Latvian Experience in Building Energy Certification

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Abstract

The paper is devoted to the analysis of the results of buildings' energy certification scheme implementation in Latvia. The paper gives description of the buildings' energy certification scheme existing in Latvia. The results of practical trial implementation of this scheme on 139 multi-storey apartment buildings in Ogre town are thoroughly analysed in this paper. Especial attention is paid to the comparison of building heat consumption before (2002/2003) and after (2003/2004) buildings' energy certification and labelling, which gave possibility to find influence of buildings' energy certification on buildings' energy consumption.

Keywords: building energy certification, building energy consumption

1. Introduction

According to the Directive 2002/91/EC on the energy performance of buildings all member states of the European Union have to introduce the energy performance certification of buildings until 4 January 2006. The Directive does not forbid member states to implement their own building's energy certification schemes as no common methodology can be developed in so short time.

Latvian scheme of building energy certification was developed by O.Belindzeva-Korkla and A.Kreslins in 2000 [1], taking into the consideration two main assumptions: first, the scheme has to evaluate thermal performance of buildings, and second, it has to stimulate the behaviour of the inhabitants in order to make them use energy more rationally. It was proposed to base the rating scale on measured annual heat consumption and to adjust it to the influence of weather conditions and differences in the level of occupancy.

This system of building's energy certification was tested with the support of EU LIFE programme in Ogre town on 139 multi-storey apartment buildings with total area of 354 265 m^2.

The main aims of building's energy certification programme in Ogre town was to achieve the reduction of buildings' energy consumption and to try, for the first time in Latvia, to implement in practice theoretically developed energy certification scheme.

2. The rating scale of Latvian heat consumption certification scheme

The Latvian scheme of energy certification is based on unique rating criteria – standardized annual specific heat consumption, which is based on real measured heat consumption for space heating and hot water supply.

Standardized annual specific heat consumption:

$$q_{st} = \frac{q_{s.h.} DD_{st}}{DD} + \frac{q_{d.w.} A}{30n}, \; kWh/m^2 \; year \qquad (1)$$

where:

$q_{s.h.}$ - measured specific consumption for space heating in rating year, kWh/m^2 year,
$q_{d.w.}$ - measured consumption for domestic hot water in rating year, kWh/m^2 year,
DD - degree-days of heating period in rating year,
DD_{st} - degree-days of standard year in favourable economical conditions,
A - heated built-in area, m^2,
30 - standard occupancy level, m^2/person,
n - number of inhabitants, persons.

The structure of the rating scale developed in order to evaluate buildings' heat consumption was harmonized [2] with GBC2000 concept. The numerical values of the scale were based on two main consumptions: common heat consumption and best present consumption according to the level indicated in Latvian Building Code "Thermal Performance of Building Envelope" [3]. Energy consumption of all other levels can be calculated from these two levels. The numerical values of rating scale are shown in Table 1.

Table 1. The rating scale

Level			Rating Category		
Nr	Description	Value, kWh/m^{2}year	Nr	Description	Values, kWh/m^{2}year
5	25% better than 3 level	109		Gold certificate	109
4	10% better than 3 level	130		Silver certificate	130
3	Best present consumption	145	A	Excellent	= 145
2	3 level +1/3(0 level-3 level)	177	B	Very good	145,01-177
1	3 level +2/3(0 level-3 level)	208	C	Good	177,01-208
0	Common consumption	240	D	Fair	208,01-240
-1	15% worse than 0 level	276	E	Bad	240,01-276
-2	30% worse than 0 level	312	F	Very bad	>276,01

3. Description of the project

The trial implementation of the building energy certification scheme was implemented by Ogre town energy supply and distribution company "Malkalne" and by Institute of Heat, Gas and Water Technology of Riga Technical University. This project had begun on April 1st, 2002 and had lasted until October 1st, 2004.

In the beginning of the project data on the heat consumption of each analysed building were collected. Data about monthly heat consumption of the analysed buildings were provided by local energy supply and distribution company "Malkalne".

