



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

**Promotion of smart and integrated NZEB renovation
measures in the European renovation market
(NeZeR)**

Contract N°: IEE/13/763/ SI2.674877
01-03-2014 – 28-02-2017

Action Plan for the City of Timisoara

Date : 24/02/2016

Lead contractor : City of Timisoara

Disclaimer

The sole responsibility for the content of this presentation lies with the authors. It does not necessarily reflect the opinion of the European Union. Neither the EACI nor the European Commission are responsible for any use that may be made of the information contained therein.

Table of contents

- Preface.....3**
- 1 Background4**
- 2 Conditions12**
- 3 Target Group15**
- 4 Objectives24**
- 5 Strategy.....25**

PREFACE

In all the decisions that it takes, the municipality must be a motivator and initiator of local energy regulations. To minimize CO₂ emissions at the local level, the local authority may intervene essentially in two essential stages during the life of a building, namely:

- the design stage and construction of a new building;
- the phase of rehabilitation, modernization or expansion of an existing building;

In this regard it should be noted that Law nr.372 / 13.12.2005 regarding the Energy Performance of Buildings sets minimum requirements for the energy performance of new buildings and for existing buildings that are subject to modernizing works and to legal provisions regarding the inspection of boilers and central heating installations; the inspections can reveal measures to reduce energy consumption and minimize emissions.

However, the local authority may grant exemptions or reductions to tax residence for individuals that undertake interventions and rehabilitation of buildings on their own expense. Local Council Timisoara adopts annually such decisions in support of physical persons, according to the Tax Code, therefore we can affirm that national and local regulations support and promote energy efficiency and implicitly the reduction of carbon dioxide emissions, compliance with the legislation having a major impact on reducing the carbon footprint in the buildings sector and particularly of buildings in the residential sector.

As the initiator of local development projects, municipal decisions are directly affecting energy consumption. Timisoara City Hall, as promoter of its own investments, may constitute an example in terms of project quality, materials used and the equipment and facilities used for their execution, in order to inspire and to determine best practice replication.

Owners of apartments and buildings in the residential sector, companies and large industrial customers in the city are those which influence the behavior of energy consumption in the City, which may be a responsible one, directed to the rational use of energy resources, or one tending to waste. The municipality does not have direct influence and action on citizens that affect the residential sector or on small businesses and institutions in the tertiary sector. However, consumers may be motivated to adopt measures to increase energy efficiency and reduce energy consumption.

In this respect, as promoter of local energy and tax policies, Timișoara may adopt tax incentives to support certain categories of users and set tariffs for local public services likely to contribute to the realization of investments, rehabilitations or upgradings which will lead to energy efficiency and production of energy from renewable sources.

1 BACKGROUND

Located at 571 km from the capital of Romania - Bucharest - City of Timisoara, the capital of Timis County, is the largest city in Western Romania with a permanent resident population, by domicile, at 07.01.2014, of 333,531 inhabitants, representing 45.11% of the population of Timis County, 16.48% of the population of West Region and 1.49% of the total population of Romania. According to data from the 2011 census, 81.36% of the total population of the City of Timisoara is of Romanian ethnicity. The total area of Timisoara is 12,927 ha, of which about 7,461 ha within built-up areas and 5,466 ha outside the built-up areas. Currently about 34% of the total area of the city is agricultural land (4438 ha), which represents a significant reserve of land for its future development.

In 2013, the number of dwellings was 138,114, with an average living area of approximately 53.29 sqm / household and 24.23 sqm / inhabitant. The average area per dwelling and average living area / person remain below the European (30.7 sqm / person level), as a result of a significant share of neighborhoods with apartment buildings dating from the communist era, characterized by highly deficient sociological indices of housing.

From the total of 138,114 existing dwellings in Timisoara, in 2013, 98.90% are private property and 1.10% represent public property.

	<u>2009</u>	<u>2010</u>	<u>2011</u>	<u>2012</u>	<u>2013</u>
<u>Existing dwellings – total (at 31 December)</u>	<u>129.545</u>	<u>129.968</u>	<u>130.314</u>	<u>130.635</u>	<u>138.114</u>
<u>- public property</u>	<u>6.462</u>	<u>6.411</u>	<u>6.412</u>	<u>6.373</u>	<u>1.523</u>
<u>- private property</u>	<u>123.083</u>	<u>123.557</u>	<u>123.902</u>	<u>124.262</u>	<u>136.591</u>
<u>Living area – total sqm</u>	<u>5.329.890</u>	<u>5.374.247</u>	<u>5.405.510</u>	<u>5.434.611</u>	<u>7.360.209</u>
<u>- public property</u>	<u>206.697</u>	<u>206.360</u>	<u>206.509</u>	<u>204.753</u>	<u>44.115</u>
<u>- private property</u>	<u>5.123.193</u>	<u>5.167.887</u>	<u>5.199.001</u>	<u>5.229.858</u>	<u>7.316.094</u>

Source: INS Timiș

The analysis of the main social aspects of living in the City of Timisoara contains the evaluation of the existing housing stock and of the socio-demographic characteristics of the population.

Social and sociological indicators of housing

	<u>2009</u>	<u>2010</u>	<u>2011</u>	<u>2012</u>	<u>2013</u>
<u>Number of dwellings/ 1000 inhabitants</u>	<u>415,06</u>	<u>417,33</u>	<u>423,70</u>	<u>426,00</u>	<u>454,71</u>
<u>Average living area/ dwelling (sqm)</u>	<u>41,14</u>	<u>41,35</u>	<u>41,48</u>	<u>41,61</u>	<u>53,29</u>
<u>Average living area / private property dwelling</u>	<u>41,62</u>	<u>41,82</u>	<u>41,96</u>	<u>42,08</u>	<u>53,56</u>
<u>Average living area / public property dwelling</u>	<u>31,99</u>	<u>32,19</u>	<u>32,20</u>	<u>32,129</u>	<u>28,96</u>
<u>Average living area / person (sqm)</u>	<u>17,07</u>	<u>17,26</u>	<u>17,58</u>	<u>17,022</u>	<u>24,23</u>
<u>Density inhabitant/dwelling</u>	<u>2,41</u>	<u>2,40</u>	<u>2,37</u>	<u>2,44</u>	<u>2,19</u>

Source: INS Timiș

On the surface of Timisoara municipality, in the year 2014 there are a total of 134,880 buildings.

In recent years there were developed and / or approved by the City Council of Timisoara over 50 zoning urban plans and detailed urban plans for the development of new housing areas, increasing in particular the number of dwellings built with financing from the population.

