Barriers that hinder deep renovation in the building sector

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EmBuild

Empower public authorities to establish a long-term strategy for mobilizing investment in the energy efficient renovation of the building stock

Imprint

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About the project

EmBuild is a coordination and support project implemented by a consortium of ten institutions based in eight countries throughout Europe under the Horizon 2020 Framework Programme for Research and Innovation. 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 6 partner countries.

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1. Introduction

While the Energy Performance of Buildings Directive (EPBD) sets minimum energy performance requirements for all buildings that undergo major renovation, Article 5 of the Energy Efficiency Directive (EED) sets a binding renovation target for public buildings and imposes related obligations. It also stresses that governments shall undertake an exemplary role in the energy retrofit of their countries' building stock. Article 5 of the EED stipulates that all Member States shall ensure, as of January 1, 2014, that 3% of the total floor area of heated and/or cooled buildings owned and occupied by its central government is renovated each year to meet at least the minimum energy performance requirements. The public building stock includes[1] offices, educational buildings, hospitals, sports facilities, etc. Buildings officially protected as part of a designated environment, buildings owned by the armed forces or central government and serving national defence purposes and buildings used as places of worship and for religious activities can be excluded from the 3% renovation target (Article 5(2) EED).

According to the Building Stock Observatory[2], the renovation monitoring is insufficient for the moment and there is no data to assess if the 3% annual target has been reached. However, according to the same source, the current average building energy renovation rate in the European Union (EU) for non-residential is estimated below 1%. The objective of the EED Article 5 is to boost energy refurbishment in the central government sector, this way showcasing deep renovation of public buildings and inspiring governments at sub-national level to follow the example. Article 5 is seen by many organisations in the construction sector advocating for energy refurbishment and an increased energy performance of the European building stock, as a great opportunity to kick-start the deep energy retrofit market.

From a regional point of view, the perspective of local governments and their role in the implementation of the EU regulations do not have the attention they fully deserve. The indicative targets and binding obligations of the EED are laid down for central governments, with little or no references to the regional and local level.

Similarly, the Energy Community Treaty does not have a special unit or does not streamline the local energy issues. As it is an intergovernmental treaty, it sets national targets and addresses national priorities in National Energy Efficiency Action Plans (NEEAPs) and often the local energy action plans are not connected to them. This lack in regulative references to local and municipal level is also at the basis of insufficient financial allocations especially designed for the implementation at local level.

Therefore, it is obvious that while municipalities play a major role in the renovation of public buildings they must overcome a series of barriers.

This report focuses on the main barriers to deep renovation that municipalities in Bulgaria, Croatia, Germany, Romania, Serbia and Slovenia have to face. The barriers are divided in six categories, corresponding to the six categories identified by BPIE [1] as the main topics that should be given serious

[1] Guidance note on Directive 2012/27/EU (SWD/2013/0445 final)

[2] https://ec.europa.eu/energy/en/eu-buildings-factsheets

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consideration to facilitate a successful planning and delivery of the national renovation strategies and their renovation potential:

- Legislative and Regulatory barriers: this category of barriers examines if the existing legal framework in each country encourages or hinders deep renovation. Overlaps between laws, complex administrative process and the lack of legislation concerning the split incentives between tenants and owners are some of the barriers reported under this category.
- Fiscal/Financial: this category studies if and how energy prices, available funds, grants, transaction cost, etc. affect deep renovation investments.
- Communication/Capacity building: insufficient communication about the advantages of deep renovation and insufficient technical capacity/knowledge to promote, plan and implement deep renovation are some of the barriers reported under this category.
- Technical: the first technical barrier that municipalities have to face is the lack of knowledge about their building stock and their technical systems. For that reason, this category of barriers examines if municipalities have in place an inventory of their public buildings and if so, if they are well structured.
- Research and Development (R&D): this category assesses the existing programmes that stimulate research and pilot deep renovations in municipalities.
- Strategic: this type of barriers presents the most pressing obstacles that hinder deep renovation and their solutions need to be prioritised in the national strategies.

The analysis of the barriers presented in the report is mainly based on the results of a survey that was conducted as part of the EmBuild project. The survey included specific questions on each type of barrier (Annex I: EmBuild questionnaire for Deliverable 4.1) and was distributed by the project partners to the local/municipal actors of each country. After the first analysis of the answers, the results were validated by the EmBuild partners. Additional input to the study was provided by the Deliverable 2.4 "Guidance note on stakeholders' involvement" of the EmBuild project [2] as well as by the BPIE report "Building renovation strategies under the spotlight" [3]. Both sources used questionnaires with stakeholders for their data collection. Research on various literature sources was also conducted to verify and support the findings presented in this study, including analysis of first national renovation strategies.

The following chapters present the analysis of the barriers to deep renovation that municipalities have to face in the six studied countries. The results of the analysis were presented, in the form of factsheets, to the relevant national authorities as a contribution of the EmBuild project to the preparation of the second national renovation strategy. The factsheets present the main barriers to renovation from a municipal perspective and suggest solutions to stimulate cost-effective deep renovations (see Annex II).

The first chapter of this report provides a general overview on how barriers to renovation are presented in the 1st national renovation strategies. The next chapters analyse the six type of barriers presented above in the countries covered by the EmBuild project. The conclusions of the analysis are drawn in the last chapter of the report.

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2. Barriers to deep renovation identified in the first national renovation strategies

National renovation strategies, required under the EU Energy Efficiency Directive (EED) - Article 4 should establish long-term strategies for mobilising investments in the renovation of the national building stock, including public buildings. The first renovation strategies were published in 2014/2015. These strategies were of varying quality with 10 (including Romania and Slovenia) considered "fully compliant" but six strategies were considered "non-compliant" (including Bulgaria) by the European Commission's (EC) Joint Research Centre (JRC) [4].

Barriers that hinder deep renovation are referred only in some renovation strategies. These obstacles were analysed in the JRC report [4] and the following table presents the results of the evaluation on the information provided by Member States.

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TABLE 1: ASSESSMENT OF THE INFORMATION ON BARRIERS PROVIDED IN THE 1ST RENOVATION STRATEGIES **[4]**

Country	Analysis of existing barriers to deep building renovation (a)	Analysis of barriers to investment (b)
Austria		
Brussels Capital Region		
Belgium Flanders		
Belgium Wallonia		
Bulgaria		
Croatia		
Cyprus		
Czech Republic		
Denmark		
Estonia		
Finland		
France		
Germany		
Gibraltar		
Greece		
Hungary		
Ireland		
Italy		
Latvia		
Lithuania		
Luxembourg		
Malta		
Netherlands		
Poland		
Portugal		
Romania		
Slovakia		
Slovenia		
Spain		
Sweden		
United Kingdom		

GREY:

Information not provided

LIGHT BLUE:

Information provided with a medium level of detail

BLUE:

Information provided with a good level of detail

In Yellow:

EmBuild countries

Column (a) presents if the first renovation strategies provide detailed information on the existing barriers to deep building renovation. The information presented in this column was used to assess the policies and measures to stimulate cost-effective deep renovations of buildings (EED Article 4(c)). Out

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of the 31[3] renovation strategies, 9 (including Bulgaria and Germany) don't include any information on the barriers to deep renovation, in 7 information is provided with a medium level of detail and in 15 (including Croatia, Romania, Slovenia) information is provided with a good level of detail.

Column (b) was part of the analysis of the forward-looking perspective to guide investment decisions (EED Article 4(d)) and presents how detailed is the analysis of barriers to investment in the strategies. Out of the 31 renovation strategies 7 (including Bulgaria) don't include any information on the barriers to investments, in 14 (including Germany and Slovenia) information is provided with a medium level of detail and in 10 (including Croatia and Romania) information is provided with a good level of detail.

According to the JRC report, the modest analysis of the barriers to deep renovation in Bulgaria is considered as one of the weaknesses of the strategy, while in Croatia the analysis of barriers has a "decent quality". In Germany "an analysis of the existing barriers and indications on how future legislation should target them are not provided in the report". In Romania, the well-defined set of policies and measures that address all identified barriers is one of the strengths of the strategy. In the Slovenian renovation strategy "a comprehensive analysis of the barriers, divided by sectors (e.g. residential, public and private) has been provided, together with detailed SWOT analysis for investment in energy efficiency buildings". The following table provides more details on how barriers are addressed in the first renovation strategies in the 6 EmBuild countries.

TABLE 2: COUNTRY ANALYSIS OF BARRIERS TO DEEP RENOVATION IN THEIR 1ST RENOVATION STRATEGY (2014)

Country	Barriers in the 1st renovation strategy
Bulgaria	No reference to the barriers for deep renovation at national or local level
Croatia	Comprehensive analysis of the barriers to the integral energy renovation of buildings and proposed solutions and new measures to overcome them
Germany	No comprehensive analysis of the barriers to deep renovation. However, there is a basic reference to the obstacles regarding awareness raising and lack of experience and knowledge on the sector
Serbia	No renovation strategy (non EU MS, 1st renovation strategy expected by October 2017)
Romania	List with selected a) legal/strategic, b) economic & c) skills, employment and education system barriers
Slovenia	Analysis of the barriers to investments in energy efficiency improvements, with a description of a package of supporting measures

No reference to barriers to deep renovation

List of barriers with no analysis or list with no clear link to measures in the plan

Analysis of barriers and measures on how to overcome them

The second strategies are due in 2017[4], with the exception of Serbia which, as a candidate country for EU membership, is in the process of implementing EU legislation and will establish its first national

[3] Submitted by: 27 Member States, Belgium BCR, Belgium Flanders, Belgium Wallonia, Gibraltar

[4] The deadline for submission of the 2nd National Renovation Strategies was on the 30th April 2017

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renovation strategy by October 2017. As of end of May 2017 only 10 renovation strategies were published on the EC website[5]. From the countries studied under the EmBuild project, only the German strategy is available; therefore, the second renovation strategies were not taken into account in the current analysis.

Involving local and regional authorities in the development of national strategies is vital as they have detailed knowledge of barriers at local level and can help to ensure they are well addressed. Furthermore, the renovation of public buildings is particularly important as they can be directly targeted by public authorities and provide an exemplary role showing the process and benefits of renovation. The following paragraphs present the main barriers to deep renovation that municipalities in the 6 EmBuild countries have to face and some of the actions that have been taken so far to overcome them.

[5] https://ec.europa.eu/energy/en/topics/energy-efficiency-directive/buildings-under-eed

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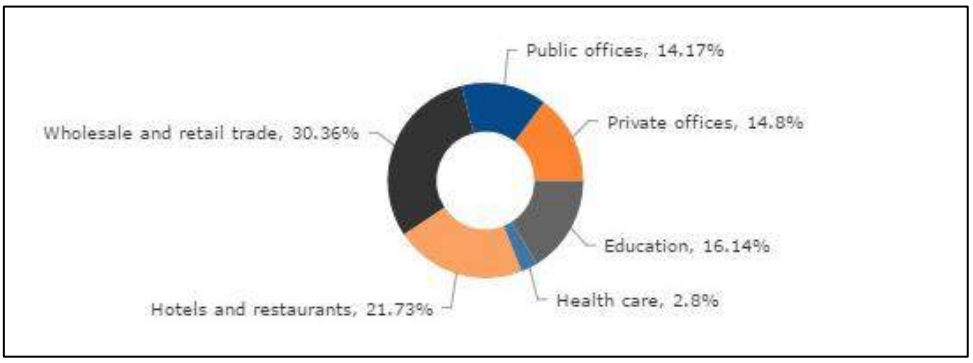
3. Bulgaria

a. Introduction

In Bulgaria, the total building stock is about 261Mm^2, with 7.5 million inhabitants living in about 3 million dwellings [5]. Residential buildings represent 75% of total floor area of buildings. Regarding the 35% of the non-residential buildings, 38% of them were built between 1959 and 1977 and the remaining 62% were designed and built to the norms applicable between 1974 and 1986.

According to the first National Energy Efficiency Action Plan (NEEAP) "a noteworthy fact is that as little as 5% of all administrative buildings were designed and built in the period 1999–2005, i.e. at the time when Bulgarian legislation was in the process of full harmonisation with the body of EU law". In Bulgaria, there are 265 municipalities that own buildings that are used for public and private municipal needs (municipal companies for instance) as well as buildings and dwellings that are rented. Not all buildings used for public purposes are owned by the municipality, some are state or private property.

FIGURE 1: BREAKDOWN OF NON-RESIDENTIAL FLOOR AREAS BY SECTOR IN BULGARIA (2013) SOURCE: BUILDINGS STOCK OBSERVATORY



Bulgaria's first renovation strategy did not include a satisfactory overview of the building stock, cost-effective approaches, policies or measures, forward-looking perspective, or estimations of potential savings. Additionally, there is no reference to the barriers for deep renovation at national or local level.

The following analysis of the barriers to deep renovation in Bulgarian municipalities is mainly based on the information provided by local and municipal actors as part of the EmBuild project.

b. Legislative and regulatory barriers

The current legislative framework in Bulgaria does not encourage deep renovation. While the National Programme for Energy Efficiency of Multifamily Residential Buildings conditionally allows (since September 2016) renovation of multifamily residential buildings to reach an energy class better than C, there is no requirement or incentive to renovate public buildings to levels higher than class C (up to 191-240 kWh/m^2/year primary energy for all energy uses). The last amendment (30/12/2016) of the Energy Efficiency Act foresees mandatory energy audits and application of the corresponding

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measures for all public buildings above 250m^2 and for any building above 50 m^2, excluding a few specific building categories. Additionally, measures related to the periodical inspection of the boilers and central air-conditioning systems were also introduced in a previous amendment of the Energy Efficiency Act. However, the general situation of application of deep energy renovation measures has not changed drastically for buildings not involved in the National Programme.