One of the important steps in the implementation of the project was creation of buildings' energy passports. The main aim of introduction of the energy passports was to provide transparent information about building's heat consumption. The energy passports were meant to help engineers of heat supplying organization and buildings' operation and maintenance managers to compare heat consumption of analysed buildings on the ground of precise and objective information. The energy passports gave the possibility to analyse the changes in building's heat consumption

in different years, as well as to compare data about heat consumption of the particular building with the same type of data of other similar buildings and to take the optimal decision for heat consumption's reduction. Each energy passport includes the following information: building's full heated area, number of inhabitants, weather conditions in rating year, measured specific consumption for space heating and hot water supply in rating year, standardized annual specific heat consumption and building's energy rating. Passport also contains information about heat consumption characteristics and energy savings measures that were implemented in the rating year.

In order to promote building energy certification and create energy awareness among inhabitants, it was decided to introduce buildings' energy labels. These labels were placed in buildings visible for all inhabitants. Anyone interested could easily study building's energy rating in comparison with other buildings. The examples of buildings' energy labels are shown in Figure1. The label with rating category "A" means the excellent level in energy consumption (=145 kWh/m^{2}year) and correspondingly "F" is the worst (>276.01 kWh/m ^{2}year).

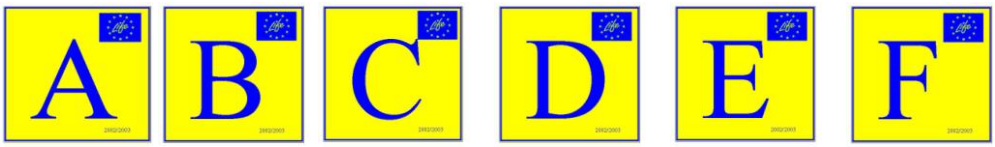

Figure1. Buildings' energy labels

In order to explain for inhabitants meaning and importance of buildings' energy certification and labelling such means as informative bulletins, newspaper publications and TV programs were used.

4. The comparison of buildings' heat consumption in 2002/2003 and 2003/2004

In order to find out influence of buildings' energy certification and labelling on buildings' heat consumption the comparison of heat consumption in 2002/2003 and 2003/2004 was made. The main parameters [4] used for comparison are shown in Table 2.

Table2. The main parameters of comparison

Nr.	Parameter	2002/ 2003	2003/ 2004	Difference in absolute values	Difference, %
1.	Degree-days	4119,5	3700,8	-418,7	-10,2
2.	Mean total annual specific heat consumption, kWh/m^2	204,68	176,16	-28,52	-13,9
3.	Mean annual specific heat consumption for space heating, kWh/m^2	128,92	102,78	-26,14	-20,3
4.	Part of space heating in total heat consumption	0,62	0,59	-0,03	-4,8
5.	Standardized specific heat consumption, kWh/m^2	215,86	195,55	-20,31	-9,4

The total measured heat consumption for all buildings in 2002/2003 was 88569 MWh and during the project time it has reduced to 76399MWh in 2003/2004.

Mean total annual specific heat consumption at the same time had reduced by 13,9% or from 204,68 , kWh/m^2 in 2002/2003 to 176,16 kWh/m^2 in 2003/2004. The total annual specific heat consumption includes both space heating and hot water consumption; for analysis it is useful to compare mean annual specific heat consumption for space heating.

In the second rating year the mean annual specific heat consumption for space heating had reduced by 20,3% from 128,92 kWh/m^2 in 2002/2003 till 102,78 kWh/m^2 in 2003/2004. But it should be taken into account that winter in 2003/2004 was much milder than in 2002/2003. The number of degree-days in 2002/2003 was 4119.5 and in 2003/2004 it was 3700.8 degree-days, i.e. by 10.2% less.

In order to make the correct comparison of buildings' heat consumption it was necessary to make comparison of standardized annual specific heat consumption. In 2002/2003 the standardized annual specific heat consumption was 215.86 kWh/m^2 and 2003/2004 it was 195.55 kWh/m^2 or by 9.4% smaller than in 2003/2004.

The annual specific heat consumption and standardized annual specific heat consumption had reduced in 130 buildings out of 139 analysed buildings after the first year of energy certification. Consequently, for majority of buildings energy ratings became better. Buildings' energy ratings comparison is shown in Table 3 and graphical results are given in Figure 2.

