied by district heating.

OPTIMIZATION: Domestic hot water is supply directly by district heating network thanks to a heat exchanger (no tank). `The control valve for hot water was adjusted for comfort causing the heat exchanger running idle for fast production. The set-up has been readjusted for heat savings preventing idle. Tenants will have to accept slightly longer waiting time for hot water.

#2: SC9b - SL

RECENT LOW-ENERGY HOUSING.

ESM: New building with 10cm EPS shell insulation, min. 10cm EPS roof/ ceiling insulation and 8cm EPS for the basement floor insulation. Windows with double-glazing. Natural ventilation.

Building is connected to district heating network through a heating substation. Temperature regulated with a night reduction clock, external sensor and immersion sensor. On each floor there is a manifold with apartment connections, each connection has a shut-off valve. Inside the apartments, temperature is regulated with thermostatic radiator valves.

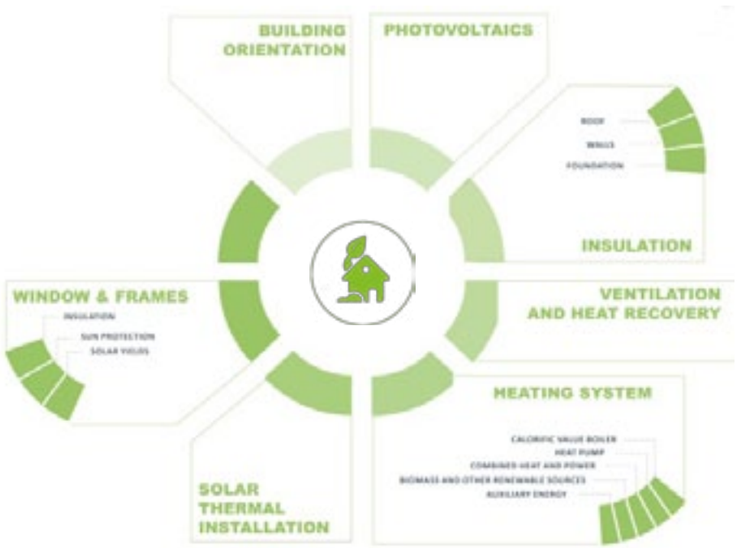
OPTIMIZATION: According to assessment from energy expert, the heating system is over dimensioned by factor 4, a tuning of the heating curves and conversion to low temperature heating in the system is implemented reducing heating power of radiators to 1/3.

#3: WOHNART3 - GE

NEW PASSIVHAUS

ESM: Passive house standard planned in PHPP (Passive House Planning Package - «The modelling software for Passivhaus buildings») including an insulation of the external thermal insulation of the facade with 30 cm EPS, double-flow ventilation system and windows with triple heat protection glazing. Electric warm water tank. The building is connected to a District Heating System.

OPTIMIZATION: Improvement of the energy consumptions for the domestic hot water system adjusting running time of the circulation pumps at night. A collective discussion with the tenants of the building has been implemented in order to implement this measure without damaging their general comfort (overview of the habits concerning domestic hot water and complementary awareness).



Julien Bonnet, Project coordinator
DELPHIS

The post-investment phase is a major challenge for energy savings, as it still contains unexplored potentials. Due to the economic context and the growing complexity of the new systems and design, social housing need to be concentrated on pragmatic solutions and knowledge in order to reach ambitious European objectives concerning energy.

