



Making Heating and Cooling Sustainable – Barriers, Solutions and Best Practices



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Authors

Francisco Puente, Margarita Puente, ESCAN

Rafael Ayuste, Ricardo González, EREN

Emilija Mihajloska, Ljupcho Dimov, Sasha Maksimovski,
Dimitar Grombanovski, Natasha, Markovska, SDEWES

Ingo Ball, Benedetta di Constanzo, Dominik Rutz, WIP

Angel Nikolaev, BSERC

Velimir Šegon, Iva Tustanovski, REGEA

Dražen Balić, Lucija Išlić, Antonia Tomas Stanković, EIHP

Samra Arnaut, Fethi Silajdžić, ENOVA

Herbert Tretter, Shruti Athavale, AEA

Slobodan Jerotić, City of Šabac

Gašper Stegnar, Tadeja Janša, Polona Lah, JSI

With contributions by:

Andreas Scharli, Stefan Drexlmeier, EWO

Slaviša Kostadinović, Nemanja Pajić, City of Šabac

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Executive Summary

The legal framework analysis builds upon the on “Policy Framework Conditions Assessment and Outlook for Sustainable Heating and Cooling in Selected European Regions” report (prepared in February 2020), within which some barriers relating to general and other framework conditions were identified and analyzed.

For the purpose of this document, stakeholder surveys were performed, and legislative and regulatory acts relevant to the HC sector and compatible activities in other sectors aimed at reducing pollutant emissions, mitigating the adverse effects of climate change, improving the energy performance of existing buildings and more were also identified. The problem of legislative and regulatory acts is that they consider broader sectoral aspects and are therefore not solely focused on the issue of decarbonisation. As a result, some solutions that are generally good and needed tend to cause severe barriers for the use of renewable energy and the implementation of measures that accelerate the transition to renewable heating and cooling (RHC). The focus of this analysis was therefore on legal aspects that impede the market acceptance of RHC systems, and in particular on split-incentives and other barriers.

It was necessary to explore what these barriers entail and to also indicate the consequences caused by them. A particularly complex problem addressed in this report is related to multi-family buildings to which the Housing Law applies. Possible barriers are the legal status of the housing community, visibility by the banking sector, and the way decisions are made about common parts of a building and joint installations.

Sharing responsibilities in the energy sector can make it difficult to make decisions at the local level. Energy laws assign more or less authority to local governments to regulate heating and cooling (HC) issues and functioning through their acts. Barriers can be generated by the role of local administrations. The actors involved in local administrations are often founders of local energy companies, users of heating services, but also regulators for HC issues, which means that local legislation and decisions of local administrations need to be analyzed. In this context, it was necessary to investigate whether there is an environment for the development of the energy services market and whether and how the use and promotion of renewable energy is encouraged and supported. Measures such as subsidy schemes, the creation of special zones in urban areas where it is acceptable to develop district heating networks, and zones where other renewable energy technologies are acceptable and sustainable, were considered in this analysis.

Conflict of interest between flat owners and tenants is very sensitive issue as well as barriers referring to decision making introduced in Tenancy Law. Complicated procedures and the need for high (sometimes majority) consent often prevent collective actions aimed at realizing energy efficiency measures and application of renewable energy. Another common barrier is the lack of funding to finance incentives that could be solved involving an ESCO model and partnerships between condominium and energy companies.

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1 | Introduction

1.1 About the Project

In order to support the decarbonisation of the HC sector, and in particular district heating and cooling, we seek the best solutions for the introduction of renewable energy technologies, to replace inefficient fossil fuel appliances with more efficient ones using biomass, solar, geothermal energy or connection to flexible district heating (and cooling) systems fourth generation where renewable energy is dominant. The acceleration of the process of transition to renewable energy sources is based on the information, education and motivation of citizens, owners of fossil fuels stoves, but also on the promotion of sustainable green technologies.

However, the transition process is not easy because of the barriers generated by social differences, existing legislation, technical regulations, available financial instruments and available renewable energy potentials. The target groups for the project are the owners of residential buildings, single-family or multi-family buildings and mixed-use buildings with a smaller share of commercial activities. Analysis of the existing situation shows that these facilities use fuel oil, coal, wood in inefficient appliances or are connected to district heating with heat sources that use solid or liquid fossil fuels or natural gas.

Climate change has caused an increased need to install cooling systems. Single, local air coolers (with single- and double ducts) are in use, with often very small EERs (evident in the Western Balkan countries), with a tendency of installing more efficient split and multi-split devices and to use heat pumps with increased COP and EER (respectively SCOP and SEER). So far there are very few district cooling systems. Consideration should also be given to the fact that the largest number of air conditioning units or heat pumps is compressor type units that use electricity for their work. The question arises whether it is reasonable to use electricity produced from fossil fuels for the operation of these devices, e.g. especially in Serbia and BiH where coal use for electricity production is dominant and where the national emission factor is very high.

The issue of green electricity is important and closely linked to the creation of an environment for the introduction of prosumers, as well as to motivate citizens to participate in collective actions to finance PV systems through crowdfunding campaigns and to establish green energy cooperatives. Addressing this issue is a common challenge for all ten project partner target regions.

1.2 About WP 2

The activities covered by WP2: Infrastructural Requirements, Legal and Regulatory Framework for the Decarbonisation of the Heating and Cooling Sector – are focused to analyze the conditions in which the HC sector is operating and developing in each of the target regions, and can be grouped into general, regulatory and legal ones.

The general conditions are defined by strategic documents and energy policies in order to realize the defined commitments on the path of mitigating the effects of climate change, as well as to achieve the adopted goals in the transition process of a fossil fuel-dominated energy sector to an energy sector dominated by renewable energy. The available resources, sustainable technologies and the existing situation in the HC sector are important conditions that should be explained and highlighted.

The objective of WP2 is the analysis of regulatory and legal frameworks in the energy sector as well as cross-sectorial overlaps of competences over instruments and measures applicable in the HC

decarbonisation process. Barriers that prevent or slowdown the implementation of measures as well as demand-response activities and collective actions need to be identified. It is very important to take into account sectorial overlaps of competences, such as energy efficiency issues in the building sector, where there is a requirement for minimum efficiency of thermo-technical systems, electrical systems, as well as the quality and construction of buildings or the thermal envelope of buildings. Barriers can sometimes also be on the side of consistent implementation of existing regulations, if disruptions occur in the energy market and energy services markets and economic reasons outweigh and slow down the decarbonisation process. The identification of barriers is necessary to propose appropriate remedial measures in the participating countries and to accelerate the decarbonisation of the HC sector.

The analysis of existing local campaigns and strategies should highlight examples of good practice in target countries and regions, and through the exchange of experiences, recognize as well as enable the replication of good projects and measures that have the greatest effects. Local campaigns can often be complex and cross-sectorial, such as improving the energy performance of existing buildings and simultaneously modernizing heating and cooling systems and replacing fossil fuels with renewable energy.

1.3 About T2.2

The legal framework analysis relies on T2.1 within which some barriers relating to general and other framework conditions will be identified and analysed. Under T2.2, stakeholder surveys should be performed and legislative and regulatory acts relevant to the HC sector and compatible activities in other sectors aimed at reducing pollutant emissions, mitigating the adverse effects of climate change, improving the energy performance of existing buildings and more should be identified. The problem of legislative and regulatory acts is that they consider broader sectorial aspects and are therefore not solely focused on the issue of decarbonisation, so some solutions that are generally good and needed, causes severe barriers for the use of renewable energy and the implementation of measures that accelerate the transition to RHC. The focus should be on **legal aspects that impede the market diffusion/success of RHC systems**, and in particular on **split-incentive and other barriers**.

It is necessary to explore what these barriers are and to indicate the consequences caused by them. A particularly complex problem is when it comes to multi-family buildings to which the Housing Law applies. Possible barriers are the legal status of the housing community, visibility by the banking sector, the way decisions are made about common parts of a building and joint installations.

Sharing responsibilities in the energy sector can make it difficult to make decisions at the local level. Energy laws assign more or less authority to local governments to regulate HC issues and functioning through their acts. Barriers can be generated by the role of local administrations. They are often founders of local energy companies, users of heating services but also regulators for HC issues, which means that local legislation and decisions of local administrations need to be analysed. In this context, it is necessary to investigate whether there is an environment for the development of the energy services market and whether and how the use and promotion of renewable energy is encouraged and supported, for example through subsidy schemes, the creation of special zones in urban areas where it is acceptable to develop district heating networks and zones where other renewable energy technologies are acceptable and sustainable.

If the market for energy services is not sufficiently developed, the barriers also generate the status of district heating (and cooling) utilities, which in this case are most often publicly owned without a clear boundary in the performance of energy activities - thermal sources, distribution and supply of heat. A key problem is public procurement financing and the choice of financing models for the

development of public district heating systems. Financing through a public-private partnership as well as the introduction of ESCO can be a very complex process hampered by vague legislation.

A number of technical issues to be addressed are dust emission regulations, noise regulations and local traffic regulations, which can be a limiting factor for the application of urban biomass in district heating systems, as well as regulations related to fire protection during construction and operation of thermal sources and plants using biomass.

Collective actions are always welcome, especially as civic initiatives or bottom-linked, where public or independent “care takers” manage the action. In this sense, it is necessary to highlight the way energy cooperatives function, the legislation relating to the establishment of energy cooperatives, the decision-making of cooperatives, and the method of raising funds.

For successful analysis of legislation and regulation, the identification of barriers alone is not sufficient. **Good practice information** should be obtained and **results and experiences** should be shared among project participants to enable implementation of good solutions and reduce the risk of recurrence of negative experiences. In this context, the survey to be conducted under T2.2 should include examples of good practice as well as suggestions for overcoming the identified barriers.

1.4 Abbreviations

BiH	Bosnia and Herzegovina
CO ₂	Carbon Dioxide
COP	Coefficient of Performance
DH	District heating
DR	Demand-Response
EED	Energy Efficiency Directive
EER	Energy Efficiency Ratio
EPBD	Energy Performance of Buildings Directive
EPC	Energy Performance Contracting
ESC	Energy Supply Contracting
ESCO	Energy Service Company
ETS	Emission Trading System
EU	European Union
FBIH	Federation of Bosnia and Herzegovina
HC	Heating and Cooling
MEUR	Million Euros
PM	Particular Matter
RES	Renewable Energy Source
RHC	Renewable Heating and Cooling
SCOP	Seasonal Coefficient of Performance
SEER	Seasonal Energy Efficiency Ratio

2 | Overview of Legal and Regulatory Barriers in the Target Countries; Solutions & Best Practices

Ownership of Apartments

As a consequence of historical heritage, housing in general has different trends in the analyzed countries. Apartment renting is more prominent in Austria, Germany, Spain, while in other project partner countries ownership of apartments is more prevalent. For example, almost half of Austria's population lives in their own apartments, while the EU average is 69.3%. In Bulgaria, on the other hand, 83.6% of the population lives in their apartments. A similar situation is observed in Slovenia, Croatia, Bosnia and Herzegovina, Macedonia and Serbia.

In Slovenia, very good quality statistics on rented apartments are available. Observed trends are that due to population migration, there is the need for additional 9,167 public housing rentals, 599 housing units, and 540 nursing homes. On the other hand, according to the 2018 data, 152,200 apartments were vacant out of a total of 852,200 apartments. There are no valid data on the number of rented apartments in Serbia. A very similar situation as in Serbia is evident in Bosnia and Herzegovina.

Conflict of Interest Owner/Tenant

When considering the motivation to invest in energy efficiency measures and renewable energy technologies, a common barrier in all target countries is the conflict of interest between flat owners and tenants. It is the responsibility of the homeowner to maintain the buildings so that the housing conditions are appropriate.

Residential tenants pay for utilities including energy, electricity and heat. From the perspective of tenants, it is important that energy costs are sustainable or as low as possible while achieving comfort conditions and security of supply. Quality is higher if the energy they use is renewable, and often such a solution means lower heating costs. This is especially evident in district heating when energy companies are obliged to form the cost of the service on a reasonable cost basis.

