

# ANALYSIS OF CURRENT NATIONAL AND REGIONAL/LOCAL RENOVATION STRATEGIES

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Deliverable D.T2.4.1

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## The eCentral project summary

Addressing poor energy performances of public buildings is at the core of EU's Energy Efficiency Directive and Energy Performance Building Directive but also one of growing financial issues in Central European countries. To address that eCentral project will support key stakeholders to realize benefits of newly implemented building standard - nearly zero energy building (nZEB). eCentral project will prove that nZEB approach, although innovative, is optimal and cost-effective solution for renovation and construction of public buildings. Project aims to capitalise on results of previous and ongoing EU initiatives. Austria has a proven track record with nZEB renovation projects and will be leading other implementing partners (CRO, SLO, HUN) by example. Transnational cooperation will be used to receive maximum international visibility of selected pilot actions. Main outputs of the project are:

- energy performance certificate (EPC) Tool for public authorities
- deployment and promotion of innovative financing schemes
- training programme and project development assistance for nZEB projects
- building renovation strategies for selected regions
- state of the art pilot nZEB public buildings in selected regions
- established cooperation with scientific institutions and other nZEB initiatives

Transnational Assessment and Support Group, formed from project experts and scientific institutions will act as a support team and provide quality checks of each output. EPC Tool will be developed and used by public sector decision makers and project developers beyond eCentral project lifetime. Trained energy efficiency teams within the regional government will serve as a backbone for conducting future nZEB projects. The European Academy of Bolzano (EURAC), one of the leading centres of expertise on energy efficiency in the Central Europe region, will focus on policy analysis and dissemination of eCentral project results.

## About this document

This document corresponds to Deliverable D.T2.4.1. of the eCentral project and should provide an analysis of nZEB policies in three CE target countries at different levels of governance in order to see what public authorities have done so far with implementation of the EPBD on strategic level.

This document was prepared in August 2018 by North-west Croatia Regional Energy Agency with the inputs of KSENA (SLO) and Energiaklub (HU).

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## A. SUMMARY

Due to the facts that existing buildings are responsible for as much as 40% of the EU's energy requirements and over one third of greenhouse gas emissions, as well as that Europeans spending 90% of their time indoors, it is very important to renovate these buildings and support healthy indoor climate.

New buildings are increasingly constructed to demanding energy performance levels, and the path has already been laid within Energy Performance of Buildings Directive (EPBD) for all new buildings to have nearly zero energy requirements. According to Article 9 of the EPBD, EU countries must develop policies and measures to stimulate the transformation of buildings that are refurbished into nearly zero energy buildings (nZEB).

The Energy Efficiency Directive (EED) sets out energy savings requirements for EU countries' buildings. This means requiring national plans to be established for renovating overall building stock. Article 4 of the EED complements other requirements within EU legislation concerning the renovation of buildings and requires EU countries to establish long-term strategies for mobilising investment in the renovation of national buildings stock, while Article 5 of EED set a 3% annual renovation target for buildings owned and occupied by central government.

EU countries have drawn up building renovation strategies to show how they plan to foster investment in the renovation of residential and commercial buildings, which are part of their National EE Action Plans. These strategies:

- Provide an overview of the country's national building stock,
- Identify key policies that the country intends to use to stimulate renovations,
- Provide an estimate of the expected energy savings that will result from renovations,
- Identify cost-effective approaches to renovations relevant to the building type and climatic zone,
- Encompass a forward-looking perspective to guide investment decisions of individuals, the construction industry and financial institutions.

## 1. Overview of Current National Renovation Strategies in Target Countries (Croatia, Hungary, Slovenia)

Article 4 of the EED requires national governments to present a first version of renovation strategy in 2014 and that this strategy to be updated every three years. To document the efforts made by EU countries, Building Performance Institute Europe (BPIE) partnered with the Renovate Europe Campaign examined the strategies provided by selected countries (Croatia, Czech Republic, France, Greece, Hungary, Ireland, Italy, Poland, Spain).

### 1.1. Croatia - Long-Term Strategy for Mobilising Investment in the Renovation of the National Building Stock of the Republic of Croatia

Long-Term Strategy for Mobilising Investment in the Renovation of the National Building Stock of the Republic of Croatia is in line with:

- Technical Regulation on Energy Economy and Heat Retention in Buildings, and
- National nZEB Plan.

#### 1.1.1. Legislation and other support measures to tackle barriers

To facilitate the renovation of multi-family buildings, Croatia amended the approval requirements to now a simple majority (51%) of residents, whereas previously such decisions needed to be unanimous. Three centres targeting energy poverty are to be established in 2018, while in the following year, research and local promotional campaigns will be undertaken in all cities with more than 30,000 residents.

#### 1.1.2. Funding and financial support for renovation

Uptake of renovation measures in residential and public buildings is highly dependent on the availability of grants from national or EU sources. While there are currently no grants for the commercial sector, financial support from the European Structural and Investment Funds (ESIF) for trade and tourism is expected to start soon and grants for public sector buildings (schools and kindergartens) are also expected. Public buildings have been renovated using grants and partially through the ESCO model.

### 1.2. Hungary - National Building Energy Performance Strategy

Hungary's energy policy is based on the National Energy Strategy 2030, adopted in 2011, which assigns a special role to building energy interventions in reducing energy consumption, given that 40% of energy consumption is used for energy supply for buildings.

In compliance with the obligation related to improvement of energy efficiency, building energy objectives receive a great deal of emphasis, so the main directions aimed at reducing energy use of domestic building stock are recorded based on a National Building Energy Strategy (hereinafter: NBES) prepared in 2014 and adopted by Government Decision No 1073/2015 of 25 February 2015.

