EXPERIENCES
of developing local renovation strategies

EmBuild
Imprint

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**KSSENA** Energy Agency of Savinjska, Šaleška and Koroška Region (Slovenia)

**eza!** Energie- und Umweltzentrum Allgäu gemeinnützige GmbH (Germany)

**BPIE** Buildings Performance Institute Europe ASBL (Belgium)

**NALAS** Network of Association of Local Authorities of South East Europe (Macedonia)

**TUM** Technische Universität München (Germany)

**AE3R** Agentia pentru eficienta energetica energii regenerabile Ploiesti-Prahova asociatie (Romania)

**UoB** University of Belgrade (Serbia)

**REGEA** North-West Croatia Regional Energy Agency (Croatia)

**EnEffect** DZZD EnEffect group (Bulgaria)

**Project website:** www.EmBuild.eu

**Lead partners for the compilation of this document**

![BPIE](image)

**With contributions from:**
Nejc Jurko – KSSENA
Felix Geyer – eza!
Catalin Csaszar – AE3R
Bojana Stankovic – UoB
Marko Vlaičić – REGEA
Dragomir Tzanev – EnEffect
Kamen Simeonov – EnEffect

**Project Coordinator contact:**
Renate Schindlbeck
Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH
Wielinger Str. 52
82340 Feldafing
renate.schindlbeck@giz.de

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EXPERIENCES
of developing local renovation strategies

Author
Frances Bean – BPIE
Maarten De Groote – BPIE
Mariangiola Fabbri – BPIE

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EmBuild is a coordination and support project implemented by a consortium of ten institutions based in eight countries throughout Europe under the Horizon 2020 research and innovation programme. Overall coordination rests with the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ).

The main objectives of EmBuild are to increase the capacity of public authorities at regional/municipal level to collect the necessary data to prepare ambitious, sustainable and realistic renovation strategies for public buildings; analyse and identify cost-effective approaches to renovations; guide investment decisions; and facilitate private sector involvement. EmBuild is supporting municipalities and towns in Bulgaria, Croatia, Germany, Romania, Serbia and Slovenia. In addition, the project will focus on analysing policies and implemented measures that stimulate cost-effective deep renovation of buildings and identify best practices in six partner countries.
INTRODUCTION

From 2016 to 2018, the EmBuild project supported municipalities to develop local renovation strategies, focused on tackling their public buildings. The ultimate aim was to address the challenges of reducing energy and CO₂ emissions, by driving the development and adoption of ambitious plans.

This report tells the story of the project. It mirrors the step-by-step approach used to support municipalities with their renovation strategies: planning (including gathering data to establish an inventory of the building stock and developing policies and measures), investing (identifying sources of financing) and capturing the benefits of renovation. This report presents selected examples of these steps and explains how tools developed by EmBuild have been used to support the development of renovation strategies. These examples can provide inspiration for other public authorities developing renovation strategies. Full details on the steps to undertake are set out in the template for renovation strategies developed for EmBuild (1). In addition, the experiences in Gorna Malina (Bulgaria) and Waltenhofen (Germany) are described in detail.

The partners in EmBuild supported 95 municipalities in Bulgaria, Croatia¹, Germany, Slovenia, Romania and Serbia to develop local renovation strategies. By the end of 2018, it is expected that strategies will be adopted in 20 municipalities².

There are eight municipalities with renovation strategies adopted (as of March 2018), and a further 37 where strategies are under development but may not be adopted by the end of 2018. In addition, in 50 other municipalities public officers have been involved and provided with support but are not currently working on strategies. Over 850 public officers were engaged in the project by various means including national, regional and local conferences, workshops, roundtables, direct consultation and communication, meetings and field visits. Annex I provides a full summary of the interactions EmBuild had with public authorities throughout the project.

Challenges which have hindered the development of strategies include the lack of a national renovation strategy to set the framework, lack of data, insufficient capacity and knowledge, and financial barriers. The conclusions and recommendations of this report look at how EmBuild overcame some of these challenges. Also, in some municipalities strategies are not currently being developed due to different political priorities for 2018, new mayors and elections.

Renovating the buildings covered by the local renovation strategies supported by EmBuild will save around 8,900GWh of energy by 2050. By 2020 it is estimated that over 330 buildings will be renovated leading to over 500GWh of energy savings by 2020. Annex II provides a breakdown of the energy savings by country and municipality.

### BY END OF 2018

<table>
<thead>
<tr>
<th>Municipalities supported</th>
<th>Local renovation strategies</th>
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<tbody>
<tr>
<td>95</td>
<td>20</td>
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¹ In Croatia, three counties were engaged covering ~50 smaller municipalities; only the three counties are counted here.
² These could be in the form of Local Energy Efficiency Action Plans (LLEAPs), Sustainable Energy Action Plans (SEAPs) or renovation strategies according to Article 4 of the EU Energy Efficiency Directive.
This programme has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No.695169.

MAP OF PUBLIC AUTHORITIES ENGAGED AND WHERE STRATEGIES WILL BE IN PLACE BY THE END OF 2018 (IN GREEN)

### Table 1 – Municipalities where development of renovation strategies has been supported by EmBuild

<table>
<thead>
<tr>
<th>Country</th>
<th>Municipalities where strategies adopted as of 31 March 2018</th>
<th>Municipalities where strategies under development as of 31 March 2018</th>
<th>Municipalities engaged (but where no strategy is under development) as of 31 March 2018</th>
<th>Municipalities where strategies are expected to be adopted by end of 2018</th>
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<tbody>
<tr>
<td>Bulgaria</td>
<td>Gorna Malina</td>
<td>Dobrich</td>
<td>Smysdovo</td>
<td>Gorna Malina</td>
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<td>Burgas</td>
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<td>(Sofia)</td>
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<td>Stara Zagora</td>
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<td>Croatia</td>
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<td>Karlovc County</td>
<td>Donauwörth</td>
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<td>Krapina-Zagorje County</td>
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<td>Zagreb County (covering ~50 municipalities)</td>
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<td>Germany</td>
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</table>

**TOTAL** 8 37 50 20

**EXPERIENCES OF DEVELOPING LOCAL RENOVATION STRATEGIES**

This programme has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No.695169.
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Graphic recording of EmBuild final conference “Planning locally” session.
PLANNING - EMBUILD TOOLS, EXPERIENCES AND EXAMPLES

Collecting and analysing data is a vital first step in the development of a renovation strategy as it provides an overview of the building stock. However, it is not an easy step and most municipalities engaged by EmBuild did not have an inventory of their building stock, so they lacked data on their buildings. The EmBuild project developed three tools to support building a better understanding of the building stock.