Furthermore, the complex administrative process which results in high transaction costs and the fact that in multi-unit buildings all owners must agree to renovation works hinder further deep renovation in Bulgaria.

c. Fiscal/Financial barriers

In Bulgaria, the National Programme for Energy Efficiency in Multifamily Residential Buildings, which is operatively managed[6] by municipalities, offers a 100% grant for renovation to at least energy class C of multifamily residential buildings. This raises the expectation that energy performance improvements should be fully paid for by the state, thus blocking other forms of financing.

For many municipalities, this programme currently represents their main commitment in the field of energy efficiency as the significant financial resources dedicated to the programme are not taken from the municipal budget while the results have visible effect on the local urban environment. Consequently, municipalities are not motivated to design and implement new renovation programmes for residential buildings. As for public buildings, grant schemes from the Operational Programmes (supported by EU structural funds) and specialised national funds are used, offering substantial subsidies (from 50 to 100%) for reaching the minimal required energy class “C”. The co-financing by the municipalities is sometimes supported by a dedicated market instrument as the Bulgarian Energy Efficiency and Renewable Sources Fund, which represents a good practice, also applicable in real market conditions (without available grants). Unfortunately, ESCO schemes are rarely used, despite the efforts of many institutions to promote this form of financing.

Additionally, low energy prices (approximately 30% lower compared to the regional market) make the cost of deep renovation relatively more expensive and payback period much longer.

The transaction cost due to the complex administrative process remain high, hindering deep renovation. In order to engage in deep renovation, municipalities have to open tenders with ecological and technical criteria higher than the minimal requirements (“green” or “sustainable” public procurement). However, this imposes problems of legal and technical nature, which are outside the capacity of most of the municipalities. Most municipalities lack not only technical capacities for the assessment of technical criteria, but also capacities for the development of sustainable public procurements. In most cases the funding comes from the Operative Programmes and the “lowest price” criterion is mandatory and strictly controlled. The procurement experts in municipalities are unexperienced in conducting “green” or “sustainable” public procurements and even if the amended

[6] The Ministry of Regional Development and Public Works has the overall management. Municipalities are responsible on a local level for the overall organization and control of the implementation of all eligible activities related to the renovation of the buildings.

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Public Procurement Act allows inclusion of higher ecological ant technical criteria in the tenders, they still prefer to use the (more familiar) minimal requirements criteria. Thus, the percentage of green tenders is negligible.

Furthermore, energy grants are used as the main instrument to support low-income families. However, this measure does not provide a sustainable solution to the energy poverty problem, as it supports the end-use energy consumption, ignoring energy efficiency measures that could be implemented to tackle the problem at its roots. Energy grants are a constant burden for the public budget that do not generate any added value. On the contrary, the implementation of deep renovation measures to fuel poor households and to social houses, which in Bulgaria are mainly municipally-owned dwellings and represent 3% the total housing stock, can contribute significantly to the eradication of energy poverty and generate added value for the economy (e.g. through job creation).

d. Communication/Capacity building barriers

In Bulgaria, there is lack of awareness among customers and investors on the wide range of benefits of deep renovation and the under-developed renovation culture. The communication about the advantages of deep renovation is characterised as insufficient.

In Bulgarian municipalities, the examples of deep renovation projects, with the implementation of complex solutions and the monitoring of the results, are very rare. Renovation projects are often limited to shallow renovation, where only measures like windows replacement, new insulation and boiler replacement are implemented. Other measures are deemed too expensive or not necessary. Both municipal experts and end-users are unaware of the wider benefits (health, productivity, etc.) of deep renovation and cannot evaluate ecological, employment or energy independency benefits.

Furthermore, technical capacity/knowledge to promote, plan and implement deep renovation seems to be insufficient in many municipalities. Despite the fact that there are trainings on energy efficiency organised in the framework of Operational Programmes (managed by the Sustainable Energy Development Agency and/or Ministry of Regional Development and Public Works), they rarely tackle the issue of deep renovation, but rather comply with the minimum requirements. This is mainly due to the fact that municipal experts are trained to implement projects according to the rules of the grant schemes, which require energy upgrades just to energy class C.

A few initiatives under EU-financed projects (BUILD UP Skills EnerPro[7], Train-to-NZEB[8]) try to bridge these gaps but the resources are far from sufficient. As a consequence, the lack of competent advice on measures and steps to renovation, combined with the lack of skills in the supply chain, lower the quality and increase scepticism on deep renovation even in the public sector.

A general communication campaign on the benefits of deep energy renovation, preferably managed by the central government and exploiting the national media but also supported by local/municipal

[7] https://ec.europa.eu/energy/intelligent/projects/en/projects/build-skills-enerpro

[8] http://www.train-to-nzeb.com/

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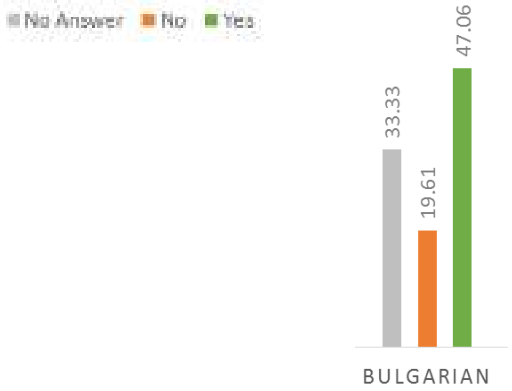
authorities, would help to address this barrier. Streamlined capacity building campaigns for the local administration, energy auditors, designers and construction companies, including the building control and supervision bodies, would help to overcome these barriers. If integrated with the communication campaign it would maximise their positive impact on deep renovation.

e. Technical barriers

Through local inventories of public buildings, most municipalities in Bulgaria are trying to overcome the lack of awareness of their building stock and their technical systems. In the survey conducted in Bulgaria, 49% of all participants have already a documented inventory of the building stock in their municipality, city or county and 47% of them indicated that energy consumption of their public building stock is measured. However, in most cases they are incomplete, as the information they include such as energy consumption, building design, energy audits, implemented energy efficiency measures is insufficient or not properly described. Therefore, in many cases the inventories do no fulfil their purpose.

FIGURE 2: RESULTS FROM THE EMBUILD SURVEY FOR DELIVERABLE 2.4 [2]

Public inventory of building stock implemented in Bulgaria



Monitoring of energy consumption of public buildings by country

Annual renovation plans for the renovation of public buildings in some municipalities are in place, as this was a requirement by the Energy Efficiency Act. However, they are not detailed enough, as information such as expected costs and funds, expected savings and benefits are not included. Furthermore, with one to the last changes of the Energy Efficiency Act, the municipalities are no longer obliged to submit energy efficiency plans but just to report on the energy efficiency projects implemented on an annual basis. Some municipalities, e.g. Dobrich, Burgas and Gabrovo, have joined the Covenant of Mayors (CoM) and will have to draft and submit more streamlined plans. The Sustainable Energy Efficiency Action Plans (SEEAPs) that have to be developed under the CoM use a

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common template with training and assistance provided by the CoM. However, there is no streamlined support or technical assistance organized at national level.

f. R&D barriers

The main barrier in R&D for deep renovation is that the implemented projects are scattered projects rather than part of a holistic local and/or national renovation plan.

The "Demonstration project for the renovation of multifamily buildings"[9] was launched in 2007 with the objective to develop and test for the first time in Bulgaria the full-cycle renovation action on multifamily buildings to provide practical experience and lessons for the implementation and success of the National Programme for Renovation of Residential Buildings. Up to 2009, 24 municipalities were involved in the project[10], which was the forerunner for the "Energy Renovation of Bulgarian Homes project" in 2013.

The results of the Bulgarian pilot project Request 2 Action[11] (2010-2012), which created a replicable scheme for the renovation of multifamily buildings, were used for the implementation of the National Programme for the Renovation of Residential Buildings. Among others, the aim of the project was also to broadly communicate the results to convince other Bulgarian municipalities, relevant building associations and multi-residential building owners/managers to put Energy Performance Contracting (EPC) recommendations into practice.

The above mentioned are the large-scale projects implemented in Bulgarian municipalities for residential buildings that form the landscape and the public attitude about renovation. Each municipality has executed a number of holistic or partial renovation projects for public buildings financed by different sources (e.g. national budget, European Regional Development Fund).

Results from other EU funded projects such as EuroPHit, BUS EnerPro, Train-to-NZEB, RePublicZEB, Step-to-Sport could also provide useful information for the uptake of the deep renovation. In their framework, different methodologies for building renovation are developed, including cases for step-by-step deep energy renovations (EuroPHit). A number of training programmes on energy efficiency and RES in buildings are elaborated and implemented through (BUS EnerPro, Train-to-NZEB); a specialised training center is opened in the University of Architecture, Civil Engineering and Geodesy in Sofia providing consultations on all nZEB-related issues, including deep renovation.

[9] Source

[10] "How does the European Regional Development Fund finance energy efficiency and renewable investments in housing sector in Bulgaria, Poland and Romania?", Energie-Cites, November 2009

[11] Request2Action

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g. Strategic barriers

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 Bulgarian municipalities have to face.

TABLE 3: RANKING OF BARRIERS TO DEEP RENOVATION OF THE WHOLE BUILDING STOCK BY IMPORTANCE, BASED ON THE OPINION OF NATIONAL STAKEHOLDERS

Type of barrier	Importance
Payback expectation	
Price signals	
Access to finance	
Information	
Expectation for high (100%) state subsidy	
Skills in the supply chain	
High transaction cost	
Complexity and hassle	
Institutional and legal framework	
Split incentives	

Bulgaria must overcome financial and informational challenges for the uptake of deep renovation. Low energy prices, expectations for high state subsidies and payback expectations combined with insufficient information and/or technical advice about the benefits, the applicable measures and the access to financing make deep renovation seem an unattractive investment.

The National Programme for Energy Efficiency of Multifamily Residential Buildings, which allows (since September 2016) renovations of multifamily residential buildings to reach an energy class better than C is a first step forward towards deep renovations. However, the fact that there is no requirement or incentive to renovate public buildings to levels higher than class C, make the legislative framework to be considered as one more barrier to deep renovation.

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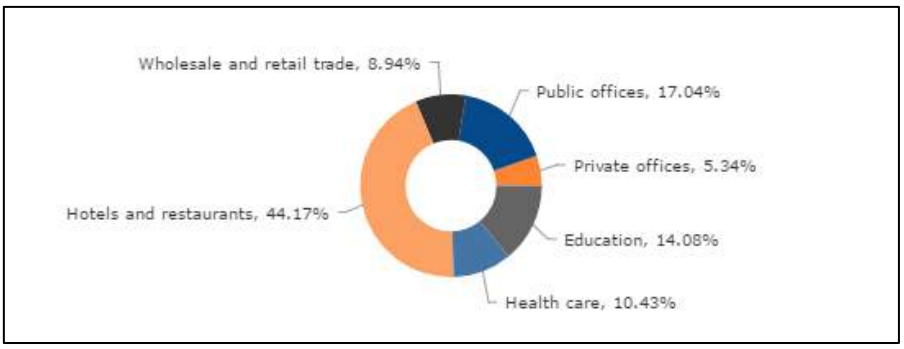
4. Croatia

a. Introduction

In Croatia, the total building stock is about 192.5 Mm^2 with 4.2 million inhabitants living in about 290,000 apartment buildings and 471,000 family houses [6]. Residential buildings represent 74% of the total floor area of buildings while the remaining 26% consists of non-residential buildings, which are divided in six categories (FIGURE 3).

Croatia is divided into 20 counties and the capital City of Zagreb. Counties are subdivided into 127 cities and 429 municipalities. The ownership of approximately 80.196 public buildings is shared among municipalities, cities, counties and national government. Most public buildings date from the period between 1941 and 1970.

FIGURE 3: BREAKDOWN OF NON-RESIDENTIAL FLOOR AREAS BY SECTOR IN CROATIA (2013) SOURCE: BUILDINGS STOCK OBSERVATORY



Croatia's first renovation strategy provided a detailed description of the current situation and possible and planned actions, but was not clear on how and when the strategy would be implemented and its expected impacts in terms of energy savings and larger benefits (jobs, etc.). The strategy included a comprehensive analysis of the barriers to integral energy renovation of buildings and proposed solutions and new measures to overcome them. These barriers combined with the results from the EmBuild survey on the topic are presented in the following paragraphs.

b. Legislative and regulatory barriers

The first renovation strategy characterises the Croatian legislation as "satisfactory" as it is not considered a barrier in the technical sense. Furthermore, based on the BPIE survey [3] on the assessment of renovation strategies, the participated stakeholders agreed that Croatia has been very advanced in implementing legislative measures referring to the Energy Efficiency Act, Building Act, Thermal Energy Market Act, building certifications and energy audits. However, regulatory barriers are among those with a large impact on the process of integral building renovation as there is no regulation introducing an obligation of energy renovation of existing buildings.

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Furthermore, the lack of legislation concerning the split incentives between tenants and owners, or just between owners hinder further deep renovation. This is a major barrier for Croatia, where ownership structures in buildings are extremely complex and, depending on the level of investment, the consent of at least 51% to 100% of tenants is required to invest in renovation. Given the financial constraints of the Croatian economy, obtaining required approvals for investment into energy renovation of buildings is extremely difficult.

Additionally, a typical barrier with non-negligible impact for the energy renovation of public buildings, is the public procurement procedure. It is always time-consuming and in most cases - as the most economic offer is preferred - it produces unsatisfactory results (low quality, delays, etc.).

c. Fiscal/Financial barriers

Financial barriers have a dominant role among those listed in the first renovation strategy. Since 2009 the investments in the construction sector have been significantly reduced, mainly due to the economic crisis. Additionally, the long period of return on investment, the insufficient financial incentives and the lack of successful financial models make investments into deep renovation even more challenging. Furthermore, the low energy prices in Croatia are not stimulating the implementation of energy efficiency measures, primarily those with relatively long pay-back period.