In line with the statements of the National Energy Strategy 2030, the NBES has aimed at primary energy savings of 49 PJ/year by 2020 and 111 PJ/year by 2030.

NBES sets out measures for the renovation of existing building stock to achieve energy savings and to tighten and revise requirements for new buildings and building renovations, as well as to promote research, development, knowledge, training and awareness-raising for energy efficiency.



The Hungarian strategy has been updated as an Annex of National Energy Efficiency Action Plan 2017 (Annex 4). The strategy provides a good overview of the national building stock, a description of the national policies and financial mechanisms supporting building renovations in the country.

A large-scale in-depth survey has been conducted, involving the analysis of data in statistical databases on buildings and existing projects and certification databases as well as the on-site inspection of a great number of buildings.

The Strategy extensively builds on the concept of cost optimality approach (the methodology is based on the governmental degree 7/2006 laying down the building energy requirements, and the applied calculations for the different building types is described in a separate document).

### **1.2.1. Main problems**

The artificially low electricity prices for end-users do not motivate people to save energy or to switch to renewables. In addition, this policy doesn't seem to be changed.

Predictable long-term government programs incentivizing citizens to invest into sustainable energy are missing. Calls are launched ad hoc and are mainly helpful to those who already have resources to invest.

Operation of schools and kindergartens is transferred to a central authority therefore the local government, as the owner, loses interest in energy efficiency or RES investments.

### **1.2.2. Supporting measures**

National Network of Energy Advisors maintained by the government supports public authorities, residential and private sectors to implement energy efficiency measures from 2017.

Citizen's sustainable energy investments are supported by a (zero interest) loan program. It was launched in April 2017 and its conditions revised and simplified several times.

### **1.2.3. Funding and financial support for renovation**

Uptake of renovation measures in residential and public buildings is highly dependent on the availability of grants from national or EU sources. For public authorities, several constructions under the EU-co-financed operative programmes were available for refurbishments and RES investments during the current programming period, but these sources are depleted. The required level of renovation in terms of energy efficiency was the cost-optimum level, only a few buildings as pilot projects are renovated according to the nZEB criteria from these funds. 'Modern cities' Programme was launched in 2017 by the government, which is also a possibility for cities with county-status to implement ambitious projects, among others to develop nZEB buildings.

Non-reimbursable EE funds for the residential sector have been withdrawn by the Government; an official EEEOP modification has been indicated by the National Development Ministry and approved by the European Commission. Funding from commercial banks for energy efficiency and renewable energy investments is difficult to obtain for local authorities, due to administrative barriers. At present, there are no specific plans for innovative funds or promoting public-private partnerships through for example, energy performance contracting.

### 1.3. Slovenia - Long-Term Strategy for Mobilising Investments in the Energy Renovation of Buildings

Slovenia, broken down into 211 municipalities, has 2 million inhabitants living in about 863,870 dwellings. Residential buildings represent 71% of total floor area of buildings, with the majority (~70%) of the Slovenian building stock being built before 1979.

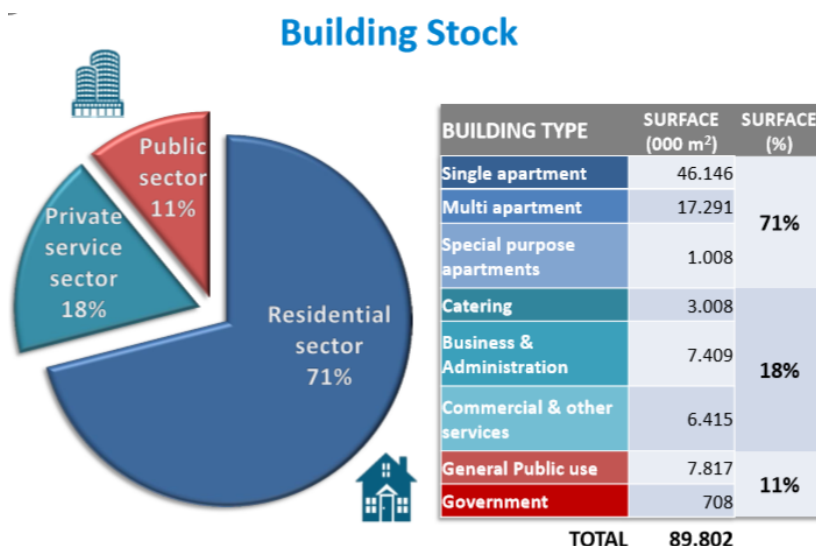


Figure 1: Breakdown of the building stock on Slovenia

Slovenia's first renovation strategy provided a detailed description of the building stock and set the target of renovating 9.1 million m<sup>2</sup> of floor area by 2023, including:

- 6 million m<sup>2</sup> of floor area in residential buildings,
- 1.8 million m<sup>2</sup> of floor area in public buildings (including the mandatory annual renovation of 3% of public buildings owned by narrow sector),
- 1.3 million m<sup>2</sup> of floor area in public buildings in the wider public sector (Entities in the wider public sector have their own legal personality which is separate from that of the Government - meaning that while such entities belong to the Government, they are not part of the Government.)

#### 1.3.1. Legislative and regulatory background

The Energy Act (EZ-1) - (Official Gazette 17/2014, 81/2015) lays down among others the principles of energy policy, energy market operation rules and principles and measures for increasing energy efficiency and energy saving. Even though the Energy Act sets some basic principles for energy renovation, the uncertainty of the regulatory framework has been reported as one of the main regulatory barriers that have to be overcome. Moreover, as mentioned in the renovation strategy, in Slovenia there is high proportion of protected buildings that requires special treatment and for which there are no guidelines on how renovation works should be performed.