<table>
<thead>
<tr>
<th>Data tools available at embuild.eu/navigator/plan:</th>
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<tr>
<td><strong>Meta-data base</strong></td>
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<tr>
<td><strong>Questionnaire for preliminary analysis</strong></td>
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<td><strong>Templates for energy audits</strong></td>
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The following sections explain how municipalities have introduced/used the tools developed by EmBuild in their planning. It includes selected examples from municipalities on how the tools were used. These tools provided the starting point to collect data. However, this was very challenging in some municipalities due to their lack of resources and capacity.

**BULGARIA**

When the project began there was no systematic collection of information on the overall building data, energy consumption and costs, energy audits or energy efficiency measures implemented in public buildings in any of the municipalities involved in the EmBuild project. This was one of the main obstacles to the preparation of good quality energy plans by these municipalities.

The EmBuild Meta-data Excel sheet for collecting data was used for the preparation of all of the strategies supported by EmBuild in Bulgaria. It was distributed to all municipalities partnering with EmBuild, and further explanation was provided to municipal experts where necessary. It was also presented, alongside the other support tools developed under the project, at a seminar in Gabrovo in April 2017, attended by about 70 participants.

The questionnaire for preliminary analysis was also used to obtain general technical information on the state of the individual buildings in some municipalities. However, it was not completed in all municipalities because of insufficient human resources with the necessary specific knowledge in some municipalities and the high workload of some municipal energy specialists due to the implementation of the ongoing National Programme for Energy Efficiency in the Multifamily Buildings.

The EmBuild template for energy audits was used in the preparation of four detailed energy analyses: Mladost Sports Hall in Burgas, House of Humour and Satire in Gabrovo, Social House for Children Deprived of Parental Care in Dobrich and the Municipal Administration in Gorna Malina. The content of the template for energy audits is similar to the usual content of energy audits for buildings in Bulgaria. However, the template produced higher quality reports as it includes comparison of several packages of measures leading to the achievement of different energy classes based on lifecycle cost analysis, and more in-depth financial analysis. The reports were highly appreciated by the municipal authorities, and the template could also be used by municipalities in future procurement of energy audits.
**Data collection EXAMPLE**

**Energy audits and recognition of comfort benefits – Gorna Malina, Bulgaria**

The analysis for Gorna Malina developed during EmBuild showed that most of the municipal buildings are severely underheated. This suggests that renovation is unlikely to bring immediate cashflow benefits to the municipality, as any savings would be used to improve thermal comfort. However, the local authority recognises comfort as an important benefit, so the plan was adapted to include a gradual increase in comfort. Positive cashflow is expected to begin at a later point within the lifecycle of the measures.

In future, in order to further optimise the investment, all energy audits will investigate a step-by-step approach, where investments in specific measures could be implemented immediately (increasing the comfort and stimulating economies of scale) at an affordable cost and providing space for further improvement.

Video on the approach in Gorna Malina: [www.youtube.com/watch?v=tiEmplC-VhI](http://www.youtube.com/watch?v=tiEmplC-VhI)

*EmBuild partner – EnEffect*

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**CROATIA**

In Croatia, the data analysis of the municipal public buildings was undertaken using REGEA’s own template for energy audits. A preliminary analysis was conducted to gather data on the building envelope, heating, ventilation and air conditioning (HVAC) systems and energy demand, and determine which public buildings to renovate. However, lack of data remained an issue. Therefore, some assumptions were made to gather basic data; for example energy consumption data was estimated on the basis of the building heated area, number of users, age of the building and average energy consumption. In some cases the building was visited to gather specific and detailed data.

The template for renovation strategies was adapted to county needs and in line with national strategy content with an additional asset management chapter.

**GERMANY**

The EmBuild Meta-data Excel spreadsheet was the starting point for work with the focus municipalities. The spreadsheet was sent to public officers to gather data on the building stock. Many municipalities already have their own building inventory. These are in some cases rather simple, while others are more elaborated, for example with data on monthly energy consumption. Nevertheless, the pilot municipalities struggled to provide the information about their buildings. This may be due to lack of time or budget within the municipal administrations and lack of understanding on what data should be collected and how it can be aggregated. However, municipal officers considered the tool to be valuable. If a similar tool were used as a common standard for all municipalities, renovation strategies could be developed faster and more easily in Germany.

Many of the municipalities in Germany have already implemented municipal-level energy management systems. Energy monitoring is an integral part of this, and most of the time implies monthly recording of energy meter readings. The meter readings are done by the building manager/caretaker and the information is aggregated in monthly and annual reports. This can be the basis for the elaboration of a long-term strategy. For some municipalities (e.g. Sonthofen, Memmingen), an external service company provides municipal energy management.

**ROMANIA**

In Romania, local authorities report energy and building related data to the regional and national statistics institutes, using existing templates. The data is not reported per individual building, but per buildings type, thus combining a lot of data. The EmBuild Meta-data Excel spreadsheet and tools were interesting to public authorities since they provide more information, making it easier to identify problems and propose tailor-made solutions. However, the EmBuild tools take much more time to fill and maintain: although after the initial effort the spreadsheet only needs updating, public authorities felt that a dedicated energy manager (at least one for several towns) would be needed. While gathering data can be done relatively easily, an expert or professional is needed to analyse data and propose clear solutions.
The questionnaire for the preliminary analyses was presented during the initial visits to the local authorities, which found it well structured and concise, yet detailed enough to give a rough idea of the status of a building. However, it was found to require more work than initially expected, including detailed information that is archived, which adds complexity and bureaucracy.

In Serbia, a database was formed for the selected municipalities based on their input for the project “Energy efficiency in public buildings” conducted by GIZ and University of Belgrade, which should result in national typology of public buildings. Currently, the national typology of schools and kindergartens is also being developed. The EmBuild preliminary analysis questionnaire was much broader, especially in the domain of building characteristics. However, it is clear that most energy consumption data is missing. Although the percentage of public buildings that have already undergone refurbishment is not large, data on pre- and post-refurbishment characteristics and consumption is not available. As a result, buildings to be renovated were not selected on the basis of their energy consumption or renovation potential but by public officers on the basis of the local importance of selected buildings (such as a school in a very poor condition, or a previously non-refurbished kindergarten).

When the project began there was no systematic collection of information on the overall building data, energy consumption and costs, energy audits or energy efficiency measures implemented in public buildings in any of the municipalities involved in the EmBuild project.

Data collection EXAMPLE

Use of analysis tools – Lajkovac, Serbia

Following the preliminary analysis and detailed analysis for a school in Lajkovac, this municipality prepared documentation, applied for, and was granted funding for its refurbishment. The energy class of the school will be upgraded, resulting in savings of about 40%.