The Croatian banking sector, which recorded losses and whose profitability has shrunk significantly, is an important barrier. Following the financial crisis, which affected the Croatian financial institution hard, with the share of bad loans increasing and the number of employees in the sector decreasing, the outlook for a rapid development of the construction and energy market is dim.

The abovementioned barriers have been described in the first renovation strategy (2014), however since then corrective measures have been taken and even though not all the barriers have been overcome, today the financial support to energy renovation is considered to be sufficient, as shown by the results of the EmBuild survey. National programmes and funds (e.g. the Programme of energy renovation of public buildings), dedicated and preferential loan programmes (TABLE 4), technical assistance programmes, Energy Performance Contracting are currently used to finance deep renovation investments.

TABLE 4: INDICATIVE LOAN PROGAMMES IN SLOVENIA

Institution	*Type of programme*	*Users*
Croatian Bank for Reconstruction and Development	Loan (> 15.000 Euro)	Local and regional authorities, private companies, other
Commercial banks	Loan (repayment up to 14 years, interest rate ≥4%)	Providers of energy service, clients, private companies investing in energy efficiency

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Zagreb bank (Green loans)	Loan (repayment up to 180 months)	Private clients interested in buying new houses with energy classes A+, A, B

d. Communication/Capacity building barriers

The level of information, education and participation of the public in taking important decisions on building renovation was considered insufficient by the first renovation strategy, with medium impact on the process of integral building renovation.

The lack of awareness of the multiple benefits of deep renovation of the building stock makes investors reluctant to finance deep refurbishments, as they are in many cases considered high risk investments.

Furthermore, the closure or bankruptcy of a large number of companies due to the economic crisis in 2009, excluded a big part of the workforce, creating a gap in knowledge, competences and skills needed for a successful accomplishment of the complex task of building renovation. To overcome this barrier, organisations in the field of energy efficiency offer trainings or capacity building for deep renovation. The Energy Efficiency Portal – launched by the Croatian Government that integrates all the available information on energy efficiency for all sectors and citizens, installer training - cross skills (a part of EU skills), involvement in the Build Upon project, marketing campaigns to support renovation are some additional actions that have been taken over the last years towards this direction. However, it has to be noted that money for these activities are limited and that little focus is put on deep renovation. Additionally, it is worth mentioning that so far local and regional authorities in Croatia don't organise such trainings. Promotional activities and experts to support deep renovation projects are available in Croatia, however, they need to be further supported.

e. Technical barriers

Inventories of the building stock play a significant role in combating the lack of information on building characteristics. In the survey conducted in Croatia as part of the EmBuild project, 78% of all participants have already a documented inventory of the building stock in their municipality, city or county. Additionally, 53% of the participants indicated that energy consumption of their public building stock is measured. It has to be noted that in most cases the inventories have to be further improved. For example, in most of them until 2016 data was manually inserted and it's only recently that information on energy consumption is automatically connected to the energy provider. Some of the inventories are under expansion to include additional data, such as recommended energy efficiency measures, energy savings, information on investments, etc.

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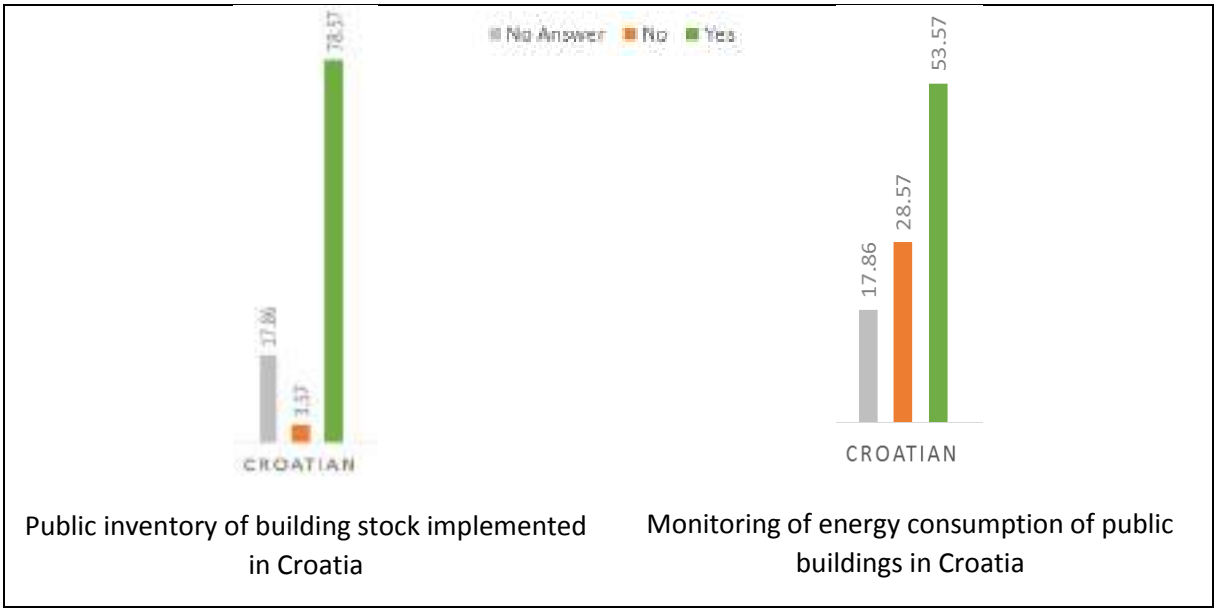
FIGURE 4: RESULTS FROM THE EMBUILD SURVEY FOR DELIVERABLE 2.4 [2]



Public inventory of building stock implemented in Croatia

Monitoring of energy consumption of public buildings in Croatia

At local level in Croatia there are many plans supporting renovation (action plan, energy efficiency plan), but they are rather general with none of them focusing on deep renovation of public buildings.

f. R&D barriers

Croatian municipalities have benefited from EU-funded projects in order to implement deep renovation measures. The Intense Energy Efficiency[12], the PRIMES Green Public Procurement[13] and the BUILD2LC[14] projects are just some of them. However, further measures to support research and development of new technology techniques, materials and elements of a cost-optimal integral building renovation are needed.

g. Strategic barriers

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 Croatian municipalities have to face.

[12] Intense Energy Efficiency (Source)

[13] PRIMES Green Public Procurement (Source)

[14] BUILD2LC (Source)

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TABLE 5: RANKING OF BARRIERS TO DEEP RENOVATION OF THE WHOLE BUILDING STOCK BY IMPORTANCE, BASED ON THE OPINION OF NATIONAL STAKEHOLDERS

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

The results from the EmBuild survey presented in TABLE 5 are in line with those presented in the first renovation strategy.

Overall, Croatia is working actively to overcome its barriers to renovation. However, a bigger focus on private finance and on deep renovation would be beneficial. Since 2014, supportive measures, such as the 'Programme of energy renovation of public buildings' and the 'Technical regulation on energy economy and heat retention in buildings' have been taken in order to overcome some of these barriers. However, there are still actions and decisions that need to be taken. These should mainly focus on the barrier of split incentives and on the legal framework which seem to be the most pressing for the municipalities.

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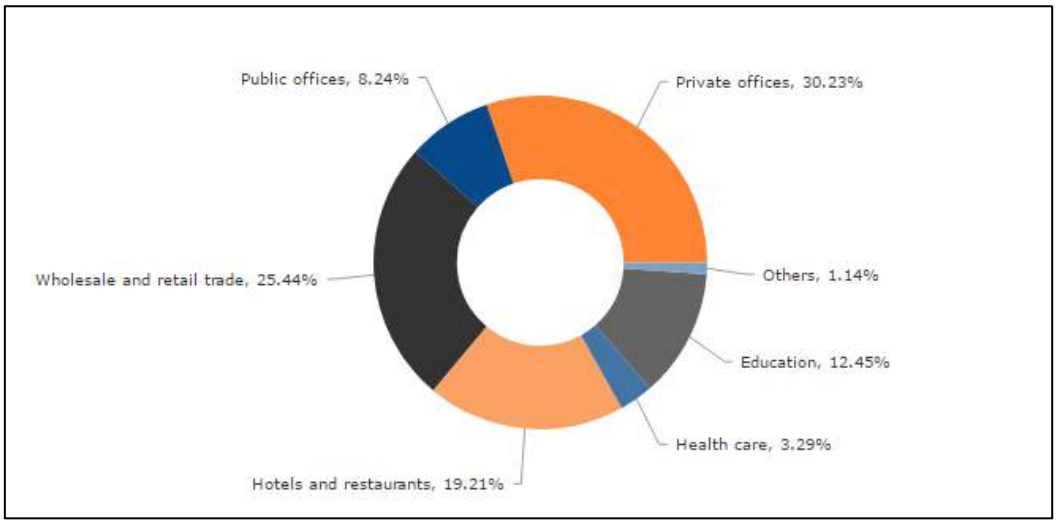
5. Germany

a. Introduction

Germany has 80.6 million inhabitants living in about 41,185,160 dwellings, with the residential buildings representing 67% of total floor area of buildings. Federal Government buildings and buildings of the federal states and municipalities account for around 20% of the overall floor area of the non-residential building stock in Germany (FIGURE 5). A large share is made up of municipal non-residential buildings (14% of the overall non-residential building stock), followed by the non-residential buildings of the federal states (4%) with the remainder (2%) accounted for by Federal Government buildings [7]. The Federal Government's civil establishments occupy a net floor area of around 8.5 million m^2. The German building stock is very old, with a majority of buildings – nearly 75% of the building stock - built before 1979.

FIGURE 5: BREAKDOWN OF NON-RESIDENTIAL FLOOR AREAS BY SECTOR IN GERMANY (2013) SOURCE: BUILDINGS STOCK OBSERVATORY



According to the European Commission's Joint Research Centre's assessment, the first German renovation strategy provides a good overview of the building stock and a comprehensive overview of the policies and financial instruments. However, the strategy did not include a satisfactory overview of cost-effective approaches nor a forward-looking perspective [4]. In the strategy there is also no comprehensive analysis of the barriers to deep renovation. However, there is a basic reference to the obstacles regarding awareness raising and lack of experience and knowledge on the sector.

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b. Legislative and regulatory barriers

Germany has a high share of not-privately owned properties. The current tenancy law (German Civil Code BGB §§ 559) allows landlords to request tenants to pay a share of the costs of energy renovation by increasing the annual rental charge by 11% of the costs for energy renovation. The amount of the modernisation levy on tenants should offset the investment costs advanced by the landlord, while tenants benefit from the modernisation through lower running costs and greater living comfort. However, these savings are often not sufficient to compensate for the modernisation costs attributable to tenants, resulting in a significant increase in the total rental charges (including incidental costs). Therefore, despite the fact that tenancy law aims at providing effective incentives for energy modernisation of the rental housing stock, it can hinder deep renovation.

Tenant laws and split incentives for commercial buildings are in some cases more significant barriers than the low economic viability of the investment. These barriers could be overcome through different means, such as mandatory upgrades on a particular timescale or at certain trigger points (e.g. sale, new lease) to achieve specific performance levels. To increase their efficiency, such measures should be supported by economic incentives.

According to stakeholders, too complex energy efficiency laws and time-consuming administrative processes to renovate buildings in Germany are hampering investments in deep energy renovation of buildings. In some cases, detailed and complex laws and procedures are necessary to include the necessary safeguards, however they have to be streamlined. Additionally, since 2014 there have not been any/few legislative measures taken to support deep renovation.

The too short timeframe for the implementation of measures that are funded by subsidies can hinder deep renovations. Energy efficiency measures in residential buildings are supported by KfW loans. However, the committed amount must be drawn down from KfW within 12 months of the loan being approved. Additionally, for some subsidies the application period is only a few months each year.

In the public sector, budget for renovation activities might be available only for a limited/short period. Municipalities and local authorities wanting to take advantage of these funds must prepare actions plans, which, due to the limited time, are often not well-designed and are not part of a holistic plan for deep renovation.

c. Fiscal/Financial barriers

In German municipalities, the municipal budget sets a threshold for investments in deep renovation of public buildings, de facto limiting the amount of investments allowed. Furthermore, the fact that the costs for renovations are allocated in the municipality's capital budget, while cost savings from renovations discharge the maintenance budget, hinders in some cases the refinancing of renovation measures.

The absence of sufficiently strong economic signals and appropriately tailored financial instruments is one more barrier that should be overcome. Feed-in tariffs, for example, for saved energy, conditional

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on achieving an ambitious level of energy savings is missing from existing policies that could stimulate deep renovation [8].

In Germany, there are building types which show high energy-saving potentials but are not renovated due to a limited return on investment. The well-established financial support system run by KfW could be further developed in order to overcome this barrier. Larger subsidies offered to building categories for which deep renovation is marginally not cost-effective could be used towards this end.

d. Communication/Capacity building barriers

The first renovation strategy in Germany sets awareness raising as an integral part of its strategy for deep renovation. It is stated that "information and advice must be provided in order to drastically raise the level of acceptance of energy saving measures and also to enable planners, investors and companies implementing the measures to initiate renovation work and structural changes at the required level of quality. On the demand side, consumer awareness must be further increased. The cause of the existing obstacles and difficulties can often be found in a lack of experience and sometimes also a lack of knowledge".

Building owners and investors need the right encouragement, information, support and incentives to choose the deep renovation option, particularly when undertaking other maintenance work on the property, as the additional cost of improving the building's energy performance at this time can be minimised. Even on the demand side, consumer awareness must be further increased in an attempt to also increase the trust to undertake energy retrofits and the benefits they bring.

