

# ONLINE BENCHMARKING OF A SUSTAINABLE INITIATIVE IN SLOVENIA

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## ABSTRACT

Municipality Jesenice, a steel industry city in Slovenia, went through economic problems and political changes in the 1990s. Due to the Residential law the former rental flats in poorly maintained social housing stock were in 90% privatized, at a very low price, mainly by low income inhabitants. The city district heating company identified over 40 buildings (1400 flats) with delivered energy consumption for heating exceeding 150 kWh/m<sup>2</sup>a, where interventions are needed. As a part of EIE project EffCoBuild and in cooperation with local authority the measures, like web-site benchmarking, progressive subsidies and pilot energy certification of buildings, were prepared aiming to help the large residential buildings in Jesenice to develop sustainable maintenance and renovation projects. The paper presents more in detail the energy indicators in existing buildings, CO<sub>2</sub> saving potentials, the municipal measures for stimulating the refurbishment and clients' acceptance as well as good practice cases.

**KEYWORDS:** apartment buildings, sustainable management, benchmarking

## INTRODUCTION

The majority of the social housing sector in the municipality Jesenice was built after the WW2, moreover in the period of rapid development of steel industry between 1960s and 1970s. The dwellings were originally property of the state, rented out at a low social rent, which was sufficient neither for proper building maintenance nor for technical improvement. In the 1990s the economic situation in the steel industry in the region became worse. This led to massive layoffs and often to unemployment of residents in the social housing stock. In the mid 1990s the Residential law encouraged privatisation of former rental flats in poorly maintained social housing stock. About 90% of rental flats were privatized, at a very low price, mainly (64%) by low income inhabitants (Figure 1). In addition, many inhabitants of these neighbourhoods are today retired, often with small pensions, and thus they are not financially able to keep up with the maintenance or even renovation costs of their apartments/buildings. In some cases they even face fuel poverty.

Currently, one can observe that over 80% of 304 existing big apartment buildings in Jesenice need intensive renovation, due to functional reasons, energy and environmental challenge and high running costs. On the other hand city district heating company, which delivers heat to 130 apartment buildings, identified over 40 buildings (1400 flats), large energy consumers, with delivered energy for heating over 150 kWh/m<sup>2</sup>a. As a part of EIE project EffCoBuild and in cooperation with local authority and municipal key actors (utilities, building owners, building management companies, technology suppliers) the energy saving potential of the existing building stock was evaluated and the municipal measures were prepared aiming to help the large residential buildings in Jesenice to develop sustainable maintenance and renovation projects.

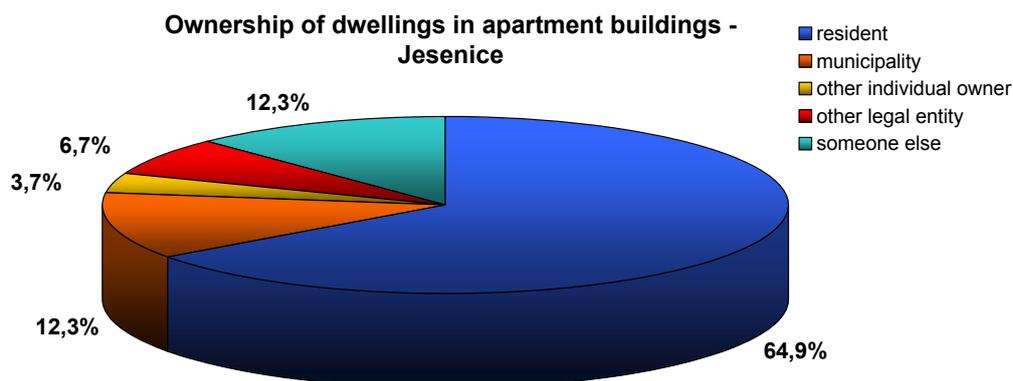


Figure 1. Ownership of apartment buildings in Jesenice (Source: Statistical office of Slovenia, Census 2002)

## **BUILDING STOCK IN JESENICE**

Currently the total residential building stock area covers 546.500 m<sup>2</sup>, i.e. 60% of the stock, the non-residential building floor area is estimated at 364.300 m<sup>2</sup>; i.e. 40% of the stock, and from that the public buildings floor area is 43.000 m<sup>2</sup>. 58% of dwellings were erected in the period 1945-1980, and therefore exhibit high energy saving potential, due to the low insulation of the envelopes and old-fashioned HVAC technologies. Renewable energy sources come to the agenda but a break through for their wider implementation is still to be reached.