EmBuild partner – UoB
INVESTING EFFECTIVELY

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20 CITIES

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SCHOOLS

MEASUREMENTS OF THE RESULTS

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WE ARE
MANAGING
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HOW DO WE MAKE
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CAN WE DO THE SAME
WITH LESS

IMPROVING
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ON
RESIDENTIAL BUILDINGS
PROMOTE A PUBLIC BUILDING

SCHOOLS

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HOW TO INCREASE LOCAL AUTHORITY
HOW TO INCENTIVISE LOCAL AUTHORITIES

HOW TO INCENTIVISE LOCAL AUTHORITIES

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LONG TERM
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ALL GOVERNMENT BUILDINGS ARE RENOVATED

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HEATING

Questions

Graphic recording of EmBuild final conference “Investing effectively” session.
Finding the funds to renovate was a common concern for the municipalities in the project. It can be difficult for municipalities to access national, EU and regional funds due to the size of their projects or lack of capacity to put together a funding proposal. In some cases, lack of awareness about potential funds means municipalities do not take advantage of the funds available to them. Nevertheless, innovative ways of financing renovation are being considered in some of municipalities involved in EmBuild. The examples below illustrate some of these examples. These could be relevant for other municipalities. In addition, more support is needed for all municipalities to access funds for renovation, such as the provision of technical assistance with applying for funding and capacity building programmes, as well as specific allocation or ring-fencing of funds for renovation, particularly in South East Europe. This is further explored in the conclusions of this report.

EmBuild developed a tool looking at tackling lack of finance. However, the tool was not widely used by the municipalities in the project as in most cases renovation strategies will fall under a different planning/accounting period, i.e. in the future. Also, while this tool offers an overview of the various approaches, it does not provide specific guidance on how to go about accessing financing for renovation or list the available funding lines in each country and for each municipality.

Finance tool available at embuild.eu/navigator/invest:

- ‘How to improve the investment climate’ report
- Overview of existing innovative approaches and mechanisms for an active involvement of stakeholders at public level and to facilitate and stimulate the application of such awareness-raising measures in practice.

Financing EXAMPLE

Crowdfunding renovation – Velenje, Slovenia

The municipality of Velenje, which is engaged with EmBuild, will renovate the building used by the University for Lifelong Learning (Ljudska Univerza Velenje) as part of the nearly-zero-energy building (nZEB) pilot project within the eCentral project. The building is a priority for renovation, because although it has decent energy performance, it is far from being a nearly-zero energy building. The pilot will be financed with a crowdfunding or crowdsourcing campaign starting in 2018. The municipality of Velenje will prepare a campaign which will have all elements of commercial crowdfunding (similar to Kickstarter, or other platforms), but it will not guarantee or promise any financial return for investors since this is not currently allowed in national legislation. If national legislation changes to allow crowdfunding to gain benefits or return on their investments, this model could be of wider use in future.

Extract from Voices of EmBuild – Velenje, Slovenia: www.youtube.com/watch?v=NT7o9QruTwE

EmBuild partner – KSSENA
**Financing EXAMPLE**

**Combining grants and lands – Burgas, Bulgaria**

In the city of Burgas, a number of renovation projects are executed through combining grant funds from the operational programmes with financing from the Bulgarian Energy Efficiency and Renewable Sources Fund. Some of them reach very ambitious energy efficiency levels: for renovation of the Mladost sports hall, the energy audit suggested reaching energy class A as the most suitable option. Supported by EmBuild, the municipality has decided to invest in a modern energy management system, which will be developed in cooperation with municipal energy efficiency network EcoEnergy and will allow for better planning processes and channelling of funds to the most appropriate projects.

*EmBuild partner – EnEffect*

**Financing EXAMPLE**

**Energy performance contracting – Karlovac, Croatia**

Energy performance contracting was shown to be a good model in Karlovac county, Croatia. Investment in changing boilers from oil to biomass was split between public and private financing. The relationship is set out in a 10-year contract between the public authority, which owns the building, and a private company, which is responsible for maintaining the boiler room and supplying the biomass fuel.

*EmBuild partner – REGEA*

**Financing EXAMPLE**

**Energy performance contracting - Celje, Slovenia**

The first energy performance contracting project in Slovenia was implemented in 2002. Since then, energy performance contracting projects have been carried out in various sectors (particularly in the public sector) for different energy efficiency and renewable energy measures and different investment volumes. In Celje, Slovenia, eight buildings will be renovated through energy contracting, using Cohesion Funds and municipal funds.

Investment: €3,858,186.00  
Surface area: 25,153 m²  
Consumption: 4,453,602 kWh/y  
Expenses: €357,928 €  
Energy savings: 1,828,486 kWh/y  
Economic savings: €175,777 €  
CO₂ reduction: 445.782 tonnes

*Voices of EmBuild – Celje, Slovenia:  [www.youtube.com/watch?v=zlJ26yxhj6r](http://www.youtube.com/watch?v=zlJ26yxhj6r)*

*EmBuild partner – KSSEN*
Financing EXAMPLE

Energy service company model – Gabrovo, Bulgaria

In the city of Gabrovo, several projects are being developed with the goal of applying for energy service company (ESCO) financing schemes. The municipality has organised a procurement procedure for selecting an ESCO for the project of modernising the energy efficiency of the street lighting system. The audit of the pilot building under EmBuild (Museum of Humour and Satire) has been developed by EnEffect (the Bulgarian EmBuild partner) to be suitable for ESCO financing. Renovation of the Orlovets sports hall is also planned via an ESCO. The recommended packages of energy efficiency measures in both energy audits aim to achieve energy class A.

*EmBuild partner – EnEffect*

Financing EXAMPLE

International funds – Gabrovo, Bulgaria

A pilot building automation project has been prepared and is currently applying for financing under a German government programme. The plan is to install building automation systems as well as intelligent energy measurement devices in eight municipality-owned buildings. The municipality’s central office will receive remote data on the building’s energy consumption.

*EmBuild partner – EnEffect*

Financing EXAMPLE

Community funds – Romania

The concept of community as a means to finance energy projects has been discussed with various stakeholders and local organisations, and the EmBuild partner AE3R promoted the idea. It was included in the Local Energy Action Plans under development. The main premise is that communities or associations can financially support their own small energy projects which in turn provide direct benefits for them, reducing their costs and providing long-term savings.

There are existing associations in different fields (home-owners associations, agricultural etc.), but not for energy efficiency, since many used national funds to finance their projects. There is still a need to grow a portfolio of projects and prove that it is feasible under local conditions; a few pilot projects could attract the much-needed attention.

*EmBuild partner – AE3R*
Graphic recording of EmBuild final conference “Capturing the benefits” session.
CAPTURING THE BENEFITS – EMBUILD TOOLS, EXPERIENCES AND EXAMPLES

The wider benefits of energy renovation can be a significant driver for putting policies in place. These go beyond reducing energy consumption to deliver greater wellbeing, health benefits, and macroeconomic benefits such as employment. As these benefits appeal to citizens, they can be interesting to municipalities that want to deliver positive changes for citizens beyond energy issues.