These barriers are the consequences of the lack of experience and sometimes also of lack of knowledge. Support could come in the form of impartial information centres or one-stop-shops, which guide the owner/investor through the whole process, reducing transaction costs and helping to make the right choice. In certain places in Germany, local or regional energy agencies (organised in the eaD)[15] are already playing a part of that role and should be further supported and strengthened in their endeavour. Knowledge transfer among municipalities on common barriers, challenges, best practises, etc. would further boost deep renovations. Additionally, efforts to improve skills within the workforce through qualification and vocational training programmes, such as those organised by the Energy- and Environmental Center Allgäu eza![16], should be continued and enhanced.

e. Technical barriers

The lack of knowledge on the used technical systems and the characteristics of the buildings can be overcome by the use of inventories of the building stock. In the survey conducted in Germany as part of the EmBuild project, 50% of all participants have already a documented inventory of the building stock in their municipality, city or county and 47% indicated that energy consumption of their public

[15] The Federal Association of German Energy and Climate Protection Agencies (http://energieagenturen.de/)

[16] http://www.eza-allgaeu.de/

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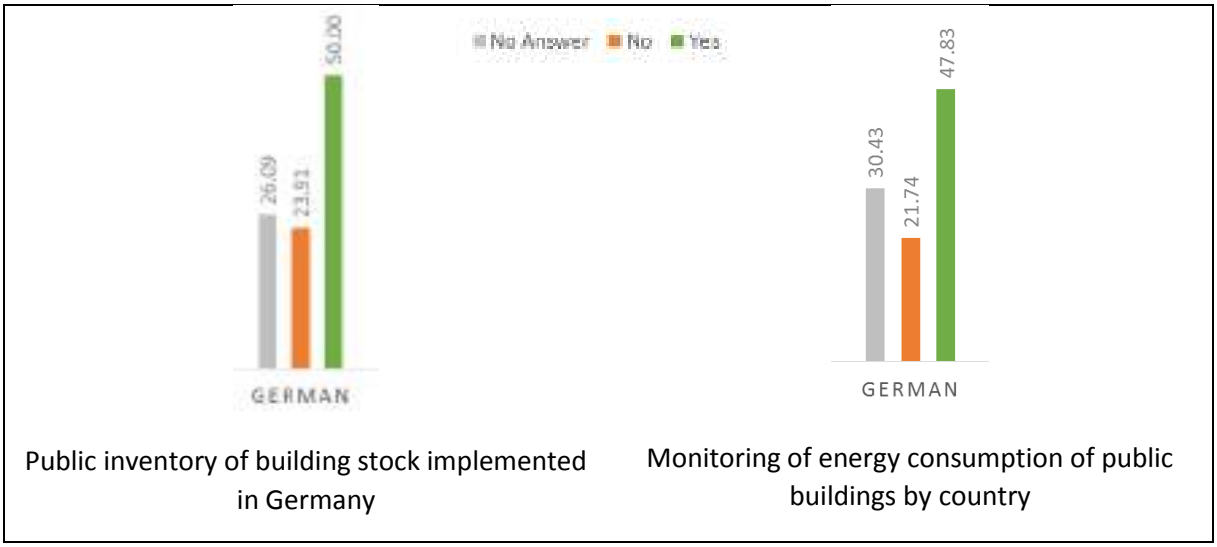
building stock is measured. However, in most municipalities these databases are not structured in a functional way and need to be further improved in order to be a useful tool not only for those with technical background but also for others involved in deep renovation projects such as portfolio managers.

FIGURE 6: RESULTS FROM THE EMBUILD SURVEY FOR DELIVERABLE 2.4 [2]



Public inventory of building stock implemented in Germany

Monitoring of energy consumption of public buildings by country

There are cities, such as Kempten, Aachen, Frankfurt, Stuttgart, Munich, etc. where energy managers are responsible for the control, report and the implementation of energy efficiency measures. In such cases part of the public building stock has been analysed and combined with financial aspects and they have set the basis for the planning of new investments.

In general, larger municipalities often have a well-organized energy management department with staff and established processes (energy management software, annual and monthly reporting, training for responsible persons etc.). On the contrary, in small municipalities (up to 50.000 inhabitants) there is often a lack of personnel and processes and therefore, the implementation of deep renovation projects is more challenging.

Inventories of buildings stock are in place and many municipalities are aware of the energy/technical needs of their building stock, but further measures should be taken to introduce the use of the inventory of the building stock among the normal practices of municipalities across the country.

f. R&D barriers

The stakeholders that participated in the EmBuild survey reported that there are no projects that stimulate deep renovation in their regions. However, in Germany several municipalities have taken advantage of such projects in order to renovate their building stock. For example, in the municipality of Linkenheim a school campus was renovated as part of the IEA Annex 61 - Development and

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Demonstration of Concepts for Deep Energy Retrofit in Government/Public Buildings[17]. Under the project "School of the Future - Towards Zero Emission with High Performance Indoor Environment" the Solitude Gymnasium in Stuttgart, a high school, was refurbished[18].

Additionally, within the so-called ENOB (Energy Optimised Buildings)[19] research area, various lighthouse projects on public buildings were conducted. The "Remscheider Entsorgungsbetriebe", a public facility which could reduce their primary energy consumption up to 75%, or the modernisation of the school "Berufskolleg Detmold" into an energy-plus-house are just some examples.

Additional projects of deep renovations to passive house standard of schools and public buildings have taken place in Germany. Information about them can be found on the website of the DBU (Deutsche Bundesstiftung Umwelt)[20] and the Energieatlas Bayern[21].

The above mentioned are some of the projects that promote deep renovations in public buildings. However, the already significant level of R&D support should be maintained and increased in order to speed up learning curves and the process of cost-reduction.

A programme for the development of accurate modelling and financing tools to increase the effectiveness of subsidy distribution is not in place in Germany. The return on investment in such a research programme would be an even more intelligent, streamlined, automated process to make use of public finances and increase the effectiveness of funds in reaching renovation targets and in triggering renovations.

g. Strategic barriers

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 German municipalities have to face.

[17] http://www.iea-ebc.org/projects/ongoing-projects/ebc-annex-61/

[18] http://www.school-of-the-future.eu/

[19] http://www.buildup.eu/en/practices/cases/energy-efficient-schools-enob-research-area

[20] www.dbu.de

[21] www.energieatlas.bayern.de

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TABLE 6: RANKING OF BARRIERS TO DEEP RENOVATION OF THE WHOLE BUILDING STOCK BY IMPORTANCE, BASED ON THE OPINION OF NATIONAL STAKEHOLDERS

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

From the above table, it can be concluded that the main barriers that hinder renovation in municipalities are related to financial aspects.

Germany recognising that the public sector should lead by example, introduced in 2001 the first Guideline on sustainable construction for public buildings, which has been amended three times so far. It stipulates requirements on ecological and social compatibility, demands economic considerations and highlights the technological model role of public buildings. However, since 2014 there have not been any/few legislative measures taken to support deep renovation. In the BPIE survey conducted in 2016 on the building renovation strategies [3], national stakeholders argued that the actions taken by authorities to support renovation are not sufficient and further measures should be implemented.

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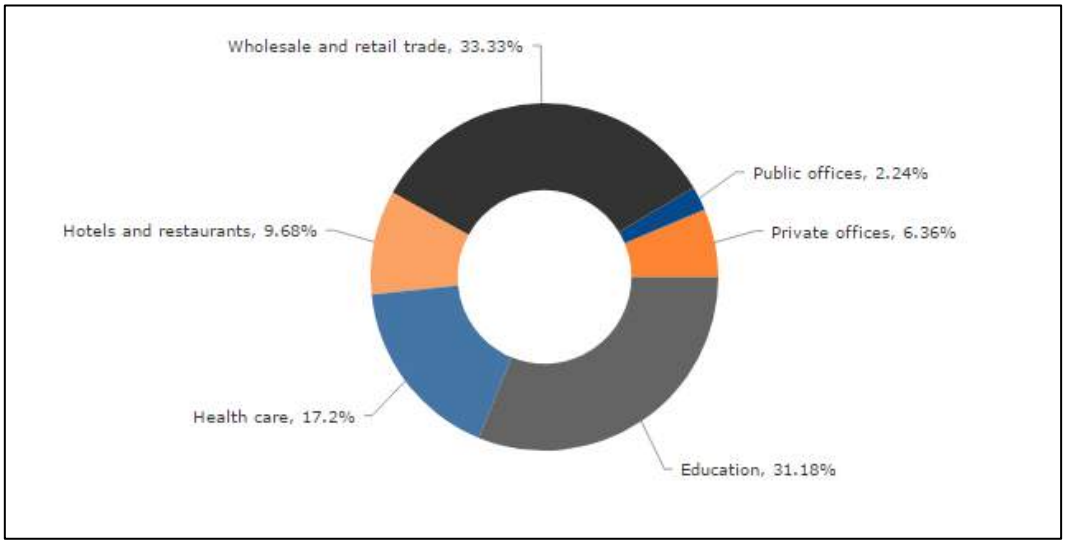
6. Romania

a. Introduction

Romania has around 20 million inhabitants living in 8,840,600 dwellings (2014). Residential buildings represent 83% of total floor area of buildings. In Romania, public buildings represent around 5% of the total building stock, and 24% of the energy consumption of non-residential buildings is from the buildings occupied by public administrations. Publicly-owned housing is almost non-existent in Romania [9].

FIGURE 7: BREAKDOWN OF NON-RESIDENTIAL FLOOR AREAS BY SECTOR IN ROMANIA (2013) SOURCE: BUILDINGS STOCK OBSERVATORY



Romania's first renovation strategy provided a satisfactory overview of the building stock and policies and measures but failed to adequately present the technical energy efficiency and renewable energy opportunities for each building category which would assist the regional and local implementation of the strategy and the development of the Romanian Energy Service Company market. A more detailed implementation timeline should also be provided [4].

The renovation strategy defines three types of barriers (legal/strategic, economic & skills, employment and education system) and lists selected barriers under each of the three headings. These barriers alongside with the information gathered as part of the EmBuild project are analysed in the following paragraphs.

b. Legislative and regulatory barriers

The Romanian construction market is restrained by complicated processes and bureaucracy. There is a focus on setting specific regulations, such as specifying an exact depth of insulation, rather than

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setting ambitious targets that can be achieved by appropriate and tailored measures. The lack of ambitious regulations, is also reported by the stakeholders that participated in the BPIE survey [3], who stated that while there are laws regulating aspects of deep renovation, their content is not ambitious enough. The main energy efficiency related laws in Romania are no. 372/2005 regarding the energy performance of buildings (updated 27 January 2016) and no. 121/2014 regarding energy efficiency (updated 15 December 2015).

The overlapping responsibilities and the lack of collaboration between ministries often result in piecemeal regulations and laws. For example, the Ministry of Finance which issued the law no. 98/2016 regarding public acquisitions did not foresee any special elements on EPC/green procurement or other measures that could encourage public authorities to include energy efficiency as a requirement in their documentations for acquisition. Therefore, the energy efficiency related laws set by the Ministry of Development, Public Administration and European Funds were not supported by the above-mentioned law.

The Romanian tendering process is generally overly focused on the price of the project. Therefore, cheap and, in most cases, inadequate materials and untrained workforce are used for the implementation of renovation projects. This has a profound impact on the quality of the work making deep renovation seem an unreliable investment.

In multi-ownership buildings, all occupants must agree on the implementation of energy efficiency measures. This fact, combined with the lack of information about the benefits of deep renovation, sets obstacles to renovation works.

c. Fiscal/Financial barriers

Economic barriers have a dominant position among those presented in the first renovation strategy. Due to the financial crisis, the funds available for deep renovation were substantially decreased, while the majority of the available financial schemes were established before 2014 and therefore, without taking into consideration the results and the recommendations of the first renovation strategy (e.g. the combination of various funds into “Multi-Fund” Operational Programmes).

High upfront cost for renovation combined with low energy prices result in long payback periods for deep renovations making them unattractive investments. The cost of renovation is further increased by the low demand for low-energy building technologies.

The lack of private investment for the rehabilitation of residential and non-residential buildings is mentioned in the first renovation strategy as one of the economic barriers. This was also one of the observations made by the participants in the BPIE survey [3], who stated that future financial programmes/schemes should be designed in a way that trigger private investments.

Obstacles to access energy efficiency services including Energy Performance Contracting hinders further deep renovation. The EUROSTAT ESA accounting rules for EPC foresee that the investments are added to the local authorities’ debt, which is not possible for many counties and municipalities. The private sector and ESCOs need to overcome this barrier and third party financing, supplied from their

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side will be a necessity [10]. The lack of multiannual budgets for public authorities makes the implementation of EPCs even more challenging.

d. Communication/Capacity building barriers

The first renovation strategy lists capacity building barriers among those of high importance. It is stated that there is "lack of skilled workers or low levels of training in the use of new technologies designed for EE and RES". This is also an outcome of the EmBuild survey: 90% of the stakeholders that participated in the survey stated that there is no training for deep renovation in their territory and 50% of them find that there is not enough technical capacity/knowledge in their territory to promote, plan and implement deep renovations. Therefore, it comes as no surprise that lack of competent advice on possible measures and steps to renovation is also considered an obstacle to deep renovation.

The CITYNVEST project, in its preparatory report for a capacity buildings Program [10], states that up to 2015 Romania participated in the Covenant of Mayors with 64 signatories (only 2 % of the total number of municipalities, but corresponding to 31% of the Romanian population). While these municipalities have well-developed Sustainable Energy Action Plans (SEAP), most Romanian municipalities lack experience in developing SEAPs and implementing sustainable energy policies.