Currently, Timisoara Municipality holds in propriety or administration under 5% of the total housing stock. The decrease of that percentage from 19.5% in 1989 is due to restitution of the dwelling buildings to former owners or to selling dwellings buildings to former tenants. In this situation, given the low local budget, it is difficult to find a solution to solve urgent social problems of the disadvantaged people.

In 2013, the rental agreements fell to 1763 for dwellings under the ownership or n administration of Timisoara City Hall. Also, in the administration of Timisoara Municipality are 74 dwellings, for which are not concluded rental agreements because they are notified under Law no. 10/2001 or are subject of litigation, so that can not be redistributed until the resolution of claim files or of the files pending before the courts and only if they remain in the property of the Romanian State.

According to the inventory, dated 31.12.2014, in the Timisoara Municipality records are a number of 1884 dwellings under the ownership or administration of Timisoara City Hall and a number of 253 social dwellings. For 2014, were distributed 174 dwellings under the administration of Timisoara Municipality, the total number of the pending requests being 199 on 31.12.2014. During 2014 the number of social dwellings under the administration of Timisoara Municipality increased by purchasing a block on Polona street nr. 19 with a total number of 109 housing units.

After 1990 and until present time there is observed a propensity to build individual houses with an architecture framed in the traditional urban architecture as a whole. The comfort provided by living at house is preferred by a majority of the population of Timisoara mainly due to the possibility to imprint on the building from the beginning a more original style or customized, thanks to more spacious rooms, but also for to freedom and privacy conferred by the existence of a green space around the house.

In the period 1992 - 2002 there was observed an increase of the number of buildings with 1,051 and of the number of dwellings with 5,304. At a 4.4% increase in the number of dwellings there was an increase in the number of living rooms with 6.4% (namely with 17 818) as well as an increase of living area with 16.5% (namely with 713 410 thousand sqm). Moreover, new houses require higher standards of living in larger residential spaces.

In the period 2002 - 2011 (the interval between the last censuses conducted nationwide) was remarketed an increase in the number of buildings with 1,236 and in the number of dwellings with 4,706.

The number of buildings, dwellings and households at the censuses in 1992, 2002 and 2011

	<u>7 january</u> <u>1992</u>	<u>18 march</u> <u>2002</u>	<u>20oct.</u> <u>2011</u>	<u>2002 compared to</u> <u>1992:</u>		<u>2011 compared to 2002:</u>	
				<u>Absolute</u> <u>data</u>	<u>Percentag</u> <u>es</u>	<u>Absolute</u> <u>data</u>	<u>Percentages</u>
<u>Number of</u> <u>buildings</u>	<u>22.182</u>	<u>23.233</u>	<u>24.469</u>	<u>1.051</u>	<u>104,7%</u>	<u>1.236</u>	<u>105,3%</u>
<u>Number of</u> <u>dwellings</u>	<u>121.260</u>	<u>126.564</u>	<u>131.270</u>	<u>5.304</u>	<u>104,4%</u>	<u>4.706</u>	<u>103,7%</u>
<u>Number of</u> <u>dwellling</u> <u>rooms</u>	<u>277.944</u>	<u>295.762</u>	<u>327.441</u>	<u>17.818</u>	<u>106,4%</u>	<u>31.679</u>	<u>110,71%</u>
• <u>The</u> <u>average</u> <u>rooms/dw</u> <u>elling</u>	<u>2,3</u>	<u>2,3</u>	<u>2,4</u>	=	=	=	=
<u>Total</u> <u>living</u> <u>surface</u> <u>(sqm)</u>	<u>4.330.394</u>	<u>5.043.804</u>	<u>7.290.884</u>	<u>713.410</u>	<u>116,5%</u>	<u>2.247.080</u>	<u>144,56%</u>
<u>Average</u> <u>surface</u> <u>(sqm) for :</u>	=	=	=	=	=	=	=
• <u>one</u> <u>dwellling</u>	<u>35,7</u>	<u>39,9</u>	<u>53,1</u>	<u>4,2</u>	<u>111,77%</u>	<u>13,2</u>	<u>133,09%</u>
• <u>one</u> <u>room</u>	<u>15,6</u>	<u>17,1</u>	<u>22,3</u>	<u>1,5</u>	<u>109,62%</u>	<u>5,2</u>	<u>130,41%</u>
• <u>one</u> <u>person</u>	<u>13,0</u>	<u>15,9</u>	<u>22,8</u>	<u>2,9</u>	<u>122,31%</u>	<u>6,9</u>	<u>143,40%</u>
<u>The</u> <u>number of</u> <u>household</u> <u>s</u>	<u>115.597</u>	<u>117.622</u>	<u>129.874</u>	<u>2.025</u>	<u>101,8%</u>	<u>12.252</u>	<u>110,42%</u>
<u>The</u> <u>average</u> <u>number of</u> <u>persons/</u> <u>householdi</u> <u>ng</u>	<u>2,7</u>	<u>2,6</u>	<u>2,5</u>	=	=	=	=

Source: INS Timiș

From the point of view of the comfort of the residential buildings, it should be mentioned that many of the buildings are in an advanced state of degradation requiring repairs, refunctionalisation and modernisations. Collective dwellings finished until 1989 require remediation works for the thermal, noise and waterproof insulation, works for condensation removal and restoration of the facades, as well as major repairs or replacement of the technical utilities installations, indoor and outdoor.

The main negative aspects established about the comfort of living in Timisoara are:

- the existence of inadequate living spaces (basements, dwellings with shared annexes);
- undersized indoor spaces (with regard to the number of rooms and living area) and inadequate subdivision of some dwellings;
- higher maintenance costs;
- weak/low noise and thermal insulation of the existing collective residential blocks built before 1990;
- degraded condition of the technical utilities installations;
- undersized or inexistence of the outdoor spaces related to the dwellings (household platforms, green areas, playgrounds for children, parking and garaging places for the motor vehicles) and their inadequate maintenance;
- lack of ordinary maintenance of the buildings - due to the difficult economic situation of the majority of the population – which, in time, generates major degradation of the construction as a whole.

In terms of access to utilities and services, as an important part of the living standard and of the organization of the living space, there are specific issues for each neighborhood:

- some neighborhoods are insufficiently equipped with educational facilities (eg. the neighborhoods Ion Ionescu de la Brad and Kuncz, peripheral areas), sanitary facilities, food markets (the areas Ronaț, Blașcovici, Mircea cel Bătrân, Fratelia) or green spaces (Calea Șagului, Arad, Circumavaiașii etc.);
- the existence of functions incompatible with housing dispersed in the residential area (eg. industrial units in the UMT and Buziașului areas, etc.);
- the existence of groups of housing in the near vicinity of production units (eg. the housing blocks near Freidorf industrial platform or UMT), these functions hampering each other;
- many buildings in historic districts are in an advanced state of degradation, being in danger of collapse; buildings need special rehabilitation measures which will improve the residents' living standard, without jeopardize the buildings' historic character; despite numerous efforts undertaken by the municipality, a solution must be found in order to secure the funding required to carry out rehabilitation works, of the buildings in the historic center of the city.