For smaller municipalities, which in most cases are lacking trained staff, following complex national legislation about energy performance contracting is even more challenging. Therefore, many municipalities rely on external experts, which results in additional costs.

For multi-unit buildings, renovation works must be agreed among all owners, which makes the decision of an energy upgrade a challenging task.

Even though legislative and regulatory barriers are not among the most important ones, a clear and stable regulatory framework would create a solid ground for the renovation market.

### **1.3.2. Funding and financial support for renovation**

Municipalities consider financial barriers as the main obstacle to deep renovation. Limited borrowing capacity for the public sector, lack of access to financing in both public and private sectors, complex financial schemes, favouring large investments and not supporting smaller public buildings are among the reported obstacles. Furthermore, cumbersome and complex public procurement process as well as obstacles to energy efficiency services and Energy Performance Contracting such as public accounting rules, hinder deep renovations.

The priority is given to investments with quick rates of return, thus favouring partial rather than complete deep renovations. Investments in deep energy renovation are also hindered by the uncertainty regarding future energy prices and by extended periods of relatively low fuel prices, which may result in long payback periods.

The Slovenian Government has introduced financial support schemes to boost deep renovation. Subsidies from the Slovenian Eco Fund, the Operational Programme for the Implementation of European Cohesion Policy 2014 - 2020, the Operational Programme for Reducing Greenhouse Gas Emissions by 2020 with the Outlook to 2030, investment loans from the Slovenian investment bank (SID), and energy performance contracting are used towards this end.

### **1.3.3. Communication/Capacity building actions**

Communication and capacity building barriers are among the factors that can hinder deep renovation. Absence of competent advice on measures and steps to renovation that stem from the fragmentary nature of knowledge, experience and skills in the sector can severely damage the quality of the outcome. The inadequate training of the energy renovation workforce is also an issue highlighted in the renovation strategy as a threat for the increased energy performance in public buildings.

Furthermore, the lack of knowledge, understanding and confidence regarding the concept of energy performance contracting combined with the lack of skills in its commissioning can turn energy performance contracting into an unusable tool. The low number of energy performance contracting providers and the limited number of promoters of energy performance contracting projects make the effective use of this tool even more challenging.

Additionally, the lack of awareness among customers and investors about the wide range of benefits brought on by deep renovation and potential measures, make deep renovation an unattractive investment.

During the past years, steps have been taken to overcome the abovementioned barriers. Numerous technical guidelines for deep renovation and instruction manuals linked to national subsidies schemes have been released, contributing to the enhancement of knowledge and the dissemination of information.

Trainings and capacity building actions for deep renovation have been developed at national level. Due to the size of Slovenia these trainings often cover also the needs for trainings at local or municipal level.





Moreover, in Slovenia the existence of local agencies (e.g. KSENA) and private companies that have the knowledge and the capacity to implement deep renovations can further facilitate the uptake of market.

Through the state energy advisory programme, ENSVET, which aims to raise awareness, citizens can benefit from free of charge advice on energy efficiency and renewable energy topics.

### 1.3.4. Technical barriers

The main technical barrier for municipalities is the lack of knowledge about their building stock. Even though all municipalities have inventory of their buildings, in most cases they include only basic information. Furthermore, inventories differ from municipality to municipality making the data in many cases incomparable. Additionally, the establishment of energy management systems in public buildings, which could provide more information on their performance, was regulated only in August 2016 and had to be implemented by 31 December 2017.










### 1.3.5. R&D

Slovenia has developed and participated in several R&D projects that stimulate deep renovation. The EU-funded projects Republic ZEB, NewBee, REFURB, MODER are some them.

Even though research programmes do exist they are mainly scattered projects that are not part of an integrated and holistic national or local plan. Focused research e.g. on specific types of buildings or on targeted areas/neighbourhoods could multiply the impact of the projects. Furthermore, R&D projects need support - in terms of time and money - from local actors, which is not always available.

### 1.3.6. Strategic issues

The following table, which is based on the opinion of national stakeholders expressed as part of the EmBuild survey, presents the main barriers to deep renovation that Slovenian municipalities must face.

Type of barrier	Importance
Access to finance	
Payback expectation	
Split incentives	
Complexity and hassle	
Price signals	
Information	
Institutional and legal framework	
Skills in the supply chain	
High transaction cost	

*Ranking of barriers by importance, based on EmBuild questionnaire findings*

Table 1: Ranking of barriers to deep renovation of the whole building stock by importance, based on the opinion of national stakeholders

As shown in the table, barriers related to financing rank in the highest positions, while legal and skill-related barriers are not considered to be of high importance. Over the last years, the Slovenian Governments has taken a lot of positive measures to boost renovation in public buildings. Funding, subsidies, improved legal framework on the efficient use of energy in buildings (Official Gazette No. 17/14 and 81/15), improved



levels of information and awareness of the cost-effective options for saving energy in buildings are some of the measures that have been taken so far.

### 1.3.7. Market Uptake

The public building energy renovation project have been implemented based on an energy performance contracting model. Energy performance contracting allows the investment of energy service company's private funds in the renovation. For the energy renovation of public buildings, €115 million in grants and €50 million in repayable cohesion funds has been provided. The cohesion funds have been combined with financial investments from dedicated funds and programmes of international financial institutions in grants and repayable funds. The total annual value of investments in the renovation of buildings (grants and repayable funds, private funds from energy performance contracting and state's own funds) amounts to approximately €40 million.

## 2. Overview of Current Renovation Strategies on Regional/Local Level

The European Commission has, in January 2008, launched a major initiative Covenant of Mayors of European cities (CoM), with the aim of connecting the energy-conscious European cities in a permanent network for the continuous exchange of experience of efficient energy use. By accepting the Agreement, the mayors, among other things, are committed to the development of the Sustainable Energy Action Plan (SEAP).