However, homeowners who rent their apartments are not motivated to invest in energy efficiency, unless they have to do so under the threat of legislation or mandatory measures that promote renewable energy, because traditional technologies that use fossil fuels are cheaper. This is a significant barrier that can only be overcome with incentives or binding regulations from state or local governments.

Condominiums, Residential Communities, and Decision Making

Legislative for condominiums or residential communities exist in all target countries. Common features are that:

- Homeowners form a community,
- Management, which involves the maintenance, improvement of energy properties and reconstruction of technical systems, as well as the use of renewable energy, is left to a professional manager or a company whose activity is managing buildings and

- maintenance or a manager chosen by the homeowners themselves (unprofessional management), and
- The mode of decision implies the consent of the qualified majority.

The complicated procedure and high quota entailed by a qualified majority make decision-making difficult. A qualified majority means in some cases the votes of 50% of the members of the residential community to an absolute consensus of 100% of the votes. Dissatisfied members of the community can always seek judicial or extrajudicial arbitration, the outcome of which may be to the detriment of the proactive part of the community.

Often, arbitration does not take into account the fact that energy efficiency or the use of renewable energy is a public interest. In Serbia, a serious barrier is represented by certain provisions of the Consumer Protection Law, which put energy services, efficient use of energy and the use of renewable energy with trade in goods and services in the general sense. A common outcome of arbitration in the application of this Act is to favor the interests of the individual to the detriment of the community in which the individual belongs.

Incentives at National and Local Level

Reserve funds for building maintenance are foreseen in all target countries under housing maintenance legislation. Money raised through these funds are not sufficient to implement energy efficiency and renewable energy measures. For this reason, different financial models are envisaged. However, there are proposals to increase rents for apartments (Slovenia), which are now considered to be too low and to finance the rehabilitation of buildings and the implementation of projects to replace heating systems using fossil fuels with renewable energy systems.

The most common solutions are energy service contracts, when an energy service company invests in implementing energy efficiency measures and renewable energy systems and, through low operating costs and savings, compensates for an investment of at least 20 years. This model is often applied in Austria, but is also recognized in other target countries. In Spain, Bulgaria and Serbia, this model is most commonly used in the public sector. A variant of this Energy Performance Contracting model is applied in Croatia, where savings are contracted to finance energy efficiency measures and the implementation of a renewable energy system.

The example of Sabac, where the public energy company has taken on the role of an energy service company, is an example that shows how the public sector can also participate in the energy services market. The local energy company provided funding of 2.5 MEUR through a contract with the European Bank for Reconstruction and Development (EBRD), and uses those funds in 2020 for energy efficiency measures to significantly reduce specific energy consumption in buildings connected to the district heating system. Homeowners will repay the investment over a 12 year period. A particular benefit is that it promotes the connection to a district heating network that is ready to use sustainable and renewable energy in the next phase.

Germany, Austria and Croatia are developing a financing model for the implementation of renewable energy through eco-social taxes in Austria and the possibility of paying carbon credits. Carbon credits evaluate the reduction of CO₂ emissions as a result of energy savings and an increase in the share of renewable energy. The money raised through the carbon credits trade is used to pay fees or invest in renewable energy as a complement to the reserve fund for building maintenance. In Germany, it is proposed that the amount of taxation ranges from 25 EUR/t_{CO2 eq} to 55 EUR/t_{CO2 eq}.

In all target countries (except Serbia), there are national programs for the rehabilitation of buildings and the implementation of renewable energy (such as RENOVA Plans in Spain or the Energy Recovery Program in Croatia). The funds earmarked for this purpose are not sufficient to carry out large-scale

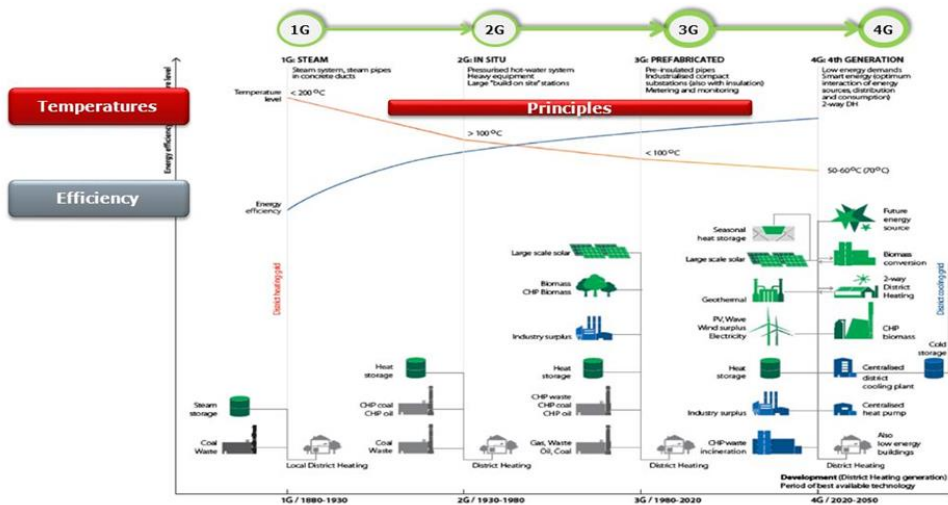
actions, yet in Spain, 80,209 households used the funds provided through The State Plan for the Promotion of Housing Rental, Building Rehabilitation and Urban Regeneration and Renovation. In Serbia, there is no national program for subsidizing energy efficiency measures and the implementation of renewable energy, but this is left to local governments under the Law on Housing and Building Maintenance. A symbolic number of households in Serbia seized this opportunity and in Sabac about 1,500 households used subsidies of 50% from the city's energy efficiency budget and through a project to improve the energy performance of buildings (thermal insulation of buildings built in '60, '70, '80 and '90 years of the last century).

Some technical requirements represent barriers to the use of renewable energy, such as fire protection requirements, which do not always take into account the significant progress made in the field of technical solutions, and especially when it comes to biomass boilers, which limit their use. More stringent requirements for device efficiency, emissions and frequency of inspections are barriers related to the application of biomass boilers, as well as some requirements for the spatial planning of the parcels and the surface to be provided for heat sources and biomass storage facilities (Austria, Croatia) do not encourage citizens to opt for such solutions. However, one examples of a good practice is the legislation in the province of Baden-Wuerttemberg (Germany), where there is an obligation for new buildings with regard to the share of renewable energy - minimum solar energy share 15%, gaseous biomass 30%, liquid and solid biomass 50%. This Federal Renewable Heat Act (EWärmeG BW) imposes a minimum renewable energy ratio of 15%. Whereas another German province (Bavaria) , for example, prefers district heating systems.

A barrier that is often justified by decision-makers by caring for citizens is the low price of fossil fuels and the disruption of the liquid and gaseous fuels market that leads to price volatility in the fuel and energy market. It so happens that fossil fuel prices are lower than the price of renewable fuels or because of large subsidies directed at electricity or coal users (example Bulgaria and Serbia), renewable energy is not attractive, but preference is given to fossil fuels such as natural gas (Slovenia example).

District heating networks are a good solution for implementing renewable energy because they are flexible in terms of adding new heat sources with biomass boilers, using solar energy, geothermal energy and high power heat pumps including energy storages. Taking into account the criteria of the working medium temperature in the DH grid, efficiency and applied technologies, the transition of thermal systems to the fourth generation (4GDH) is underway.

What are the district heating generations?



5 |

Danfoss Heating Segment - Application Centre

Dr. Oddgeir Gudmundsson - 2016

ENGINEERING TOMORROW



Figure 1: District Heating 4th Generation (4GDH)

Source: Danfoss – Denmark

The problem faced by district heating energy companies is the regulatory aspect. The prices of heat from district heating systems also include a part related to investment in development, and regulators often do not attach sufficient importance to this, especially when regulators are not independent, as is the case in Serbia. When it comes to the district heating sector, municipalities in Serbia have a threefold role: DH regulators, founders and owners of local energy companies, and service users (because they are owners of public buildings connected to DH). Here there is an obvious conflict of interest in the municipalities acting as DH regulators, which causes local energy companies not to invest enough in development because the price of services is undervalued. For this reason, energy companies do not sufficiently invest in the development of DH, do not have sufficient resources for renewable energy technologies, and are turning rather to traditional (fossil) fuels.

In addition to the ESCO models and the Energy Performance Contracting and Energy Supply Contracting variants already mentioned, which are a good combination of incentives and market business, an interesting way of financing the replacement of fossil fuels with renewable energy is the crowdfunding model. This model is a collective action to motivate citizens to invest their funds, not necessarily into their installations, and thus save or generate profits from the operation of renewable energy systems. In addition to Austria and Germany, which have already recognized the model of energy cooperatives, experience with energy cooperatives exists in Bosnia and Herzegovina – Fojnica and Pecka, in Croatia – Križevci, and in Serbia – Šabac which established an energy cooperative that is just preparing the first renewable energy implementation project.

Energy cooperatives are a good way to solve the problem of energy poverty, which is also addressed by Slovenia. In Slovenia, subsidies of up to 100% are foreseen for projects that reduce energy poverty, and this incentive scheme is a good example of a responsible community. The problem of energy poverty is also visible in Serbia, FBiH, North Macedonia and Croatia and has an impact on air pollution (environmental pollution). The issue is too sensitive because it can lead to a negative connotation of a vulnerable and marginal group. That is why the example of Slovenia and North Macedonia are of utmost importance.

3 | Country Analyses

3.1 Austria

With regards to the housing situation in Austria, a distinction can be made between the legal basis (ownership, rent, etc.) and the general form of housing (single apartment/residential building and multi-party residential building) according to the (Chamber of Labour, 2020). Almost half of Austrian households live in owner-occupied housing, with central heating being the most prevalent type of heating (70%). All other types are used less frequently. In contrast, households in (main) rent use district heating systems most often (44%), followed by central heating (21%) and floor heating (19%). In single-family houses and apartments, central heating is the most frequently used type of heating (76%). Households in multi-party houses are mainly heated with district heating or a central heating system (35% each).

It is striking that 67% of households without a (permanently installed) heating system are rented, and 80% of these households are in multi-party houses. The situation is similar for electric heaters: approximately 53% of electric heaters are in rented flats, while 76% are in multi-party houses. It is also interesting to look at district heating systems from this perspective: here it can be seen that about 3/4 of this type of heating can be found in tenancies and even 90% are used in multi-party buildings.

As can be seen in Figure 2, households that live in their own property use gas most often (25%) as an energy source – although this is below average compared to the Austrian overall average. Firewood (23%) and heating oil (21%), on the other hand, are used above average. Rented households mainly use district heating and gas. Alternative energy sources are mainly used in condominium ownership and in single family houses or single apartments.



Figure 2: Household Shares by Energy Source and Housing Situation

Source: (Chamber of Labour, 2020)

Heating oil in Austria is used by around 16 percent of all households and is, after natural gas with 27 percent and district heat 25 percent, in third place alongside firewood. It is used in individual stoves and floor heating systems, but mainly in central heating systems. More than half of the households that utilize fuel oil for space heating are situated in western Austria (Tyrol, Salzburg, Vorarlberg) and in Carinthia. Fuel oil is used by different types of families, often by pensioner couple households or a three-person household (two adults and one child) in the middle income bracket, as well as in owner-occupied and single-family homes.

About two thirds of households that use fuel oil for residential space heating are property buildings or condominium flats. About one third of households - that use fuel oil - live in rental flats or are subletting the space. Separated according to income deciles, some representative heating types are distributed as follows: firewood and fuel oil each have a share of about 10-20% in all deciles, electricity always less than 10%. Fuel oil is more likely to be used in the upper income deciles. By contrast, households without fixed heating systems and coal are found mainly in the lowest income deciles. Expensive electric heating systems and firewood are also used more than average in the lower income deciles, and 10% of the poorest households also use heating oil as their primary energy source. In order to offer these households solutions, different promotion models are needed. These must also be supported by targeted, socially graduated subsidies.