These technically based difficulties are combined with continuative decrease of steel production, decrease of workers income and consequently with lower capability of inhabitants to invest in maintenance or event energy efficient refurbishment of the building stock. In the last 20 years the environmental issues came strongly to the agenda of Municipality Jesenice. The environment, once polluted because of the industrial emissions, is being continuously improved. The emissions caused by low quality of buildings and low efficiency of heating systems have been systematically focused since 1999. To complement the existing awareness raising activities and programmes of subsidies also additional programmes are needed to inform and teach the building owners and users about the energy efficiency and to stimulate the realisation of energy savings through EE investments as well as through behavioural change, not neglecting more and more important public participation decision making

The central part of the municipality is heated by district heating. The town has the sixth largest (according to heat capacity) district heating system in Slovenia that covers 43% of demand in building sector. Around this area at the outskirts the natural gas network is being developed, that contributes 7% to the energy supply; while 48% of the building sector in more distant locations are supplied by oil, biomass and combined systems. In more scattered locations there are still the individual heat generators using coil. The reduction of the latest is planned, either to switch to natural gas or to use alternative energy sources (preferably wood biomass).

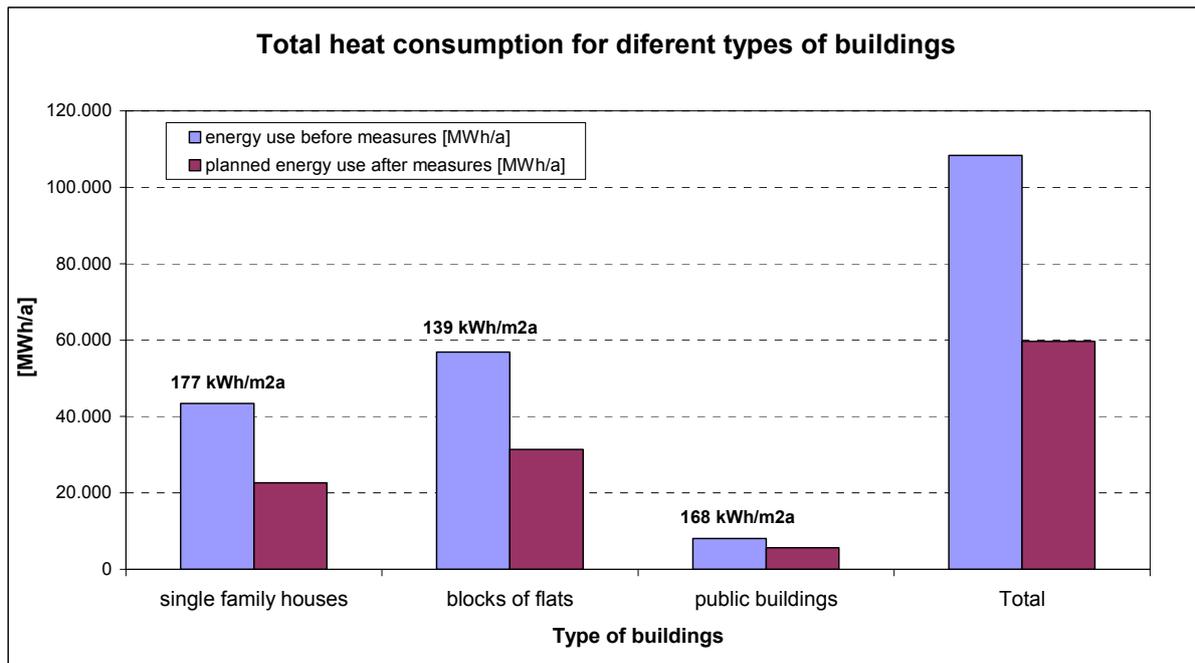


Figure 2. Total energy consumption in the building sector in Jesenice municipality before (indicated figures are related to existing situation) and after the theoretical implementation of identified energy saving potentials

The estimated energy savings in residential and municipal housing stock could reach 45% (48.642 MWh /year) in case of implementation of the most important energy saving measures (envelope insulation, refurbishment of heating systems and heat generators, improved local and central regulation, hydraulic balance of the heating system, installation of thermostatic valves, heat metering and billing according to actual energy use) (Figure 2). 30% of the identified energy saving measures exhibit the payback below 10 years.