The lack of communication on the benefits of deep renovation sets additional barriers to renovation works. Almost 60% of the participants to the EmBuild survey stated that the communication on the advantages of deep renovation is insufficient in their territory. This lack of awareness among customers and investors results in low demand for renovation works and consequently higher prices. Additionally, the insufficient communication sustains also the culture to maximise profits with minimal effort, which results in sub-optimal works.

The fact that building owners are not involved in the set up and roll-out of renovation programmes, leads to less than optimal results and distrust, hindering further deep renovation. The decisions for the renovation programmes of public buildings are taken at central level by the Ministry of Development, Public Administration and European Funds.

Some steps have been taken in order to overcome the abovementioned barriers. The Romania GBC, through Build Upon, is arranging consultation and workshops among a large number of stakeholders and ministries in an attempt to overcome this barrier. Such activities should be further expanded and supported at national and local level.

e. Technical barriers

Inventories of (public) buildings can give valuable information on the technical aspects/ characteristics of the building stock, allowing authorities to take informed decisions. In the survey conducted as part of the EmBuild project in Romania, 45% of all participants have already a documented inventory of the building stock in their municipality, city or county and 35% of them indicated that energy consumption of their public building stock is measured. In Romania, Sustainable Energy Action Plans are mandatory for cities with over 20,000 inhabitants and one of the first steps of such a process is the creation of the

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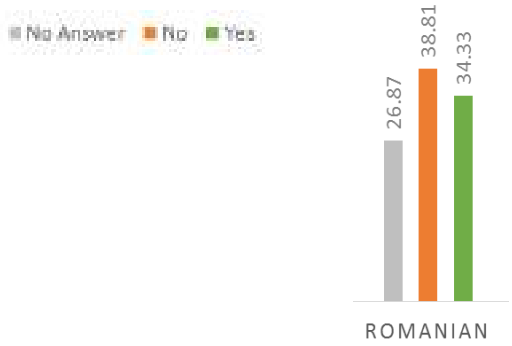
inventory of its public buildings. However, for smaller cities there is no such obligation leaving a gap in their ability to plan tailored renovation strategies at local level.

FIGURE 8: RESULTS FROM THE EMBUILD SURVEY FOR DELIVERABLE 2.4 [2]

Public inventory of building stock implemented in Romania



Monitoring of energy consumption of public buildings in Romania

f. R&D barriers

The lack of R&D projects in Romania is profound. The large majority (94%) of stakeholders that participated in the EmBuild survey stated that they are not aware of any programme to stimulate research or pilot deep renovations in their area. However, deep renovation projects take place in Romania, although in most cases they focus on renovating individual buildings rather than being part of regional/local renovation action plans. For example, as part of the NeZeR project[22] three buildings in Romania were renovated and in two of them the municipality of Timisoara was involved.

In the Municipality of Sector 1 Bucharest a project that represents the most ambitious SEAP in Romania is under development. It started in 2011 and its completion is expected in 2020. It foresees large scale intervention on all 140 buildings administrated by local authority and on all 850 residential multi-store apartment buildings [11]. Despite the fact that this project can set the example for other municipalities, so far its results are not well communicated and technical and economical details that could be useful for the replication of such projects are not available.

g. Strategic barriers

The following table, which is based on the opinion of national stakeholders expressed as part of the EmBuild survey, shows that for Romanian municipalities barriers to renovation related to financing rank in the highest positions, followed by legal and skill-related barriers.

[22] NeZeR project (Source)

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TABLE 7: RANKING OF BARRIERS TO DEEP RENOVATION OF THE WHOLE BUILDING STOCK BY IMPORTANCE, BASED ON THE OPINION OF NATIONAL STAKEHOLDERS

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

Based on the BPIE survey [3], for Romania the renovation of buildings has an important role to play in the achievement of climate and energy related goals. Several steps in the right direction have already been made, such as the establishment of a database of public buildings, supporting schemes to renovation etc. However, even though Romania is making progress, there is still much room for improvement. The big difference among cities should also be noticed: Bucharest is making substantial steps in supporting deep renovation, while other cities lag behind. A reason behind that might be that Bucharest has the highest GDP per capita in Romania and therefore, private investments in deep renovation measures are more likely to be triggered.

More transparency and a better stakeholder involvement, revision and assessment of the existing measures and schemes would boost deep renovation. A district approach could also benefit the rate and depth of renovation: policies and strategies could increase their impact if instead of focusing on renovation done building by building, they would support more holistic plans e.g. renovations per neighbourhood.

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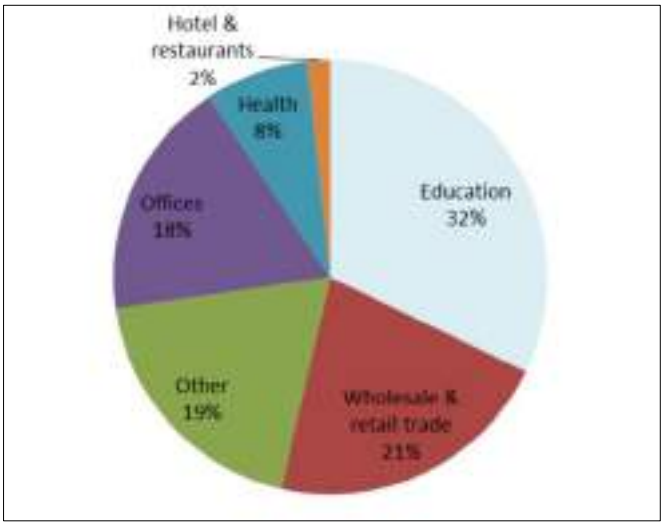
7. Serbia

a. Introduction

The total building stock area in the Republic of Serbia is about 197 Mm^2 [12] from which about 164 Mm^2 (83%) is related to residential buildings and the rest (17%) to the service sector (Figure 9).

FIGURE 9: BREAK-DOWN OF SERVICE SECTOR IN SERBIA (2008) [12]



It is estimated that the housing sector accounts for 38% of total energy consumption, and on average 125KWh is consumed for heating per m^2. In public buildings, the energy consumption is about 194 kWh/m^2 (assessment by Energy Efficiency Agency of the Republic of Serbia) [13]. Electricity has the highest share in the energy consumption in buildings (52.7%), followed by district heating (15%), coal, natural gas, biomass and oil (Figure 10). Biomass and coal are not used in the service sector, where apart from electricity, oil, gas and district heating are used to cover the energy needs.

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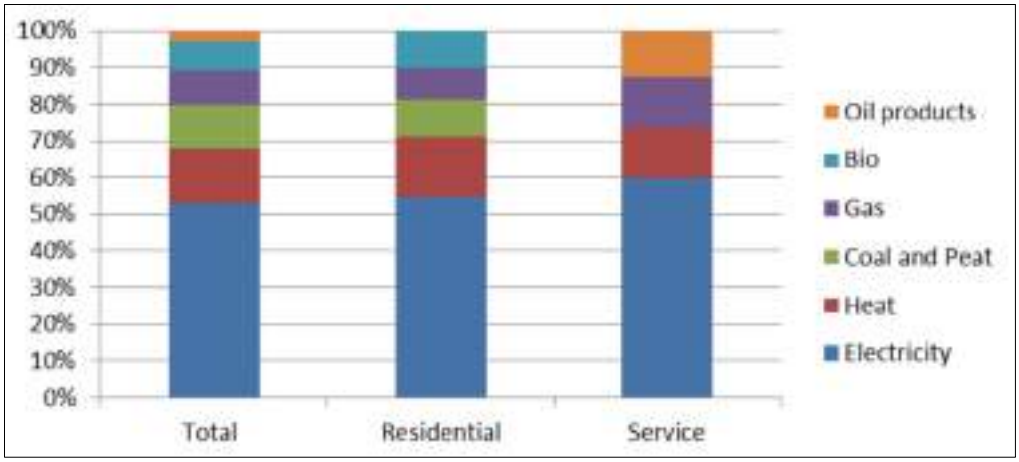
FIGURE 10: TOTAL ENERGY CONSUMPTION OF THE BUILDING SECTOR (2009) [12]



There is currently no renovation strategy in Serbia. Several action plans with general recommendations have been developed over the past six years, but they do not focus on deep renovation and lack clear implementation plans or links with financing.

b. Legislative and regulatory barriers

Energy performance of buildings has been recognized as one of the main issues in the overall energy balance of the Republic of Serbia, but still there is no valid national strategy in this sector.

The EU Directive 2012/27/EU, which requires for EU countries to develop a first version of the national renovation strategy not later than 30 April 2014 (art. 4 EED), with improvements or updates set to happen every three years, became obligatory for the Republic of Serbia with the resolution of the Ministerial council (D/2015/08/MC-EnC) in 2015. According to the resolution, the date set for the implementation of the conclusions is October 2017.

Apart from this resolution several documents regarding the renovation strategies in Serbia have been developed over the past six years, but they are presented in the form of action plans composed of rather general recommendations, lacking procedural clarification, financial modalities and a clear implementation algorithm.

Two main laws are addressing the issue of energy efficiency performance: the law on Planning and Construction[23] (2009) and Law on Rational Use of Energy[24] (2013). Both have been followed by a series of regulations that are addressing the issues in more detail. The current legislative/regulatory framework is somewhat unclear regarding the conventional energy renovation of buildings, but there is a clear intent to facilitate these procedures. However, deep renovation measures are not properly

[23] Official Gazette of the Republic of Serbia, No. 72/2009

[24] Official Gazette of RS, No. 25/13

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recognised and the legislative and regulatory framework is rather stringent for deep renovation measures.

In addition, the current legislation does not recognise the difference between deep energy renovation and non-energy related major renovations. Thus, deep renovation measures are not properly recognised, creating unnecessary administrative obstacles, unfavourable interpretations of zoning codes and high taxes.

Last but not least, in Serbia legislation foresees that in multi-unit buildings all owners must agree to proceed with the renovation works, which does not facilitate the implementation of deep renovation measures.

c. Fiscal/Financial barriers

A budgetary fund for energy efficiency, although envisioned by the first NEEAP in 2010, has only been established in 2014. It is envisioned as the support for improvement of energy efficiency in private, public, commercial and other buildings through the implementation of measures for the rational use of energy. It also supports the development of the energy management systems for third parties (not obligatory by law).

In 2014 the Ministry of Energy and Mining defined the conditions in which the available funds could be used, their distribution and monitoring rules. So far, 11 municipalities have been granted funds for various projects to invest in energy efficiency improvements. So far hardly 15% of the fund has been allocated. Many project proposals were denied due to incomplete documentation, which indicates lack of project planning and proposal writing capacity at local level. In 2016 a new ordinance on conditions for the use of budgetary funds has been issued clarifying the procedures for application, the required documentation and financial reporting. Additional funding is also available through an agreement with UNDP for the development of energy management systems at the local level.

d. Communication/Capacity building barriers

The technical capacity/knowledge to promote, plan and implement deep renovations vary between municipalities, but is mainly orientated to basic and conventional energy improvements. At the moment, no institutions are offering training or capacity building for deep renovation.

Communication about the advantages of deep renovation is insufficient, although the awareness levels may vary. While local authorities are fairly well informed about some basic energy efficiency issues, they are not familiar with deep renovation, which is still perceived as unaffordable and inappropriate in current market conditions. Moreover, builders, constructors and craftsmen are not only unfamiliar with deep renovation, but they are often reluctant when contracting even basic, code-compliant renovations.

Energy managers, which are the main contact point at the municipality level, are also ill-informed: since the implementation of legislative and regulatory framework is a strong barrier, it is very important to properly inform and educate all professionals involved in the administrative procedures.

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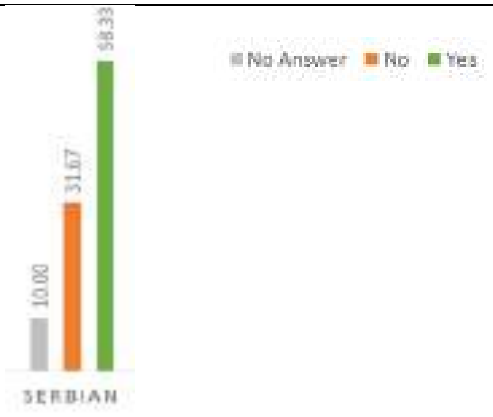
Workshops, discussion panels, presentation of good practice etc. are identified as potentially effective ways to improve awareness levels and facilitate implementation.

Following the development of the Central Registry of Energy Performance Certificates (CREP) which is gradually being filled by data on new and renovated buildings which have been issued an Energy Performance Certificate (EPC), it can be stated a database with sufficient information is to be established. However, one of the current drawbacks for a faster creation of the database is the lack of obligation to fulfil the CREP and the exemption from certification for buildings constructed without permits which are in the process of legalisation.

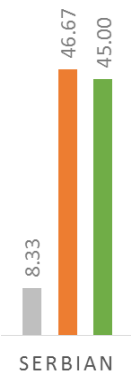
e. Technical barriers

To combat the lack of knowledge of their building stock, most municipalities in Serbia have an inventory of public buildings. In the survey conducted as part of the EmBuild project in Serbia, 58% of all participants have already a documented inventory of the building stock in their municipality, city or county and 45% of them indicated that energy consumption of their public building stock is measured. However, only few of them have some quality indicators or information on the extent of necessary renovation. The existing inventories are not structured or organised in the same manner throughout municipalities, so the level of collected data and its quality cannot be guaranteed, nor a joint public building inventory on the state level can be compiled.