In Salzburg, most households utilizing fuel oil are living in one- and two-family houses. A smaller percentage resides in flats, where split-incentives still play a role with regard to replacement of fuel oil by heating and cooling systems based on renewable sources (RES HC systems).

3.1.1 Barriers for RES HC Systems related to “Split-Incentives”

Challenges with investments in sustainable energy supply systems in rental housing

The general situation related to split incentives has been recently described in the EU Project (SEFIPA, 2019): in Austria, the owners of rented residential buildings subject to the Tenancy Law Act (Mietrechtsgesetz - (MRG, 1981)) have to bear the investment costs for the heating system. The tenant, on the other hand, bears the running costs such as costs related to energy, service and maintenance. In the past, this circumstance has led to the fact that when a heating system is renewed, the owner has almost always chosen the variant with the lowest investment costs. Up to now, this has usually been a system using fossil natural gas or oil.

Sustainable energy supply solutions, such as in-house (solar thermal assisted) heat pump, wood chips or pellets boilers or even micro grid solutions based on biomass or (geothermal) heat pumps (the latter even with seasonal ground storage), which because of available investment funds often are competitive with fossil-fuelled heating systems over a period of 20 years, would certainly be a feasible option. With such sustainable energy systems the tenant would benefit from low energy costs. However, the owner would have to make much higher investments than for natural gas or oil systems without having a financial advantage. Thus, a landlord/tenant has a conflict of interest when choosing a heating system.

In case a landlord cannot or does not want to take an investment in such a sustainable energy supply solution, e.g. because of lack of finance, knowledge about the technology and lack of staff that takes care for operation of and billing for such systems, alternative business models are possible as well. One common business model for those landlords is heat contracting. The following description is taken from (SEFIPA, 2019) and explains this model in more detail.

Heat supply contracting as a financing solution for sustainable heating systems in rental housing

Heat supply contracting is a financing and business model in which an external company (contractor) invests in the construction of a heat supply system and operates it for a fixed contract period, e.g. 20 years. In return, the customers (tenants) undertake to purchase the heat required for their property from the contractor at an agreed tariff (a base price and working price, like for district heating).

In rental housing, the contractor thus assumes the high initial investment costs for sustainable heating systems and at the same time benefits from the low energy and operating costs in the following years. This enables the heat supply contractor to deliver to the customer at a heat price that is similarly low or even cheaper than the natural gas or oil solution or than the running cost the tenant has had so far.

Legal barriers for refinancing higher up-front by allocating them as an add-on to lower running costs

In both cases, being it a landlord or a contractor who invests in a sustainable heating system, tenants could benefit from a renewable energy source and lower running costs of the sustainable heating system. The higher up-front costs in Austria currently can be allocated over a sufficient long period of time as an add-on to the lower energy and operating costs only in the area where the Non-Profit Housing Act (WGG, 1979) is applicable. Legal barriers have been lowered in an amendment of the act in 2000 only in this area. For buildings where the Tenancy Law Act (MRG, 1981) or the Condominium Act (WEG, 2002) is applicable, this barrier still exists (see descriptions in the following tables).

Table 1: Good Practice Example Non-Profit Housing Act (WGG, 1979).

Non-Profit Housing Act (WGG, 1979)	
Link to reference	https://www.ris.bka.gv.at/GeltendeFassung.wxe?Abfrage=Bundesnormen&Gesetzesnummer=10011509
Level	Federal
Key aspects of legislation	<p>This law deals with dwellings built by non-profit building associations.</p> <p>According to the Austrian Association of Non-Profit Building Associations (GBV, 2020), the stock of the non-profit building associations amounts to approx. 925,000 flats. This corresponds to about 25 percent of the total housing stock in Austria. Thirty years ago, this share was only around ten percent. In the urban area, due to the intensified activities in the new building sector in recent decades, the share of such dwellings is already over 40 percent (30 years ago: about 18 percent).</p> <p>Around 70 percent of the apartments are either rented or cooperative apartments, while the remaining 30% are condominiums. Of the approximately 613,000 rented and cooperative apartments, the majority were built by the municipalities themselves, while about 38,000 apartments are managed for municipalities.</p>
Barrier description	<p>Before the amendment of the act in 2000, energy-related measures (higher up-front investment) could not be financed from the savings in operating costs achieved, as is typical for savings at contracting models (described above). The reason was that in the course of the annual settlement of accounts, only the actual operating costs (and not any ad-on costs from allocation from additional up-front investment) could be charged to the housing users until that time.</p>
Suggestion to overcome the barrier	<p>Until 2000, it was not possible to maintain the level of the operating costs into future periods to finance the savings measures from the difference between the "previous" and "expected" (inherent) operating costs.</p> <p>In addition, the previously applicable maximum financing period for allocation of investments into refurbishment measures was limited to ten years, which did</p>

Non-Profit Housing Act (WGG, 1979)

not correspond to the lifetime of many measures and limited the investment volume.

Good practice parts

The 2000 amendment facilitates the use of renewable heating systems in the residential sector mainly through the following innovations:

- Saved operating costs (energy costs) can be used to finance energy-saving maintenance measures (energiesparende "Erhaltungsmaßnahmen") (§ 14 (5a) (WGG, 1979)).
- Extension of the concept of maintenance measures (beyond measures to reduce energy consumption) to include measures for creating buildings with a contemporary interior design that is suitable for residents. Thus e.g. the installation of central heat supply systems and the installations inside the flats become easier.
- Extension of the refinancing period – relating to legal proceedings – from 10 to 20 years (flexibly manageable), or more than 20 years if the measures are to remain in place for a longer period of time or if public funding is granted for a longer period. This increases the potential investment volume of economically viable work, which makes more savings' measures possible. Afterwards, the savings must benefit the users.
- However, the refinancing costs must not exceed the savings achieved. The principle of cost neutrality for the housing user applies.

How could the good practice parts be strengthened

According to the government programme, the current Austrian Federal Government is planning an eco-social tax reform. This is intended to effectively price emissions that are harmful to the climate in a revenue-neutral manner and to relieve companies and private individuals in the sector. This step will take place in 2022.

It is to ensure that there are no additional burdens for the economy and for private individuals, taking into account existing changeover opportunities, sectorial effects, regional differences in living conditions and social cushioning while maintaining the CO₂ steering effect. Cases of social hardship are to be avoided in any case.

A new federal law should regulate the phase-out of oil and coal in the building sector in a phased plan. In order to avoid social hardship, all measures will be flanked by long-term, digressive and socially staggered support.

The amendment of the Energy Efficiency Act is to be based, among other things, on the principle that savings obligations are to be supplemented by the possibility of a substitute payment (by obligated parties) into a fund. The funds raised will flow to the federal Environmental Subsidy Scheme (UFI¹), to finance energy efficiency measures in households (with special consideration to cases of social hardship).

The Vienna Chamber of Labour welcomes the establishment of a fund to finance energy efficiency measures in households and recommends that social vulnerability and the funding requirements, respectively, are newly defined and

¹ Umweltförderung im Inland

Non-Profit Housing Act (WGG, 1979)

more accurate. Subsidies should be designed according to social need and not be repayable. While both should be considered, the thermal quality of the building shell and the sustainability, efficiency of the heating system, more qualified installers will be needed. Furthermore, the quality and performance of the installed heating systems should be regularly assessed by chimney sweepers or installers. Households need to be more and better informed on reasonable and financeable climate and energy relevant measures. Additionally, in case of a renewal on sustainable heating systems suiting their houses, consumers should also receive targeted information addressing their needs and expectations. Moreover, further financial burdens for tenants and apartment owners should be avoided.

Contracting is possible based on the amended WGG but, according to Vienna Chamber of Labour, needs more price transparency and cost adequacy (see below).

Sources: Austrian Energy Agency (AEA), (Adensam, et al., 2001), Government programme 2020-2024 of the current Austrian Federal Government (a coalition of Austrians green and conservative parties), Interview with Vienna Chamber of Labour (on 27.02.2020).

In the field of energy efficiency and energy supply contracting, generally more cost and contractual transparency and less intransparent business models are needed. In multi-storey residential buildings, business models with several (intermediate) energy suppliers and additional billing undertakings are often used, thus making contracting services intransparent and sometimes quite expensive.

According to (Rosifka, 2020), contracts for the implementation of heating system and refurbishment related measures are concluded by landlords or administrators on the one hand and service providers, contractors or heating operators on the other. However, the costs are borne by the tenants and owners of the flats. It is obvious that these are classic contracts at the expense of third parties. It is therefore necessary to strengthen the voice and control possibilities of tenants and owners of the flats in order to prevent possible overreaching of the other parties.

It would be therefore necessary, especially at new developed houses, that contracts with contractors are concluded together with landlords and tenants or flat owners, who have been adequately informed of the new contracts and of their (voting) rights. Business models with intermediate heat suppliers and separate billing bodies should be avoided: more actors leads to higher (unnecessary) costs for end consumers. Heat supply and billing should be carried out by the same operational unit. With regard to the problem of "heat contracting", the (Chamber of Labour, 2020) demands that in the case of heat generation in the building itself (or in the immediate vicinity) the property owner (landlord/dwelling owner community) must always be the direct provider of heat to the users (tenants/owners) and not a "third party". There is currently no legal framework for such cases that defines what is possible and what is not.

According to the Vienna Chamber of Labour, there is a pressing need for a Federal Heating Act (Wärmegesetz). Some aspects that were discussed (additionally to those mentioned above) are:

- Free, easily accessible and independent advice on alternative renewable heat supply options in relation to the specific situation of each household and on support and financing options. After all, in addition to the technical/legal issues, a switch depends above all on the financial possibilities.
- A stronger involvement of the building users is necessary. The usefulness / benefits for the users must be recognizable and the measures must also be financially acceptable to the end

consumers. More transparent direct business models are required that ensure that energy savings and related cost reductions have a limited impact on end consumers' energy bills.

- In practice, the real behaviour of the building users is not sufficiently taken into account in the planning stage. In any case, a fair distribution of costs between owner and tenant is necessary. Vulnerable end consumers would need special rights to be better protected.
- The establishment of a "heating fund" to finance low-income households switching from coal or fuel oil heating to a clean heating system. Solutions can also be found for those 16,500 Austrian households that currently have no heating at all.
- In the field of district heating, more transparent prices (a price monitoring) and transparent contracts would be needed. A further problem, especially for micro heating grids, is that micro grids with less than four end consumers sometimes do not fall within the scope of the Heating Costs Settlement Act (Heizkostenabrechnungsgesetz – HeizKG, (HeizKG, 1992)), where end consumer rights are better protected.
- The role of chimney sweepers should be strengthened so that they can take over reoccurring heating system checks (as described in the previous D2.1 report, in the section on Austria), give advice and recommendations and eventually collect data for public bodies in charge of space heating and domestic hot water preparation.
- In order to exploit the potential of the building sector to achieve the climate targets, according to (Rosifka, 2020), it is above all necessary to implement minimum standards for existing buildings, including the one and two-family house sector, in the building codes. An expansion of the scope of application of the Tenancy Act and individual amendments to the Tenancy and Housing Act can also contribute to an increase in the rate of refurbishment. At the same time, however, the opportunities for tenants and owners to have a say and exercise control should be strengthened and additional financial burdens for them should be avoided, or at least minimized.

In general, some general protections – that already exist for the electricity and natural gas markets – should also be established for heating markets. One such example is the establishment of a conciliation office where end consumers can claim rights (ex. the reasonability of costs).

