Analysis of the Influence of Energy Performance of Buildings on the Romanian Real-Estate Market

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SUMMARY

Investors, property owners, and tenants show an increasing interest in energy efficiency of buildings. Energy efficiency is correlated with potential energy savings, which are considerate a good motivation for all levels of the society, from governments until end-users, to have an active role in EU policies. A new trend in real-estate business can be notice lately: consideration of energy savings as a marketable feature of buildings. New methodologies are needed to quantify it. This paper presents a new methodology to calculate the added value of buildings, generated by its energy performance. The method is useful in daily practice of real-estate valuation. A case study from the city of Iasi (Romania) is presented.

INTRODUCTION

On 17 December 2008, the European Parliament passed resolutions for 20/20/20 energy goals, which means 20% reduction in greenhouse gas emissions compared to 1990 and 20% share of renewable energy until 2020 [1] Different terms are used all around the world to underline benefits of buildings with low associated green-house-gas emissions: energy efficiency, green value, sustainability.
Definition of green buildings, presented in the upcoming ASHRAE Standard 189.1P assumes that green features increase economic value of buildings over time; "a high performance green building is a building designed, constructed and capable of being operated in a manner which increases environmental performance and economic value over time, seeks to establish an indoor environmental performance that supports the health of occupants, and enhances satisfaction and productivity of occupants through integration of environmental-preferable building materials, and water-efficient and energy efficient systems" [2]. It must be underlined that this definition includes terms such as increase of economic value, which suppose there is an impact of green value on the real estate market. The American Appraisal Institute is making efforts in facing the challenge. A seminar „Valuation of Green Residential Properties" organized for valuers who want to enhance and expand their current real estate practices into the green building industry was recently introduced [3].
Same as in U.S, impact of energy policies on people mentality and as a consequence on the real-estate market may be noticed in Europe. Real-estate valuation organizations react. The Royal Institution of Chartered Surveyors (RICS), published a guideless notes on the necessity that sustainability features should be taken into consideration in valuation process [4]
Banfi et al. studied the impact on the real-estate market of energy performing buildings, in the context of the Swiss housing sector [5]. Their analysis includes both renovated and new

buildings, single family houses and renting apartments. The study points out a significant willingness to pay for energy efficiency attributes: about 3 percent of the standard case price for having an enhanced insulated façade, 8 percent of the standard case price for having a ventilation system in new buildings and 13 percent for having energy-efficient windows in old buildings.
In European countries, Energy Performance Certificates will be compulsory soon. Many questions regarding impact, extent and enforcement of Directive 2002/91/EC (EPBD) implementation are still being raised [6], [7]. One of them is, that even if everybody agrees that the impact of energy efficiency on the real estate market cannot be neglected anymore, new appraisal methodologies for valuing added value generated by energy performance are not available yet. Since, EU buyers/sellers seems to become sensitive to energy efficiency features during transactions, expert valuers, which reflect the market by doing estimation of the most likely selling price of buildings, must take it into consideration. Their reports are necessary for many purposes: financial reporting, lending, securitization, insurance and investments. Therefore, new methodologies to quantify impact of energy efficiency of buildings on the market are highly needed.
This paper presents a new methodology to calculate the added financial value of buildings generated by energy performing. The method, based on the sales comparison approach methodology, is recommendable in daily practice of real-estate valuation. A case study from the city of Iasi (Romania) is analyzed.

METHOD

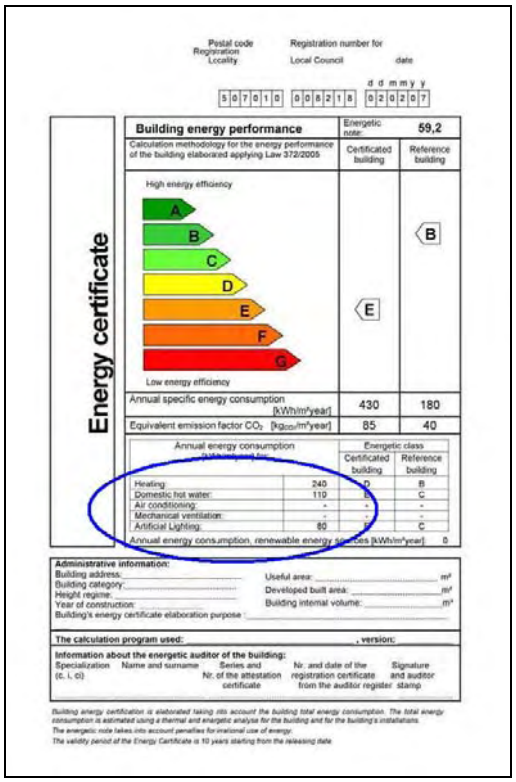
Valuation of buildings by the sales comparison approach is based on the idea that identical properties should have identical prices when they are sold. The property to be valuated is called “subject property” and the properties which offers comparison market data are called “comparable properties”. The valuation process consists in several steps: analysis of prices of comparables, making adjustments in accordance with differences between the comparables properties and the subject property, calculation of an indicated value for the subject property. This paper proposes calculation of economic added value for energy efficiency, by using sales comparison approach.
The proposed methodology uses the so called “Energy Saving Potential” (*ESP*) as input in calculation of derived value of the subject property [8, 9]. The Energy Saving Potential for each type of energy is calculated by the Equation,