What are WIDER BENEFITS of energy efficiency and deep renovation?

<table>
<thead>
<tr>
<th>MEASURES</th>
<th>MAIN BENEFITS</th>
<th>WIDER BENEFITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deep renovation</td>
<td>Reduced energy consumption</td>
<td>Wellbeing (indoor)</td>
</tr>
<tr>
<td>Energy efficiency</td>
<td></td>
<td>Health</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Macroeconomic benefits</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Economic productivity</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Aesthetics</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Energy generation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Energy infrastructure</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Environment (CO2, GHGs,..)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>R&amp;D</td>
</tr>
<tr>
<td></td>
<td></td>
<td>etc...</td>
</tr>
<tr>
<td></td>
<td>Traditional calculation</td>
<td>Calculation incorporating wider benefits</td>
</tr>
<tr>
<td></td>
<td>Return on investment</td>
<td>⇒ shorter payback periods</td>
</tr>
<tr>
<td></td>
<td>Reduced energy costs/year</td>
<td>⇒ many arguments and benefits for various sectors and stakeholders</td>
</tr>
<tr>
<td></td>
<td>⇒ long payback periods</td>
<td></td>
</tr>
<tr>
<td></td>
<td>⇒ few arguments</td>
<td></td>
</tr>
</tbody>
</table>

Such benefits can be difficult to quantify and therefore are often overlooked by municipalities. However, the evidence base evaluating wider benefits is growing. For example, it is estimated that every €1 million invested in energy efficiency creates 8 to 27 jobs per year [2].

EmBuild explored the potential of wider benefits and developed tools to better identify and measure these multiple benefits:

Wider benefits tools (available at: embuild.eu/navigator/benefit):

- Valuation and specification of wider benefits of deep renovation measures
- Analysis to evaluate wider benefits that follow deep renovation measures and respective energy savings.
- Technical guide on methodologies for measuring wider benefits

However, these tools were not widely used in the EmBuild project as they were finalised in the final months of the project. Nevertheless, there are some examples of how municipalities involved identified and exploited advantages of renovation beyond energy savings.
Wider benefits EXAMPLE

Reinvesting savings in education – Karlovac, Croatia

In Karlovac, Croatia, where a private company replaced a school’s oil boiler with a wood chip boiler, financial savings in the first year of operation were sufficient to equip the school library with new books.

EmBuild partner – REGEA

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Wider benefits EXAMPLE

Reinvesting savings in education Reinvesting savings in healthcare – Ivanjica, Serbia

The local government of Ivanjica allocated savings achieved from the refurbishment of several public buildings (a school, municipality building, and a medical centre) to the construction of a new dialysis centre. This also reduced the need for patients to travel up to 200km three times a week to another city, Čačak, to get treatment. About €200,000 was allocated from the local budget for the construction of this centre.

This would not be possible if the municipality of Ivanjica had not managed its resources rationally in previous years by analysing and refurbishing several public buildings. The municipality building refurbishment (facade thermal insulations and window replacement) was financed from the municipal budget; total investment was €60,000 and yearly savings amount to about €9,000. A deep refushishment of the school was financed by the Public Investment Management Office, costing about €200,000. For all refurbishment works local companies and manufacturers are selected (for instance, a local manufacturer of laminated wooden windows) so there are also local economic benefits beyond energy savings.
Voices of EmBuild – Ivanjica, Serbia
www.youtube.com/watch?v=mlfLV5tB6Y

School in Medjurecje village in Ivanjica municipality during and after refurbishment

EmBuild partner – UoB

We then invested these savings into a small modern building for hemodialysis.
THE EMBUILD STORY IN GORNA MALINA (BULGARIA)

In Gorna Malina in Bulgaria, EmBuild supported the municipality with a preliminary analysis of the building stock, selecting first projects and defining the financial framework. The challenges of paying energy bills and the desire to reduce costs, aligned with the aspiration to be a “green municipality” and reduce CO₂, provided the drivers for action. The strategic approach and systematic planning of projects has helped to attract the interest of investors. The full story is set out in the figure below.

Video: www.youtube.com/watch?v=tiEmplC-Vhl

STARTING POINT:
- Low energy consumption due to low thermal comfort and not fully occupied buildings
- Still, difficulties in paying energy bills
- Willingness to build an image of “green municipality”

STRATEGIC GOALS:
- Increase comfort
- Decrease costs
- Decrease CO₂ emissions and eliminate use of coal and wood for heating
- Promote renovation to energy class A supported by renewables
EXPERIENCES OF DEVELOPING LOCAL RENOVATION STRATEGIES

**APPROACH:**

- Define the financial framework
- Make a preliminary analysis of the building stock
- Select a set of projects for the first planning period based on pre-defined criteria

**PROJECT (BUILDING)**

<table>
<thead>
<tr>
<th>Building</th>
<th>Score</th>
<th>Reduced emissions (%)</th>
<th>NPV Q</th>
<th>Financial savings</th>
<th>Investment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Municipal administration – Gorna Malina village</td>
<td>116</td>
<td>79.56%</td>
<td>0.8915</td>
<td>38 006</td>
<td>345 000</td>
</tr>
<tr>
<td>“St. Cyril and Methodius” schools, Aprilovo village</td>
<td>98</td>
<td>77.96%</td>
<td>0.0778</td>
<td>19 849</td>
<td>320 000</td>
</tr>
<tr>
<td>Memorial house „Elin Pelin“, Balivo village</td>
<td>118</td>
<td>80.58%</td>
<td>2.0095</td>
<td>24 681</td>
<td>140 000</td>
</tr>
<tr>
<td>“Vasili Levski” Community center, Gorna Malina</td>
<td>128</td>
<td>89.42%</td>
<td>4.0579</td>
<td>29 746</td>
<td>100 000</td>
</tr>
<tr>
<td>“Father Paisy” school, Dolno Kamartsi village</td>
<td>93</td>
<td>86.15%</td>
<td>0.7603</td>
<td>9 728</td>
<td>95 000</td>
</tr>
<tr>
<td>Cultural center, Belopoltsi village</td>
<td>78</td>
<td>77.52%</td>
<td>-0.4831</td>
<td>2 452</td>
<td>85 000</td>
</tr>
<tr>
<td>“Iristo Botev” school, Gorna Malina (all building units)</td>
<td>110</td>
<td>65.41%</td>
<td>2.1317</td>
<td>12 846</td>
<td>70 000</td>
</tr>
<tr>
<td>Health Center, Gorna Kamartsi village</td>
<td>103</td>
<td>85.36%</td>
<td>1.1635</td>
<td>8 206</td>
<td>65 000</td>
</tr>
<tr>
<td>Ritual center, Gorna Malina village</td>
<td>93</td>
<td>79.31%</td>
<td>0.1736</td>
<td>3 656</td>
<td>54 000</td>
</tr>
</tbody>
</table>

