Energy Intelligent Education for Retrofitting of Social Houses

Project supported by: Intelligent Energy Europe

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Introduction

The project "Energy Intelligent Education for Retrofitting of Social Houses" (El-Education) is an action in the framework of the "Intelligent Energy – Europe" Programme.

The primary objectives of El-Education project are to:

- Give the social housing companies and municipalities knowledge and tools to perform energy efficient retrofitting in form of an education programme and
- Prepare a guidebook with best practical examples, ideas and checklists.

The El-Education programme and guidebook will be presented to the municipalities and housing associations of the EU members and associate countries through CECODHAS, the European Liaison Committee for Social Housing. The aim is to raise the awareness of the importance of energy efficient retrofitting.

At national level, the programme and the guidebook will be offered to social housing companies as a part of recognized supplementary education programmes. The El-Education programme will be implemented by organizing national training courses for social housing companies in 6 countries.

The target groups of the project:

The target groups are the National Housing Associations and the social housing companies in Europe.

In many countries social housing companies are related to local authorities, in others it is also involving private housing initiatives. The overall target group includes all the different kinds of social housing companies.

The duration of the project is 24 months (01.01.2006-31.12.2007)

Partners in the project are:

- Aarhus School of Architecture, department for Supplementary Education (AAA), coordinator – Denmark;
- Energy research Centre of the Netherlands (ECN), the Netherlands;
- Cenergia Energy Consultants (Cenergia), Denmark;
- O.Oe. Energiesparverband (ESV), Austria;
- Centre Scientifique et Technique du Bâtiment (CSTB), France;
- Sofia Energy Centre (SEC), Bulgaria;
- Building and Civil Engineering Institute ZRMK (BCEI ZRMK), Slovenia;
- National Association of Housing Companies in Denmark (BL), Denmark;
- Housing Fund of Ljubljana (HF LJ), Slovenia;
- Development, Etudes pour le Logement, la Promotion de l'Habitat, l'Innovation et le Social (DELPHIS), France.

Description of work:

- **An El-Education programme for social housing companies, including a practical guidebook** is under elaboration to motivate and educate them on how to perform energy saving measures. The programme has its base on the best practice projects on energy efficient retrofitting in Europe.
- Implementation of the El-Education programme by organizing **national training courses** for social housing companies in 6 countries.
- **An awareness rising seminar** for Housing Associations will be organized under the auspice of CECODHAS, the European Liaison Committee for Social Housing and inviting ECTP (European Construction Technology Platform).

The seminar will be organized in connection with CECODHAS' annual conferences in 2007.

Expected results:

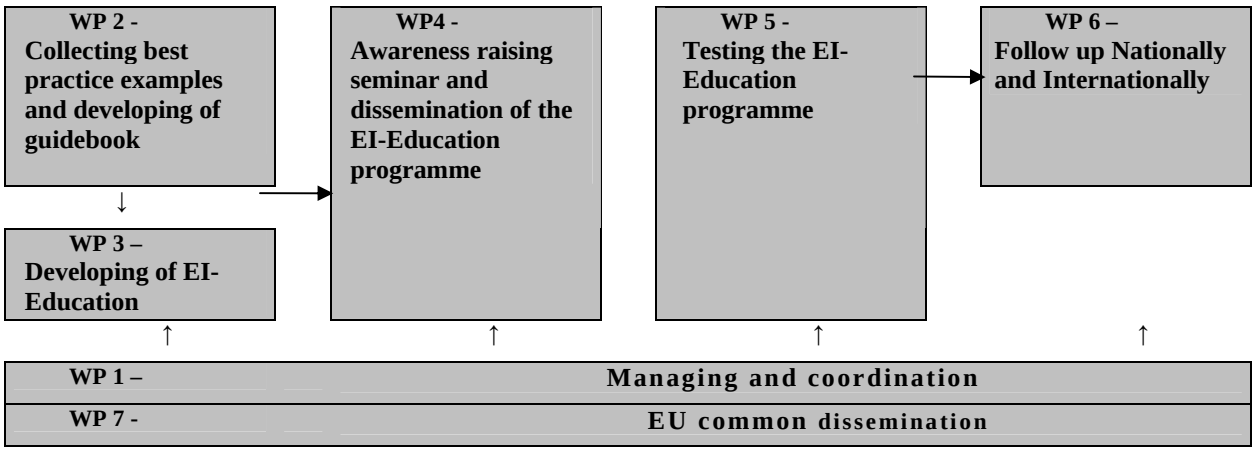
The result of the project will be at least six national El-Education programmes, a guidebook on best practice solutions of energy efficient retrofitting in Europe, and a number of ambassadors within the social housing sector that will advocate for the importance of and the responsibility for the social housing sector to save energy.