Table 2: The Tenancy Law Act would require a similar amendment as the Non-Profit Housing Act

Tenancy Law Act (Mietrechtsgesetz 1981 – MRG)	
Link to reference	https://www.ris.bka.gv.at/GeltendeFassung.wxe?Abfrage=Bundesnormen&Gesetzesnummer=10002531
Level	Federal
Key aspects of legislation	This federal law applies to the rent of apartments, individual parts of apartments or business premises of all kinds (such as in particular business premises, warehouses, workshops, workrooms, offices or chambers) including any rented house or floor space (such as in particular gardens, storage, loading or parking areas) and to the cooperative usage contracts for such objects (rented objects).
Barrier description	<p>In tenancy law, a clearer definition of energy-saving measures, so that these can be regarded as maintenance measures, and the further development of financing instruments is being discussed.</p> <p>Landlords are generally legally obliged to carry out maintenance measures and (limited) improvements in/to their buildings. This gives them the opportunity to use this obligation also for measures that serve to decarbonise buildings. However, a few legal changes must first be made for this.</p> <p>In current law, measures to reduce energy consumption in the MRG are generally "only" improvement measures and not maintenance measures. Landlords are therefore not always obliged to implement them. If, for example, an outdated but</p>

Tenancy Law Act (Mietrechtsgesetz 1981 – MRG)

functioning gas boiler is found in a residential complex, the conversion to district heating would not be a maintenance measure, as the boiler is not prone to damage. A clearer formulation in the Tenancy Law Act would be desirable here, so that such measures can also be carried out as maintenance work when there is no tendency to damage. This would make it easier to switch to more climate friendly heating systems in line with achieving the climate targets.

Suggestion to overcome the barrier

According to (Rosifka, 2020), the principles that

- the expenses for maintenance and improvement work are to be financed from the so-called rent reserve (= rent income minus maintenance expenses in the building, in each case for the last 10 years)
- and that rent increases may only be made – and only through legal proceedings – if the costs of economically reasonable work are not fully covered by the rent reserve

should not be changed.

The rent reserve (rental income of the last 10 years minus the costs of maintenance and improvement work carried out during the same period) is not always so generously endowed that repairs and improvements, including measures to reduce energy consumption, can be easily financed from it. In such cases, the Tenancy Law Act provides for the uncovered costs to be passed on to the tenants (§ 18). This means a temporary rent increase, which can be so substantial that tenants are forced to give up their homes.

The problem here is that (according to the Tenancy Act) the costs of the measures are distributed over a fixed period of only 10 years (§ 18), thus increasing the rent, even if the service life of the new thermal insulation façade is 40 years or more. This legal regulation is therefore extremely unfair because it results in unobjectively high rent increases.

The law should therefore extend the period during which the rent can be increased because of such maintenance and improvement work; this would mean that the increases would be correspondingly lower and would not impose an excessive burden on the tenants. As it is already the case in the Non-Profit Housing Act, the period should be 20 years and should be flexible.

Good practice parts

In the case of maintenance work that landlords are required to carry out under the Tenancy Act, every tenant, but also the municipality in which the property is located, has the right to take legal action against idle landlords. If the proceedings are successful, a court order to carry out the necessary work will be issued.

Such a possibility does not exist, however, if the work is to reduce energy consumption. In such cases, only the majority of tenants can initiate proceedings to ensure that the work is carried out. However, the majority of tenants are unlikely to become active, as there are far too many fixed-term contracts and also tenants who are generally afraid of conflicts with their landlords.

If you want to promote measures to reduce energy consumption in multi-storey housing, then you should definitely grant every single tenant and the municipality a legal right to apply to the conciliation board or to the court for these maintenance and improvement works.

How could the good practice parts be strengthened

In the debate about the importance of the Tenancy and Condominium Act for climate protection, according to (Rosifka, 2020), one key point is often overlooked: tenancy law and residential property law are basically only applicable to multi-storey residential buildings, whereas 70 percent of the total CO₂ emissions from residential buildings are attributable to single and two-family houses.

Tenancy Law Act (Mietrechtsgesetz 1981 – MRG)

According to (Rosifka, 2020), the multi-storey buildings currently subject to the Tenancy Act account for less than two percent of all residential buildings. In general, the tenancy law is often not or only partially applicable to buildings that are in a bad energetic condition. This applies, for example, to private multi-storey residential buildings built between the 1950s and 1980s, but also to detached and semi-detached houses.

According to (Rosifka, 2020), the scope of application of the Tenant Act should also include the above-mentioned building sectors. It should apply to all single and two-family houses and also to multi-storey residential buildings that were freely financed and subsidised after 1945. In his opinion, buildings could in this manner be included more effectively in which measures to reduce energy consumption have a larger potential than in those currently applicable to MRG.

Sources: (MRG, 1981), AEA, Interview with the Vienna Chamber of Labour (on 27.02.2020), (Rosifka, 2020).

Table 3: Also the Condominium Act would require a similar amendment as the Non-Profit Housing Act

Condominium Act 2002 (Wohnungseigentumsgesetz 2002 – WEG 2002)

Link to reference	https://www.ris.bka.gv.at/GeltendeFassung.wxe?Abfrage=Bundesnormen&Gesetzesnummer=20001921
Level	Federal
Key aspects of legislation	This Federal Act regulates the legal form of condominium ownership, in particular the conditions, establishment, acquisition and termination of condominium ownership, the rights and obligations of condominium owners and condominium applicants, the condominium organiser and the manager, the management of the property, the owners' association, the exclusion of condominium owners, the provisional condominium ownership of the sole owner of the property and the condominium law out-of-court proceedings.
Barrier description	The barriers described in the Tenancy Law Act (MRG) are the same as observable in the scope of the Condominium Act (WEG).
Suggestion to overcome the barrier	See MRG, above.
Good practice parts (if any)	See MRG, above. In the WEG for a decision regarding the implementation of energy savings or climate-friendly fuel switch measures a simple majority (> 50%) of co-ownership share of condominium ownership is required. Like in the MRG, the outvoted minority of the co-ownership share, but also the municipality in which the property is located, has the right to take legal action against majority decisions. If the proceedings are successful, a court order to carry out the necessary work will be issued.
How could the good practice parts be strengthened (if so)	Like in the MRG every single flat owner and the municipality should be granted a legal right to apply to the conciliation board or to the court for reasonable climate-friendly maintenance and improvement works.

Sources: (WEG, 2002), AEA, Interview with the Vienna Chamber of Labour (on 27.02.2020), (Rosifka, 2020).

3.1.2 Barriers for RES HC Systems related to Other Legal Issues

Table 4: Frequency of Regular On-Site Inspection of Heating Systems

Heating Systems and Fuel Ordinances of the Federal Provinces & Directive TRVL 118 (2016)	
Link to reference	e.g. Ordinance of Upper Austria https://www.ris.bka.gv.at/GeltendeFassung.wxe?Abfrage=LrOO&Gesetzesnummer=20000404 Directive TRVL 118: https://www.bundesfeuerwehrverband.at/produkt/trvb-118-16-h-automatische-holzfeuerungsanlagen
Level	Länder (federal provinces of Austria) Federal: Directive TRVL 118 (Technical Directive Preventive Fire Protection – Technischen Richtlinie Vorbeugender Brandschutz)
Key aspects of legislation	The ordinances of the federal provinces regulate, among other things, safety requirements and environmental protection issues concerning heating systems and the storage of fuels. TRVL 118 (2016): The purpose of this Directive is to establish minimum fire safety requirements for the installation and operation of automatic wood combustion installations. This Directive applies to combustion installations (heating and hot water installations) which are automatically fed with wood chips, pellets or production-related wood residues (e.g. underfeed furnaces, retort furnaces, pre-furnace furnaces and throw-in furnaces). This guideline does not apply to blow-in furnaces, individual room heaters, manually loaded wood-burning boilers, wood-burning stoves, cooking stoves, floor heating systems, etc., although this guideline can be used as a basis for a fire protection assessment of such furnaces. The mentioned measures are to be observed wherever existing laws, regulations and/or decrees do not stipulate otherwise.
Barrier description	Sometimes the federal province Ordinances or the Directive, respectively do not reflect the state of the art of heating technologies. Therefore e.g. contractors argue that the frequency of regular on-site inspection is too high or inadequately high when compared to fossil fuelled (e.g. natural gas) systems, respectively.
Suggestion to overcome the barrier	Review of the appropriateness of the frequency of regular on-site inspection for different technologies.

Source: Interview with an Austrian Contractor.

Table 5: Reduction of gross floor area at housing developments by external heating houses and containers.

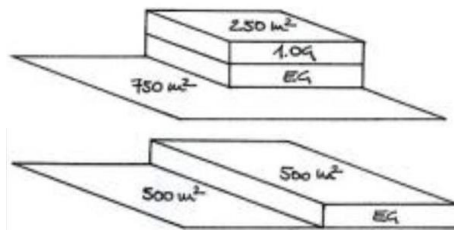
Land use (zoning) planning Development planning	
Link to reference	https://www.salzburg.gv.at/themen/bauen-wohnen/raumplanung/oertliche-raumplanung/flaechenwidmungsplan https://www.salzburg.gv.at/themen/bauen-wohnen/raumplanung/oertliche-raumplanung/bebauungsplan
Level	Federal States
Key aspects of legislation	The zoning plan regulates the orderly land use of the entire municipal territory by defining the use categories of building land, traffic areas and grassland. On the basis of the spatial development concept, zoning plans are to be defined in such a way that conflicts arising from the different uses are avoided. The development plan is to be developed from the building land designated in the zoning plan. It regulates the intensity and design of building development and traffic development, with particular attention to economical land use and orderly

Land use (zoning) planning
Development planning

settlement development. It comes into force as a municipal ordinance.

Barrier description

To understand the barrier it is required to introduce the following key figure: the structural usability of a property in residential areas is expressed by a so called “storey area related figure” (GFZ ... in German Geschößflächenzahl). GFZ is a ratio between the gross floor area (GFA) and the size of the property, i.e.: $GFZ = GFA / \text{area of the building site}$. Here is an example: with a GFZ of 0.5, a building with 500 m² gross floor area could be realized with a plot size of 1000 m² (see also the two visualized examples with a GFZ of 0.5 below). Depending on the construction height, a flat and low or a narrower and higher building could be created.



Source of figures: Stadt Salzburg.²

In general the space required for a heating system and if necessary for fuel storage reduces the floor area available for tenants or dwelling owners in a larger building. According to the land use (zoning) and development planning also external buildings or on the same property, accommodating heating systems or fuel (e.g. heating containers or houses) reduce the total floor area installable with a building development.

In case of a free standing heating container the total installable floor area of the whole building development is reduced by the ground area of the container (e.g. 15 m²) divided by the GFZ of that building development. On a plot with 750 m² and a 4-storey building with a total of 500 m² gross floor area the GFZ is $500/750 = 0.67$. The heating container therefore reduces the total floor area of the house by $15/0.67 = 22.5 \text{ m}^2$.

That means that the building developer can build only a 4-storey building with 477.5 m² gross floor area instead of a 500 m² building in case, in case an external heating container shall be installed on the plot.

Suggestion to overcome the barrier

An external “free standing” heating container or heating house built in the immediate vicinity of a new developed building or on the same plot, respectively, should not reduce the total gross floor area of that building.

Source: Interview with an Austrian Contractor.

Table 6: Trench work coordination by municipalities

Trench work ordinances

² stadt-salzburg.at/internet/wirtschaft_umwelt/stadtplanung/bebauungsplanung_422953/geschossflaechezahl_gfz_422957.htm

Trench work ordinances

Link to reference	E.g. https://www.innsbruck.gv.at/data.cfm?vpath=redaktion/ma_iii/tiefbau/dokumente17/grabungsordnung-2012
Level	Municipal
Key aspects of legislation	Directives on the procedure for excavations in public traffic areas and associated facilities.
Barrier description	<p>If necessary for coordination with other construction or excavation work, the municipality may set a date in the excavation permit by which the excavation work must be completed.</p> <p>A municipal council can decide that excavation works are allowed only all 5 years. This is the example of the City of Innsbruck: During the warranty period of 3 years or 5 years for paving and slabbed surfaces in connection with the construction, renovation or new construction of the bituminous surface of a public traffic area, the performance of excavation work is also prohibited.</p> <p>Such regulations can be a barrier, if a district heating grid has to cross or go alongside a street and would have to wait some years before doing so.</p>
Suggestion to overcome the barrier	Flexibility (or exemptions) for renewable energy infrastructure.