**SOLUTIONS:**

- Detailed evaluation of projects
- Relating specific projects to suitable sources of financing
- Whole building renovation approach, applying sustainable heating sources
- Options for staged renovation

**CONCLUSIONS**

1. Political will is crucial
2. Optimal comfort at current or even lower level of expenditure is achievable, despite unfavourable starting point
3. Detailed analysis based on systematic collection of data allows directing of specific projects to the most suitable forms of financing, avoiding cream skimming and blocking effects of shallow or partial renovation measures
4. Systematic planning helps attract market financing: interest from ESCOs and obligated parties already evidenced
THE EMBUILD STORY IN WALTENHOFEN (GERMANY)

In Waltenhofen, Germany, EmBuild partners supported the inspection and analysis of municipal buildings to establish the data and knowledge necessary to develop a long-term renovation strategy. The strategy was driven forward by the competition between municipalities on providing good infrastructure for citizens and the desire to reduce energy costs. Within the municipality a dedicated public officer took a keen interest in taking forward the renovation strategy, and good collaboration between the municipality, energy agency and experts aided the success of the project.

Video: [www.youtube.com/watch?v=di_sr7Grvn0](www.youtube.com/watch?v=di_sr7Grvn0)

STARTING POINT:

- Competition between municipalities to offer good infrastructure (schools etc.) for their citizens
- Mature building stock; Refurbishments without improvement of energy efficiency have been done

STRATEGIC GOALS:

- Reduction of energy costs
- Wise use of financial resources
- Long-term view and strategy for more than one legislative period
**CONCLUSIONS**

1. Motivated person in municipality that takes care of the topic is necessary
2. Financing of measures is not really an issue
3. Political persuasiveness necessary to implement and follow the long-term strategy
4. Plan-Do-Check-Act: Strategy must be adapted to reality and circumstances

**APPROACH:**
- Inspection and analysis of the municipal buildings to set up a long-term renovation strategy
- Deep renovation of one school

**SOLUTIONS:**
- Step-wise planning and implementation
- Energy management for monitoring and evaluation of the results
- Collaboration of municipality with energy agency and architects / expert planners

**CONCLUSIONS**

1. Motivated person in municipality that takes care of the topic is necessary
2. Financing of measures is not really an issue
3. Political persuasiveness necessary to implement and follow the long-term strategy
4. Plan-Do-Check-Act: Strategy must be adapted to reality and circumstances
CONCLUSION

The work of EmBuild has yielded some interesting examples which can feed into and inspire other public authorities to renovate their buildings.

In general, the creation of new and comprehensive renovation strategies in 20 municipalities (by the end of 2018) is encouraging news and consolidates the successes of the EmBuild project. Before the project started, most municipalities either did not have a plan or it was very generic. These municipalities now have a better understanding and analysis of their building stock and a strategy in place to tackle renovation of it. In others, steps have been taken towards developing strategies. These strategies should provide inspiration to other municipalities.

Many of the tools developed by EmBuild were used in the municipalities to support the process, but they will also continue to be useful for municipalities beyond those involved in the project since they are available on the EmBuild website and Navigator. The Navigator is an online practical guidance developed by the project that navigates the reader through the steps and milestones of preparing an effective renovation strategy for buildings (http://embuild.eu/navigator/). EmBuild partners will continue to use these tools as they engage with municipalities beyond the project.

Many of the challenges experienced in developing renovation strategies echo the general barriers to renovation recognised by the project [3]. While local solutions have been found in some cases, greater work at national and EU level is also needed to overcome the structural barriers. The recommendations that follow focus on how these barriers have been addressed by EmBuild and how they could be more effectively addressed in the future at local, national, EU and regional levels.

The recently recast EU Energy Performance of Buildings Directive has strengthened the requirement of national renovation strategies including requiring national governments to consult and engage with stakeholders [4]. Therefore, the drive for strategies at local level will not only continue but is expected to be stepped up as they play an important role in supporting national strategies.
RECOMMENDATIONS TO ADDRESS CHALLENGES

The development of local renovation strategies is not without its challenges. Throughout the EmBuild project some solutions have been found or identified, and tools developed that may be useful for overcoming barriers experienced in other municipalities. However, further action is also needed, learning from the lessons and experiences of EmBuild. This includes action at local, national, EU and regional level to address some of the key barriers in a more comprehensive and holistic manner.

LACK OF NATIONAL RENOVATION STRATEGY

Every EU Member State should have first established a national long-term renovation strategy in 2014 and an update in 2017, as required by the EU Energy Efficiency Directive (2012/27/EU). Serbia as an Energy Community contracting party should have established its renovation strategy in 2017. However, national renovation strategies are not in place in Serbia and Slovenia, and in Bulgaria only covers the period to 2020. National renovation strategies should set the context and framework for local strategies.

EmBuild solutions

In Serbia, to provide inspiration at local level without the national renovation strategy to set the context, three model strategies were developed for:

- large municipalities (cities, local self-governments and city municipalities) within the energy management system (larger than 20,000 inhabitants.)
- small local self-governments
- city municipalities (less than 20,000 inhabitants.).

Renovation strategies were developed for Vrbas, Lajkovac and Sopot. These will be used and presented to other municipalities, so they can use them as a basis for their own strategies. Also, work on models for local renovation strategies is expected to provide insights into the development of the national renovation strategy. In addition, it is expected than when the national strategy is in place, it will lead to and inspire more local strategies.

In Slovenia, some small municipalities are developing renovation strategies as they have fewer buildings to tackle, but larger municipalities are reluctant to do so without the national renovation strategy to set a clear vision and support their strategies. However, some larger municipalities have taken initial steps such as collecting data, conducting preliminary building analysis and making first proposals for measures. The strategy itself, however, will not be finalised until the national strategy is adopted.

At national level, Bulgaria does not have a building renovation strategy, an energy efficiency strategy or an energy strategy for beyond 2020. Combined with the traditional centralisation of the Bulgarian governance system, this makes it extremely hard for the local authorities to develop and commit to long-term approaches. Local authorities are legally required to provide their annual energy savings to the National Sustainable Development Agency but there is no planning in place to support this. However, this complex situation provides opportunities for input into the municipal energy efficiency planning process, and this was the working approach undertaken by the EmBuild project in Bulgaria: to develop and disseminate best practice examples through active collaboration with selected municipalities in different stages of the planning and implementation process. It can also be expected that lessons learned from EmBuild will continue to be exploited in the regular planning and reporting activities of all engaged municipalities.
EmBuild recommendations

Within municipalities:

➤ Promote the benefits of renovation

The wider benefits of energy renovation can be a significant driver for policies to be put in place, even without a national renovation strategy. These go beyond the main benefits of reducing energy consumption to deliver greater wellbeing, health benefits, and macroeconomic benefits such as employment. These benefits appeal to citizens, and can be a political “vote-winner” in municipal elections. Tools developed by EmBuild have evaluated the wider benefits of renovation. They should be used to promote renovation and the need for renovation strategies.