FIGURE 11: RESULTS FROM THE EMBUILD SURVEY FOR DELIVERABLE 2.4 [2]



Public inventory of building stock implemented in Serbia



Monitoring of energy consumption of public buildings in Serbia

Renovation plans, strategies or initiatives have been developed by some municipalities, but they do not foresee deep renovations for public buildings. There are some exemptions, but only as an attempt to make a flagship project.

Tools are being developed to facilitate the renovation of the housing stock. A National typology of residential buildings was completed via the TABULA project and two renovation scenarios are

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proposed for each building type. Publications with detailed explanations and brochures for all building types offer a good starting point for energy renovation. A software tool for the estimations of savings linked to various energy upgrades is being developed in order to further facilitate the renovation process in the housing sector.

f. R&D barriers

At the moment, there are no programmes stimulating research or pilot deep renovation at local level. However, some academic research is in progress, as well as some isolated individual attempts to develop pilots for deep renovation.

Activities regarding energy efficiency performance, renovation principles and estimation of potentials, savings and reduction of CO_2 have been conducted in collaboration with foreign donors manly in the field of structuring the building fund, development of LEEAP-s or investigation of energy consumption structure and characteristics (fuel type, efficiency levels...).

One of the largest projects has been the development of National typology of residential buildings following the TABULA methodology which has been conducted by the Faculty of Architecture University of Belgrade and supported by GIZ. In the course of the project more than 22000 individual buildings were investigated formulating the large database that has served as the ground for strategic planning in the formulation of the NEEAP.

Currently the scope of the research activities, by the same research team, has been shifted from residential towards the public sector focusing primarily on Schools and Kindergartens. It is anticipated that the project will be finalised by the end of the 2017, resulting in adequate structuring of this portion of public buildings giving at the same time recommendations for various levels of renovation together with economic analysis of proposed measures.

Some municipalities finance renovation projects through various national and international funds. About 100 buildings have been conducted through two-phased Serbian Energy Efficiency Project (SEEP)[25], 2005-2012 (financing through WB IDA credit and IBRD loan), mainly focused on schools and hospitals, through which some municipalities gained experience in EE implementation, but without long-term capacity building generated.

g. Strategic barriers

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 for Serbian municipalities.

[25] http://projects.worldbank.org/P075343/energy-efficiency-project?lang=en

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TABLE 8: RANKING OF BARRIERS TO DEEP RENOVATION OF THE WHOLE BUILDING STOCK BY IMPORTANCE, BASED ON THE OPINION OF NATIONAL STAKEHOLDERS

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

The most pressing barriers to remove are limited access to finance, high payback expectations and split incentives, low level of awareness and legislative and administrative procedures. Institutional and legal frameworks should be a minor barrier in theory, but in practice they often prove to be a very strong barrier. Various discrepancies occur in the local administrative procedures, with a wide scope of different interpretations of legislative documents. Furthermore, the information barrier is often linked to the lack of coordination between various awareness campaigns and initiatives so even when there is a proper information source or access to impartial advice, there is no good information about it. Last but not least, the access to finance should be improved even though barriers are related to the overall access conditions rather than specific problems at local level.

The only national strategic documents relevant for improving the energy efficiency of the building stock are the National Action Plans. These plans refer primarily to conventional renovation and only the common points might be applicable. Up to now, there are no strategic documents focusing on deep renovation, neither on national nor on local level. Some municipalities have renovation plans, strategies or initiatives, but they do not foresee deep renovations for public buildings. There are some exemptions, but only as an attempt to develop a flagship project.

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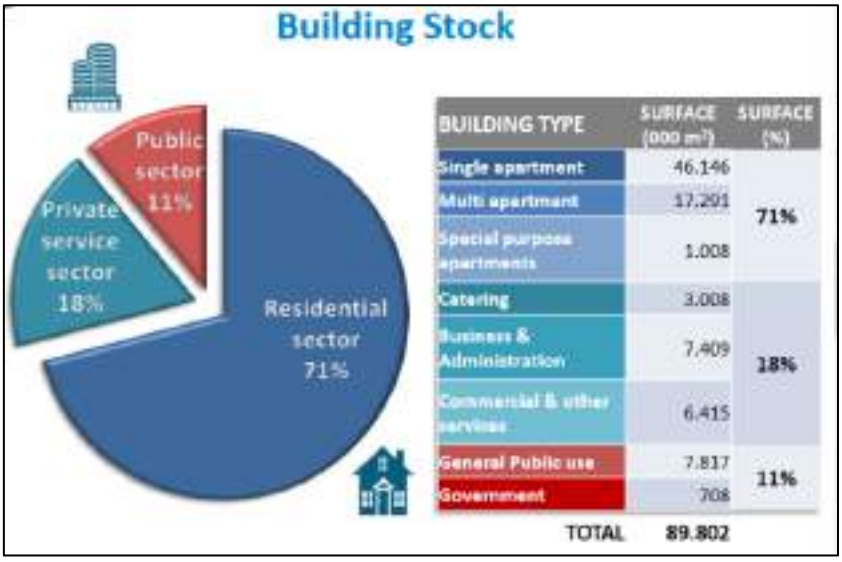
8. Slovenia

a. Introduction

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 12: BREAK-DOWN OF THE BUILDING STOCK ON SLOVENIA [14]



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

- 6 million m^2 of floor area in residential buildings,
- 1.8 million m^2 of floor area in public buildings (including the mandatory annual renovation of 3% of public buildings owned by narrow sector),
- 1.3 million m^2 of floor area in public buildings in the wider public sector[26].

The energy renovation of public buildings will be implemented on the basis of an energy performance contracting model. For this purpose, €115 million in grants and €50 million in repayable cohesion funds are planned for the period 2016-2023. The cohesion funds will be combined with financial investments from dedicated funds and programmes of international financial institutions in grants and repayable funds.

[26] 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.

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The strategy also provided an analysis of the barriers to investments in energy efficiency improvements, with a description of a package of supporting measures. The analysis is divided inthree categories based on the type of building sector: a) Housing sector b) Buildings owned and occupied by central government c) Public and private service sector. These barriers (mainly those for buildings owned and occupied by the central government) alongside with the information gathered as part from the EmBuild project are analysed in the following paragraphs.

b. Legislative and regulatory barriers

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. Despite the fact that 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.

It is foreseen that public energy renovation will be implemented with an energy performance contracting model, however, legal rules such as public accounting rules, hinder energy performance contracting and consequently energy renovations. Legal complications and the lack of a support environment for the implementation of energy performance contracting projects are also mentioned in the Slovenian renovation strategy among the weaknesses for investing in increased energy efficiency in public buildings.

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 have to 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.

c. Fiscal/Financial barriers

Financial barriers are considered by municipalities 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.

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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. Subsides from the Slovenian Eco Found, 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.

d. Communication/Capacity building barriers

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 steam from the fragmentary nature of knowledge, experience and skills in the sector can severely damage the quality of the final 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. KSSENA) 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.

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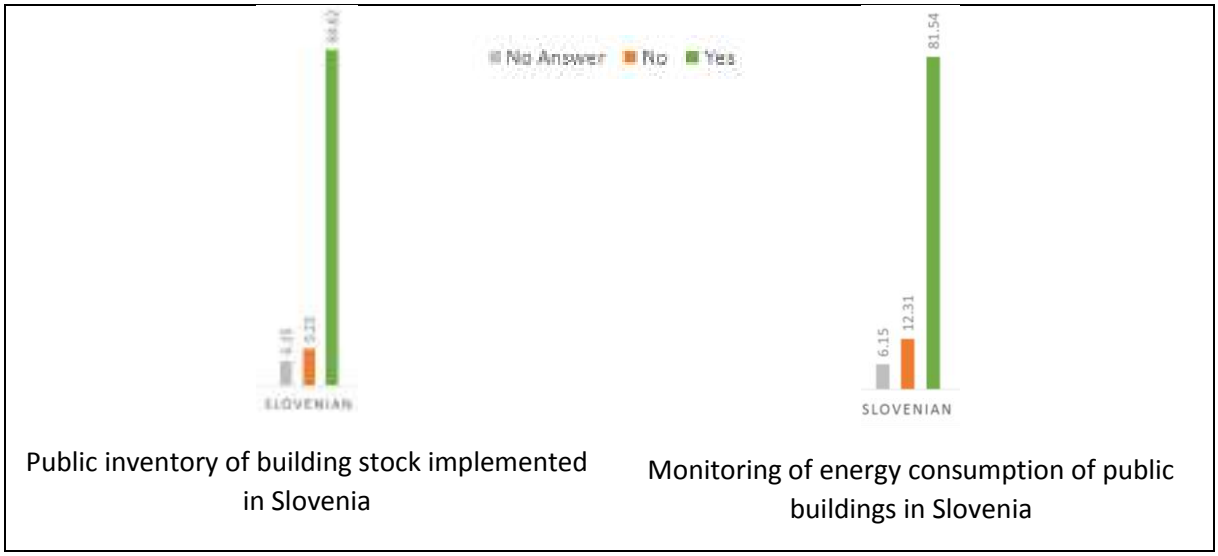
e. Technical barriers

The main technical barrier for municipalities is the lack of knowledge about their building stock. Despite the fact that all municipalities have some kind of inventory of their buildings, in most cases they include only basic information. In the survey conducted as part of the EmBuild project in Slovenia, 85% of all participants have already a documented inventory of the building stock in their municipality, city or county and 81% of them indicated that the energy consumption of their public building stock is measured. 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 has to be implemented by 31 December 2017.

FIGURE 13: RESULTS FROM THE EMBUILD SURVEY FOR DELIVERABLE 2.4 [2]



Public inventory of building stock implemented in Slovenia

Monitoring of energy consumption of public buildings in Slovenia

Local stakeholders mentioned that in many cases the investment plans for renovations are superficial, including only estimations on investment cost and on proposed measures. For that reason, actual costs and implemented measures differ from those initially planned creating a big uncertainty about the investments.

f. R&D barriers

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

Also, municipalities have participated in R&D projects for deep renovation. The Municipality of Ptuj participated to the Intense Energy Efficiency project to renovate buildings in its historical town. The project is expected to serve as a good example and by 2020, 25% of historical houses in the old city centre are expected to be renovated.

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Despite the fact that 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.

g. Strategic barriers

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 have to face.

TABLE 9: RANKING OF BARRIERS TO DEEP RENOVATION OF THE WHOLE BUILDING STOCK BY IMPORTANCE, BASED ON THE OPINION OF NATIONAL STAKEHOLDERS

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

Ranking of barriers by importance, based on Embuild questionnaire findings

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. In order to overcome the financial barriers, in April 2017 the City of Ljubljana, which serves as role model for numerous cities, and a consortium of companies signed a contact on energy renovation of public buildings under the ownership of the City of Ljubljana. This is the biggest public-private partnership project in Slovenia in the area of energy contracting in Slovenian municipalities. Comprehensive renovation is foreseen for 26 buildings and partial energy renovation for 23 buildings with the total cost of the project set at €14.94 million.

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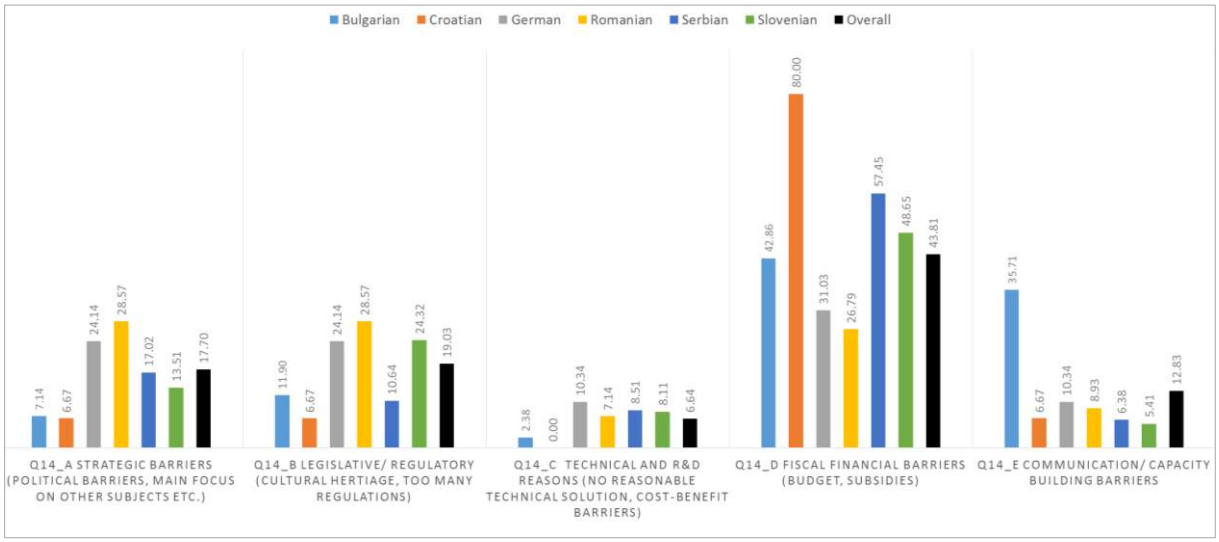
9. Conclusions

Understanding what are the main barriers to deep renovation is the first step towards designing a renovation strategy. It would be ineffective to establish policies and measures to drive deep renovation without knowing what are the reasons behind slow or low quality renovation rates.

Despite different national characteristics and building stocks and specific local conditions, the division of barriers to renovation in the six categories used in the report resonates among stakeholders.

While specific barriers can be identified in each of the countries analysed in this report, fiscal and financial barriers were identified as the strongest barriers that hinder deep renovation, followed by legislative and strategic ones (see Figure 14).