Source: Interview with an Austrian Contractor.

3.1.3 (Further) Good Practices of Legislation

Those have already been published in Deliverable 2.1 “Policy framework conditions assessment and outlook for sustainable heating and cooling in selected European regions”.

3.2 Germany

In Germany, the so-called “Wärmewende” (transition in the heating sector to more sustainable heat) is a political issue, which has been discussed for several years. Although the need for more renewable heating has been agreed upon, still there are legal frameworks that hamper a faster implementation of existing sustainable heating solutions.

To gain an overview about the most hindering legal and regulatory barriers for a switch from fossil-fuelled heating systems to renewable heating solutions a telephone interview with energy manager Andreas Scharli from Energiewende Oberland (EWO) as well as a literature research was conducted.

3.2.1 Barriers for RES HC Systems related to “Split-Incentives”

The protection of tenants as well as of owners in apartment houses of being financially burdened is the most important barrier when it comes to the replacement of a heating system. The German Civil Code (Bürgerliches Gesetzbuch – BGB) and the Act on the Ownership of Apartments and the Permanent Residential Right (Wohnungseigentumsgesetz – WEG) are the most relevant laws related with “Split Incentives”.

German Civil Code - BGB

The BGB is the central codification of the German general civil law. It regulates the legal relations between private individuals (i.e. citizens and companies). The BGB plays a role when lessors/owners plan to replace old heating systems and intend to install a sustainable heating system.

Table 7: Barriers due to the German Civil Code

Bürgerliches Gesetzbuch - BGB (German Civil Code)	
Link to reference	https://www.gesetze-im-internet.de/bgb/index.html#BJNR001950896BJNE055703377
Level	State
Key aspects of legislation	The BGB is the central codification of the German general civil law
Barrier description	In Germany, according to Section 556c BGB, after a conversion from internal supply to an independent commercial supply from a heat supplier (heat supply), lessees (tenants) only must pay the operating costs for heat or hot water, if costs of heat supply do not exceed the operating costs for the previous internal supply of heat or hot water, and, if the heat is supplied more efficiently, either from a new system constructed by the heat supplier or from a heat network. Presently, heat produced from a DH network is more expensive than heat produced via natural gas, thus tenants can refuse to pay higher operating costs and lessors will not change to a more sustainable
Suggestion to overcome the barrier	Carbon pricing schemes, that are high enough so that fossil fuels become less economic than sustainable alternatives. CO ₂ pricing is planned in Germany from 2021 on, with a starting price of 25 €/ton CO ₂ , being increased to a price of 55 €/ton. In 2026, this price shall be in a price corridor between minimum 55 and maximum 65 €/ton CO ₂ (Bundesregierung, 2019, Klimaschutzprogramm 2030). This is considered as too low by many environmental experts.
Good practice parts	The CO ₂ pricing can be seen as at least a good start. Good practice regarding this instrument comes from Sweden, where in 1991 a CO ₂ price of 24 €/t was introduced. Until 2019, the CO ₂ price rose to 114 €/t. In the same time, emissions being caused by the energy consumption of Swedish households decreased by

Bürgerliches Gesetzbuch - BGB (German Civil Code)

	85 % and the Swedish GDP grew by 75 % (Erneuerbare Energie Österreich, 2019).
How could the good practice parts be strengthened	The German CO ₂ pricing would need to be more ambitious. The German Federal Environment Agency (Umwelt Bundesamt, 2019: 8) suggested a starting price of 40 €/t CO ₂ . Compared with the

Act on the Ownership of Apartments and the Permanent Residential Right – WEG

The WEG principally regulates legal issues around property, including common property. It is a supplement to the BGB, which does not regulate properly the ownership of buildings or apartments.

Table 8: Barriers due to the Act on the Ownership of Apartments and the Permanent Residential Right

Wohnungseigentumsgesetz – WEG (Act on the Ownership of Apartments and the Permanent Residential Right)

Link to reference	https://www.gesetze-im-internet.de/englisch_woeigg/index.html
Level	State
Key aspects of legislation	The WEG principally regulates legal issues around property, including common property
Barrier description	In common properties, tenants need to accept maintenance measures (§ 555a BGB). For modernisation measures however (§ 22, 2 WEG in conjunction with § 555b, 1 to 5, e.g. conversion to a sustainable heating system), 75 % of all owners and more than 50 % of all rental property shares need to agree to the measures.
Suggestion to overcome the barrier	Information campaigning about future scenarios, including the economic consequences, to convince owners of sustainable systems. Direct contact to house administrations to get involved in property owner meetings could be an efficient approach.
Good practice parts	So far, no activities could be found in which property owner meetings are targeted.
How could the good practice parts be strengthened	According to §20 II. BV (Zweite Berechnungsverordnung - second calculation regulation), an obligatory reserve accumulation for maintenance measures needs to be considered by owners (maximum between 7.10 and 11.50 €/m ² * year, depending on the age of the building). If the legal framework could be changed to an obligatory use (maybe partly) of the maintenance measures reserve for sustainable replacements, the decision to use the money for a sustainable could be fostered.

3.2.2 Barriers for RES HC Systems related to Other Legal Issues

In Germany, furthermore regulations about emissions (i.e. impacts of noise, dirt, radiation and other emissions on the environment) and about sweeping and revision of biomass heated systems can be identified as other legal barriers for more renewable heating systems. The Federal Emission Control Act with the corresponding ordinances and the Sweeping and Revision Regulation (KÜO) have been identified as most relevant barriers apart from “Split Incentives”.

First Ordinance on the Implementation of the Federal Immission Control (1. BImSchV)

The 1. BImSchV describes the regulations for the exhaust emissions of furnaces. Small and medium furnaces (until 1 MW rated thermal input) must not exceed emission limit values for dust (0.02 g/m³)

and carbon monoxide (0.3 to 0.4 g/m³). According to § 26, 1. BImSchV, the regulation requires the decommissioning of furnaces with certain ages according to the type plate (e.g. furnaces constructed between 1 January 1985 to 31 December 1994 need to be decommissioned until 31 December 2020).

Table 9: Barriers due to the First Ordinance on the Implementation of the Federal Emission Control

Erste Verordnung zur Durchführung des Bundes-Immissionsschutzgesetzes (Verordnung über kleine und mittlere Feuerungsanlagen - 1. BImSchV) - (First Ordinance on the Implementation of the Federal Emission Control)

Link to reference	http://www.gesetze-im-internet.de/bimschv_1_2010/1_BImSchV.pdf
Level	State/
Key aspects of legislation	The 1. BImSchV describes the regulations for the exhaust emissions of furnaces. Small and medium furnaces (until 1 MW rated thermal input) must not exceed emission limit values for dust (0.02 g/m ³) and carbon monoxide (0.3 to 0.4 g/m ³). According to § 26, 1. BImSchV, the regulation requires the decommissioning of furnaces with certain ages according to the type plate (e.g. furnaces constructed between 1 January 1985 to 31 December 1994 need to be decommissioned until 31 December 2020).
Barrier description	In many households, in accordance with § 26, 1. BImSchV, furnaces are decommissioned, which, in case the furnaces are not replaced, can lead to a higher consumption of fossil fuels. In fact, there is an information gap on the side of many owners of an outdated furnace who believe to being obliged to decommission the systems.
Suggestion to overcome the barrier	Outdated furnaces can still be operated if they comply with the limit values of the 1. BImSchV. This information needs to be disseminated so that well-working furnaces can be maintained.
Good practice parts	Information is available on the internet, however only if a targeted search is being conducted, e.g. https://www.meinhausshop.de/magazin/umsetzung-der-1-bimschv/
How could the good practice parts be strengthened	If the information material that informs about the obligatory decommissioning of outdated furnaces needs to inform in a prominent way that old furnaces can be kept if they are technically in order.

Sweeping and Revision Regulation (KÜO)

The KÜO regulates the sweeping and revision of exhaust systems, flue gas of furnaces, smoking plants, and necessary combustion air and return air systems to guarantee fire protection. More obligatory revisions for biomass heating systems mean a financial extra burden compared with fossil fueled heating systems. The resulting ash from the biomass heating systems needs to be disposed in a legal way, which means additional costs for the operators.

Table 10: Barriers due to the Sweeping and Revision Regulation

Verordnung über die Kehrung und Überprüfung von Anlagen (Kehr- und Überprüfungsordnung – KÜO) – (Sweeping and Revision Regulation)

Link to reference	http://www.gesetze-im-internet.de/k_o/K%C3%9CO.pdf
Level	State
Key aspects of legislation	The KÜO regulates the sweeping and revision of exhaust systems, flue gas of furnaces, smoking plants, and necessary combustion air and return air systems to guarantee fire protection.

Verordnung über die Kehrung und Überprüfung von Anlagen (Kehr- und Überprüfungsordnung – KÜO) – (Sweeping and Revision Regulation)

Barrier description	In accordance with the KÜO (Annex 1 to §1 IV KÜO), exhaust systems of biomass boilers must be controlled more often (to be swept up to 4 times per year) than the exhaust systems of fossil fuelled condensing boilers. That leads to more costs which are mostly borne by the users. The bigger issue is that the ashes need to be disposed in a safe and legal way and for bigger biomass heating plants this can lead to high costs.
Suggestion to overcome the barrier	It is known that ashes contain different nutrients (24 – 45% calcium oxide, 3 – 6% magnesium- and potassium oxide, and 2 – 3 % phosphor), of which phosphor, in the form of phosphate rock, is classified by the EU as one of 20 critical raw materials. A recovery of the nutrients is therefore a possible solution.
Good practice parts (if any)	The German project SAV (Stoffliche Holz- und Pflanzenascheverwertung - http://www.sav-netzwerk.de/) examines the possibilities to convert wood ashes into added-value products (different fertilizers). The comprehensive approach includes logistics, quality management, treatment, approvals and exploitation along the value chain of wood ashes.
How could the good practice parts be strengthened (if so)	Once such projects show ecologic and economic feasibility, it should be implemented into legal forms by lawmakers.

3.2.3 (Further) Good Practices of Legislation

Although, in Germany some barriers still exist which hinder a faster “Wärmewende”, there are also good practice examples of legislation to be mentioned.

Renewable Heat Act (EWärmeG BW)

The federal state of Baden-Württemberg has implemented an own land law, the Renewable Heat Act (EWärmeG BW) to address the issue of heating system replacements in existing buildings.

Table 11: Good practice example Renewable Heat Act in Baden-Wuerttemberg

Gesetz zur Nutzung erneuerbarer Wärmeenergie in Baden-Württemberg (Erneuerbare-Wärme-Gesetz – EWärmeG BW) - Renewable Heat Act

Link to reference	https://um.baden-wuerttemberg.de/fileadmin/redaktion/m-um/intern/Dateien/Dokumente/5_Energie/Energieeffizienz/EWaermeG_BW/150317_Novelle_Erneuerbare_Waerme-Gesetz.pdf
Level	Regional
Key aspects	In addition to the national Renewable Energy Heat Act (EEWärmeG), which regulates the obligatory use of renewable heat in new buildings (minimum share 15 % solar energy, 30 % for gaseous biomass, and 50 % for liquid and solid biomass as well as geothermal energy and ambient heat. The Renewable Heat Act of the federal state Baden-Württemberg addresses in addition existing residential buildings.
Description of good practice	The Renewable Heat Act requires that in case of a heating system replacement (starting from 1 January 2010), a minimum share of 15 % (until 2015, 10 % of the heat is generated from renewable energies (§ 4 EWärmeG BW).

District heat licensing agreement (Gestattungsvertrag Fernwärme)

The Free State of Bavaria has issued a recommendation for model contracts for district heating, which shall facilitate the construction of district heating networks in municipalities by easy legal processing if district heating pipelines need to be installed on municipal grounds.