Construction of dwellings in Timisoara was relaunched especially after 2000, when first developers appeared in the building landscape of Timișoara. The period after 2000 is dominated by the expansion of the living area into the surrounding areas (peripheral) of the city and suburban area, respectively in communes and villages nearby Timisoara (Dumbrăvița, Chișoda, Giroc, Urseni, Moșnița, Sânmihaiu Roman, Sag, Giarmata, Sanandrei, Săcălaz). However, aspects of the technical infrastructure and access to some of these residential areas remain problematic.

Residential areas of collective dwelling, built during the communist regime, were designed to provide the necessary infrastructure and the utilities needed by a community (schools, kindergartens, commercial premises, post etc), but the dwellings are of poor quality . From the realised sociological studies it appears that low-income people are living in conditions of

overpopulation and the available budget does not allow them the purchase of an apartment. Because of these inconveniences, the solution was to rehabilitate these buildings. Due to the high cost of the rehabilitation, work is much slower relative to the large number of buildings that need rehabilitation. Problems of the roofs found a partial solving through building mansards on the blocks where the structure allowed it, the costs of the works being assumed by the developer in exchange of the space obtained through building the mansard.

<u>Crt. nr.</u>	-	<u>2010</u>	<u>2011</u>	<u>2012</u>	<u>2013</u>
<u>1</u>	<u>Within the built-up area surface (hectars)</u>	<u>7461</u>	<u>7461</u>	<u>7461</u>	<u>7461</u>
<u>2</u>	<u>Green spaces surface</u>	<u>525</u>	<u>525</u>	<u>525</u>	<u>525</u>
<u>3</u>	<u>Urban streets length (km)</u>	<u>582</u>	<u>582</u>	<u>582</u>	<u>582</u>
<u>4</u>	<u>Length of the modernised urban streets</u>	<u>455</u>	<u>455</u>	<u>455</u>	<u>455</u>
<u>5</u>	<u>Existing dwellings at the end of the year by ownership</u>				
	<i>Total of which</i>	<u>129.968</u>	<u>137.199</u>	<u>137.520</u>	<u>138.114</u>
	<i>public property</i>	<u>6.411</u>	<u>1.423</u>	<u>1.384</u>	<u>1.523</u>
	<i>private property</i>	<u>123.557</u>	<u>135.776</u>	<u>136.136</u>	<u>136.591</u>
<u>6</u>	<u>Completed dwellings completed during the year by funding sources</u>				
	<i>Total of which</i>	<u>421</u>	<u>414</u>	<u>413</u>	<u>593</u>
	<i>from public funds</i>	<u>—</u>	<u>1</u>	<u>—</u>	<u>190</u>
	<i>from private funds</i>	<u>421</u>	<u>413</u>	<u>413</u>	<u>403</u>
<u>7</u>	<u>Existing living area at the end of the year by types of ownership (evolute area qsm)</u>				
	<i>Total of which</i>	<u>5.374.247</u>	<u>7.290.875</u>	<u>7.319.976</u>	<u>7.360.209</u>
	<i>public property</i>	<u>206.360</u>	<u>40.425</u>	<u>38.669</u>	<u>44.115</u>
	<i>private property</i>	<u>5.167.887</u>	<u>7.250.450</u>	<u>7.281.307</u>	<u>7.316.094</u>
<u>8</u>	<u>The total length of the simple drinking water distribution network (km)</u>	<u>623,7</u>	<u>632</u>	<u>632</u>	<u>641,2</u>
<u>9</u>	<u>The capacity of the drinking water production plant (cm/day)</u>	<u>188.352</u>	<u>188.352</u>	<u>188.352</u>	<u>188.352</u>

<u>10</u>	<u>The quantity of the distributed drinking water to the consumers(cm)</u>	<u>20.646</u>	<u>21.623</u>	<u>21.650</u>	<u>20.454</u>
	<u>Total of which for domestic water use</u>	<u>14.211</u>	<u>13.829</u>	<u>13.830</u>	<u>13.241</u>
<u>11</u>	<u>Simple total length of the sewer pipes</u>	<u>530,4</u>	<u>535</u>	<u>535</u>	<u>562,5</u>
<u>12</u>	<u>Distributed thermal energy (Gcal)</u>	<u>813.160</u>	<u>991.936</u>	<u>815.630</u>	<u>587.096</u>
<u>13</u>	<u>Distributed natural gases by destination (thousands cm)</u>	<u>133.535</u>	<u>236.023</u>	<u>216.464</u>	<u>194.639</u>
	<u>Total of which pentru uz casnic</u>	<u>63.399</u>	<u>71.074</u>	<u>72.316</u>	<u>74.764</u>
<u>14</u>	<u>The number of inventory vehicles for local public passenger transport by type of vehicle</u>	<u>323</u>	<u>310</u>	<u>322</u>	<u>322</u>
	<u>Total of which</u>				
	<u>Trams</u>	<u>160</u>	<u>147</u>	<u>158</u>	<u>159</u>
	<u>Buses and minibuses</u>	<u>113</u>	<u>113</u>	<u>114</u>	<u>113</u>
	<u>Trolleybuses</u>	<u>50</u>	<u>50</u>	<u>50</u>	<u>50</u>

Regarding thermal rehabilitation, between 2009-2011 the local administration of Timisoara through the local multiannual program on increasing the energy efficiency of residential buildings under the Emergency Ordinance no. 18/2009, monitored the intervention works for the thermal rehabilitation of 61 buildings whose value amounts to 23,294,300 lei and through which was achieved a considerable increase in the energy efficiency of the buildings. Because this program depends on budgetary allocations (50% of the costs are allocated from the state budget and 30% from the local budget, homeowners associations supporting only 20% of costs), the funds allocated are insufficient, the results are hardly visible, given the needs.

The Municipality of Timisoara has also launched other thermal rehabilitation projects, the last of this kind being a European project of 16.5 mil. Lei (3.7 mil. Euros), of which 9 mil. Lei (2 mil. Euro) represent the grant for the thermal rehabilitation of 25 housing blocks with 908 apartments.