Work programme:

The project is divided into the following main phases, which at the same time are the work package structure:

- Managing and coordination (WP1)
- Collecting of best practice examples and developing of guidebook (WP 2)
- Developing of EI-Education programme (WP 3)
- Awareness raising seminar and dissemination of the EI-Education programme(WP 4)
- Testing the EI-Education programme and the guidebook (WP 5)
- Follow up nationally and internationally (WP 6)
- EU common dissemination (WP 7)

The structure of the work programme is summarized as follows:



Guidebook and best practice examples:

On the base of collecting data and experience from the best practice models from other EU projects (GREEN CATALOGUE, E-TOOL, INVESTIMMO, EPIQR and LOCOSOC) the model for collecting the best practice examples is determined. The model contains criteria, such as:

- The increase of energy efficiency;
- The different energy efficiency measures;
- The pay back period, etc.

60 examples where collected from the participating countries and neighbour countries (Austria, Bulgaria, Denmark, France, Netherlands and Slovenia).

Content of the guidebook

Chapter 1: Status quo of renovation (common practice) and needs for innovation and education in the partner countries – short reports from the participating countries

Chapter 2: Why to renovate – needs of refurbishment and high energy consumption in social housing

Chapter 3: When to renovate – organisational and financial preconditions

Chapter 4: How to renovate - In the guidebook the 10 most important elements of saving energy will be described – windows, insulation, ventilation, etc., including financial and organization parts.

Chapter 5: Checklists and tools

Chapter 6: Best practice examples - The guidebook will describe 5-10 best practice examples from each region – from technical, financial and from organizational point of view, demonstrating that it is possible to increase the energy efficiency in social houses by retrofitting by at least 30%.

Chapter 7: Recommendations to overcome barriers and support drivers.

Development of El-Education

An Education programme will be elaborate. The main aim of the programme is to motivate and instruct key persons of the social housing companies and municipalities how to implement measures for energy efficient retrofitting. The programme and the guidebook will be developed electronically and put on the Internet.

It was mentioned that the work on the El-Education project began in the beginning of year 2006. This means the work so far focused on collecting best practice examples and developing the guidebook and El-Education programme. We will not review the other work phases in the current report.

We would like to present a few case studies, which are peculiar to the objectives of the project.

Best practice from Bulgaria

Block №10, district Zaharna Fabrica, Sofia. The multi-dwelling building was constructed in 1947 with 1100 m^2 living area (13 dwellings) and renovated in 2004.

Objectives and results of the project

The objectives of this project were to carry out a renovation and further maintenance of multi-dwelling building which flats are owned by the inhabitants, overcoming the problems that arise from the low incomes of the owners and their different interests. The renovation should also lead to a lower energy consumption and improvement of the comfort of the flats.

The project includes also a whole reconstruction of the roof. On the last floor (attic) there are two common premises that were transformed in small flats. The rent of these new flats will help the reimbursement of the loan.

The project is initiated and realised by Bulgarian Housing Association in partnership with Housing Association De Nieuwe Unie, Rotterdam and Housing Association Woondrecht, Dordrecht.