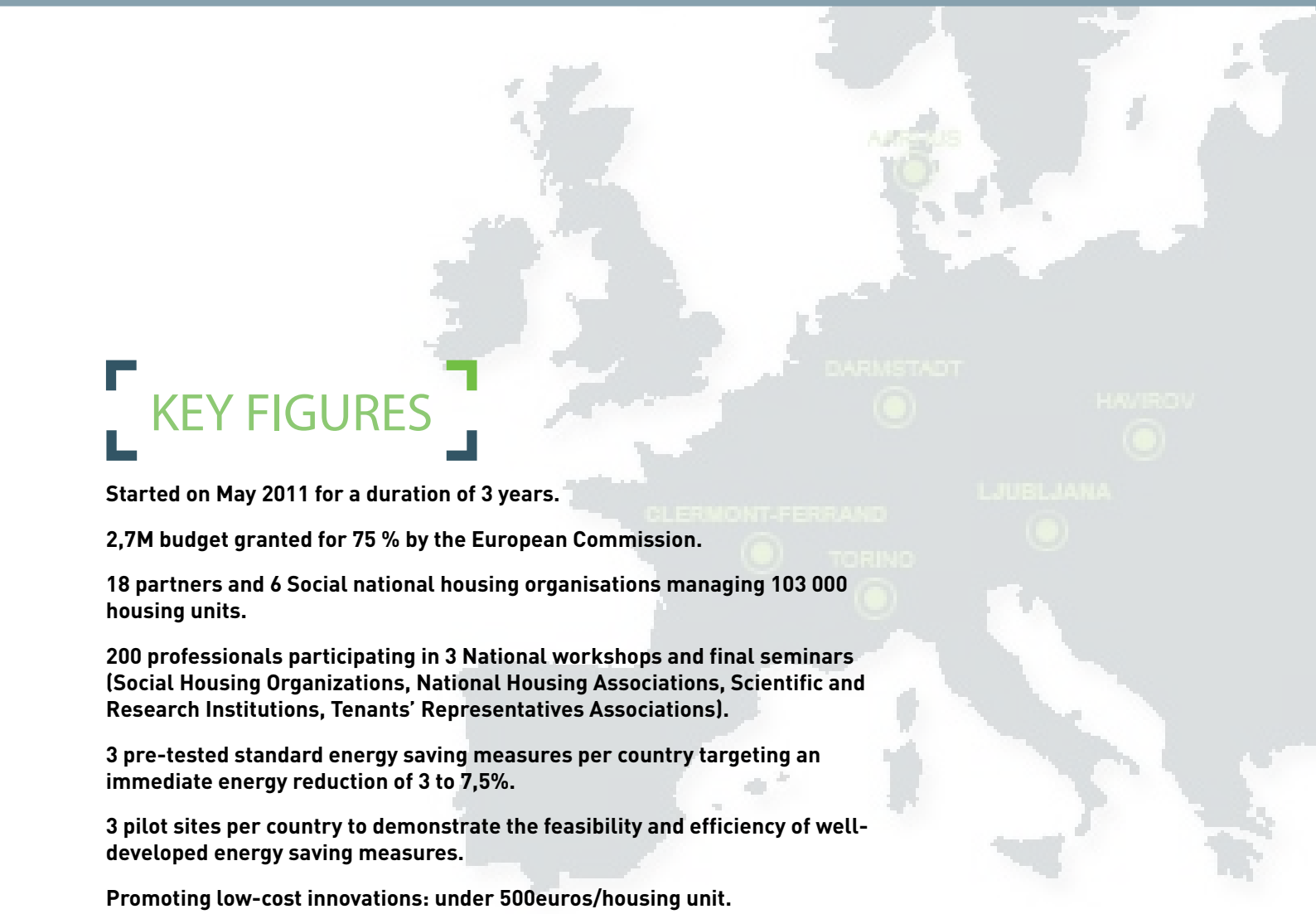
The team behind the AFTER project, which is being presented in this magazine, has been looking for energy solutions to be implemented «after» the design and construction phases. The challenge has been finding adjustments and corrections to bring the building up to its constructed energy and economic performance and then to optimize it.

AFTER is covering a large range of actions related to the energy performance. This includes technical interventions on heating, ventilation or domestic hot water systems, but also measures related to the contracts and tenants awareness. Managing and highlighting this variety of approaches is one key issue for the project.

18 Pilot Sites have been involved in the project including more than 1000 dwellings in 6 different countries. 3 to 7% of additional savings have been achieved concerning these Pilot Sites. These savings are related to already implemented investments such as global refurbishments, replacement of boilers or construction of low- energy buildings.

The interesting results are concerning interventions such as intelligent monitoring solutions for heating, hybrid ventilation, balancing of oversized heating systems, control of the domestic hot water consumptions in low energy buildings or tenants campaigns.

Efficient impacts have been achieved with limited investments. All the results will impact the future routines of our participating Social Housing Organizations and can be used as recommendations and a toolbox for other European Social Housing Companies. The project website, www.afterproject.eu in seven different languages, supply this magazine, and all the detailed information on the project can be found here.



KEY FIGURES

Started on May 2011 for a duration of 3 years.

2,7M budget granted for 75 % by the European Commission.

18 partners and 6 Social national housing organisations managing 103 000 housing units.

200 professionals participating in 3 National workshops and final seminars (Social Housing Organizations, National Housing Associations, Scientific and Research Institutions, Tenants' Representatives Associations).

3 pre-tested standard energy saving measures per country targeting an immediate energy reduction of 3 to 7,5%.

3 pilot sites per country to demonstrate the feasibility and efficiency of well-developed energy saving measures.

Promoting low-cost innovations: under 500euros/housing unit.

http://afterproject.eu/

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