Sustainable Energy Action Plan (SEAP) represents a basic document which, on the basis of the collected data on the existing situation, identifies the real situation and gives precise and clear guidelines for the implementation of projects based on energy efficiency, renewable energy and environmentally friendly fuels on the city level, which will result in a reduction of CO<sub>2</sub> emissions by more than 20% by 2020.

In October 2015, following a consultation process on the future of the Covenant of Mayors, the European Commission launched the new integrated Covenant of Mayors for Climate and Energy, which goes beyond the objectives set for 2020. The signatories of the new Covenant commit to reduce their CO<sub>2</sub> emissions and to adopt a joint approach to tackling mitigation and adaptation to climate change.

As a consequence, a new, upgraded version of the SEAP was conceived, namely the Sustainable Energy and Climate Action Plan (SECAP). SECAP is aimed at defining actions that allow cutting down at least 40% of CO<sub>2</sub> emissions by 2030.

### 2.1. Croatia - City of Sveta Nedelja

Strategic documents on regional/local level in Croatia are:

- Sustainable Energy Action Plans (SEAPs),
- Sustainable Energy and Climate Action Plans (SECAPs), and
- Energy Efficiency Action Plans.

In the City of Sveta Nedelja, there are two strategic documents that are important in terms of implementing energy efficiency measures in the public sector buildings:

#### 2.1.1. City of Sveta Nedelja Sustainable Energy Action Plan (SEAP)

The City of Sveta Nedelja is one of the the first twenty cities in Croatia that accepted the Covenant of Mayors of European cities agreement. As a consequence, the Sustainable Energy Action Plan was developed in 2011.

Regarding the SEAP, priority measures for building sector in City of Sveta Nedelja which will result with largest reduction of CO<sub>2</sub> emissions are:

- Installation of solar systems for the preparation of hot water in educational, sports and administrative buildings owned by the City;
- Installation of thermostatic valve sets on radiators in buildings owned by the City;
- Replacing lighting fixtures with modern and energy efficient light technology solutions in accordance with European standards and directives;
- Thermal insulation of facades and roofs of buildings owned by the City;

- Installation of energy saving bulbs in all buildings owned by the City;
- Installation of energy efficient windows in buildings owned by the City;
- Installation of solar systems for the preparation of hot water in households by 2020;
- Reconstruction of the external thermal insulation and roof restoration of the existing housing stock by 2020 based on sustainable principles;
- Installation of thermostatic valves on radiators in households;
- Adoption of the City Council Decision according to which all new commercial and service buildings built on low energy (heating energy consumption  $\leq 45$  kWh/m<sup>2</sup>) or the passive standard (heating energy consumption  $\leq 15$  kWh/m<sup>2</sup>) achieves a certain discount on communal contribution;
- Adoption and systematic implementation of the City Council 's Decision according to which all new commercial and service buildings equipped with heat pumps, photovoltaic and/or solar power systems achieves a discount of an additional 30% of total billing for communal contribution.

### 2.1.2. City of Sveta Nedelja Development Strategy (2018-2022)

The Strategy was developed in March 2018 and was prepared by the City of Sveta Nedelja in cooperation with socio-economic partners and citizens. The process of development of the strategy was led by working group headed by the mayor of the city.

The Strategy has been developed through several phases:

1. Survey for data collection for the preparation of workshop about strategical planning;
2. Workshop about strategical planning;
3. Presentation of final draft of the strategy.

In the preparation phase, the collection of ideas for development was also open to the public by online surveys.

The basis for the SWOT analysis was the analysis of socio-economic situation, and then based on the SWOT analysis the key needs and opportunities for development are defined. In this process, the city was led by the theory of change model and good practices.

The Strategy was prepared for the period of 5 years because the working group considered that this is an optimal period in which is possible to expect the achievement of planned outputs. Besides, this period is harmonized with the period of implementation of the current financial perspective of cohesion policy.

In the final year of implementation, it is planned the independent external evaluation of implementation of the strategy, which will serve as a basis for further strategical planning.

According to the Strategy, the city intends to actively implement measures to strengthen energy efficiency in the public sector buildings and ensure that at least 40% of public buildings (including schools and healthcare buildings) are in energy class B and higher.

## 2.2. Hungary - Municipality of 18th District of Budapest

Main strategic documents at local level in Hungary are the Integrated City Development Plans, which can also contain energy efficiency or building retrofit elements. It is important to notice that districts of Budapest have the same legal status as other local municipalities.

Directly aiming energy consumption reducing, the most current strategies at local level are

- Sustainable Energy Action Plans (SEAPs)- before 2017
- Sustainable Energy and Climate Action Plans (SECAPs), and
- Local climate strategies, which could be elaborated from 2018 following a common methodology developed by Covenant of Climate-Friendly Settlements of Hungary and its partners in 2016-2017. Its methodology is corresponding to the one of CoM: a baseline inventory is required, and built upon that, energy reduction, climate adaptation and awareness-raising measures must be elaborated. Local municipalities had the chance from 04.2018 to 06.2018 to apply for EU-cofinanced grant to elaborate their local climate strategy and implement local awareness-raising programmes. This type of climate strategy doesn't require a minimum reduction (neither in Co2 emission, nor in energy use).

At county-level, a similar financing possibility was open in 2017, so for 2018, each county municipality of Hungary has its climate strategy, also elaborated following a common methodology developed by Covenant of Climate-Friendly Settlements of Hungary.

It must be mentioned that from 2017 each public building operator is obligated to plan 'Energy Saving Actions' and then monitor and report them which are centrally collected and revised.