FIGURE 14: STRONGEST BARRIERS THAT HINDER THE IMPLEMENTATION OF EE AND DEEP RENOVATION STRATEGIES [2]



Access to finance is considered a main issue in most countries, with local authorities often lacking the technical skills necessary to apply for available funding (e.g. EU funds like Structural and Cohesion funds, EFSI). Limited borrowing capacity for the public sector, complex financial schemes favouring large investments and unfavourable accounting rules are also reported as key barriers for municipalities.

Complex or unclear legislative and regulatory requirements (e.g. no obligation to renovate existing buildings, no definition of deep renovation) and time-consuming administrative processes to renovate buildings are also important barriers for municipalities. Public procurement processes favouring price rather than quality are also a deterrent.

Incomplete inventories of their building stock as well as limited availability of trainings for deep renovation and the lack of technical capacity to promote, plan and implement deep renovations in their territory are recurring barriers among the EmBuild countries.

Research and development is not a priority for municipalities, even though successful pilot projects could be replicated to create awareness. Even in countries where municipalities have been part of R&D

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projects (e.g. Slovenia, Romania, Croatia) they are usually not promoted and technical and economical details are not available.

Some of the barriers highlighted in the report are relevant at all levels of government (national, regional and municipal), like limited access to finance or complex public procurement procedures, while others are particularly striking at local level, in particular limited technical capacity and unfavourable accounting rules that don't consider energy efficiency investments for renovation as investment but as an expense.

To be successful, national renovation strategies should incentivise deep renovation and support public authorities at all levels of government by including policies and measures tailored for them. Removing barriers to renovation is the first step towards the creation of a successful strategy, but focusing on barriers relevant only at national level, ignoring the difficulties that regions and municipalities are facing daily, may preclude the success of these strategies. Municipalities should be involved in the process from the beginning and be asked to contribute with the knowledge of their market, their territory and their own implementation capacity to ensure that the appropriate measures to remove the stumbling blocks to deep renovation are included in their national renovation strategies.

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10. Annex I: EmBuild questionnaire for Deliverable 4.1

EMBUILD WP4 - QUESTIONS FOR REPORT ON MARKET BARRIERS AND INCENTIVES TO DEEP RENOVATION

Note: this is a list of questions that should guide your meetings/interviews/research. Try to support this information with as much data and information as possible (especially when it comes to funding, energy saving targets, number of trainings etc.). For each question, there is a multiple choice or a scoring option, but also an opportunity to capture verbatim comments.

Date of interview

Interviewee details:

Name:
Organisation:
Country:
Contact information:

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a. Questions on strategic barriers to deep renovation

Question 1 – Which are the most pressing barriers to deep energy renovation in your territory? (please rank the top 5)

BARRIERS	**RANKING** *(1 = the biggest barrier, 2 = the second biggest etc.)*
Skills in the supply chain	Ranking
Complexity and hassle	Ranking
Split incentives (e.g. landlord/tenant)	Ranking
Access to finance	Ranking
Payback expectations/investment horizons	Ranking
Price signals	Ranking
Information (e.g. access to impartial advice)	Ranking
High transaction costs	Ranking
Institutional and legal frameworks	Ranking
Other (please specify)	Ranking

Comment:

Question 2 – Has action been taken by the government - since 2014 - to remove barriers to deep renovation?

Yes ☐

No ☐

Please describe *(If 'no' - what action would have been or is necessary?):*

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b. Questions on legislative/regulatory measures

Question 3 – Does the current legislative/regulatory framework stimulate deep energy renovation in your territory?

Yes ☐

No ☐

Please describe *(If 'no' – what should be improved?):*

Question 4 – Have legislative measures been enacted in order to implement the renovation strategy and stimulate deep renovation since 2014? (See for example the measures identified in the national renovation strategy)

Yes ☐

No ☐

Please describe *(If 'no' - what measures are necessary):*

c. Questions on fiscal/financial measures

Question 5 – Have new or amended financial support schemes or fiscal incentives been introduced since 2014 supporting renovation of the building stock (or certain parts of it)?

Yes ☐

No ☐

Please describe *(If 'no'* - what scheme would have been necessary/useful to stimulate deep renovation in your territory?*):*

Question 6 – In the current framework, are there any financial schemes that hinder deep renovation?

Yes ☐

No ☐

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Please describe

d. Questions on communication/capacity building

Question 7 – Do you think that communication about the advantages of deep renovation is sufficient in your territory?

Yes ☐

No ☐

Please describe *(If 'no' – what should be done to increase awareness?)*

Question 8 –Do you think there is enough technical capacity/knowledge in your territory to promote, plan and implement deep renovations?

Yes ☐

No ☐

Please describe *(If 'no' – what should be done to increase the capacity?)*

Question 9 –Does your local authority/municipality/chamber of commerce offer training or capacity building for deep renovation?

Yes ☐

No ☐

Please describe

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e. Questions on technical issues

Question 10 – Do you have an inventory of your public buildings?

Yes ☐

No ☐

Please describe

Question 11 – Do you have a renovation plan for your territory?

Yes ☐

No ☐

Please describe *(Does it include (rate, expected costs and funds, expected savings, benefits)*

f. Question on Research and Development

Question 12 – Are you aware of any programme to stimulate research or pilot deep renovations in your area?

Yes ☐

No ☐

Please describe

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11. Annex II: Country factsheets

Bulgaria

Context

38% of administrative buildings in Bulgaria were built and commissioned between 1959 and 1977, i.e. they were designed in accordance with the norms prevailing in 1959. The remaining 62% of these buildings were designed and built to the norms applicable between 1974 and 1986. [15]

According to the European Commission's Joint Research Centre's assessment, Bulgaria's first renovation strategy did not include a satisfactory overview of the building stock, cost-effective approaches, policies or measures, forward-looking perspective, or estimations of potential savings [4].

Barriers to deep renovation of public buildings

Type of barrier	Importance
Payback expectation	
Price signals	
Access to finance	
Information	
Expectation for high (100%) state subsidy	
Skills in the supply chain	
High transaction cost	
Complexity and hassle	
Institutional and legal framework	
Split incentives	

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

The most relevant barriers to deep renovation of public buildings are:

Legislative framework: The current legislative framework does not encourage deep renovation. While the National Programme for Energy Efficiency of Multifamily Residential Buildings encourages (since September 2016) renovation of multifamily residential buildings to energy class B (although this is not widely promoted), there is no incentive to renovate public buildings to levels higher than class C.

Access to information: Advice on the benefits of deep renovation, applicable measures and access to financing is currently insufficient.

Skills of the building experts: Bulgaria suffers from a lack of training and skills within the construction sector.

Financing and costs: Low energy prices (30% lower compared to the regional market) make the cost of deep renovation less financially attractive and the payback period longer

Breakdown of barriers and potential measures to overcome specific barriers

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	BARRIERS	Potential MEASURES
COMMUNICATION	**Lack of awareness** of the wide range of benefits deep renovation. **Under-developed renovation culture**, hampering a faster and deeper renovation rate. **No pilot sites** or visible examples of proven deep energy renovation projects. **Lack of consistency**. The unclear future for several programmes hampers long-term investments.	**Promote demonstration projects on the local level** to exemplify the benefits and viability of deep renovation projects**.** **Capacity building campaign and training** at a local level for administrators, energy auditors, certifiers, designers and construction professionals. **One-stop-shops** for effective advice on the renovation process for public authorities. **Communication campaign** to shed light on the benefits of deep renovation for public authorities – led by the central Government and supported at local level.
QUALITY	**Lack of qualitative advice** on measures and steps to renovation. **Lack of skills in the supply chain** lowering quality and increasing scepticism. **Lack of training on deep renovation** for local administrations (including building control and supervision bodies), energy auditors, designers and construction companies. **Lack of monitoring.** There are no systematic practices for measurement, monitoring and evaluation of the actual energy savings after the renovation projects take place.	**Set out clear guidelines** for measuring, review and verification of actual energy savings from deep renovation projects. **Practical training** for building professionals to ensure a high-quality renovation process with intended results.
LEGISLATIVE/ REGULATORY	**Insufficient energy performance requirements** for both public and private buildings. **High transaction costs** due to complex administrative processes.	**Introduce high energy performance requirements** for all buildings, and especially for the renovation of public buildings. **Phase out** the worst performing public buildings over time.
FINANCIAL	**Lack access to finance** in both public and private sector. **Low energy prices** making the cost of deep renovation less financially attractive.	**Stimulation of the market for Energy Performance Contracting** and Energy Service Companies – such as providing guidance documents, sample procurement and

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	**Long payback periods** due to high upfront costs of renovation compared to energy prices.	contract documents, and encouraging the public sector to lead by example. **Public procurement processes** that focus on additional variables than the lowest price. **Shift provisional energy subsidies** to lasting investments in energy efficiency programmes.

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Croatia

Context

64% of Croatia's national non-residential building stock is public buildings, which have a total area of 13.8 million m^2. Around 9% of the total building stock is publically owned, the majority of these buildings are non-residential, with less than 1% of residential buildings publically owned. Around 32% of the non-residential public building stock was built before 1971. [16]

According to the European Commission's Joint Research Centre's assessment, Croatia's first renovation strategy provided a detailed description of the current situation as well as possible and planned actions, but it was not clear on how and when the strategy would be implemented and its expected impacts in terms of energy savings and larger benefits (jobs, etc.) [4].

Barriers to deep renovation of public buildings

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

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

The most relevant barriers to deep renovation of public buildings are:

Banking sector: The current situation in the Croatian banking sector, which recorded losses and whose profitability has shrunk significantly, is an important barrier. Following the financial crises, which affected the Croatian financial sector hard, with the share of bad loans increasing and the number of employees in the sector decreasing, the outlook for a rapid development of the construction and energy market is dim.

Insufficient awareness – among the public and policy-makers - of the multiple benefits deep renovation of the building stock might bring. Demonstration projects of public building renovation and promotion of good examples can help to raise awareness of the benefits and viability of deep renovation, like the recently inaugurated Energy Center in Bračak (ECB)[27], a historic building under heritage protection[28], recently rehabilitated focusing on the application of advanced technical solutions and retrofitting.

[27] http://www.fedarene.org/best-practices/bracak-energy-centre-18020

[28] The building is owned by the Krapina Zagorje county and is operated by REGEA.

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Breakdown of barriers and potential measures to overcome specific barriers

	BARRIERS	Potential MEASURES
COMMUNICATION	**Lack of knowledge and awareness** of deep renovation in the construction sector**.** **Lack of awareness** of the multiple benefits that deep renovation. **Insufficient motivation** from the financial investors. **Perception that deep renovation** is a high-risk investment.	**Promote demonstration projects at the local level** to exemplify the benefits and viability of deep renovation. **One-stop-shops** for effective advice on the renovation process for public authorities. **Communication campaign** to shed light on the benefits of deep renovation for public authorities – led by the central Government and supported at local level. **Pilots projects** for specific building types (for example, courts and buildings with cultural heritage).
QUALITY	**Insufficient construction sector knowledge** and awareness of deep renovation. **Lack of skills** in the supply chain lowering quality and increasing scepticism of deep renovation.	**Capacity building campaign and training** for building professionals to secure a high-quality renovation process.
LEGISLATIVE/ REGULATORY	**Insufficient regulation** to implement energy efficiency and renewable energy use in buildings. **Transaction costs** due to time-consuming public procurement processes.	**Adopt higher energy performance standards** for the renovation of public buildings. **Phase out** the worst performing buildings over time.
FINANCIAL	**Lack of developed and proven financial models** on the market. **Impact of the economic crisis** reducing the capacity for investment in to all economic sectors, including the construction sector. **Low energy prices** make the alternative cost for energy efficiency more expensive.	**Stimulation of the market for Energy Performance Contracting** and Energy Service Companies – such as providing guidance documents, sample procurement and contract documents, and encouraging the public sector to lead by example. **Public procurement processes** that focus on more variables than the lowest price. **Use EU structural and cohesion funds** to leverage public and private investments in deep renovation.

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Germany

Context

Federal Government buildings and buildings of the Federal States and municipalities account for around 20% of the overall floor area of the non-residential building stock in Germany. Most of these are municipal non-residential buildings (14% of the overall non-residential building stock), followed by the non-residential buildings of the Federal States (4%) with the remainder (2%) accounted for by Federal Government buildings. The Federal Government's civil establishments occupy a net floor area of around 8.5 million m^2. [17]

According to the European Commission's Joint Research Centre's assessment, the first German renovation strategy provided a good overview of the building stock and a comprehensive overview of the policies and financial instruments. However, the strategy did not include a satisfactory overview of cost-effective approaches nor a forward-looking perspective. [4]

Barriers to deep renovation of public buildings

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

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

The most relevant barriers to deep renovation of public buildings are:

Administrative processes: The administrative processes to renovate buildings in Germany are, according to stakeholders, too complex and time-consuming, hampering investments.

Public budgets: Municipal budget limitations set a threshold for investments in deep renovation of public buildings. This is partly due to the municipal budget consolidation, which limits possible budget deficits.

Financial barriers: The costs for renovations are allocated in the municipality's capital budget, while cost savings from renovations discharge the maintenance budget. This structure of the municipal budget, in some cases, hinders the refinancing of renovation measures.