In the case of the implementation of the proposed measures, the municipality Jesenice could reduce CO<sub>2</sub> emissions in the building sector by 8.4 million tones per year in single family houses, by 6.0 million tones per year in apartment buildings and by 0.6 million tones per year in public building sector.

## MUNICIPAL MEASURES TO STIMULATE BUILDING REFURBISHMENT

On the basis of detailed analysis of the energy saving potential, it was concluded, to build the concept of measures for Jesenice around the most problematic municipal sector – the existing apartment building sector. This sector has on one hand the highest saving potential and on the other hand the biggest problems with realisation of this potential, due to well known barriers in recently privatized apartment buildings: building owners and / or tenants with low income, low “social capital” in residential building sector, lack of building users’ interest and motivation for improvement, scattered ownership of recently privatized existing apartment buildings, and thus the lack of consensus for common actions; lack of interest and expertise for EE projects at building management companies, organisational barriers due to building regulation (consensus, loan guarantee), lack of technical information and lack of best practice information from the neighbourhood.

On the basis of workshops in the local community, in cooperation with key actors on the national level, following the existing boundary conditions in the municipality and international consultation in the EIE EffCoBuild team, possible municipal measures were highlighted and finally confirmed. The ideas for the municipal measures were developed around the four main activities.

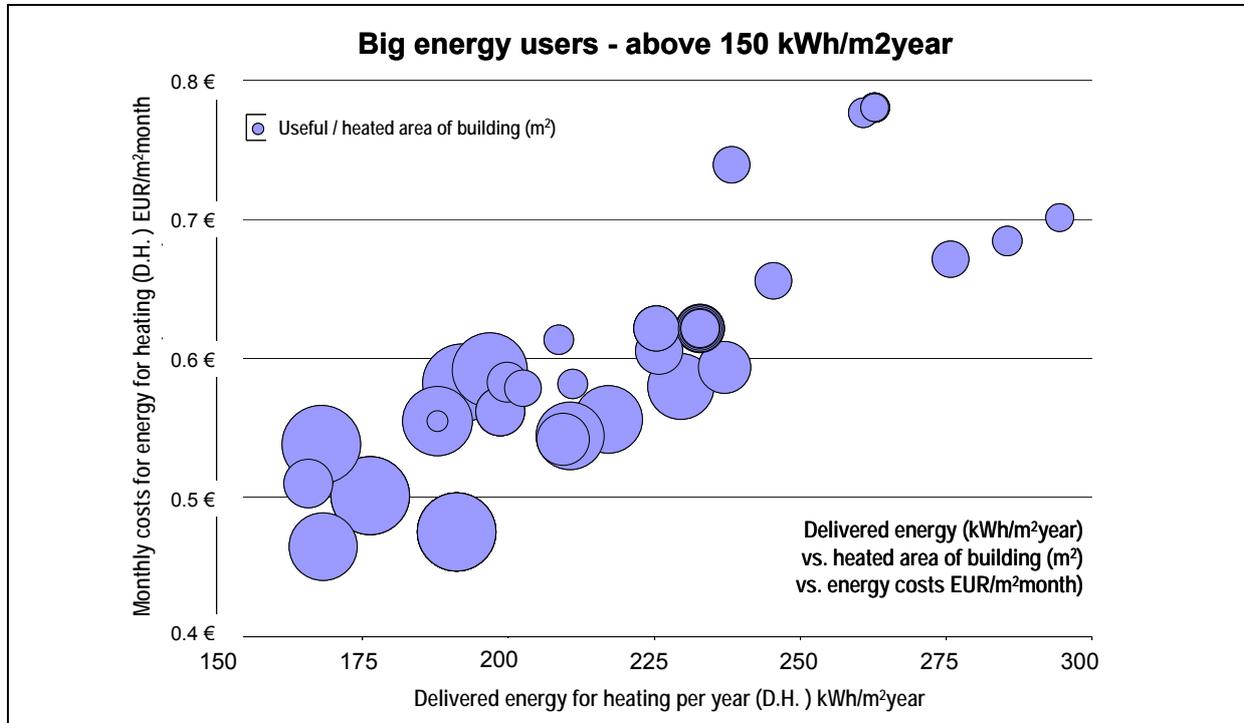


Figure 3. Energy use and energy costs indicators for 40 older apartment buildings - big energy consumers in the municipality Jesenice, the core target group for the implementation of the concept of measures