18th District of Budapest has two strategic documents that are important in terms of implementing energy efficiency measures in the public-sector buildings:

### 2.2.1. Integrated Development Strategy of BP 18 (2014-2020)

The Strategy was developed in 2015 and its implementation is monitored year by year. This is the main strategic document of the District.

One of the horizontal objectives of the IDS is 'climate-awareness and sustainability' and the Strategy defines the energy-efficient residential building stock and sustainable management of own properties as thematic objectives and the realization of sustainable and efficient energy use as one of the key projects.

Expected indicators of the key project:

- 20% reduction of CO2 emissions of buildings operated by the Municipality
- elaborated concept on public energy knowledge centre
- implemented complex status quo analysis of public buildings operated by the Municipality

The Municipality is implementing several projects related to these objectives and many other refurbishments under other actions during the planning period.

### 2.2.2. Sustainable Energy Action Plan (SEAP) of Budapest 18th District

The Municipality of Budapest 18th District is one of the first cities in Hungary that accepted the Covenant of Mayors of European cities agreement in 2013. Therefore, the Sustainable Energy Action Plan was developed in 2014.

Regarding the SEAP, priority measures which would have the largest reduction of CO<sub>2</sub> emissions are:

- Installation of solar systems for the preparation of hot water and/or electricity in educational, sports and administrative buildings (56) owned by the City;
- Replacing lighting fixtures with modern and energy efficient light technology solutions;
- Complex energy efficiency refurbishment of buildings owned by the City;
- Complex energy efficiency refurbishment of the existing housing stock;
- RES investments in 10% of existing and 10% of new residential buildings;
- Encouraging of sustainable mobility with the development of public transport, biking and P+R parking possibilities;
- Energy efficiency and RES investments in private sector;
- Encouraging the implementation of a PV plant (10 MW).

SEAP of BP 18 is under monitoring and the Municipality intends to set new objectives following SECAP methodology in 2018.

## 2.3. Slovenia - Municipality of Velenje

Following the rules and regulations of the Energy Act (Energetski zakon-EZ-1) and the signed Agreement of the Covenant of Mayors of European cities, current renovation strategies on regional/local level in Slovenia should be in compliance with the following documents:

- Sustainable Energy Action Plans (SEAPs),
- Local Energy Concept (LEC).

### 2.3.1. Sustainable Energy Action Plan of the Municipality of Velenje (SEAP)

Since the Šalek Valley is one of the most important energy centers in Slovenia, Municipality of Velenje as the largest settlement in this region was one of the first municipalities in Slovenia that has adopted Sustainable Energy Action Plan in 2011.

The analysis about supply and use of energy was made based on the available information from the Novalation of the energy concept of the Municipality of Velenje prepared in 2003. Industry sector was exempted from the analysis since the local self-government can hardly influence on the supply and use of energy in the private sector. The calculation of CO<sub>2</sub> emissions was made in accordance with the guidelines of the Energy Commission and the protocol of the Intergovernmental Panel on Climate Change - IPCC. The analysis of data has shown that the largest proportion of CO<sub>2</sub> emissions and use of energy are caused by buildings (80% by residential buildings, 14 % by public buildings and 6% the rest of buildings) and therefore, the Action Plan focuses mainly on energy efficient construction and renovation of buildings, energy efficient rehabilitation of the district heating system and exploitation of renewable energy sources in buildings.

The goals of the Action Plan for reduction of CO<sub>2</sub> emissions by 2020 are presented in the table below:



Targeted areas	Energy consumption in 2003 (MWh)	CO2 emissions in 2003 (t CO2)	Goal: Reduction of energy consumption by 2020 (MWh)	Goal: Reduction of CO2 emissions by 2020 (t CO2)	Reduction of emissions in %	Participation in total emissions in %
Buildings	400.302,2	147.488,3	91.101,6	31.392,0	21,3%	19,4%
Transport	61.159,0	13.081,0	58.957,3	5.444,4	41,6%	3,4%
Public lighting	1.694,5	943,8	906,6	505,0	53,5%	0,3%
<b>Total</b>	<b>463.155,7</b>	<b>161.513,1</b>	<b>150.965,5</b>	<b>37.341,4</b>		<b>23,1%</b>

Suggested measures for achieving the goals are the following:

No	Sign	Measure	Area	Value [€]
1.	M1JR 1d	Replacing energy inefficient bulbs with energy saving types	Public lighting	14.000
2.	M2JR 1d	Lamps replacement	Public lighting	73.000
3.	M3JR 1d	High power lamps replacement (200-500 W)	Public lighting	201.240
4.	M4JR 1d	Medium power lamps replacement (100-199 W)	Public lighting	569.908
5.	M5JR 1d	Low power lamps replacement (1-99 W)	Public lighting	338.576
6.	M6JR 1d	Implementation of the regulation of lighting fixtures	Public lighting	211.416
7.	M7JR 1d	Implementation of PV public lighting (also possible to connect to the network)	Public lighting	250.000
8.	M1P 2c	Implementation of 7.5% share of biofuels in total transport fuel consumption in the Municipality of Velenje in 2020	Public transport	0
9.	M2P 2c	Restriction of parking in central area of town	Public transport	0
10.	M3P 7c	Educational, awareness-raising and promotional activities	Public transport	108.000