Table 3. Buildings' energy ratings comparison

Rating	A	B	C	D	E	F	Total:
Number of buildings in 2003 year	0	6	50	69	12	2	139
Percents of total	0,00	4,32	35,97	49,64	8,63	1,44	100,00
Number of buildings in 2004 year	1	20	87	29	1	1	139
Percents of total	0,72	14,39	62,59	20,86	0,72	0,72	100,00

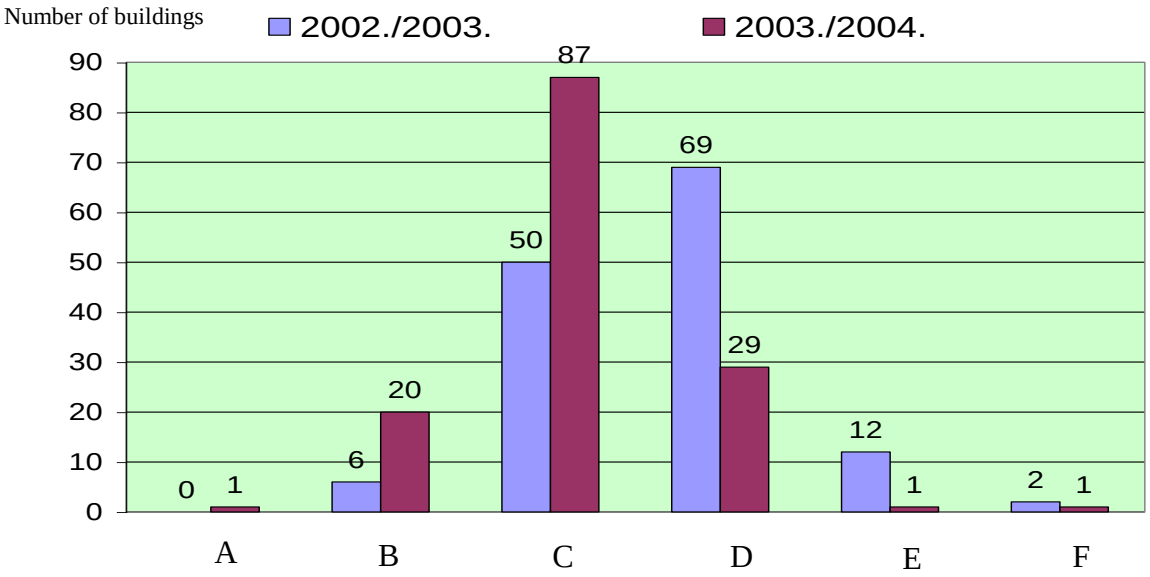

Figure 2. *Changes of buildings' energy rating categories in 2002/03 and 2003/04*

During the first rating year 35.97% of all analysed buildings according to common level of consumption belonged to rating C and 49.64% - to rating D.

In the second rating year situation had changed significantly to the better: 62,59% of all analysed buildings belong to the rating C and only 20,86% belong to the category D. There is considerable shift to the higher ratings: 78% of all buildings have better ratings than rating D in common heat consumption and only 1,5% has worse consumption. More information about results of the project could be found at www.bf.rtu.lv/~enerlab.

5. Further perspectives of energy certification in Latvia

Taking into account the achieved positive results in Ogre town it was decided to continue research and to study the possibilities for modification of the before mentioned buildings' energy certification scheme. The modified energy certification scheme should take into consideration full buildings' energy consumption including also gas and electricity consumption. The new scheme will give possibility to create full image of buildings' energy performance and to reach further reduction of energy consumption. In addition, the modified energy certification scheme will be in conformity with the requirements of the Directive 2002/91/EC. More information about the project could be found at http://www.bf.rtu.lv/~encerb.

6. Conclusions

1. For the first time in Latvia the trial implementation of energy certification scheme with the support of EU LIFE programme was done in Ogre town in 2002 – 2004.
2. The Latvian scheme of energy certification is based on unique rating criteria – standardized annual specific heat consumption, which is based on real measured heat consumption for space heating and hot water supply.
3. In order to promote energy certification and to create energy awareness of inhabitants the unique mechanism of buildings energy labels was used during the project.
4. In 2002/2003 the standardized annual specific heat consumption was 215.86 kWh/m^2 and 2003/2004 it was 195.55 kWh/m^2 or by 9.4% smaller than in 2003/2004.
5. Comparison of buildings' energy certification results shows that project assumption was correct and it is possible to achieve 5-10% reduction of buildings' heat consumption by relatively cheap measures of energy certification and creation of energy awareness among inhabitants.
6. Taking into account the achieved positive results in Ogre town it was decided to continue research and to study the possibilities for modification of the before mentioned buildings' energy certification scheme.

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