### Progressive municipal subsidies

Municipality Jesenice introduced a municipal “150 subsidy programme” for RES and RUE investments back in 2000. The grants are available for big energy consumers (above 150 kWh/m<sup>2</sup>a) (Figure 3). The problem of this existing measure is relatively low yearly budget and secondly the grant is too low to remove the »lack of many« barrier, which is the main barrier in the worst condition buildings. The new idea was to allocate additional municipal budget in of 45.000 EUR in 2007 to develop progressive subsidies scheme for 40 big energy consuming buildings, based on diversification of percentage of subsidy according to the energy consumption: 10% - 15% for 150 – 180 kWh/m<sup>2</sup>a buildings (24 potential cases according to 2006 status), 15% - 20% for 180 – 210 kWh/m<sup>2</sup>a buildings (17 potential cases), 20% - 25% for 210 – 230 kWh/m<sup>2</sup>a buildings (7 potential cases) and 30% for more than 230 kWh/m<sup>2</sup>a buildings (1 or 2 cases expected). The aim is to actually offer bigger contribution to the worst buildings.

In practice the biggest energy consumers are apartment buildings from 60-ties, with low insulation, insufficient maintenance, used by owners and/or tenants with low income (retired, unemployed). Co-financing 30% of investment in combination with additional subsidies at the national level and soft loans should enable the financing of the measures even in the

described conditions. Eligible measures are the insulation of the envelope, replacement of windows, connection to district heating, installation of heat pumps and solar systems or hot water generation and installation of wood biomass boilers.

### **Contracting in top 40 apartment buildings**

Municipal district heating company JEKO-IN and recently privatized company for heat generation in Jesenice ENOS have developed the idea to stimulate energy performance contracting projects in Jesenice buildings. In spite of the fact that not all measures in the building sector are interesting enough for energy service companies (ESCOs) (long pay back period of building envelope measures), the actors believe that these projects are feasible with the financial participation of building owners.

Successful energy performance contracting has certain rules, like creation of the pool of buildings with big saving potential to reduce the risk and the freedom to implement only the most cost effective measures, which normally exclude measures regarding envelope (insulation, windows). The later are highly needed in Jesenice building stock also because of the maintenance reasons.

Being aware of contracting rules and on the other hand taking into account the broader aspect of good building management the contracting actors decided to further develop the idea of contracting with involvement of owners in part of the investment (related to maintenance works). For the contracting period such participation model was considered, that users participate in the savings, in order to increase the interest in project.

### **Training of building managers**

Building managers and/or building management companies are obligatory in Slovenian apartment buildings based on the Residential Act. Based on the management contract, signed with the building owners, their role is to prepare the maintenance and investments plan and to organize all kind of refurbishment works. For the technical improvements the 100% consensus of building owners is needed. The role of building managers in identification of the energy efficiency projects may be crucial, since many of measures are linked with regular maintenance works or can be done at the lowest price in such a moment. There are already some best practice cases available of such a successful interaction between building manager and the owners, but in general such companies need additional education in identification of the most feasible projects, stimulation building owners to come to a consensus, detailed technical knowledge, preparation of tenders and evaluation of bids, and in financing possibilities; above all, they need to share the information about overcoming the barriers and best practice cases.

### **Web-site benchmarking**

“Web-site benchmarking” is an umbrella name for a set of measures using internet for communication with the target group: building owners (incl. users, tenants) and/ or building managers in order to stimulate the EE renovation projects in building sector in Jesenice and to facilitate the use of available municipal co-financing instruments and other national supporting instruments. Currently, the biggest problem is to build a refurbishment project, i.e. to move from the identified energy saving potential to actual decision for the implementation of the measure. Internet was considered to be a powerful tool to bring the general information about the actual energy use, the actual building condition, the energy saving potential to the

relevant target group (building managers, building owners, ESCOs, technology suppliers and building contractors). Communication with key actors through a home page of municipal district heating company JEKO-IN is used also to present energy performance certificates, thermographic pictures, available financial incentives, energy advisory options; as well as it is planned to disseminate the useful results of other EIE projects in the field of municipalities, social housing, energy certificates and passive house renovation.

Web-site benchmarking of delivered energy for 40 big apartment buildings in the centre of Jesenice, connected to district heating, and considered as big energy consumers in the heating season 1998/99 due to delivered energy above 150 kWh/m<sup>2</sup>a, was developed. The data are available on the EffCoBuild section at JEKO-IN homepage (<http://www.jeko-in.si/index.php?i=137>). JEKO-IN, as a municipal utility, can provide updated data on energy consumption which can be compared with the data for recent years as well as with almost 10 years old information on energy consumption. In addition all 40 buildings are presented also with pilot energy performance certificates (Figure 4), thermographic pictures and various energy indicators (Figure 5). A recommended scenario of building refurbishment is based on energy audit results and on life cycle thinking in planning of sustainable maintenance and refurbishment.