Table 12: Good practice District heat licensing agreement in Bavaria

Vertrag über die Gestattung von Verlegung und Betrieb von Fernwärmeleitungen auf kommunalen Liegenschaften (Gestattungsvertrag Fernwärme) - District heat licensing agreement	
Link to reference	https://shop.wolterskluwer-online.de/Rechtsgebiete/Verwaltungsrecht/Kommunalrecht/66185000-Kommunales-Vertragsrecht.html
Level	Regional
Key aspects	Due the increase of district heating pipelines on municipal grounds in the recent years, the German Association of Towns and Municipalities has developed a template for a district heat licensing agreement.
Description of good practice	The template advises Bavarian municipalities how to elaborate legally sound contracts with companies that plan to develop district heating networks and need to use municipal grounds to do so. With the model contracts, the municipalities facilitate the uncomplicated enabling of the realisation of district heating systems.

Source: (Scharli, 2020)

3.3 Spain

3.3.1 Barriers for RES HC Systems related to “Split-Incentives”

Table 13: Housing Law / Barriers

Law 49/1960 Housing Law	
Link to reference	https://comunidadhorizontal.com/ley-de-propiedad-horizontal/
Level	State
Key aspects of legislation	Article 9.1 f) establishes the reserve fund of the Community of Owners
Barrier description	(A) fund may be insufficient, (B) necessary to create another extraordinary fund , (C) a single owner can object to perform a new RHC installation
Suggestion to overcome the barrier	(B) use the services of an ESCO
Good practice parts (if any)	A “good practice” to address larger initial investment for RHC systems could be to double the building maintenance fund and use ESCOs together
How could the good practice parts be strengthened (if so)	see next section- ESE market Law 56/2016

Source: (*Law 49/1960 on horizontal property in Spain (Housing Law), 2019*) - **Law 49/1960 on horizontal property in Spain (Housing Law)**.³ Article 9.1 f) of the LPH establishes that the reserve fund of the Community of Owners will be endowed with an amount that in no case may be less than 5% of its last regular budget. The reserve fund is an economic item that the Community of Owners must have prepared to maintain the building and its bone infrastructure, the most urgent or extraordinary needs that may arise. (A) This fund may be insufficient for changes to RES systems (e.g., from diesel to biomass boiler, etc.); (B) To undertake these deep renovation works, generally it will be necessary to create another extraordinary fund (spill) or use the services of an ESCO; (C) To perform a new installation (e.g. install thermal solar panel on the roof of a apartment building), 3/5 of the owner votes are needed and also a single owner can object if the expense is more than 12 months of monthly quota ordinary.

Table 14: Energy Services Providers Accreditation

Law 56/2016 ESCOs	
Link to reference	https://www.boe.es/buscar/pdf/2016/BOE-A-2016-1460-consolidado.pdf

³ Ley 49/1960, de 21 de julio, sobre propiedad horizontal. Published in: «BOE» No. 176, dated 07/23/1960. Entry into force: 08/12/1960. Last update: 06/03/2019
<https://comunidadhorizontal.com/ley-de-propiedad-horizontal/>

Law 56/2016

ESCOs

Level	State
Key aspects of legislation	Accreditation of energy service providers
Barrier description	(A) -need the adaptation of the contract according to the special conditions of each client; (B) - the temporary limitations of the contracting of energy services by the Public Administrations
Suggestion to overcome the barrier	Better contract, close to private clients and ESCOs needs
Good practice parts (if any)	(A) aggregating the demand , (B)exploiting good relationships ESCO with customers
How could the good practice parts be strengthened (if so)	Disseminate knowledge

Source: (Royal Decree Law 56/2016, 2016) • **Royal Decree Law 56/2016 accreditation of energy service providers (ESEs or ESCOs)**⁴

The ESE market in Spain in general, and particularly in the residential sector, has not developed as expected due to the existence of a series of barriers:

- Legal: Among the most important are: (A) - the adaptation of the contract according to the special conditions of each client; (B) - the temporary limitations of the contracting of energy services by the Public Administrations
- Economic-financial
- Commercial
- Others: lack of awareness, ignorance of the user, ...

To overcome some of the existing barriers to the implementation of the ESE model, a series of “Good practices” are being developed:

- Disseminate knowledge about energy services and projects that can be implemented
- Establish an accreditation or registration system that guarantees customers the quality and reliability of services
- Normalize savings and verification measures
- That governments serve as an example and implement, through this model, energy efficiency measures in public buildings.

⁴ <http://www.prefieres.es/gestion-y-servicios-energeticos-empresas>
<https://www.boe.es/buscar/pdf/2016/BOE-A-2016-1460-consolidado.pdf>
<https://www.researchgate.net/publication/258332795> ESCOs for residential buildings market situation in the European Union and policy recommendations

Energy services entail combining a series of tasks that were independent: design, engineering, energy supply, technical installation, maintenance, etc. The main traditional agents of the ESEs market are:

- Installers and maintenance companies
- Energy advisory consultancies
- Power suppliers (gas and / or electricity)

The need to adapt and improve public facilities and buildings to reduce their emissions, together with the significant lack of economic resources of administrations in the current context of economic crisis, becomes a great business opportunity for Energy Service Companies.

This means that opportunities for future projects and installations could be exploited, mainly and in the medium term, in large consumption centers, whether public or private:

- Residential buildings (residential)
- Hospitals
- Hotels
- Public buildings both locally and regionally and nationally
- Public lighting
- Malls

The main measures to support the ESEs sector in the public sector were in 2009 and 2010 the AGE 330 and 2000ESE Plans, which were complemented by financial support measures. In both cases, it was intended to implement energy saving measures through energy service contracts in 330 buildings of the General State Administration and the Regional Governments and municipalities. However, these measures have barely had an impact and have resulted in few contracts.

Despite the large economic energy saving potential in the EU the energy service companies (ESCOs) market for residential buildings is much less developed than in other demand sectors (e.g. the industry or public/service sectors). Given the existing situation, energy policy experts and researchers appear generally quite sceptic about the possibility of a real and significant development in the near future. Besides sector cross-cutting barriers (e.g. low level of energy prices, lack of information and awareness, lack of appropriate forms of finance) there are indeed specific barriers which make a large scale application of the ESCO model for residential buildings particularly difficult. However encouraging development trends are being registered in specific market segments where “good practices” as the possibility of aggregating the demand or exploiting good relationships with customers have created interesting investment opportunities for ESCOs

Table 15: National Spanish Building Renovation Programme

State Building - Renovation Promotion Program	
Link to reference	https://www.fundacionlaboral.org/actualidad/noticias/reportajes/de-que-ayudas-a-la-rehabilitacion-de-viviendas-te-puedes-beneficiar-con-el-plan-estatal-de-vivienda-2018-2021
Level	State
Key aspects of legislation	Building Rehabilitation Promotion Program stands out

State Building - Renovation Promotion Program

Barrier description	(A) The grants small in relation to expenditure; (B) difficulties in agreeing to the owners; (C) The period of return on investment is long
Suggestion to overcome the barrier	Better grants, close to private clients and ESCOs needs

Source: (State Rehabilitation Promotion Program (3R), 2013) • **State Rehabilitation Promotion Program (3R)**⁵

The State Plan for the promotion of housing rental, building rehabilitation, and urban regeneration and renovation, 2013-2016, was approved in April 2013 by the Ministry of Development with a total initial budget of € 2,421 M. The Plan included several programs, among which the Building Rehabilitation Promotion Program stands out. The Plan, extended in 2017, has continuity through the recent approval of the State Housing Plan, 2018-2021, which also includes a program aimed at building efficiency – Program to promote the improvement of energy efficiency and housing sustainability–. The granting of the aid is subject to obtaining a reduction in the annual energy demand for heating and cooling of the building, referred to the energy certification of the building. In the new Plan this reduction requirement varies according to the climatic zone between 20% and 35%. The aid of the first of these programs has enabled the renovation of 80,709 homes.

The management of the Plan's aid corresponds to the Regional Governments. (A) The grants are small in relation to the expenditure to be made, the funds for subsidies are insufficient (B) There are difficulties in agreeing to the owners both at the time of installation (project approval) and at the time of maintenance and management (eg how to settle expenses & economic benefits in RES facilities), (C) The period of return on investment is long.

Table 16: National Spanish Leasing Law

Leasing Law

Link to reference	https://www.boe.es/buscar/pdf/2019/BOE-A-2019-3108-consolidado.pdf
Level	State
Key aspects of legislation	Leasing Law does not sufficiently contemplate the new RHC installations
Barrier description	When the landlord invest in a RHC system but the beneficiary is only the tenant who is the one who saves on the energy bill.
Suggestion to overcome the barrier	Better law, close to landlord and tenant needs

Source: (Leasing Law) • **Leasing Law** (could impede the reimbursement of a larger initial investment for RHC systems)⁶

⁵<https://www.fundacionlaboral.org/actualidad/noticias/reportajes/de-que-ayudas-a-la-rehabilitacion-de-viviendas-te-puedes-beneficiar-con-el-plan-estatal-de-vivienda-2018-2021>

⁶ <https://www.abogadosparatodos.net/ley-291994-de-arrendamientos-urbanos/>
<https://www.boe.es/buscar/pdf/2019/BOE-A-2019-3108-consolidado.pdf>

Split incentives may lead to this outcome: (A) when the landlord pays the energy bill and cannot influence the choice of energy consumption by the tenant, (B) when the tenant cannot perfectly influence the prior choice of insulation / efficient RHC systems by the landlord, and (C) when the landlord invest in a RHC system but the beneficiary is only the tenant who is the one who saves on the energy bill.

However, there may be low-cost policies, such as disclosure requirements in leases on the quality of insulation, information programs, feedback programs, or standards on the insulation in new rental units, which could improve economic efficiency by helping to alleviate the effects of these split incentive problems.

Table 17: National Spanish Condominium Law

Condominium law	
Link to reference	https://vlex.es/tags/ley-condominio-vigente-3708787
Level	State
Key aspects of legislation	Condominium law does not sufficiently contemplate the new RHC installations
Barrier description	requires an agreement of 100% of all owners to take action
Suggestion to overcome the barrier	Better law, close to proactive owners needs

Source: (Condominium Law)

- **Condominium law**⁷ (replacements to RHC systems may require 100% approval from all owners). Here in Spain, for example, the high-volume buildings that are owned by the occupants (condominium) requires an agreement of 100% of all owners to take action
- In addition to tenants and owners, there may also be **conflicts / barriers** related to third-party activities that wish to contract plants, for example. In Spain, the surface of an independent biomass heating container / house could reduce the usable living area of the entire property accordingly, since it is treated as a building, for example, this is a serious economic barrier. The same goes for the space needed to store the biomass, necessary to power the biomass boilers.

3.3.2 Barriers for RES HC Systems related to Other Legal Issues

Table 18: National Spanish Law on Public Sector Contracts

Law 9/2017 on public sector contracts	
Link to reference	https://www.idae.es/evento/jornada-los-nuevos-modelos-de-pliegos-de-contratos-de-servicios-energeticos
Level	State

https://www.researchgate.net/publication/276196010_Split_Incentives_in_Residential_Energy_Consumption

⁷ <https://vlex.es/tags/ley-condominio-vigente-3708787>

Law 9/2017 on public sector contracts

Key aspects of legislation	energy efficiency improvement investments are financed directly from the savings and that the private sector (ESCO) assumes the risks
Barrier description	<i>currently used for Public Administration Buildings should be adapted to the private sector Buildings</i>
Suggestion to overcome the barrier	Adaptation to Private sector

Source: (Low 9/2017 on public sector contracts, 2017) • **Law 9/2017 on public sector contracts**⁸ (presentation event IDAE 22.01.2020)

Law 9/2017, has allowed the IDAE in 2020 year to adapt its models of specifications for the contracting of energy services companies (ESCOs), under the typology of mixed supply and services contract with investment for Public Administration Buildings. Among the advantages that these contracts offer for the public sector, is that the energy efficiency improvement investments are financed directly from the savings and that the private sector (ESCO) assumes the risks of the necessary works and facilities, being able to guarantee the energy saving, based on your experience to help achieve the best technical solutions.