Fig. 1 Building before renovation

The renovation includes:

- Thermal insulation of external walls;
- Whole reconstruction of attic;
- Water proofing and thermal insulation of roof;
- Thermal insulation of basement ceiling;
- New double glazed windows with PVC frames;
- Improvement of heating system.

The costs of the renovation were 104 750 BGN (approx. 52 375 euros)

Energy saving

Energy consumption before renovation:

KWh/m2 per year: heating 162.6
hot water 30.5
integrated characteristic 194.7

Energy consumption after renovation:

KWh/m2 per year: heating 60.2
hot water 43.8
integrated characteristic 105.6

Percentage energy saving 46%

After the renovation the building get certificate A. Integrated characteristic required for certificate A – 121.7 KWh/m^2 per year.

Fig. 2 Refurbished building

Additional information

- For the realization of the project was registered the first association of owners in Bulgaria;
- The project is financed through a loan from banks from the Netherlands as they offered lower interest rates. The loan is for 20 years;
- The monthly payment of the loan is 700 BGN (approx. 350 Euros), but half of this amount is ensured by the rent of the two new flats in the attic;
- The project can easily be replicated in the neighbouring buildings, as they are the same;
- An energy monitoring was done before and after the refurbishment;

The inhabitants are satisfied by the results. The renovation lengthens the life span of the building with 40 years. The insulation of the external envelope lead to a better comfort and energy saving.

Lessons learned and conclusions

- ☞ **For the realization of refurbishment of a multi-dwelling building in Bulgaria it is necessary to involve all owners and to organise them in an association;**
- ☞ **The costs of refurbishment can be, at least partially, covered by an extension of the building. Most of the buildings could be extended with an additional floor;**
- ☞ The financing institutions should be flexible when giving loans for such projects, most of the owners are with low or medium incomes and the banks should take this into account.

Fig. 3 In process of refurbishment

Best practice from Geneva (Switzerland)

Low rent residential building, rue de Lancy 1-3, Carouge, Geneve.

The apartment building was constructed in 1953 and renovated in 2005. The building has total floor area of 3845 m^2 and 62 dwellings.

The owner is "Fondations Immobilières de Droit Public" (housing association).

The renovation is financed by the owner.

Objectives and Results

The "Fondations Immobilières de Droit Public" presented to the government an ambitious refurbishment project upgrading the building by adding new balconies, transforming the apartments layout and reducing the energy consumption to 26 kWh/ m^2 (87% reduction) for a budget of 64'500 € / apt. The project was refused for political reasons and the budget was cut to 35'650 €/apt. The design team managed to preserve a high energy standard (42 kWh/m^2 - class A) with 44% less financial resources. The secret of this success is the sobriety in the technical choices: high-performance envelope and heat production system and controlled natural ventilation.

Fig. 4 The building before renovation

The renovation includes:

- Roof, façade and floor insulation;
- High efficiency insulation of glazing and frames;
- High efficiency boiler;
- Low temperature heating;
- Controlled natural ventilation;

Energy consumption before renovation was 214 kWh/m^2 and after is 42 kWh/m^2 (for heating and domestic hot water)

Fig. 5 The building after renovation

Lessons learned and conclusions

- ☞ **This project proves that even buildings with very low rents and limited refurbishment budgets can afford high energy performance and indoor environment quality.**
- ☞ **High energy performance means also high building quality.**
- ☞ **High energy performance does not necessarily mean complex, expensive and exotic technical installations. It can also be achieved by robust conventional solutions like high insulation thickness, high performance double glazing and high quality conventional gas boilers. The initial plan was an innovation-**

oriented project. Cost constraints have driven the project towards a radically different strategy (economic, robust and well known common technical solutions). The result in kWh/m2 is not very different.

It was mentioned earlier that up to now the efforts in the project execution focused on determining the model for collecting the best practice examples, as well as gathering and studying them. Thus over 60 examples have been collected.

Some preliminary examination of the data and information in the presented best examples leads to the following conclusions:

- **The comparison between the retrofitting models in different European regions is extremely important.** From the presented examples it is clearly seen that in various region are applied different measures for refurbishment of the buildings and improving the energy efficiency.