The project "Supporting investments in energy efficiency of residential buildings in Timisoara for families with an average income below 350 euros per month" will be implemented over a period of 12 months. So far, the Municipality of Timisoara has signed five contracts for thermal rehabilitation funding, totaling nearly 44 million. Lei (about 10 mil. Euro), of which the grant is 24.6 mil. Lei (5, 6 mil. euros). Thermal rehabilitation aims to reduce the beneficiaries' costs by increasing the energy performance of buildings, but also to reduce the annual energy consumption for heating by approximately 60%.

In terms of technical and urban equipping and of road networks, the situation is as follows: 99% of Timisoara's homes have water supply installations, 96% are connected to the sewage system, 99.5% have electrical installation, 80.2% have central heating through district heating or their own central heating and 3.1% have heating stoves and gas.

All these negative aspects regarding the deficiencies of existing housing stock in Timisoara, coupled with the modest incomes of the population, necessitate the intervention of local authorities through various social measures, such as fiscal facilities given in order to encourage rehabilitation of the buildings.

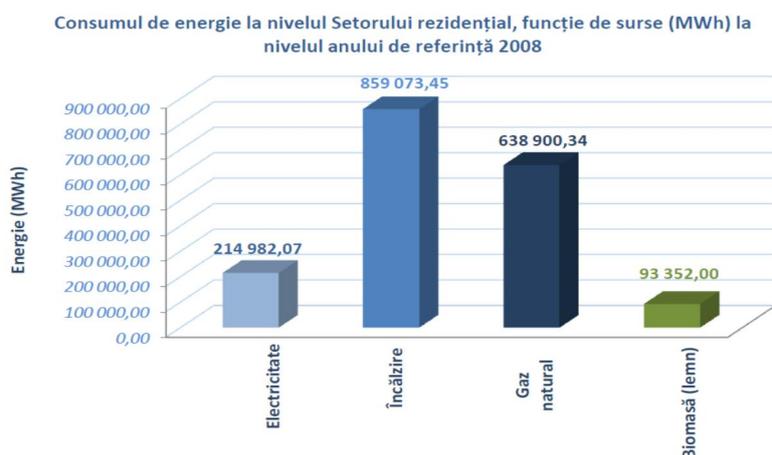
2 CONDITIONS

The 2011 Census of Population and Housing provides important data on residential buildings and buildings from the municipal and tertiary sector. The partial data provided by the National Statistics Institute shows the following results:

Statistical data		Value
Number of conventional dwelling 2013:		131.270
Type of ownership		
Private:	Number:	127.841
	% of total:	97%
State:	Number:	2.514
	% of total:	1,9%
Private group ownership:	Number:	557
	% of total:	0,4%
Cooperative ownership:	Number:	40
	% of total:	0%
Associative:	Number:	118
	% of total:	0,1%
Of religious denominations:	Number:	200
	% of total:	0,2%

Energy consumptions and their associated impact in the residential sector

The residential sector is responsible for 1,806,307.85 MWh energy consumption by the year 2008. These consumptions have as sources of primary energy the following: electricity, natural gas, heating through the central heating system and biomass (wood-fuelled heating systems).

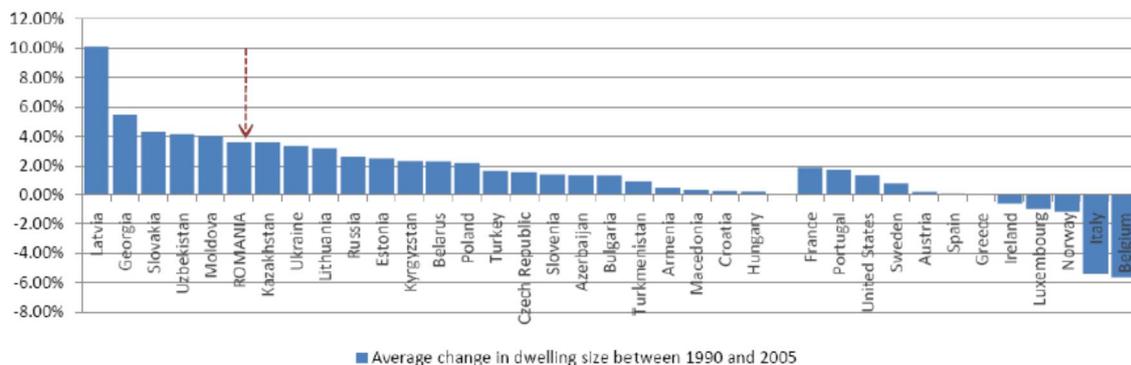


Energy consumption at the residential sector level, according to the source (MWh) for the year of reference 2008

Regarding the description of the residential sector, it should be noted that in addition to historic buildings, most housing were built during communism, the main feature being the standardization and low quality. Residential apartment blocks built in that period were designed with 1-2, 3 and rarely 4 rooms, the low building costs being the main criterion, at the expense of the aesthetic aspect, of insulation and energy efficiency. With areas of common use difficult to maintain, usually these homes did not ensure the comfort of the residents.

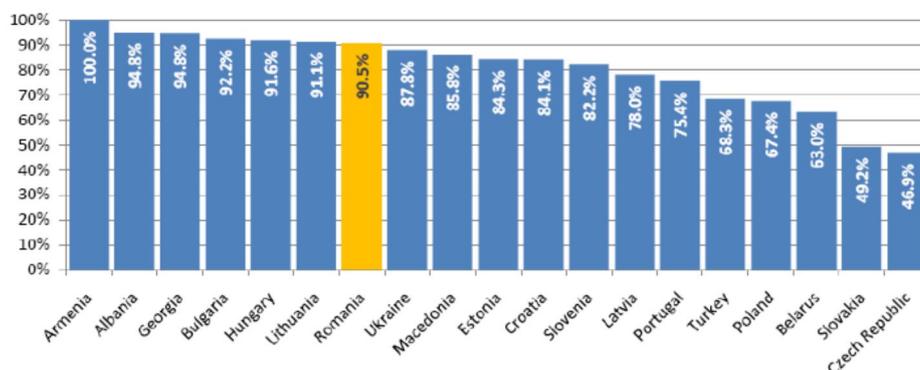
Since 1990, housing dimensions have increased significantly, statistics showing an annual increase of 5% until 2005. The real estate boom has led not only to an increase in the size of new homes, with increasingly diverse amenities and facilities, but also to an increase in built areas, many residents opting for individual houses with courtyard and garden.

People prefer to live in increasingly larger homes, according to European statistics, and Romania and Timisoara fit within these general trends.



Source: Eurostat "Strengthen the capacities of spatial planning - a prerequisite for sustainable urban development" - World Bank, Ministry of Regional Development and Public Administration, Ministry of European Funds

Another feature is that in the residential sector, the dwellings are mostly privately owned, because after 1989 much of the housing stock was subject to sale in order to provide stability or storage of value. In Romania, the percentage of private housing is 90.5%, Timisoara falling within this trend.