11.	M4P 2a	Improving the fleet owned by the Municipality of Velenje	Public transport	90.000
12.	M5P 2c	Promoting Carpooling to increase the utilization of vehicles	Public transport	0
13.	M6P 2b	Free public transport - Lokalc	Public transport	4.500.000
14.	M1ZG 7a	Educational events, raising the awareness and information in the field of RES and RUE in public buildings	Public buildings and other users	4.000
15.	M2ZG 3c	Implementation of several PV systems on public buildings / locations (100kWp/a)	Public buildings and other users	2.500.000
16.	M3ZG 4c	Installation of solar thermal energy systems for public buildings (5x)	Public buildings and other users	60.000
17.	M4ZG 4b	Optimization of district heating system	Public buildings and other users	1.000.000
18.	M5ZG 4c	Increase number of buildings with district cooling system	Public buildings and other users	1.000.000
19.	M6ZG 1a	Optimization of indoor lighting in public buildings	Public buildings and other users	500.000
20.	M7ZG 1a	Replacement of electrical appliances with energy efficient (in public buildings)	Public buildings and other users	500.000
21.	M8ZG 1a	Modernization of hardware and regulation techniques in the boiler rooms of public buildings	Public buildings and other users	1.000.000
22.	M9ZG 1a	Replacing doors and windows, heating control and improving the building envelope on public buildings	Public buildings and other users	696.486
23.	M10ZG 7c	Promoting a low energy and passive reconstruction or. construction of public building	Public buildings and other users	5.000
24.	M11ZG 7c	Educational events, raising the awareness and information in the field of RES and RUE in private buildings, dwellings	Public buildings and other users	2.000.000
25.	M12ZG 1c	Installing of separate heat meters in multi residential buildings	Public buildings and other users	1.000.000
26.	M13ZG 1c	Replacing energy inefficient household appliances	Public buildings and other users	11.697.000
27.	M14ZG 1c	Installation of solar thermal energy systems for private buildings	Public buildings and other users	1.000.000





28.	M15ZG 1c	Replacement the lighting in dwellings with more energy-efficient techniques	Public buildings and other users	300.000
29.	M16ZG 1c	Replacing doors and windows, improving the building envelope, heating control systems and boilers in private buildings	Public buildings and other users	2.500.000
30.	M17ZG 3c	Implementation of micro PV systems on private buildings (~4kWp)	Public buildings and other users	1.200.000
31.	M18ZG 7c	Promoting a low energy and passive reconstruction or construction of private building	Public buildings and other users	5.000
<b>Total</b>				<b>33.323.626</b>

As it is presented, measures regarding the building sector should be mainly focused on reconstruction of existing heating systems, improved thermal insulation of buildings, replacement of windows, doors and other building furniture, use of energy efficient machines and appliances, general information sharing and awareness raising among citizens on efficient use of energy (EEU) as well as exploitation of renewable energy sources (RES).

In the transport sector, much attention should be paid primarily to the purchase and use of environmentally-friendly vehicles: low-fuel vehicles with lower CO<sub>2</sub> emissions per 100 km (below 120 g / 100 km), hybrid and electric vehicles.

The field of public lighting represents a relatively low share of CO<sub>2</sub> emissions in the overall balance but has a potential for significant savings. Measures on public lighting are mainly focused on replacement of energy-inefficient lamps, their regulation as well as exploitation of renewable energy sources for lighting (solar lamp, etc.).

Below are presented potential financial sources for implementation of the suggested measures:

Financial source	Type	Highest possible amount	Participation of the MoV in total costs	Year in which they might be available
Municipal budget	Own resources	-	100 %	2011 - 2020
Public-private partnership	Own resources/ private equity	-	-	-
ESCO model (Energy Service Company)	Own resources/ private equity	-	-	2011 - 2020
IPA 2 Program (Cross-border cooperation: SI -HR)	Grants/own resources	300.000 € per project/partner	85 %	2011 - 2013



Cross-border cooperation (Si - AT), Transnational programs: SE Europe, Central Europe, Mediterranean, Alpe...)	Grants/own resources	300.000 € per project/partner	85 %	2011 - 2013
Intelligent Energy Europe (CIP, IEE)	Grants/own resources	2,5 mio € per project	75 %	2011 - 2013
Framework programs (FP7)	Grants/own resources	32,4 mlrd € - in total	75 %	2011 - 2013
Cohesian Funds for sustainable use of energy	Grants/own resources	160 mil. €	do 85 %	2011 - 2013
ELENA	Grants/own resources	15 - 50 mil. €	100	After 2011

So far, the following investments have been done:

Year	Value of the investment	Municipal budget	Grants	Other sources	Savings in Mwh/y
2011	1.044.595,01 €	1.044.595,01 €			131,50
2012	217.000,00 €	217.000,00 €			142,00
2013	29.000,00 €	29.000,00 €			21,00
2014	2.069.951,21 €	1.008.589,21 €	1.061.362,00 €		1.553,00
2015	3.497.887,43 €	1.000.231,85 €	2.497.655,58 €		200,80
2016	60.026,49 €	60.026,49 €			21,00
2017	134.142,37 €	134.142,37 €			30,00
<b>Total</b>	<b>7.052.602,51 €</b>	<b>3.493.584,93 €</b>	<b>3.559.017,58 €</b>		<b>2.099,30</b>
%		49,54%	50,46%		

2018- 2020	1.200.000,00 €	84.000,00 €	504.000,00 €	612.000,00 €	
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The most significant implemented projects regarding renovation of the building stock are:

Name of the project	Value of the total investment in EUR	Municipal budget	Grants	Savings
Energy renovation of the Villa Rožle	273.134,33 €	40.970,15 €	232.164,18 (Cross border SLO-HR)	40 MWh/y 60 %
Energy renovation of the Regional Gallery Velenje	1.381.977 €	436.059 €	945.918 € (ERDF)	80 MWh/y 30 %
Renovation of the start-up center Standard	1.695.975,94 €	376.402,54 €	1.319.573,40 € (ERDF)	
Energy renovation of the kindergarden Tinkara	224.580 €	100.150 €	124.430 € (Ministry for infrastructure)	75 MWh/y
Energy renovation of the kindergarden Lučka	278.185 €	92.630 €	185.555 € (Ministry for infrastructure)	79 MWh/y
Energy renovation of the Health Center Velenje	1.288.616 €	537.239 €	751.377 € (Ministry for infrastructure)	760 MWh/y
<b>Total</b>	<b>5.142.468,27 €</b>	<b>1.583.450,69 €</b>	<b>3.559.017,58 €</b>	

### 2.3.2. Local Energy Concept (LEK)

Every Slovenian Municipality, with the prior consent of the Minister responsible for energy, must adopt and publicly announce the energy management program named Local Energy Concept (hereinafter: LEK).