In Spain, these “models of specifications for the contracting of ESCOs” currently used for Public Administration Buildings should be adapted to the private sector.

Table 19: Spanish Grants Programme for Local Administrations

FEDER-IDAE grants for energy projects of local entities

Link to reference	https://www.idae.es/ayudas-y-financiacion/fondo-europeo-de-desarrollo-regional-feder-0
Level	State
Key aspects of legislation	It only applies to Public Entity Buildings
Barrier description	non applies to Private Buildings (ex. It does not apply to Apartment Block Buildings)
Suggestion to overcome the barrier	Adaptation to Private sector

Source: (FEDER-IDAE grants for energy projects of local entities) • **FEDER-IDAE grants for energy projects of local entities.**⁹

⁸ <https://www.idae.es/evento/jornada-los-nuevos-modelos-de-pliegos-de-contratos-de-servicios-energeticos>
<https://www.asociacion3e.org/documento/modelos-de-contratos-de-servicios-energeticos-para-administraciones-locales>

⁹ <https://www.idae.es/ayudas-y-financiacion/fondo-europeo-de-desarrollo-regional-feder-0>

It only applies to Public Entity Buildings and not to Private Buildings (ex. It does not apply to Apartment Block Buildings)

Table 20: Spanish Renovation Plan for RES and Energy Efficiency Systems

RENOVE Plans (for RES Systems)	
Link to reference	https://blog.ferroli.es/blog-subvenciones-para-eficiencia-energetica-y-o-energias-renovables-de-las-comunidades-autonomas/
Level	Regional
Key aspects of legislation	Grants for RENOVE Heating and Cooling systems
Barrier description	The aid is small in relation to the expenditure to be made, the funds are insufficient
Suggestion to overcome the barrier	Adaptation to customer needs

Source: (RENOVE Plans (for RES Systems)) • RENOVE Plans (for RES Systems) 10

The management of the Plan's aid corresponds to the Regional Governments. The aid is small in relation to the expenditure to be made, the funds are insufficient.

¹⁰ <https://blog.ferroli.es/blog-subvenciones-para-eficiencia-energetica-y-o-energias-renovables-de-las-comunidades-autonomas/>

3.4 North Macedonia

3.1.1 Barriers for RES HC Systems related to “Split-Incentives”

In N. Macedonia the Tenancy or Condominium law is included in the Housing law. This legislation requires each building to have a housing council or tenant community. Nevertheless, this is not the case in all buildings. Tenants' community and house councils make the decisions by a simple rule of **majority (50 + 1 %)**.

Table 21: Common Barriers related to the Housing law

Housing law	
Link to reference	https://www.pravdiko.mk/wp-content/uploads/2013/11/Zakon-za-domuvan-e-15-03-2012.pdf
Level	State
Key aspects of legislation	The Housing law regulates the housing buildings types, the management of residential buildings, the relationships between owners of individual parts and third parties, the owner's community, tenancy relationships, the manner of managing and maintaining facilities, rights and obligations of the country and the municipalities in housing, inspection and administrative oversight and other housing issues.
Barrier description	Buildings usually lack of common space for heating equipment if they are not connected to the central heating system. One of the barriers might be that the construction of the heating network in such buildings is expensive investment per apartment. Not all apartments are ready to install such a system and therefore many technical problems occur for those who want it. There are no adequate funds for this purpose and the EE fund has not yet been established.
Suggestion to overcome the barrier	Tax incentives should be introduced for RES equipment for heating, in order to make it more accessible to interested parties.
Barrier description	The municipalities are obliged to have housing inspectors, which does not apply to the case.
Suggestion to overcome the barrier	Should be following the regulations.

There are very few articles in these laws regulating the RES HC systems. Therefore, some barriers related to Split-incentives and heating systems in buildings are in the Rulebook on the heat supply, Law on Energy efficiency (EE), etc.

Table 22: Heat Supply Barrier

Rulebook on the heat supply terms	
Link to reference	https://www.erc.org.mk/odluki/2009-12-16-%20Pravilnik%20za%20Uslovi%20za%20snabduvanje%20s%20topl%20energija-%20RKE&Toplifik.%20(final).pdf

Level	State
Key aspects of legislation	Regulation on the conditions and manner of heat supply, rights, obligations and responsibilities of all users in energy distribution. In particular regulates the: <ul style="list-style-type: none"> relationships between distribution network users; basic preconditions for delivering heat to consumers; exclusion, limitation or interruption of heat supply; measurement of the delivered heat energy; calculation method and delivered heat payment.
Barrier description	Buildings that have improved their envelope isolation face hurdles in case they want to regulate their heat supply on a building level. No clear and prompt procedure has been defined on how to change the heat supply contract. This provides no incentive to reduce the overall heating demand or to introduce energy efficiency measures. (Article 40)
Suggestion to overcome the barrier	All new DH connections should be required to have a metering device. Simple procedures for the implementation of individual heat metering on an individual level or heat regulation on a building level should be provided.

Table 23: Good example of released lump sum for collective housing

Rulebook on the heat supply	
Link to reference	https://www.erc.org.mk/odluki/2012-07-30-%20PRAVILA%20SNABDUVANJE%20TOPLINSKA%20ENERGIJA.pdf
Level	State
Key aspects of legislation	Regulation on the conditions and manner of heat supply, rights, obligations and responsibilities of all users in energy distribution.
Barrier description	In collective housing with a single metering device, consumers upon their request may be individually switched off, upon prior consent of the total number of consumers of the building. The excluded consumer shall be obliged to pay the fixed heat amount of charge, which is determined in accordance with the tariff heat system. If all consumers request a disconnection from the heating system for the whole heating season or more heating seasons the fee is excluded.
Suggestion to overcome the barrier	The obstacle has been overcome by the fact that the lump sum that consumers pay is now released.

Table 24: Good example of inclusion of Building “passport” in lease agreements

Rulebook on the Energy Performance of Buildings	
Link to reference	http://www.ea.gov.mk/images/stories/E_Izdanija/pravilnik_energetski_karakter_z_gradi.pdf
Level	State
Key aspects of legislation	The purpose of this Rulebook is to implement EE policies in buildings through measures and EE activities, increase energy savings, reduce the negative environmental impacts on the performance of energy activities and energy

	consumption and improve the security of energy supply.
Barrier description	According to the Rulebook on the Energy Performance of Buildings, the lease agreement must contain the energy class of the building (passport). The main barrier for comes from the weak enforcement of this requirement. As a result, information on the building “passport” is very rarely included in lease agreements.
Suggestion to overcome the barrier	Fines for the landlord if they do not include the energy class of the building, or prohibition for renting.

Table 25: Good practices from the new Law on energy efficiency

Law on energy efficiency (EE)	
Link to reference	http://www.economy.gov.mk/Upload/Documents/Zakon%20za%20energetska%20efikasnost.pdf
Level	State
Key aspects of legislation	This law provide a reduction of energy needs through efficient use of energy by implementation of EE measures; reduction of energy consumption, reduction of negative impact on the environment and increase of efficiency in production, transmission and distribution of energy; increasing EE in the field of housing and construction and in public sector by improving the energy performance of buildings and increasing EE by utilizing RES.
Barrier description	With the previous Law on EE, the metering of delivered heat was calculated be shared substation and divided by squares including the losses.
Suggestion to overcome the barrier	With the new Law on EE, the metering of delivered heat must be calculated per user, not by shared substation as it is now.

3.1.2 Barriers for RES HC Systems related to Other Legal Issues

In following chapter, the stakeholders gave an overview of possible and existing barriers in topic such building law, spatial plans, energy controls, subsidies in the field of HC systems that should be applied, etc.

Table 26: Identified improvement concerning RES HC system

Should be included in the Construction law	
Link to reference	http://mioa.gov.mk/sites/default/files/pbl_files/documents/legislation/zakon_za_gradenje_konsolidiran_032018.pdf
Level	State
Key aspects of legislation	The Construction Law regulates the construction of buildings, project documentation, use and maintenance of buildings, realization of basic requirements of buildings, ensuring the conformity of construction with spatial, urban plans and projects and the principles of environmental protection and improvement environment.
Barrier description	The process of granting approvals for construction of new buildings has not required a mandatory connection to the existing district heating system should be it available. Moreover, no requirement is set for new buildings to install building

	level RES system.
Suggestion to overcome the barrier	Should include the requirement for connection to the existing central heating system or their own RES system.

Table 27: Insufficient government subsidies

Annual Action Plans	
Link to reference	http://www.economy.gov.mk/Upload/Documents/ГОДИШЕН%20ПЛАН%20ЗА%20РАБОТА%20НА%20МЕ%20БО%202020%20r.(4).pdf
Level	State
Key aspects of legislation	The Annual action plans consists of strategic programs such: programs for bettering the economy and sustainable utilization of natural resource including energy development.
Barrier description	Subsidies for replacement of heating systems with RES should be in line with the Government's Annual Action Plans. Nevertheless, municipalities must subsidize such systems from their budget, which is an additional financial burden.
Suggestion to overcome the barrier	Greater concern of the government for the RES HC system replacement.

Table 28: Concerns on inspection of fossil-fueled boiler and RES replacement

Rulebook on energy control and inspection of fossil-fuelled boiler systems	
Link to reference	http://www.ea.gov.mk/images/stories/E_Izdanija/pravilnik_energetski_kontroli.pdf
Level	State
Key aspects of legislation	The energy control determines the efficiency of energy use, as well as the possibilities for energy consumption reduction and savings.
Barrier description	The Rulebook on energy control and inspection of fossil-fueled boiler systems being replaced with RES systems at 3 and 5 years is often disregarded.
Suggestion to overcome the barrier	The Municipalities in their EE programs besides remediation of buildings with EE measures should include measures for replacement of RES HC systems.

Table 29: Underrated underground infrastructure for new and old heating systems

Annual planning documents for the reconstruction and construction of road infrastructure	
This is general statement from the stakeholders (not to be found in a specific document)	
Link to reference	https://skopje.gov.mk/media/4911/strategija-za-lokalen-ekonomski-razvoj-na-grad-skopje-so-akcionen-plan-period-2018-2021.pdf
Level	Municipal
Key aspects of legislation	The local economic development is a priority for the local governments to effectively and efficiently manage the available resources and to create conditions to stimulate economic activities. The priorities and goals are defined in the

	programs, projects, plans and activities through which are implemented.
Barrier description	The Municipalities in their Annual planning documents for the reconstruction and construction of road infrastructure often forget the underground infrastructure or the pipes for new and old heating systems.

The opinion of the stakeholders concerning the gas infrastructure is that the secondary and tertiary natural gas network in the municipalities must be developed under a proper strategy. Hence, they believe that developing the distribution natural gas grid to the end consumers is not the best approach. The reasons behind this are plentiful, but some of them are: the lack of national experience with natural gas installation in households, lack of consumer habits, lack of natural gas based end-use appliances etc. Instead, the natural gas grid should be developed only with the aim of a fuel switch in existing large oil boilers that can transit to gas or to supply a CHP fed DH system.

There are EE incentives for transmission and distribution as well. They require the suppliers of electricity, heat and natural gas to inform consumers on the measures that they can undertake to improve EE and on the effects of those measures. Moreover, consumers must also be informed about available financing mechanisms, types of energy service contracts, and contact data with energy service providers, including ESCO, in accordance with the relevant Supply Rules adopted pursuant to the Energy Law. When planning the development of the appropriate systems for the area in which they operate, the operators of the transmission and distribution systems are obliged to assess the loss reduction and the potential for EE improvement in their systems. The operator of the heat distribution system shall be obliged to provide its customers with information on the efficiency of the DH system as well as on the RES share.

3.1.3 (Further) Good Practices of Legislation

In communication with our stakeholders they highlighted several other good practices.