$$ESP = \left(E_{demand}\right) - \left(E_{sample}\right) \qquad (1)$$

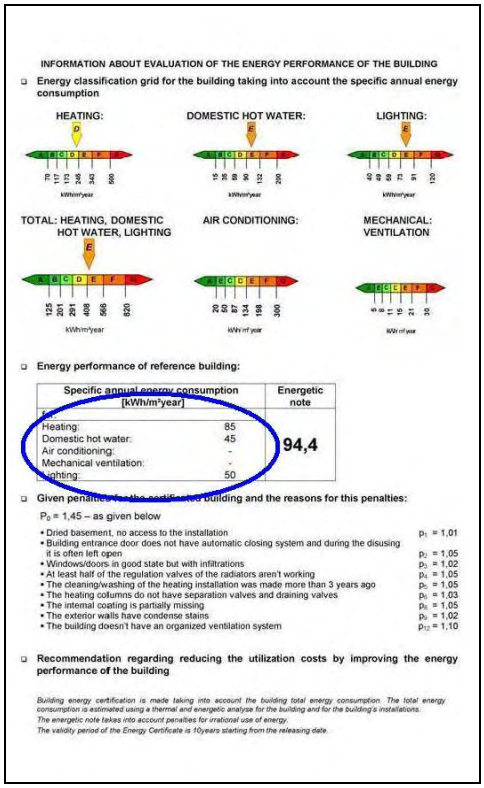
where:
ESP - annual Energy Saving Potential [kWh/m².year];
E_{demand} - annual energy demand [kWh/m².year];
E_{sample} - annual energy demand of the sample [kWh/m².year].
The energy demand of the sample can be calculated with following Equation,

$$\left(E_{sample}\right) = \left(\frac{1}{m} \cdot \sum_{j=1}^{m} E_{ref,j} \right) \qquad (2)$$

where E_{ref} is the reference rate extracted from the EPC, for *m* buildings constructed under same construction codes.
There are different definitions of reference rates and calculation procedures for each EU country and methodologies must be adopted accordingly. For Romania, it is recommendable to use in Equation 2, the energy demand for the reference building. In Figure 1, the EPC from Romania is presented including indications about were the E_{demand} and the E_{ref} can be found.



Page1. Energy demand E_{demand} .



Page 2. Energy reference E_{ref} .

Figure 1. Romanian Energy Performance Certificate.

The methodology presented here considers that costs of *ESP*, during the remaining economic life of the building generates depreciations/appreciations due to energy efficiency. The financial benefit or added value of *ESP* is calculated as follows,

$$V_{ESP} = MAR \cdot ESP \cdot (C_E) \cdot \left(\frac{(1+i)^t - 1}{(1+i)^t \cdot i} \right) \qquad (3)$$

where:
V_{ESP} - value of costs of Energy Saving Potential [EUR/m^2];
MAR - market adjustment rate;
ESP - annual Energy Saving Potential [kWh/m².year];
(C_E) - price of the unit of energy [EUR/kWh];
t - remaining economic life-time of the building [years];
i - discount rate.

Adjustments A_k of each comparable *k* are made with the Equation

$$A_k = (V_{ESP\,comp\,i} - V_{ESP\,subject}) \cdot S_{subject}. \qquad (4)$$

By applying adjustments to each comparable, the derived value of the subject property can be calculated.

RESULTS

As an example, valuation for a thermal retrofitted apartment, situated in a block of flats from the city of Iasi (Romania) was done. The tested methodology was applied only for appreciations/depreciations generated by the energy demand for space heating. No other type of energy was taken into account.
The subject property and the comparables used in the sales comparison approach were apartments situated in block of flats constructed in the period 1973-1975. The required thermal resistance in that period were: R=0.8 m^2K/W for exterior walls, R=1.02 m^2K/W for the terrace and R=0.87m^2K/W for the basement. A number of 22 EPC for buildings, constructed in the same period as the subject property and the comparables were used for calculation of annual sample energy demand (E_{sample}).
The following data were used for calculation of added value generated by energy performance: current price of natural gas is C_E=0.0296 EUR/kWh; market adjustment rate *MAR*=1; discount rate 8.0 %; total economic life-time of the building 60 years, surface area $S_{subject}$=67.34m^2; E_{sample}=149.01[kWh/m^2 year] ; $ESP_{subject}$= -6.84[kWh/m².year]; $ESP_{comp\ 1}$= 117.82[kWh/m².year]; $ESP_{comp\ 2}$= 126.13 [kWh/m².year]; $ESP_{comp\ 3}$= 115.33[kWh/m².year].
The market value represents the value to be reached by appropriate calculation. Results are presented in Table 1.

Table 1. Results of study case.

Valuation method	Calculated value of the subject property [EUR/m^2]
Market value	815.74
Value calculated by using the classic methodology	764.53
Value calculated by using the proposed methodology	807.72

As it may be noticed, the market value of the retrofitted property is higher than the derived value calculated by using classic methodology, which neglect energy efficiency. The proposed methodology can perform a better valuation by including costs of energy savings calculated with Equation 3.

DISCUSSION

The paper presents a method for calculation of added value generated by energy performance of buildings. The method is useful in calculation of value of thermal retrofitted buildings when the market can offer, for valuation process, only transaction prices of non-thermal retrofitted buildings. The method is in accordance with basic valuation principles.

Results seems to indicate that market trends indicate that sellers/buyers are sensitive to energy savings, but in a broader sense more correlated with sustainability. The willingness to pay more is generated by the willingness to have a modern, healthy, comfortable property, which includes energy performance.

ACKNOWLEDGEMENT

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