The potential of incorporating WIDER BENEFITS

- Each €1 million invested in energy efficiency creates 8 to 27 jobs per year (modelled data).
- Energy efficiency stimulates GDP growth rates ranging from 0.25% to 1.1%
- When quantified health and wellbeing impacts (reduced illness, better indoor comfort) are included in assessments of energy efficiency retrofit programmes, the benefit-cost ratio can be as high as 4:1
- Incorporating a broad range of multiple benefits could create a benefit-cost ratio of 2.3:1 for the services offered by energy providers (improving energy security and energy prices)
- Carbon emissions from regulated and efficient energy use in the building sector across the EU-27 could be reduced by 71% up to 90% in 2050.
- Renovation removed 1,375 households from fuel poverty (out of 22,618 in 2006) in three years in Scotland.

➤ Share good examples of long-term renovation strategies

Examples of renovation strategies that have been developed can provide inspiration and advice to municipalities considering or at the first stages of establishing a renovation strategy. While those at national level are available on the European Commission’s website, local level strategies are less commonly available. The strategies developed under EmBuild will be publicly available (where possible due to data protection). These should be further promoted by the municipalities involved and the EmBuild partners to reach other municipalities.

➤ Promote the importance of renovation strategies

Linked to promoting the benefits of renovation, the importance of renovation strategies also needs to be highlighted. Strategies ensure that a systematic and far-sighted approach to renovation is set out based on a full understanding the building stock, local issues and potential measures.

Extract from graphic recording of EmBuild final conference

Voices of EmBuild – Ivanjica municipality, Serbia: www.youtube.com/watch?v=miftV3lt8OY
At national level:

- National governments must implement and develop ambitious and sustainable renovation strategies which set clear goals and measures for renovation.

National strategies are vital to steer the creation and direction of strategies at local level. Most EU Member States first established a national long-term renovation strategy in 2014 and updated it in 2017, as required by the EU Energy Efficiency Directive. Several organisations analysed the strategies from 2014 and found they were insufficient in terms of their content and approach. The 2017 updates are yet to be fully analysed, but a first analysis shows a range of newly developed measures [5]. Some of the updated strategies show that it is possible to introduce strategic policies and supporting measures which benefit citizens and the economy alike. These countries also prove that progress in renovating the building stock can be achieved if political will and priorities allow. However, there are still some concerns as not all national governments have updated their strategies. In Serbia, the government is beginning work to establish its national renovation strategy but will still take some time.

- National governments must consult local governments and local stakeholders on the next version of their national renovation strategies.

The recent review of the EU Energy Performance of Buildings Directive has strengthened the requirement for national renovation strategies and requires a more comprehensive approach to developing and implementing renovation strategies. It sets a clearer vision for their aim of achieving a decarbonised building stock by 2050 as well as an obligation for national governments to consult with stakeholders. This consultation process is an opportunity for local governments to be more actively involved in the development of national strategies.

At EU level:

- EU institutions must enforce the requirement to set EU national renovation strategies to ensure national governments comply.

Where countries have not met the requirement of having a long-term renovation strategy, the European Commission must enforce this. In addition, the updated 2017 national renovation strategies must be checked to ensure they are compliant and set a truly strategic approach to renovation.

DATA BARRIERS

A common problem and barrier to developing an overview of the building stock is lack of data. Achieving a full understanding of the existing building stock is essential, as it forms the basis for measures to be developed and a plan for renovation to be put in place.

EmBuild solutions

While several EmBuild tools attempted to build a better understanding of the building stock, the fundamental lack of data was an issue. In many cases it simply was not collected.

In Croatia, site visits were used to collect missing data, and more generalised or recent data used if nothing more was available.

In Serbia, energy consumption data was often missing. This made it difficult to identify buildings where energy consumption/energy bills were high and to select these buildings for renovation. To overcome this, buildings were prioritised and selected on the basis of their importance to the local community (e.g. a school), poor condition or lack of previous renovation. The problem of not being able to monitor the impacts of renovation remained. It was acknowledged that commitment and perseverance to collect data was essential.

Voices of EmBuild – Vrbas, Serbia:

www.youtube.com/watch?v=CggF1cPbk9Y
This programme has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No.695169.

Voices of EmBuild – Vrbas, Serbia: www.youtube.com/watch?v=CggF1cPbk9Y

In Romania, authorities report energy and building-related data to the regional and national statistics institutes, but the data is not reported per building, but per building type. To get a full understanding of the building stock more detail is needed, but this requires more time and a dedicated energy manager (at least one for several towns).

EmBuild solutions

In Serbia national building typologies have been developed looking at different building types from residential buildings, schools and offices [6]. These play an important role in understanding the existing building stock. The data they contain can be used as the basis for national renovation strategies as they provide a comprehensive overview of the building stock, upon which measures and policies can be based.

In Bulgaria, municipal energy specialists need support to collect and manage data on the buildings’ performance, as well as on development, implementation and monitoring of the municipal renovation strategies. Additionally, due to the lack of resources and technical/professional capacity, there are just a few practices for systematic monitoring of completed projects’ performance, which limits the basis for continuous efforts in the area of evaluation, adaptation and further planning.

EmBuild recommendations

At national level:

• Energy management systems should be required by national legislation.

In Slovenia it is required that energy management systems are in place. This means data is collected on buildings which can be used as the basis for establishing renovation strategies.

• National building typologies should provide support to local plans.

In Serbia national building typologies have been developed looking at different building types from residential buildings, schools and offices [6]. These play an important role in understanding the existing building stock. The data they contain can be used as the basis for national renovation strategies as they provide a comprehensive overview of the building stock, upon which measures and policies can be based.

LACK OF CAPACITY AND INSUFFICIENT KNOWLEDGE

In Bulgaria, municipal energy specialists need support to collect and manage data on the buildings’ performance, as well as on development, implementation and monitoring of the municipal renovation strategies. Additionally, due to the lack of resources and technical/professional capacity, there are just a few practices for systematic monitoring of completed projects’ performance, which limits the basis for continuous efforts in the area of evaluation, adaptation and further planning.

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FINANCE CHALLENGES

Finding the funds to renovate is a common concern for the municipalities in the project. It can be difficult for municipalities to access national, EU and regional funds due to the size of their projects or lack of capacity to put together a funding proposal. In some cases, lack of awareness about potential funds means municipalities do not take advantage of the funds available to them.

EmBuild solutions

Innovative ways of financing renovation are being considered in some municipalities involved in EmBuild, such as crowdfunding, combining grants and loans, energy performance contracting/energy service company models, international funding and community funding. These are set out in the above section on investing. They could provide inspiration to other municipalities.