Source: Eurostat "Strengthen the capacities of spatial planning - a prerequisite for sustainable urban development" - World Bank, Ministry of Regional Development and Public Administration, Ministry of European Funds

Another aspect of energy efficiency is closely related to the interior lighting system of buildings. Reconsidering the lighting system is essential for ensuring energy efficiency in

buildings, be they municipal, tertiary or residential. A good knowledge of improvement options, of the uses of every type of lamp, of the benefits in terms of energy efficiency and of energy savings will lead to reaching the targets established for this sector. It should be pointed out that, wherever possible, daylight should prevail, as the most efficient way of lighting.

In the following figure are shown the most used types of lamps, as well as the options, specific uses and benefits in terms of energy savings.

Type of lamp	Specific uses	Option for energy efficiency	Benefits of energy savings
Tungsten Bulbs	General lighting and lighting for specific purposes. Typically used in the household.	Replace with energy saving bulbs.	75% reduction plus a much longer lifespan
Fluorescent Tubes of 38 mm (T12)	General lighting commonly used in public buildings, shelters, community centers and libraries.	Replace with triphosphate fluorescent neon of 26 mm (T8) with equivalent power but lower consumption	8% reduction plus a longer lifespan
High power filament lamps or Tungsten halogen lamps	Used to illuminate large outdoor areas, facades or monuments	Replace light bulbs with economical high power bulbs	65%-75% reduction plus a longer lifespan
Filament spotlight or high capacity spotlight	Used for spot lighting or areas that need light stronger or clearer evidence of color. They are frequently used in reception areas, public spaces and museums.	Replace with tungsten and halogen lamps, of low voltage or with metal halide.	30% - 80% for equivalent lightning
Equipments with fluorescent lamps of 125W and 40W	General lighting commonly used in public buildings, shelters, community centers, libraries.	Replace with efficient systems using floodlights or prismatic elements, fitted with high frequency electronic gear	30%-40% economy and higher quality. High frequency electronics eliminate the blurring, flashing and stroboscopic effect.
Fluorescent systems with opaque diffusers or prismatic control systems that lose color	General lighting in older buildings that would require rehabilitation, such as administrative offices, town hall, library, etc.	No reduction in energy consumption but increasing light power by 30% to 60%. Lighting improves the work environment.	

Lighting Options for Energy Efficiency

Source: „Local Authorities – How to save energy in public buildings?” – publication translated by the Association ALMA-RO within the framework of the Project „Building bridges between civil society and decision makers for a post-Kyoto agreement”, finanțat de Ambasada Britanică la București (Saving energy in local authority buildings” – www.carbontrust.co.uk

3 TARGET GROUP

The following three target groups have been identified, which require different approaches when it comes to raising awareness:

1. **Decision makers and property owners** (cities, municipalities, social housing organizations, local building authorities and city politicians)
2. **Actors in the building industry executing the renovation** (architects, engineers, construction companies, maintenance organizations)
3. **Producers of technical components and solutions** for NZEBR

Recent European research projects (such as NewBEE, SUSREF, North Pass) have made several interviews and inquiries to clarify the barriers and drivers for energy efficient retrofitting and to understand the specific needs of different stakeholders. The needs of different target group will be carefully considered in the development of information on technological solutions and benefits and during the dissemination activities. To maximize the impact of dissemination activities, the right and most useful information will be targeted to different actors.

Since in this Action Plan our focus is on residential buildings, for the present study we identified a number of 3 residential buildings, which are part of the program of thermal rehabilitation of residential buildings developed by Timisoara City Hall. All buildings have four floors and basement. The buildings are located in the south of Timisoara in an urban area with direct access to public transport, green spaces, health centers, administrative units, as follows:

Address: Liviu Rebreanu Boulevard, nr. 134A

Parametres	Neighborhood	Walking distance
Transport	Tramway	65 m
	Trolleybus	150 m
Green areas	Lidia Park	1200 m
Sports	"Dan Paltinisan" Stadium	700 m
Medical centers	County Hospital	450 m
Education	General school nr. 25	800 m
Administration	Timisoara City Hall	2250 m

Address: Calea Martirilor nr. 70 si 78

Parametres	Neighborhood	Walking distance
Transport	Tramway	900 m
	Trolleybus	150 m
Green areas	Lidia Park	400 m
Sports	"Dan Păltinișan" Stadium	1600 m
Medical centers	County Hospital	500 m
Education	General school nr. 25	800 m
Administration	Timisoara City Hall	3200 m

Structural characteristics of the buildings

The 3 residential buildings have four floors and basement, one or two staircases. The ground floor of the buildings is also residential.

Address	Number of apartments	Suprafața apartamentelor mp	Year of construction
Bd. Liviu Rebreanu nr. 134A	10	78	1977
		67	
		64	
Calea Martirilor nr. 70	29	83	1988
		66	
		51	
Calea Martirilor nr. 78	19	84	1983
		66	

Common characteristics of the buildings:

Foundation: continuous foundation made of monolithic concrete. The infrastructure consists of basement walls 20 cm thick;

Exterior walls: large multilayer panels made of reinforced concrete and AAC (27cm), with a 10 cm. inner resistance layer;

Interior walls: large prefabricated panels 14 cm thick;

Floors: large panels made of 13 cm of reinforced concrete, and the stairs have 1 or 2 pre-cast reinforced concrete ramps;

Roof: flat or sloped

Windows: exterior woodwork was originally made of wood and the windows had double panes of glass. Most woodwork has been replaced with PVC or aluminum joinery with insulating glazing. In the first stage after taking over the apartments, the tenants began by closing off the balconies and loggias with metal joinery and single glazing, this being the trend in the years 1980s-90s. Subsequently, these were replaced with PVC or aluminum joinery with double glazing. However, the closure of the balconies created a heterogeneous aspect of the facades, due primarily to the various sizes that were used.