LEK is the most important strategic tool in planning the local energy policy. It encompasses ways by which local communities can tailor solutions for efficient, economical and environmentally friendly energy services in homes, businesses and public institutions. The document also lists the concrete effects that the local community can achieve by carrying out activities from the LEK. Based on LEK, the spatial and economic development of the local community is planned, the development of local energy utilities, the efficient use of energy and its saving, the use of renewable energy sources and the improvement of air quality in the local community.

LEK enables:

- monitoring, identifying and documenting energy consumption and changes in the energy and environmental status,
- creating a short-term and long-term energy policy,
- selecting and defining the objectives of energy planning and energy policy in the local community,
- designing and comparing different alternatives and scenarios of potential energy and related economic development,



- an overview of the measures for effective improvement of the energy situation and, therefore, of the state of the environment.

The local self-government prepares LEK itself or with one or more other local self-governments. Additionally, each Municipality can achieve the goals independently or in cooperation with other Municipalities.

Based on the guidelines from LEK, the Municipality might issue a decree for priority use of energy products for heating, considering the environmental criteria and technical characteristics of buildings.

Local authorities and energy service providers from the territorial area covered by LEK are obliged to align their development documents and activities with the objectives and measures foreseen in LEK. Hence, LEK represents a compulsory professional basis for preparation of spatial plans of local communities. In the case of incompatibility between the LEK and the spatial plan, the non-compliance should be fixed by revising or supplementing the spatial plan. If the local authority has not started the process of planning, revising or supplementing the spatial plan at the time of accepting the LEK, this procedure shall be initiated based on identified non-compliance with the LEK.

Moreover, each LEK must be in line with the Energy Concept of Slovenia (EKS), which is a new strategic document that must be adopted by the end of 2018. Based on EKS, Municipalities must produce new or adjusted old LEKs with clearly stated, realistic and achievable implementation plan.

The Minister responsible for energy sets the content and the methodology for preparation of LEK with a special act, determined by the "Rules on the methodology and mandatory content of the local energy concept (Official Gazette of the RS, No. 56/2016)".

The most usual challenges in preparation of the LEK are:

- lack of updated and precise energy data for making the initial analysis
- lack of cooperation between stakeholders
- lack of qualified staff for planning and implementation of LEK
- lack of finances for putting the measures into practice
- lack of understanding the LEK as live strategic document not just a legal responsibility
- lack of a system for monitoring and evaluation of the implemented measures

Municipality of Velenje has adopted its Local Energy Concept in 2012 and according to the 29 article of the Energy Act (EA-1) must revise it after 5 years or more often if it is necessary and to prepare a new one after 10 years. The base line years for the analysis have been available data from 2011 and 2003.

The document offers analysis about:

- the use of energy in residential buildings, public buildings, bigger business users, public lightening and others
- transport
- emission of CO<sub>2</sub>



- various sources of energy production
- projection of the future use of energy

Furthermore, based on the analysis the weak points are identified as well as the potentials for more efficient use of energy and possible use of renewable sources.

The most important part of the LEK are the goals and the suggested measures for reaching those goals.

The table below presents the targeted goals up to 2020:

Goals	Long-term goals of the Municipality of Velenje regarding energy	Indicators
Goal 1	Reduction of total energy consumption in buildings by 14% by 2020 compared to 2011	Lower energy consumption (in kWh) and reduction of energy costs (in €)
Goal 2	Increase the share of renewable energy by 4.5% by 2020 compared to 2011	Increased share of energy from renewable energy sources (in kWh), reduced share of CO2 emissions (in%)
Goal 3	Increase motivation, awareness and energy consciousness about the importance of efficient energy use and the promotion of renewable energy sources	Number of participants in educational events on the topic of energy efficiency and the exploitation of renewable energy sources
Goal 4	Reduction of the electricity use for public lighting	Reduced use of electricity (in kWh) and reduction of energy costs (in €) for public lighting

In order to achieve the goals, the following measures have been recommended:

#### A. Households

Measures	
Heating	<ul style="list-style-type: none"> <li>- good thermal insulation of buildings;</li> <li>- precise room temperature regulation;</li> <li>- suitable arrangement of heating elements;</li> <li>- quality windows and doors;</li> <li>- additional sealing of windows;</li> <li>- connection to the district heating or gas (where possible);</li> <li>- introduction of renewable energy sources;</li> <li>- replacement of worn-out heating elements with more efficient, more modern ones;</li> <li>- installation of thermostatic valves.</li> </ul>