EmBuild recommendations

At national and EU level:

• Provide support to municipalities to access funds for renovation.

  This should include setting up national project development groups to assist and assess the development of renovation projects, as well as creating capacity building initiatives focusing on effective financing instruments and project development skills for renovation programmes.

At EU level:

• Utilise EU funds more effectively for building renovation.

  This means, making investing in demand-side infrastructure a strategic priority, overcoming the lack of project proposals for demand-side projects, removing silos that are hindering effective governance of funding streams, and reducing uncertainty to spur private investments [7].

  The upcoming EU Multiannual Financial Framework (MFF) beyond 2020 is an opportunity to strengthen financial support to renovation. It should ring-fence funds for renovation, particularly in South-East Europe. This means recognise investments in demand-side infrastructure as a strategic priority, as well as simplifying access to funds by promoting project aggregation and facilitating project development assistance for community-based projects, to allow cities and municipalities to aggregate proposals and obtain funds for renovation. The regulatory framework and the governance structure should be changed to allow flexibility in using and blending different funding sources to enable project aggregation (at regional, national or transnational level) [8].
BIBLIOGRAPHY

ANNEX I:
INTERACTION WITH MUNICIPALITIES

EmBuild directly and indirectly interacted with public officials at municipalities in numerous ways to support capacity building activities and provide support through the tools developed by the project.

BG

The interaction with the Bulgarian municipalities was based on three main pillars:

1. Memoranda of Understanding (MoUs) with the selected municipalities and municipal networks for influencing their members – MoUs were concluded with the municipalities of Burgas, Gabrovo, Dobrich, Gorna Malina and Bansko, and with municipal energy efficiency network EcoEnergy, the Association of Bulgarian Southwestern Municipalities, and Plovdiv Energy Agency. With each municipality, a pilot building was selected, to be analysed with EmBuild tools and according to the Bulgarian norms. For each building, several packages of energy-saving measures were proposed, achieving at least 60% energy savings in favourable financial conditions. The existing plans were analysed and new plans or written suggestions for improvement of the current plans were developed.

2. Presentation of the activities and achieved results at targeted conferences (including those of partnering networks) – a number of conferences were organised and attended to present the EmBuild tools, the process and the results of activities. These conferences attracted more than 50 municipalities and regional authorities, many of them attending several times. EmBuild experts presented the available tools, the planning process and the conclusions from the conducted planning activities. In addition, conferences were used to establish a stronger connection between the different levels of governance, as key speakers from the Ministries of Energy and Regional Development were invited to present the recent changes in the ongoing building renovation programmes and the work on the National Housing Strategy (yet to be published).

3. An intensive dissemination campaign through online and printed publications – the EmBuild project and its results were presented actively through all available communication channels. These included direct mailing to municipal networks’ members; more than 10 articles in the newsletters of EcoEnergy; case studies and presentations for the pilot municipalities distributed to the members of the associated networks; video streaming of presentations at national and international events (including participation in the policy session of the European Sustainable Energy Week (EUSEW) 2017); cooperation with the Covenant of Mayors Office; webinars for the use of the tools; TV appearance focussing on EmBuild; and publications on the EnEffect website and social media.

HR

The process of interaction with county representatives started with meetings in 2016. In counties in Croatia it is obligatory to have an energy efficiency action plan for two-year periods with a list of measures to be implemented in that period.

One of the measures listed in three counties’ action plans in 2016 is developing a long-term strategy for mobilising investment in renovation of public building stock. Action plans were adopted as official documents. With this (officially approved) document, the EmBuild project also received recognition and approval. Other means of interaction were mostly done via workshops and conferences.

In Croatia, three renovation strategies will be developed at county level as most of the public buildings at municipality level are under county ownership.
During the project, EmBuild partner ezal was in direct contact with 12 municipalities. The aim was to develop long-term strategies for the municipalities as a service. This resulted in a close cooperation with the pilot municipalities, including assessment of the data, on-site visits of the municipal buildings and suggestions for a long-term strategy until 2050. During the work with the pilot municipalities, the tools were developed further. To find pilot municipalities, on the other hand, was not easy, because providing energy-consumption data and time for the on-site visits meant extra effort for the public officers.

The project itself, the existing tools and first results of EmBuild were presented at a workshop with 20 municipalities. Some of the pilot municipalities were among the participants of this workshop and renovation strategies were drafted for them. The results of one pilot municipality – Waltenhofen – were presented at a conference in March 2018 by a public officer of the municipality.

The progress of the project was disseminated by the ezal newsletter, and via the news on the German EmBuild website. A series of short explanatory videos in German is available on the EmBuild YouTube channel.

The Serbian EmBuild partner gathered a network of 24 municipalities which expressed interest in the project scope. Each of these municipalities formed a team of five public officers, who are regularly informed about project activities (via roundtables, webinars, online surveys, conferences etc.). Almost all of the public officers engaged with online materials (webinars, surveys etc.) but some were less willing to be involved directly in roundtables, conferences or project meetings. Direct interaction and communication is active with 20 municipalities. Public officers from these municipalities have attended roundtables and conferences, hosted and organised visits for performance of preliminary analyses, provided data for detailed analyses etc.

Since Serbian municipalities have no legal obligation to produce a renovation strategy and no national renovation strategy has yet been adopted, the status of the municipality has a large influence on the planning process for energy efficiency renovation. If the municipality (local government or city status, or city municipality) is in the energy management system (larger than 20,000 inhabitants), then it is obliged to adopt a Local Energy Efficiency Action Plan (LEEAP) every three years and have established an energy management system. If the municipality does not have an energy management system, then the planning process of energy efficiency renovation is part of annual budgeting with no specific thresholds or targets. Also, the size of the public building stock usually depends on the size of the municipality, so renovation strategies for some municipalities have fewer buildings to address or consider.

Based on the analysis of the structure and characteristics of the cluster of municipalities the EmBuild project in Serbia is collaborating with, it was decided to develop three model strategies for municipalities of Vrbas, Lajkovac and Sopot, and present these to other municipalities as pilot strategies.
The Slovenian Energy Act (EZ-1) (article 29) defines that every local community must revise their own local energy concept (LEK) every 10 years or more often if necessary. The Ministry for Infrastructure prepared a methodology and mandatory content for local energy concepts.

The Slovenian EmBuild partner, KSSENA, worked with policy-makers and decision-makers, as well as the expert level executive and non-executive municipal staff to enhance their knowledge. This included providing information on funding opportunities for energy efficiency/deep renovation from national and international sources of financing. This enabled the municipalities to search and apply for funding, and enhance their capacities to collaborate with other local governments in partnerships and project consortia.