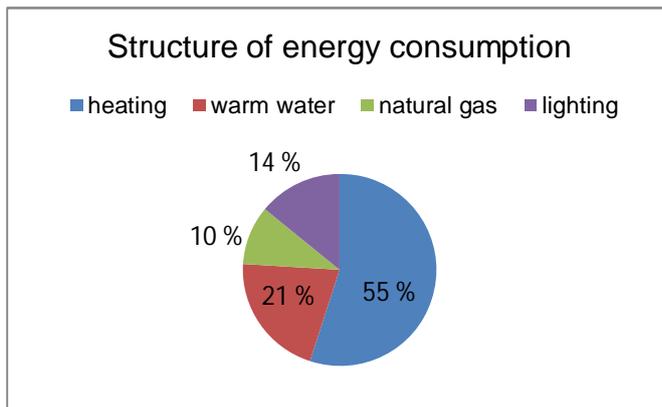
Article		Material	Conservation	Defects
Roof	Type	flat or sloped	No visible degradation and no infiltrations	
	Covering	Roof tiles or bituminous membrane		
	Insulation	Expanded clay aggregate		
Structure	Foundation	Continuous foundation made of monolithic concrete	Good	
	Basement flooring board component layers	Reinforced concrete Levelling floor screed Expanded clay flooring	Good	Not provided with insulation
	Board above the 4th floor	Reinforced concrete Beton simplu Levelling floor screed Styrofoam plaster	Good	
Facade	Exterior walls: component layers	Plaster Concrete AAC layers plastering	Deficient	Concrete degradation in the monolithic areas
	Entrances	Main acces door made of metal or PVC joinery		No sealing measures
	Windows	Wood PVC aluminum	Good	The coexistence of different types of windows
Instalations	Water	From a central		Obsolete

		source, flowmeters at the points of consumption		(approx. 25-30 years old)
	Electricity	Incandescent lamps 70-75% Partially economical fluorescent lamps		Obsolete (approx. 25-30 years old)
	Heating	District central heating with radiators	Good	

Source: *The Energy Audit Reports of the buildings, by the Energy Auditor, Mr. Vasile Olaru*

In conclusion, thermal rehabilitation can be achieved with no need for interventions to strengthen the existing structure.

The structure of average energy consumption for buildings constructed between 1950-1990 is as follows:

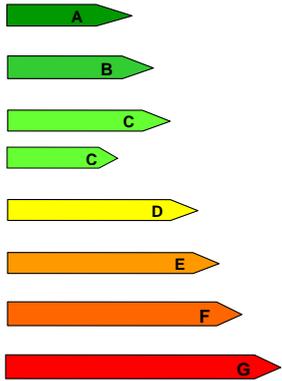
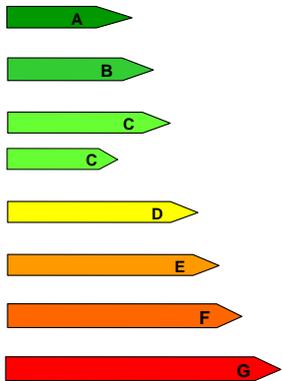
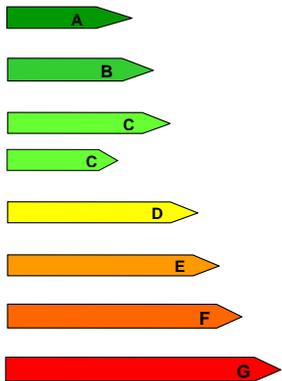


Source: http://www.mdrl.ro/_documente/lucrari_publice/reabilitare_termica/brosura_reabilitare_termica.pdf

THE AUDIT AND ENERGY PERFORMANCE CERTIFICATE OF THE BUILDING

The energy audit of a building aims to identify the main thermal and energetic characteristics of the building and of its related facilities, and to establish technical and economical solutions for the rehabilitation or the thermal and energetic modernization of the building and of its related facilities, based on results generated from the thermal and energetical analysis of the building.

The energy audit initially determined the specific annual energy consumption in buildings under conditions of normal use, based on the actual characteristics of the system construction - related installations (heating, hot water, ventilation, air conditioning):

Building	Emissions Kg CO ₂ /m ² /year		Specific annual consumption for heating kWh/m ² /year	Specific annual consumption for energy kWh/m ² /year	Fuel	Rating
Liviu Rebreanu nr. 134A	Global indicator		153,65	242,46	Gas + electricity	84,66
	54,95					
C. Martirilor nr. 70	Global indicator		132,22	219,49	Gas + electricity	87,48
	49,52					
C. Martirilor nr. 78	Global indicator		129,47	215,77	Gas + electricity	87,08
	48,91					

Source: The Energy Audit Reports of the buildings, by the Energy Auditor, Mr. Vasile Olaru

Data supplied by the energy performance certificates are consistent with the type of building and the values obtained in other similar cases.

The data that formed the basis of establishing energy performances of buildings:

The geometrical characteristics of the buildings:

Nr.	Building	Useful area m ²	Built area m ²	Area to be rehabilitated m ²	Heated volume of the building m ³	Ground floor board area m ²	Area of the board under the attic /terrace m ²	Heated area m ²
1	L. Rebreanu nr. 134A	783	1000	1244,91	1980,77	200	200	792,31
2	C. Martirilor nr. 70	2060	2455	2410,48	5382,85	491,1	491,1	2153,14
3	C. Martirilor nr. 78	1423	1962	1746,48	3509,85	327,34	327,34	1403,94

Source: The Energy Audit Reports of the buildings, by the Energy Auditor, Mr. Vasile Olaru

Thermotechnical characteristics of construction materials:

Nr.	Building material	Density Kg/m ³	Thermal conductivity W/(mk)
1.	Reinforced concrete	2500	0,8
2.	Cement mortar for cold floors	1800	0,93
3.	Cement mortar and lime plasters	1700	0,87
4.	Plain concrete	2400	1,62
5.	Bitumen for waterproofing	1100	0,17
6.	Plasterboard	1000	0,37
7.	Mineral wool	70	0,042
8.	Fir wood	550	0,35
10.	Full-sized brick masonry	1800	0,8

Source: The Energy Audit Reports of the buildings, by the Energy Auditor, Mr. Vasile Olaru

Unidimensional thermal resistance of construction elements (L. Rebreanu nr. 134A)

Construction element	Description	Orientation	Area m ²	Thermal resistance m ² K/W
Exterior wall 1	Current exterior walls	South	242,88	0,82888591
Exterior wall 2	Current exterior walls	East	86,915	0,82888591
Exterior wall 2	Current exterior walls	West	124	0,82888591
Exterior wall 4	Current exterior walls	North	266,4	0,82888591
Exterior door	Insulated (thermopane) exterior door	South	4,12	0,44
Exterior door	Insulated (thermopane) exterior door	East	9	0,44
Exterior door	Insulated (thermopane) exterior door	West	9	0,44
Exterior door	Insulated (thermopane) exterior door	North	0	0,44
Exterior window 1	Double-paned (thermopane) window	South	32,25	0,44
Exterior window 2	Wooden double coupled window	South	10,75	0,39
Exterior window 3	Double-paned (thermopane) windows	North	17,7	0,44
Exterior window 4	Wooden double coupled window	North	5,9	0,39
Exterior window 5	Double-paned (thermopane) windows	East	18	0,44
Exterior window 6	Double-paned (thermopane) windows	West	9	0,44
Basement board	Board over the basement		200	0,923418336

Board floor	Boarding above the last floor		200	0,907225486
-------------	-------------------------------	--	-----	-------------

Source: *The Energy Audit Reports of the buildings, by the Energy Auditor, Mr. Vasile Olaru*

These data allow us to establish the measures that need to be taken in order to improve the energy performance of buildings in order to reduce energy consumption.