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Breakdown of barriers and potential measures to overcome specific barriers

	BARRIERS	Potential MEASURES
COMMUNICATION	**Lack of interest** in deep renovation, especially when compared to renewable energy investments. **Scepticism** that energy retrofits will deliver the forecasted efficiency savings.	**Highlight 'lighthouse-projects'** at the local level to show viability of deep renovation projects and increase interest. **Capacity building campaign and training** at a local level for energy auditors, certifiers, designers and construction companies. **Data, facts and figures** should be made more easily available to decision makers, experts etc.
QUALITY	**Lack of knowledge, expertise and skills** by the professionals within the supply chain (e.g. lack of knowledge about passive houses among architects and too many non-skilled workers on construction sites).	**Train building professionals** with high qualifications, preparing them to build and upgrade the building stock for the future.
LEGISLATIVE/ REGULATORY	**Complex administrative process** to renovate buildings. **Too short timeframes** for implementation of deep renovation measures funded by subsidies.	**Adopt higher energy performance standards** for the renovation of public buildings. **Phase out** the worst performing buildings over time.
FINANCIAL	**Limited public funds** due to the municipal budget consolidation. **Lack of a strong price signal** for saving energy and reducing CO_2.	**Stimulation of the market for Energy Performance Contracting** and Energy Service Companies – such as providing guidance documents, sample procurement and contract documents, and encouraging the public sector to lead by example.

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Romania

Context

In Romania, public buildings represent around 5% of the total building stock, and 24% of the energy consumption of non-residential buildings is from the buildings occupied by public administrations. Publicly owned housing is almost non-existent in Romania. [18]

According to the European Commission's Joint Research Centre's assessment, Romania's first renovation strategy provided a satisfactory overview of the building stock and policies and measures, but failed to adequately present the technical energy efficiency and renewable energy opportunities for each building category which would assist the regional and local implementation of the strategy and the development of the Romanian Energy Service Company market. A more detailed implementation timeline should also be provided. [4]

Barriers to deep renovation of public buildings

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

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

The most relevant barriers to deep renovation of public buildings are:

Tendering process: The Romanian tendering process is generally overly focused on the price of the project, in some cases leading to inadequate material and low-quality work. Tendering contracts are often integrated contracts, which can comprise construction work on the building envelope, the supply of systems and energy, financing, management and maintenance services, but also energy conservation guarantees.

Complex regulatory process: The Romanian construction market is – according to stakeholders - restrained by complicated processes and bureaucracy. There is a focus on setting specific regulations, such as specifying an exact depth of insulation, rather than setting ambitious targets that can be achieved by appropriate and tailored measures.

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Breakdown of barriers and potential measures to overcome specific barriers

	BARRIERS	Potential MEASURES
COMMUNICATION	**Lack of competent advice** on possible measures and steps to renovation. **Lack of awareness** of the wide range of benefits brought by deep renovation. **No pilot sites.** Many local regions lack visible examples of proven deep energy renovation projects.	**Promote demonstration projects on the local level** to exemplify the benefits and viability of deep renovation projects. **Capacity building campaign and training** at a local level for administrators, energy auditors, certifiers, designers and construction professionals. **Communication campaign** to shed light on the benefits of deep renovation for public authorities – led by central Government and supported at local level. **One-stop-shops** for effective advice on the renovation process for public authorities.
QUALITY	**Lack of skills** in the supply chain. **Culture to maximise profits with minimal effort** resulting in sub-optimal works. **Lack of training** on deep renovation: for local administrations (including building control and supervision bodies), energy auditors, designers and construction companies.	**Set out clear guidelines** for measuring, review and verification of actual energy savings from deep renovation projects. **Practical training** for building professionals to ensure a qualitative renovation process with intended results.
LEGISLATIVE/ REGULATORY	**Complex administrative process** to renovate buildings.	**Adopt higher energy performance standards** for the renovation of public buildings. **Phase out** the worst performing buildings over time.

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FINANCIAL 	**Low energy prices** making deep renovation less financially attractive. **Obstacles to access energy efficiency services** including Energy Performance Contracting. **Limited access to financing** in both public and private sector. **Public procurement** process favours lowest price. **Long payback periods** due to relatively high upfront costs of renovation compared to energy prices.	**Stimulation of the market for Energy Performance Contracting** and Energy Service Companies – such as providing guidance documents, sample procurement and contract documents, and encouraging the public sector to lead by example. **Public procurement processes** that focus on additional variables than the lowest price.

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Serbia

Context

Detailed data on the structure, composition and performance of the building stock does not exist in Serbia. Work is underway to establish a database and inventory of public buildings to comply with the requirements under the Energy Efficiency Directive.

There is currently no renovation strategy available in Serbia. The country is due to establish its first national renovation strategy by October 2017. Several action plans with general recommendations have been developed over the past six years, but they do not focus on deep renovation and lack clear implementation plans or links to financing.

Barriers to deep renovation of public buildings

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

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

The most relevant barriers to deep renovation of public buildings are:

Legislative: The current legislative framework does not recognise the difference between deep energy renovation and non-energy related major renovations, resulting in that deep renovation measures are not properly recognised, creating unnecessary administrative obstacles, unfavourable interpretations of zoning codes and high taxes.

Local funding support and capacity: 11 municipalities have been granted funds for various projects to make energy efficiency improvements, from which hardly 15% are allocated. A lot of project proposals were denied due to incomplete documentation, which indicates lack of project proposal writing capacity at local level.

Communication: Information and communication on the advantages of deep renovation are insufficient. While fairly well informed about some basic energy efficiency issues, local authorities are not familiar with deep renovation. It is still perceived as unaffordable and thus inappropriate on the current market.

Skills in the supply chain: Builders, constructors and craftsmen are not only unfamiliar with deep renovation, but they are often reluctant to carry out basic energy efficiency measures.

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Breakdown of barriers and potential measures to overcome specific barriers

	BARRIERS	Potential MEASURES
COMMUNICATION	**Lack of awareness** of the wide range of benefits brought by deep renovation. **No pilot sites** or no visible examples of proven deep energy renovation projects.	**Promote demonstration projects on the local level** to exemplify the benefits and viability of deep renovation projects. **Capacity building campaign and training** at a local level for administrators, energy auditors, certifiers, designers and construction professionals. **Communication campaign** to shed light on the benefits of deep renovation for public authorities – led by the central Government and supported at local level. **One-stop-shops** for effective advice on the renovation process for public authorities.
QUALITY	**Lack of qualitative data** to assess and measure energy savings. **Lack of skills** in the supply chain. **Insufficient capacity** in municipalities to develop projects. **No training or capacity building** on deep renovation.	**Practical training campaigns** for builders, constructors and craftsmen at local level to highlight issues in the construction and planning process that are crucial for energy savings.
LEGISLATIVE/ REGULATORY	**Insufficient building performance requirements** and inadequate enforcement of existing requirements. **Deep renovation measures not properly recognised** in legislation, creating administrative obstacles, unfavourable interpretations of zoning codes and high taxes.	**Introduce high energy performance requirements** for the renovation of public buildings. **Redefinition of energy requirements** for minimum energy performance in all renovated buildings, introducing deep renovation targets. **Phase out** the worst performing buildings. **Better compliance** of energy performance requirements.

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FINANCIAL 	**Poor access to financing** in both public and private sector. **Low energy prices** making deep renovation less financially attractive.	**Stimulation of the market for Energy Performance Contracting** and Energy Service Companies – such as providing guidance documents, sample procurement and contract documents, and encouraging the public sector to lead by example. **Public procurement processes** that focus on additional variables than the lowest price.

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Slovenia

Context

In Slovenia, the public sector accounts for 38% of the total floor area of non-residential buildings. The largest public sector category comprises primary schools (2 million m^2). The potential for renovation to a nearly zero-energy building standard in public buildings was estimated in 2015 at 6 857 million m^2 (66 % of the total floor area of public buildings). [19]

According to the European Commission's Joint Research Centre's assessment, Slovenia's first renovation strategy provided a detailed description of the building stock and analysis of the barriers to investment in energy efficiency improvements, with a description of a package of supporting measures. More packages of measures should be clearly reported and a scenario analysis up to 2050 should be provided in the second strategy. [4]

Barriers to deep renovation of public buildings

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 to deep renovation of the whole building stock by importance, based on the opinion of national stakeholders

The most relevant barriers to deep renovation of public buildings are:

Short term perspective: Priority is given to quick rates of return, thus favouring partial rather than complete deep renovation projects. The short-sighted perspective hampers long-term investments and underlines the need for an effective long-term renovation strategy that guides the market through a forward-looking perspective.

Complex financial schemes: Schemes favour large investments and do not encourage investments in smaller public buildings.

Rigid legal rules: Legal rules, such as public accounting rules, hinder innovative financing tools, such as Energy Performance Contracting and Energy Service Companies, to enter the market.

Administrative processes: The processes to renovate buildings in Slovenia are, according to stakeholders, too complex and time-consuming, discouraging investments in deep energy renovation of buildings.

Lock-in effects: Public authorities generally only have funds available for smaller investments. These are often necessary, but partial renovations lower the potential for future deep renovation. By implementing such an investment, the financial potential for deep renovation diminishes.

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Breakdown of barriers and potential measures to overcome specific barriers

	BARRIERS 	Potential MEASURES 
 COMMUNICATION	**Lack of competent advice** on measures and steps to renovation. **Lack of awareness** among customers/ investors of the wide range of benefits deep renovation brings. **No pilot sites** and no visible examples of proven deep energy renovation projects.	**Promote demonstration projects on the local level** to exemplify the benefits and viability of deep renovation projects**.** **Capacity building campaign and training** at a local level for administrators, energy auditors, certifiers, designers and construction professionals. **Communication campaign** to shed light on the benefits of deep renovation for public authorities. **One-stop-shops** for effective advice on the renovation process for public authorities. **Pilots projects** for specific building types (for example, courts and buildings with cultural heritage).
 QUALITY	**Quality of data.** Lack of information and of reliable sources of data for estimating savings. **Lack of skills in the supply chain** lowering quality and increasing scepticism.	**Practical training campaigns** for builders, constructors and craftsmen at local level to highlight issues in the construction and planning process that are crucial for energy savings.
LEGISLATIVE/ REGULATORY 	**Uncertainty** in the regulatory framework in a couple of years. **Legislation**, such as public accounting rules, hinder Energy Performance Contracting and other innovative financial instruments.	**Introduce high energy performance requirements** for the renovation of public buildings. **Phase out** the worst performing buildings.
FINANCIAL 	**Limited borrowing capacity** available for the public sector. **Public procurement** processes are in general too complex and time-consuming. **Lack of access to financing** in both public and private sector. **Priority given to quick rates of return**, thus, favouring partial rather than complete deep renovation projects. **Complex financial schemes** favouring large investments and not supporting smaller public buildings.	**Stimulation of the market for Energy Performance Contracting** and Energy Service Companies – such as providing guidance documents, sample procurement and contract documents, and encouraging the public sector to lead by example. **Public procurement processes** that focus on additional variables than the lowest price. **Use EU structural and cohesion funds** to leverage public and private investments in deep renovation.

This project receives funding from the Horizon 2020 European Union Research and Innovation Programme under Grant Agreement No 95169

12. Bibliography

[1] "A guide to developing strategies for deep renovation," BPIE, 2013.

[2] "Guidance note on stakeholder involvement," EmBuild project, http://www.embuild.eu/knowledge-center/publications/, 2016.

[3] "Building renovation strategies under the spotlight," BPIE, 2016.

[4] Joint Research Centre , "Synthesis Report on the assessment of Member States' building renovation strategies," 2016.

[5] "The challenges, dynamics and activities in the building sector and its energy demand in the Republic of Bulgaria," ENTRANZE project, http://www.google.be/url?sa=t&rct=j&q=&esrc=s&source=web&cd=9&cad=rja&uact=8&ved=0ahUKEwjpipyeqOLTAhUHIlAKHcgbA4sQFghKMAg&url=http%3A%2F%2Fwww.entranze.eu%2Ffiles%2Fdownloads%2FD2_1%2FD2_1_Short_country_summary_report_-final-Bulgaria.pdf&usg=AFQjCNE7KAH_w.

[6] "Proposal of the Long-Term Strategy for Mobilisinf Investments in the Renoavtion othe National Building Stock of the Republic of Croatia," MINISTRY OF CONSTRUCTION AND PHYSICAL PLANNING, 2014.

[7] "Report on the long-term strategy for mobilising investment in the renovation of the national building stock,," Goverment of the Federal Republic of Germany, 2014.

[8] "Renovating Germany’s building stock," BPIE, 2015.

[9] "Renovating Romania," BPIE, 2014.

[10] "Preparatory report capacity building program," CITYNVEST.

[11] "Marathon 2020 - Community of Bucharest District 1 to be the first energy efficient community in Romania by 2020," Agency for Energy Efficiency and Environment Protection Bucharest.

[12] "The challenges, dynamics and activities in the building sector and its energy demand in the Republic of Serbia," ENTRANZE project, 2014.

[13] "ENERGY EFFICIENCY IN THE BUILDING SECTOR IN SERBIA," ENERGY EFFICIENCY AGENCY OF THE REPUBLIC OF SERBIA , 2010.

[14] "ENERGY RENOVATION OF BUILDINGS," Republic of Slovenia Ministry of Infrastructure, http://www.mzi.gov.si/en/areas_of_work/energy/energy_renovation_of_buildings/.

[15] Republic of Bulgaria Ministry of Economy and Energy, "NATIONAL ENERGY EFFICIENCY ACTION PLAN 2014-2020," 2014.

This project receives funding from the Horizon 2020 European Union Research and Innovation Programme under Grant Agreement No 95169

[16] Republic of Croatia MINISTRY OF CONSTRUCTION AND PHYSICAL PLANNING , "Long-Term Strategy for Mobilising Investment in the Renovation of the National Building Stock of the Republic of Croatia," 2014.

[17] Government of the Federal Republic of Germany, "Report on the long-term strategy for mobilising investment in the renovation of the national building stock," 2014.

[18] BPIE, "Renovating Romania," 2014.

[19] Republic of Slovenia, "Long-Term Strategy for Mobilising Investments in the ENERGY RENOVATION OF BUILDINGS," 2015.

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