According to the Decree on Energy Management in Public Sector (Official Gazette 52/16) there is an obligation to establish a system of energy management in buildings used by the public sector (i.e. buildings and parts of buildings that are owned by the Republic of Slovenia or local authorities and which are occupied by state authorities, local communities, public institutions, public commercial institutions, public funds, public agencies and institutions whose founder is the Republic of Slovenia or local government) (with usable area of more 250 m²), with the aim of increasing energy efficiency and use of renewable energy in buildings.

On the basis of national as well as the EU legislation, the government of the Republic of Slovenia adopted a Long-Term Strategy for Mobilising Investments in the Energy Renovation of Buildings on 29 October 2015. An appendix was added in 2018.

**SUMMARY**

<p>| Table 2 - Number of public officers influenced directly |
|---------------------------------|-----------------|--------------------------------------------------|</p>
<table>
<thead>
<tr>
<th><strong>Country</strong></th>
<th><strong>Number of public officers influenced directly</strong></th>
<th><strong>Means of influencing</strong></th>
</tr>
</thead>
</table>
| Bulgaria | 213 | Events in Gabrovo, Burgas and Sofia  
National roundtables  
Direct consultations  
Specific analysis for priority buildings  
(Burgas – “Mladost” sports hall detailed analysis, Gabrovo – “Dom na humora i satišta” gallery/museum, Gorna Malina – Administrative building of the municipality, Dobrich – Social cares dome) |
| Croatia | 184 | Meetings  
Workshop on data collection  
National conferences |
| Germany | 126 | Workshop in Kempten  
Presentation for Mayors of Oberallgäu  
Direct interaction |
| Romania | 150 | Field visits  
Meetings  
Discussions via phone/fax/email |
| Serbia | 110 | National roundtables  
National conferences  
Direct email communication including invitations to events, dissemination of EmBuild materials (questionnaires, factsheets, webinar recordings, newsletter) |
| Slovenia | 100 | Meetings  
Roundtables  
Workshops  
National conferences  
Direct communication |
| TOTAL | 863 | |

This programme has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No 695169.
Table 3 - Number of stakeholders indirectly influenced

<table>
<thead>
<tr>
<th>Country</th>
<th>Number of stakeholders indirectly influenced (including public officers)</th>
<th>Means of influencing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulgaria</td>
<td>800</td>
<td>Newsletter, Facebook, live streams, TV interview, presentations on events</td>
</tr>
<tr>
<td>Croatia</td>
<td>2,512</td>
<td>Meetings, workshops, presentations at conferences and the REGEA newsletter</td>
</tr>
<tr>
<td>Germany</td>
<td>3,804</td>
<td>Newsletter ezal-aktuell</td>
</tr>
<tr>
<td>Romania</td>
<td>(more than) 4,700</td>
<td>Newsletter, local/regional/national conferences, social media</td>
</tr>
<tr>
<td>Serbia</td>
<td>1,500</td>
<td>Communication network with all municipalities (SCTM network, dissemination channels – web platforms)</td>
</tr>
<tr>
<td>Slovenia</td>
<td>1,200</td>
<td>National conferences, articles, workshops, meetings, alliance of Slovene energy agencies, Sinenergija newsletter</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>14,516</strong></td>
<td></td>
</tr>
</tbody>
</table>

ANNEX II:
ENERGY SAVINGS

Table 4 - Summary of energy to be saved from renovating buildings covered by local renovation strategies supported by EmBuild

<table>
<thead>
<tr>
<th>Country</th>
<th>Total cumulative primary energy savings between now and 2050 (GWh)</th>
<th>Total energy saved in 5-year increments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2020</td>
<td>2025</td>
</tr>
<tr>
<td>Bulgaria</td>
<td>7151.8</td>
<td>53.0</td>
</tr>
<tr>
<td>Croatia</td>
<td>35.0</td>
<td></td>
</tr>
<tr>
<td>Germany</td>
<td>94.41</td>
<td>36.85</td>
</tr>
<tr>
<td>Romania</td>
<td>1,781</td>
<td>365</td>
</tr>
<tr>
<td>Serbia</td>
<td>186.3</td>
<td>63.9</td>
</tr>
<tr>
<td>Slovenia</td>
<td>32.83</td>
<td>4.49</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>9,280.5</strong></td>
<td></td>
</tr>
</tbody>
</table>
### Table 5 - Summary of energy to be saved by municipality

<table>
<thead>
<tr>
<th>Country</th>
<th>Municipality</th>
<th>Total number of public buildings to be renovated</th>
<th>Total cumulative primary energy savings between now and 2050 (GWh)</th>
<th>Number of buildings to be renovated by 2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulgaria (All energy savings are calculated with adjusted baseline assuming that indoor microclimate in the buildings is according the national norms)</td>
<td>Gorna Malina</td>
<td>38</td>
<td>112.2</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>Bansko</td>
<td>55</td>
<td>248.7</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Gabrovo</td>
<td>66</td>
<td>604.9</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Burgas</td>
<td>194</td>
<td>703</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Dobrich</td>
<td>66</td>
<td>570.9</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Smyadovo</td>
<td>6</td>
<td>25.5</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Lom</td>
<td>57</td>
<td>224.2</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Pernik</td>
<td>73</td>
<td>503.6</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Pleven</td>
<td>104</td>
<td>550.2</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Svishov</td>
<td>60</td>
<td>294.2</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Sevlievo</td>
<td>47</td>
<td>325.2</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Silistra</td>
<td>36</td>
<td>566.9</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Stara Zagora</td>
<td>116</td>
<td>889.6</td>
<td>6</td>
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<tr>
<td></td>
<td>Troyan</td>
<td>37</td>
<td>202.2</td>
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<tr>
<td></td>
<td>Yanbol</td>
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<td>530.8</td>
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<tr>
<td></td>
<td>Lyaskovets</td>
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<tr>
<td></td>
<td>Kula</td>
<td>9</td>
<td>86.2</td>
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<tr>
<td></td>
<td>Krushari</td>
<td>41</td>
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<td></td>
<td>Stolichna Obshina</td>
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<td></td>
<td>Etropole</td>
<td>42</td>
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<tr>
<td>Croatia (approximations)</td>
<td>Karlovac County</td>
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<tr>
<td></td>
<td>Krapina-Zagorje County</td>
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<td>Zagreb County</td>
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<td>Germany</td>
<td>Burgberg</td>
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<td>191</td>
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<td>69</td>
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<td>338</td>
<td>12</td>
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<td>Plopieni</td>
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<td>Leovaurele</td>
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<td>5</td>
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<td>73</td>
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<tr>
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<td>Lajkovac</td>
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<td>13</td>
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<td>Slovenia</td>
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<td>40</td>
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<td>Celje</td>
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<td>10.6</td>
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<tr>
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<td>Ravne na Koroškem</td>
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<tr>
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<td>Žalec</td>
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