- increasing the unidirectional thermal resistance of external walls over the value of 2.5 m²K / W through the thermal insulation of external walls with fireproof expanded polystyrene 10 cm thick, including its protection and applying external plaster. In applying the thermosystem, particular attention is paid to covering existing thermal bridges. By applying this insulating layer an unidirectional thermal resistance value of external walls of 2.571 m²K / W will be obtained;
- replacement of the remaining wooden joinery from the facade with insulating waterproof PVC frame, with a minimum of 5 rooms and double-glazed windows, Low-e treated and possibly treated with a layer of argon;
- increasing the unidirectional thermal resistance of the board above the basement over the minimum value of 1.25 m²K / W by glueing, securing or fastening with mechanical devices an insulating layer made of slabs of expanded polystyrene 5 cm thick or mineral wool. The insulation must be protected with a wall putty reinforced with fiberglass mesh. By applying this insulating layer an unidirectional thermal resistance value of the board above the basement of 2,154 m²K / W will be obtained.
- Increasing the unidirectional thermal resistance of the board from the attic / terrace above the minimum value of 3.5 m²K / W by removing the outer layers to the waterproofing and installing a new thermal insulation layer, with quality and thickness corresponding to the new requirements. The insulating layer may be composed of:
 - slabs of expanded polystyrene of high density, 12 cm thick, protected by a reinforced cement screed mortar, or
 - extruded polystyrene slabs 12 cm thick;
- The insulating layer will "envelop" the attic and connect with the insulating layer from the facade of the building. By applying this layer, an unidirectional thermal resistance value of the terrace of 3.29 m²K / W will be obtained.
- Recommended solutions for the facilities related to the building:
 - Installing energy efficient light bulbs instead of incandescent bulbs
 - Ensuring indoor air quality through natural or hybrid apartment ventilation(permanent introduction of outdoor air through holes in the facade and evacuation of interior air through the bathrooms and toilets).

Energetical analysis of the rehabilitation solutions

Adjusted heat resistance of the elements of the reference building (Building having mainly the same structure characteristics as the real building and in which efficient energy use is ensured):

Exterior joinery $R_F = 0,55 \text{ m}^2\text{K/W}$

Board above the last level $R_{PP} = 3 \text{ m}^2\text{K/W}$

Board above the basement $R_{PS} = 1,65 \text{ m}^2\text{K/W}$

The results of the analysis of energy saving obtained after the rehabilitation are presented in the following table:

Building		Heat requirement of the building	Heating annual consumption	Specific heating annual consumption	Total specific consumption	Total consumption	Annual economy	Annual economy	Economy relative to heating	Rating	Duration of the return on investment
		(kWh/year)	(kWh/year)	(kWh/m ² year)	(kWh/m ² year)	(kWh/an)	(kWh/year)	(%)	(%)		(years)
L.Rebreanu nr.134A	Current situation	107.360,73	121.671,16	153,65	242,46	188.919,46	0	0	0	84,65	0
	Proposed situation	44.460	50.454,62	63,75	152,56	117.702,91	71.218	37	59	97,12	10
C. Martirilor nr. 70	Current situation	251.308,44	284.633,23	132,22	219,49	463.262,40	0	0	0	87,08	0
	Proposed situation	97.780,42	110.802,94	51,48	138,76	289.432,11	173.830,29	38	61	98,54	8
C. Martirilor nr. 78	Current situation	160.435,89	181.698,03	129,47	215,77	298.915,68	0	0	0	87,48	0
	Proposed situation	52.616,79	70.450,82	50,22	136,53	187.668,43	111.247,21	38	61	98,78	9

Source: The Energy Audit Reports of the buildings, by the Energy Auditor, Mr. Vasile Olaru

The chosen rehabilitation option is good both in energetical and in economical terms, resulting in the decrease of the specific annual consumption for heating even up to the value of 61 % (building on C. Martirilor no. 78).

Considering that the specific energy price will increase in the coming years, the duration of the returns on investment will be reduced accordingly.

4 OBJECTIVES

The main objective is the transformation of Timisoara in a green city, with a heritage of public buildings, private and commercial, that are energy efficient, aesthetically attractive and with a high degree of comfort, through an increase in the use of renewable energy sources by the population - a solid partner of the municipality, more conscious of the need for respect for the environment, for the responsible use of natural resources, favorable to the welfare and health of the entire population.

The annual reduction of gas emissions with greenhouse effect, expressed in equivalent CO₂ is shown in the following table:

Building	L. Rebreanu nr.134A	C. Martirilor nr. 70	C. Martirilor nr. 78
Reduction of CO₂e emissions (kg/year)	13.870	41.719	32.553

5 STRATEGY

In order to achieve the overall objective, it is necessary to implement development projects, actions and measures, as follows:

- 1. Conducting an energy audit of all municipal buildings as well as the energy labelling of buildings** - a measure whose aim is to gain knowledge of the energy situation of each building and the concrete measures to be implemented in order to attain energy efficiency.
- 2. Undertaking a study of energy efficiency in five public buildings by 2016 in order to find the best methods for energy efficiency and the possibility of their replication by other buildings belonging to the municipality of Timisoara, in order to achieve the criteria for nearly zero-energy buildings** - a measure that aims to find the best, next-generation solutions, based on a realistic cost - benefit analysis, applicable to public buildings, municipal buildings (schools, kindergartens, administrative buildings, culture and sports buildings), so that in the coming years only the energy solutions which have the best results will be implemented.
- 3. The thermal rehabilitation of municipal buildings through works on at least 5 public buildings by the year 2020:** the priority being the municipal public buildings for which the technical and economical documentation are already done; the buildings will be rehabilitated depending on the ranking of energy efficiency and potential to reduce energy consumption.
- 4. Upgrading interior lighting systems using energy efficient equipment through works on at least 5 municipal buildings per year until 2020** - a move that aims to make interventions on electrical installations, consisting in implementing smart metering systems for electricity, replacing incandescent lighting with high energy efficiency lamps, with possibilities of control according to program and long lifespan, in order to reduce electricity consumption and increasing lighting comfort.
- 5. Using renewable energy for treating hot water and electricity in public buildings, through investing in a total of 25 municipal buildings (schools which have canteens, sports facilities, dormitories and social facilities) by the year 2020** - a measure that aims at installing photovoltaic solar panels on public and municipal buildings that are not part of the historical heritage.
- 6. Implementing internal organizational measures, to reduce cold air infiltration, and sealing the glazing (windows, doors, skylights, vents) in municipal public buildings** - a measure which will automatically lead to a saving of at least 5% of heating energy, provided that immediate action is taken by sealing / insulation. The measure can be implemented in the short term, the associated costs are reduced and savings potential is high.
- 7. Permanent monitoring of energy consumption in office buildings, schools, public buildings belonging to the municipality by using the specialized (software) application EMS** - Energy monitoring system that will lead to continuous updating of the database containing detailed technical information concerning public buildings of the municipality and the record of electricity, heat, natural gas and water consumption, in order to create a system of permanent monitoring of public buildings, energy consumption and the energy efficiency works carried out, their type, stage and results.
- 8. Verification of the heating infrastructure, metering, thermostats of public institutions. Mounting of thermostats in schools in order to improve the heating system of the building and lower monthly consumption in winter** - a move that