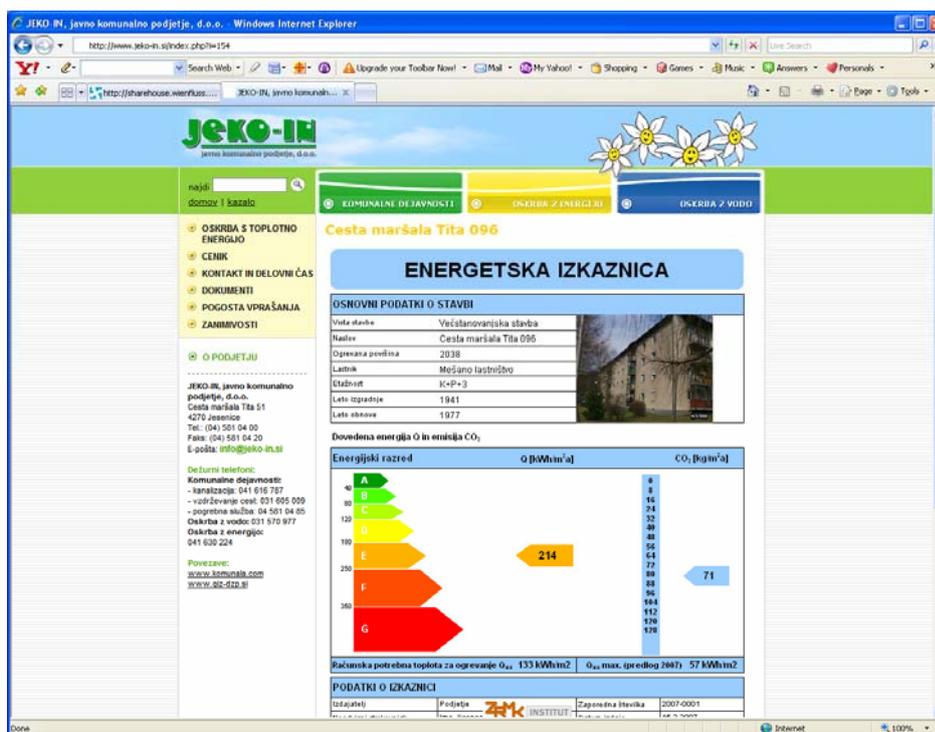


Figure 4. Example of an energy certificate, available on-line, for 40 top energy consumers

The specific energy indicators of 40 big consumers are compared also with the energy indicators of all 130 residential buildings in the municipality, connected to the same district heating system. The observation showed that 46 buildings with the lowest energy consumption (65 – 120 kWh/m<sup>2</sup>a) have heat metering devices installed and they have billing by actual energy consumption established. It is interesting that in this group of buildings the envelope insulation level did not have the prevailing impact on the energy consumption, the users' behaviour and motivation for savings was of utmost importance. The existing

buildings with renovated heating systems but without heat metering and billing demonstrated higher energy use (130 kWh/m<sup>2</sup>a).