  The development of the guidebook with ideas and guidelines for technical, financial and sociological solutions for the Northern, Southern, Eastern and Western countries is of extreme importance.

- **The increase of the energy efficiency in the presented examples ranges from 25% to 94%. The average value is 50%.** The highest values for energy consumption before renovation - 312 kWh/m^2.a and after renovation - 245 kWh/m^2.a come from an apartment building in Ljubljana (Slovenia). The lowest values for energy consumption before and after renovation respectively – 75 kWh/m^2.a and 30 kWh/m^2.a in an apartment building in Riedim Junkreis (Upper Austria). The result is energy saving of 60% but only 45 kWh/m^2.a.

The conclusion, one can make, is that the renovation of a building aimed at increasing the energy efficiency can be done both in old building in poor condition as well as in new buildings.

- **The cost of renovation in Euro per m^2 varies in wide range.**

  An example of a high cost would be Geneva and Lausanne (Switzerland) where the cost of renovation is 607 Euro/m^2 and 660 Euro/m^2 respectively. The cost of renovation in Slovenia, Bulgaria and Latvia ranges from 23 Euro/m^2 to 89 Euro/m^2 with average energy saving of 42%. In Austria the average cost for renovation is 356 Euro/m^2 and the average value of energy saved is 58%.

The cost for renovation depends on:

- Whether the measures applied are for energy efficiency only or for renovation of the building in general;
- The number of different measures taken;
- The characteristics of the suggested measures (traditional or ones requiring high technologies);
- The standard of living in the country.

☞ **Main refurbishment measures**

The main measures taken can be divided in the following types:

- *High envelope performance, including:*
  - Insulation of façades;
  - Insulation of the roof;
  - Insulation of the top ceiling;
  - Insulation of the ground floor;
  - Double glazed windows with PVC frames;
  - Renovation of the balconies;
  - Renovation of the entrances.
- *Improvement of the heat systems*
  - Insulation of distribution pipes;
  - Management and control system;
  - Installation of heat meters;
  - Installation of heat valves;
  - New energy-efficient boiler.
- *Installations*
  - Mechanical ventilation with heat recovery.
- *Renewable energy sources*
  - Solar thermal collectors;
  - PV-systems.

The above mentioned measures are the main conventional solutions and with them high energy performance can also be achieved.

In lieu of a conclusion to this report I would like to present some lessons learned and conclusions form the best practice examples.

- **Austria**
  - It is worthwhile to involve and inform the occupants well and to listen to their wishes and proposals and, where possible, to fulfill some of them.
  - New buildings in GIWOG (social housing association) should be equipped with mechanical ventilation from now on.
  - The energy saving potential is very high but is dependant also on the user behaviour, especially with the new windows and installed outside walls.
- **Bulgaria**
  - For the realization of refurbishment of an apartment building in Bulgaria it is necessary to involve all owners in an association.
  - The implemented insulation of external walls, roof and basement are cost-effective.

- **Latvia and Lithuania**
  - It is very important to involve all occupants in the process of refurbishment.
  - A flexible financing scheme would help for a better implementation and better results.
  - The availability of grants, soft loans and flexible credits is necessary for the realization of projects for renovation of multi-dwelling buildings.
  - The role of the municipalities is very important for the implementation of a wide-scale social housing refurbishment.
- **Denmark**
  - PV modules are efficient.
  - The individual heat recovery ventilation system has performed well and contributed to a much improved indoor air climate.
  - Solar low energy retrofit projects are among the most important in the housing sector in Denmark.
- **France, Germany and Switzerland**
  - The improvements of the apartment buildings increase their quality and the living comfort.
  - Balanced ventilation with heat recovery can be achieved even if interior interventions must be avoided.
  - Solar thermal panels for DHW and PV for pumps, ventilation and lightning are good solutions.
- **The Netherlands**
  - The effort to communicate with tenants has contributed to a final success.
  - The total living costs after the renovation cannot increase.