will help reduce energy consumption, especially during the hours when the building is not used, on week-ends and school holidays.

9. **Empowering a person in each institution about the monitoring of consumptions and spot checks on actual consumption.**
10. **Allocation by public institutions of annual percentile targets of reduction in total consumption for the next year from the previous year and information on opportunities to reduce energy consumption and costs** - a move which will be implemented gradually in order to bring awareness about issues regarding the possibilities to reduce energy consumption and involvement of the leadership of public institutions and to all employees and their users in achieving the goals and targets assumed.
11. **Developing model projects of new NZEBR municipal public buildings in November - 5 projects until 2017** - in order to achieve projects that are applicable to public buildings, given that at the local level - universities, energy experts and architects - the necessary knowledge to develop projects exists. Knowledge transfer and dissemination of good practice at the local and regional level through these projects will lead to a broader application of this concept, in view of the sustainable development of the municipality.
12. **Protecting and rehabilitating the historical built heritage of Timisoara through measures of thermal rehabilitation and integration of energy efficiency measures in buildings, by using the best existing technical solutions at the local level** - a measure whose purpose is the application of best available techniques and solutions of energetical and thermal rehabilitation, given the fact that historic buildings constitute a particularly large share of the historical districts of Timisoara.
13. **Promoting the thermal rehabilitation of buildings in the tertiary sector in order to improve the energy performance of buildings, with a rate of 5% of all buildings belonging to tertiary sector per year** - a move that will require better collaboration and cooperation with the residential sector, which should be involved in order to achieve the objectives and targets assigned to this sector;
14. **Designing / restoring the lighting systems based on principles of energy efficiency and installation of automated control components in compliance with Directive 2002/96/EC;**
15. **Involvement of energy service companies (ESCO) by promoting the benefits of Energy Performance Contracts in various sectors by conducting work-shops for information and involvement of stakeholders - one annual event** - given that the implementation of energy efficiency solutions and installations that exploit renewable energy sources (solar, geothermal), entails an important investment level, hiring companies for ESCO energy services and organizing seminars, workshops and information campaigns are extremely important. Dissemination of success, best practices in implementing EE measures and RES energy use will boost approaches from this perspective.
16. **Promoting the improvement of the energy performance of individual buildings in the tertiary sector with an area larger than 1,000 square meters and the introduction of solar thermal collectors for 30% of annual consumption of hot water - 50 businesses** - is a measure of information and awareness of these possibilities and the benefits that the use of SER energy brings; however this measure is extremely sensitive in terms of financing, knowing that the payback period of such facilities is long, and that it needs a significant investment level.
17. **Thermal rehabilitation of apartment blocks in Timisoara, with a rate of 50 apartment blocks / year of the total blocks with flats / condominiums** - is a measure that should be supported by the municipality, under the various national programs in the field;

- 18. Promoting the thermal rehabilitation of private buildings in Timisoara in order to improve the energy performance of buildings** - by organizing information and awareness activities among citizens about the benefits of these works - is a measure that should be encouraged at the local level, particularly in what relate to residential buildings, but only through the application of best materials and techniques for thermal rehabilitation
- 19. Promoting the the installation of solar panels for domestic water heating for residential buildings that are facing south, with a rate of 2% / year of the total buildings in Timișoara that have southern exposure** - a measure that will help reduce consumptions associated with domestic water heating and will even contribute to the heating of the dwelling in the cold season.
- 20. Promoting the the installation of photovoltaic panels in an off grid system to produce electricity, with power between 1-3 KW, with a rate of 2% / year from the number of buildings with roofs with a southern exposure from Timisoara** - a move that will help increase the production and use of renewable energy for household appliances, initially in the off-grid system, in order to provide in part the necessary of energy, given that the procedures for installation of PV on-grid systems involve a series of extremely long and expensive authorization procedures
- 21. Promoting through a Decision of the Local Council of Timisoara measures to support the owners of residential buildings, by granting tax relief from the tax on buildings, in case of investments in energy efficiency / photovoltaic panels / solar panels / heat pumps and other solutions for energy efficiency and use of renewable energy** - a fiscal measure that will contribute to promoting and supporting the investments of individuals in EE and production of RES energy in the residential sector;
- 22. Promoting the installation of thermostats for environmental temperature control in residential buildings** - a move which could help reduce energy consumption in residential buildings heated by their own heating systems.
- 23. Promoting the the possibility of applying to the National Programme "Green House" for housing and other national programs aimed at the use of renewable energy sources through information and technical support** - measures designed to supplement or change traditional heating systems and hot water production with systems that use renewable energy resources by installing thermal and solar panels for hot water production and contribution to heating, in changing the classical heating system with systems using heat pumps to reduce natural gas consumption by 10% and electricity by 2.5%, to invest in electricity generation systems using solar energy for own consumption in buildings by installing photovoltaic panels.
- 24. Promoting a tool for self-monitoring of energy consumption in homes, through the involvement of 10,000 homes by 2020** - a move that aims to educate the public about the monitoring of daily and monthly consumption, to identify the sources of energy and to take action for the modernization of equipment, replacing old and / or energy inefficient appliances and ensuring control of household consumptions in general;
- 25. Promoting the modernization of individual heating systems of housing by replacing traditional stoves with energy-efficient biomass, for individual buildings that use wood heating** - to reduce consumption, to ensure thermal comfort and accident prevention
- 26. The development of single-family residential building projects or NZEBR - 3 projects until 2017** - projects applicable to residential buildings, which will lead to a broader application of this concept, in view of the sustainable development of the municipality and of the housing.