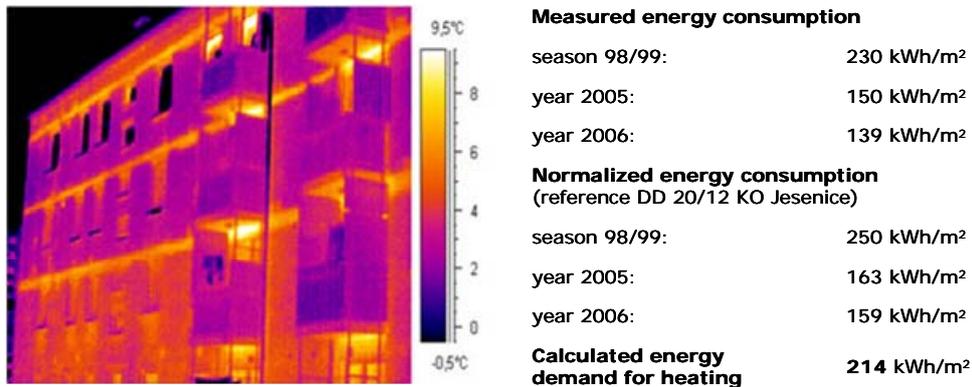


Figure 5. Example of IR thermography and energy indicators, available on-line

The selection of 40 buildings originates from almost ten years ago when municipality Jesenice financed an energy audit for them. Since that time some buildings already implemented renovation measures while the other remained the same. Based on this follow-up activity the key actors can be informed about the saving potential and the impact of the implemented measures. The information is presented graphically, using Google map tool, with indicated ranking by red colour – for a big potential, yellow colour – for an average condition, green colour – for good buildings, already refurbished in recent years. Further information on energy use can be obtained by clicking on the selected building on the map. The aim of the measure is information and awareness raising of key actors, and further deployment of successful renovation cases.

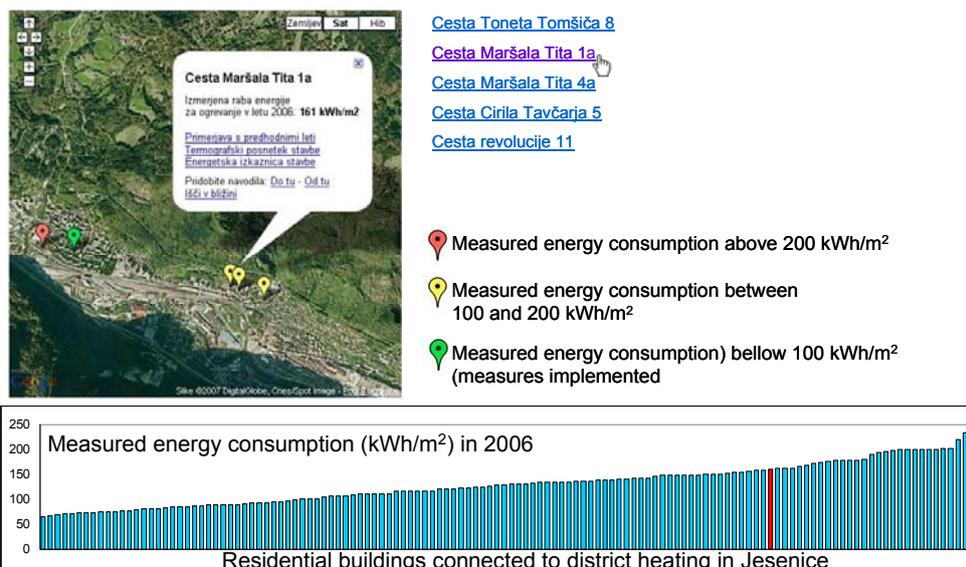


Figure 6. Ranking of buildings on-line (<http://www.jeko-in.si/index.php?i=179>)

Best practice in renovation is important due to the replication possibility; therefore a brochure with 10 best practice cases in Jesenice was prepared. A case study of renovation of an

apartment building at address Cesta marsala Tita 16, built in 1966 and refurbished in 2000 demonstrated 40% of absolute energy reduction per a building as a whole, and 50% reduction of specific energy savings, from 165 kWh/m<sup>2</sup>a to 86 kWh/m<sup>2</sup>a. In the building with 7 floors and 1412 m<sup>2</sup> of floor area the wall and roof insulation was added (29.500 EUR) and windows were replaced (26.000 EUR). Specific investment in renovation was 39 EUR/m<sup>2</sup> of useful floor area. In addition the connection to district heating system was done. CO<sub>2</sub> emissions were reduced by 18 t/a.

## **CONCLUSION**

Preliminary field trial of the Jesenice homepage for web-site benchmarking demonstrated a great interest for the available information among the key actors (building management companies, housing companies, building owners and technology providers). Once the homepage is completed (planned in March 2008) the dissemination phase will begin, which is the most important for achieving the actual goal – development of energy renovation projects. Utility JEKO-IN has a possibility as well as a commitment by the Energy act to disseminate the information about the energy efficiency status to the customers. The municipality believes that the described set of municipal measures gives a necessary framework conditions for generation of renovation projects. The later is important since Slovenia has not only the aim to improve the buildings technical and aesthetic quality, to reduce the energy costs and to improve the indoor comfort parameters, but also to reach ambitious CO<sub>2</sub> reduction targets, set by Kyoto protocol, EU directive on Energy performance of buildings (2002/91/EC) and EU directive on Energy end-use efficiency and energy services ESD (2006/32/EC).

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