<b>Ventilation</b>	<ul style="list-style-type: none"> <li>- controlled ventilation of rooms: when heating is included, windows should be closed, even permanently sealed windows are inadequate;</li> <li>- proper ventilation: open the window for a few minutes and at the same time close the valves on the heating elements, then close the windows and re-open the valves on the heating elements;</li> <li>- check the sealing of the windows and doors regularly and, if necessary, replace or install seals.</li> </ul>
<b>Electricity (lighting, appliances and devices)</b>	<ul style="list-style-type: none"> <li>- to maximize the use of natural light;</li> <li>- windows should be regularly cleaned, as is the case with lamps;</li> <li>- check that the layout and type of lamps are appropriate according to the purpose of the rooms</li> <li>- use of energy saving lamps;</li> <li>- the shutdown of the light, when there is no one in the room;</li> <li>- switch off various appliances when not in use;</li> <li>- when purchasing, it is necessary to decide on modern devices that use very little electricity at standstill or standby;</li> <li>- auxiliary electric heaters should only be used in exceptional cases.</li> </ul>
<b>Water</b>	<ul style="list-style-type: none"> <li>- control whether the pipes are closed after use;</li> <li>- closing the tap when water is not needed directly;</li> <li>- regular inspection of the water supply network and timely replacement of worn-out seals or defective valves;</li> <li>- installation of economical toilets with two flush levels;</li> <li>- installation of meters in residential blocks in an individual apartment;</li> <li>- purchase of modern washing machines and dishwashers.</li> </ul>

In this context, the municipality should use a range of instruments for promotion of energy savings among the inhabitants:

- advising citizens on EEU and RES,
- motivating citizens for EEU measures (building insulation, energy saving lamps, etc.),
- implementation of demo and pilot projects,
- motivating citizens to introduce RES (wood biomass, solar energy).

The first and most important measure that the Municipality must carry out is to constantly raise the awareness of the citizens about the possibilities of savings, the benefits they can have for the more efficient use of energy and the exploitation of renewable energy sources. To this end, the Municipality should organize various events on this topic, to ensure that the topic will appear in local media (radio, TV, local newspapers), etc. Awareness raising often increases the activity of residents in solving environmental and energy problems. Experience shows that it is possible to reduce the use of energy in the facility by up to 20% with the proper behaviour of informed consumers, without reducing the comfort in the building.

## B. Public buildings

For the benefit of the LEK, for each public building a basic energy performance analysis was prepared, and the following measures are suggested:

- Preparation of extended energy audit as a basis for preparation of a feasibility study for renovation of the public buildings

- Establishing/assigning energy management for public buildings
- Introduction of energy accounting in all public buildings owned by Municipality of Velenje
- Implementation of investment measures to reduce energy use
- Implementation of organizational and investment measures to reduce energy use in the manner of contracting the provision of energy savings
- Organization of informative and educational events for executives, managers, employees and maintainers of public buildings.

### **C. Business users**

For the business users the following measures have been recommended:

- preparation of extended energy audit reports
- introduction of energy management and energy accounting
- replacement of energy inefficient windows and doors and insulation of the external walls of the building
- energy efficient heating (cogeneration of electricity and heat, condensing boilers, regulation, etc.): utilization of waste heat for heating the rooms and preparation of sanitary hot water, control of the temperatures in the room, daily monitoring of fuel consumption for heating depending on external temperature and analysis of operating costs of local electric heaters
- energy efficient lighting: switching off when no lighting is needed, local lighting, daylight and energy efficient lighting.
- efficient use and elimination of water leakage: weekly monitoring of water consumption.
- optimization of technological processes.

### **D. Public lighting**

LEK recommends preparation of a detailed plan for managing the public lighting as well as update of the cadastre, use of modern LED lamps and renewable energy.

### **E. Use of local energy resources**

- construction of a district heating system for wood biomass installation of individual wood biomass boilers (pellets, chips or logs);
- heat pumps;
- solar collectors;
- installation of photovoltaic power plants

As part of the LEK action plan with detailed activities is set for each year up to 2022 together with the financial construction and timetable for implementation of the suggested measures.

Municipality of Velenje together with KSENA has the responsibility to report on the implemented actions on annual basis.



### 3. Analysis of nZEB Policies in Target Countries (Croatia, Hungary, Slovenia)

Article 9 of the EPBD requires EU countries not only to set a national nZEB definition, but also to actively promote higher market uptake of such buildings. EU countries shall prepare and submit to the European Commission the national plans with clear definitions and measures for the promotion of nZEBs.



Country	Status of the definition	Main reference(s)	Year of enforcement		EPBD scope of nZEB definition	nZEB definition for new buildings					nZEB definition for existing buildings		
			Public	Non-public		Numerical indicator	Maximum primary energy [kWh/m2y]		Share of renewable energy	Other indicators	Status of the definition	Maximum primary energy [kWh/m2y]	
							Residential buildings	Non-residential buildings				Residential buildings	Non-residential buildings
Croatia	✓	Regulation OG 97/14, National nZEB Plan	1/1/2019	1/1/2021	✓	✓	35-80 (depending on the location and building type)	25-250 (depending on the location and building type)	30%	Envelope performance	No data	-	-
Hungary	✓	Amended governmental degree 7/2006	1/1/2019	1/1/2021	✓	✓	100	Offices: 90 Educational buildings: 85	25%	Limits for heat transfer coefficient of structures; heat loss factors; EP, specific requirements for the mechanical elements, risk of summer overheating, renewable share	-	-	-
Slovenia	✓	An action plan for almost zero-energy buildings for the period up to 2020 (AN SNES)	1/4/2015	1/4/2015	✓		[single houses] New buildings <75 Deep renovation <95  [multi residential buildings] New buildings <80 Deep renovation <90	New buildings <55 Deep renovation <65	50%			[single houses] Deep renovation <95  [multi residential buildings] Deep renovation <90	Deep renovation <65



## 4. Conclusions and recommendations

Energy renovation roadmaps on regional and local levels will build on existing strategic documents (e.g. SEAPs) and will present concrete renovation plans in line with targets and methodology of national long-term building renovation strategies.

Based on results from this document, nZEB principles will be embedded in strategic energy planning documents (e.g. SEAPs).