- The Government Air pollution abatement measures for 2019 and now 2020 encourage the replacement of fossil-fueled boilers with RES HC system (i.e replacement of the inefficient oil boiler system with RES HC system in one kindergarten in the municipality of Karposh).
- The requirements of the Rulebook on Energy Performance of Buildings in the construction permit phase limit the maximum permitted class of the building (class C up to 100 kWh/m²a) are a prerequisite for the RES HC systems.
- The subsidies from the Municipality of Karposh for the 15% utility tax return contributed to the realization of the over 93 facilities with RES systems.
- Building approval is not required for the PV generators installed on facilities for electricity production with maximum installed capacity up to 1MW.
- The net billing scheme for PV generators indirectly incentives increased self-consumption because it reduces the remuneration tariff if prosumers as prosumers export more energy to the grid. Increased self-consumption is complementary with the use of heat pumps and thermal storage in buildings.

In the Housing Law the lessor shall be deemed to have unreasonably refused to consent to interventions in the apartment if the intervention complies with modern technical requirements and is in the personal interest of the tenant (modernization or reconstruction of water, electricity, gas,

heating, sanitary or similar installations; reorganization of the apartment to reduce energy use or increase its functionality); improvements that are subsidized by public funds [1].

The new Building law has an article on efficient energy use and heat protection in which the building and its installations must meet the prescribed EE requirements (report for EE (including the HC systems), fire and noise protection elaborate, environmental impact assessment). The building and its appliances for heating, cooling, lighting and ventilation shall be designed and constructed in such a way that depending on the climatic conditions, the purpose and the way of use of the building, the amount of the energy they require to be as small as possible [2].

Under the new Energy law, consumers will have the choice of any energy source by any supplier that is registered in the country, whether it be oil, gas, electricity or any other energy source. The law would provide greater competitiveness in the supply of all energy, and thus lower prices, and would prevent energy companies from commuting, which would have to work in the free market and be more productive [3].

The Rulebook on the energy consumption labelling applies to the air conditioners in households that are using electricity, excluding the installations that use other energy sources, heat pumps and installations with cooling output power greater than 12kW [4].

The 2019 Rulebook on heat supply gives an opportunity to the consumers in the residential and commercial buildings to disconnect from the DH without obligation to pay the lump sum for being switched off from the system, unless the consumer develop an EE report that confirms that the alternative heating system to be used after the shutdown is more energy efficient, environmentally friendly and significantly reduces the use of primary energy required compared to the central heating system (greater than 10%), taking into account the energy required for extraction, conversion, transport and distribution [5].

The utilization of the solar energy is defined by both the old and the new Energy Law and the Rulebook on Energy Performance of Buildings by which all public buildings from 2015 should have solar thermal systems (which does not exclude the possibility of combined heating systems as well).

Also, another good example is installation on hybrid PV system. According to the new Rulebook on RES and the new legal solutions in the Laws on Energy and EE (2019, 2020) such systems are planned for schools, kindergartens that will meet at least 80% of the electricity needs of the grid and 100% of the needs for sanitary hot water.

Macedonia also foresees subsidies for projects that reduce energy poverty. So far, the responsible communities were given financial assistance to install PV system up to 4kW for their own needs. However, now the Government Action plan envision installation of 4kW capacity onsite for these citizens.

3.5 Bulgaria

3.5.1 Barriers for RES HC Systems related to “Split-Incentives”

In 2018, 83.6% of the Bulgarian population lived in own dwellings – much more than the EU average of 69.3% (Eurostat, 2020). This percentage is unevenly distributed in the country. Although there is no statistical information available at regional level, it is clear that the percentage is lower in the large cities that attract labour force from elsewhere and higher in depopulating rural areas, such as Rhodope region. Therefore “split incentive”, where the building owner pays for energy upgrades but cannot recover the related savings from reduced energy use / cost that accrue to the tenant, affects relatively small share of the Rhodope region residents.

The Energy Efficiency Act, in line with the EU Energy Performance of Buildings Directive, requires that the landlord provides to the tenant a copy of the energy efficiency certificate of the building. However, the enforcement of that requirement is very poor. Additionally, in contrast to other EU Member States, in Bulgaria it is not forbidden to let properties of low energy efficiency.

Private landlords typically rent out individual dwellings – either single family houses or single apartments in multi-family buildings. Only in rare cases landlords own a whole multi-family building. Therefore, it is easy for a private owner to negotiate with the tenant an investment in HC or building renovation, where the costs and benefits are split in a balanced way. There are no legal restrictions in this regard.

Public owners own a minor share of the dwellings. For example, at the time of last census in 2011, in Smolyan region, covering 10 of the 12 target Rhodope municipalities, this share was only 1.36% (NSI, 2011). Each public owner independently decides on the conditions for renting out its property, through the adoption of a Regulation.

Situations where tenants are not responsible for paying their energy bills (and thereby have no incentive to conserve energy), known as “reverse split incentive”, are highly uncommon, so this is not a barrier in the country.

The barrier related to “split incentives” identified above is summarized in the below table.

Table 30: Split incentives

Law/act	
Link to reference:	Energy Efficiency Act: https://www.lex.bg/bg/laws/ldoc/2136500695
Level	State
Key aspects of legislation	The landlord is obliged to provide to the tenant a copy of the energy efficiency certificate of the building
Barrier description	Low enforcement of the above requirement
Suggestion to overcome the barrier	There are substantial difficulties related to the enforcement of the obligation. Review of the experience of other EU MS with similar building ownership situation is needed to identify a solution.

3.5.2 Barriers for RES HC Systems related to Other Legal Issues

Exemption of polluting fuels from taxes and excise duties

The low fuel / energy prices are a substantial barrier to the switch to more efficient heating. Externalities are either not or partly included in the fuel price. For example, according to the Excise Duties and Tax Warehouses Act (2020), the coal sold to natural persons (e.g. residents) is exempted from excise duty. This results in competitive prices and at the time of 2011 Census coal briquettes were the main heating source for 19.8% of the dwellings (NSI, 2011). The barrier and a proposed solution are summarized below.

Table 31: Exemption of polluting fuels from taxes and excise duties

Law/act	
Link to reference	Excise Duties and Tax Warehouses Act: https://www.lex.bg/laws/ldoc/2135512728
Level	State
Key aspects of legislation	Release of polluting fuels (e.g. coal briquettes) used by households from excise duty
Barrier description	The low fuel cost discourages both replacement of the polluting fuels and replacement of the inefficient heating technologies.
Suggestion to overcome the barrier	Excise duties, reflecting the externalities of fuels, regardless of their application. In parallel, the financial support to the low-income consumers can be increased to avoid higher burden on them.

Condominium management

According to BACC (2020), the Condominium Ownership Management Act (2019) does not provide reliable mechanisms to control the legal compliance of the owners of individual dwellings. Additionally, there are normally no intermediaries to provide technical assistance to owners (BACC, 2020). Furthermore, in the majority of the cases the owners have not established an association of owners (a legal person), which limits their opportunities to undertake energy refurbishment, invest in common heating, get financing and others.

The poor organization of the building owners is related to another barrier – district heating companies need to calculate the heating consumption and bill each individual owner, instead of the building as a whole only. The latter option is usually applied in most EU countries. The calculation is done, according to the Energy Act (2019) and other regulations that do not take into account a number of factors and some owners are dissatisfied. The necessity for DH companies to have relations with the individual owners is a burden for the companies that is transferred to the cost of the service. Additionally, the numerous cases of not paying consumers brought to the court by DH companies create negative image of DH.

Table 32: Poor condominium management

Law/act	
Link to reference	Condominium Ownership Management Act: https://www.lex.bg/laws/ldoc/2135614516
Level	State
Key aspects of legislation	<ol style="list-style-type: none"> 1. Lack of obligation to establish an association of owners; 2. Lack of responsibilities for the association of owners.
Barrier description	Disagreement on heat cost distribution within the building, unsatisfied and disconnected individual DH clients, high burden for DH companies
Suggestion to overcome	Obligation of buildings with more than a certain number (e.g. 5) of apartment

Law/act	
the barrier	to establish an association of owners, being the sole building contractor of the DH company. It would make its own arrangements with the individual owners – bill distribution, collection of payment, bringing owners to the court, etc.
Good practice parts	There are examples of associations of owners, established according to the Act, which act as a sole contractor of DH companies and manage internally all relations with the building owners.
How could the good practice parts be strengthened	To extend this good practice, the most effective instrument is obligation, as described above.

The Condominium Ownership Management Act (2019) law requires 50% majority of owner votes for the connection of a multi-family building to the district heating or natural gas network. Similarly, 50% majority is required for disconnection from these networks. On the other hand, the Energy Act (2019), which prevails, requires at least two-thirds majority for the connection to district heating. This high share, combined with the difficulty to contact all owners, is a serious barrier to connection. Information about the barrier and a proposed solution is summarized in the below table.

Table 33: Majority of owners required to connect to district heating

Law/act	
Link to reference	Energy Act: https://lex.bg/laws/ldoc/2135475623
Level	State
Key aspects of legislation	Majority of two-thirds of owners required for connection to DH
Barrier description	Difficulty to obtain such a majority
Suggestion to overcome the barrier	Majority of 50%, as stipulated in the Condominium Ownership Management Act, is more feasible.

District heating licensing and regulation

District heating (DH) plants and networks over 10 MW thermal capacity are required to obtain a license. This is related to substantial legal requirements, such as price regulation, restrictions, complicated procedures for project design, coordination, construction, and customer relations.

The price regulation methodology is very complicated. The Regulator sets maximum eligible costs for several cost categories. Additionally, it has too great freedom to accept or reject costs, used for the price formation. As a result, the experience shows that the licensed DH plants operate at a loss during the last 15 years and are unable to invest enough in renovation, modernization, and development, which in turn results in poor quality service and often higher costs per unit of heat delivered.

Furthermore, all gas-fuelled DH plants above 5 MW capacity are required to have CHP installation. Such an installation is not always feasible, because the heat load might be very low. The high investment in CHP, therefore, may be a barrier for constructing a DH plant.

The above barriers and possible solutions are summarized in the below table.

Table 34: High licensing requirements and subjective price regulation of district heating

Law/act	
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Law/act	
Link to reference	Energy Act: https://lex.bg/laws/ldoc/2135475623
Level	State
Key aspects of legislation	District heating licensing and regulation
Barrier description	Very high licensing requirements for DH Unsound price regulation practices, resulting in less attractive DH service both at the supply and demand side. Obligation to use CHP, although in some cases it makes no economic sense
Suggestion to overcome the barrier	Licensing can be applied to plants over 20 MW, instead of 10 MW. Lighter licensing requirements. Simpler price regulation method, not allowing Regulator's subjective intervention. No obligation to use CHP

Gas and heat distribution networks

There are many State and municipal requirements for the construction and repair of the natural gas and DH distribution networks. The extension of the pipe network to new (previously unplanned) areas is a complicated and expensive process. The revision of the detailed urban development plan is a long (up to 8 months) administrative procedure that disturbs the investment process. Additionally, the arrangement of the pipe routes, passing through municipal or private lands, is very slow and expensive – the cost is commensurate with the construction cost.

Building documentation

Many residential buildings have no technical passports and energy efficiency certificates of residential buildings, resulting in unclear building (energy) condition and delay in the project realization. The development of the technical passports is difficult, because of the requirement to assess each building individually, although the majority of the buildings are standard (BACC, 2020). The barrier is summarized in the below table.

Table 35: Missing Building Documentation

Law/act	
Link to reference	Regulation on technical passports of buildings https://www.lex.bg/laws/ldoc/2135542058
Level	State
Key aspects of legislation	Complicated procedure to issue technical passports of buildings
Barrier description	Unclear building condition; delayed project realization.
Suggestion to overcome the barrier	Allow the use of technical passports from identical buildings.

Energy supply contracting

Energy supply contracting (ESC) is a contractual arrangement for the efficient supply of energy, contracted and measured in Megawatt hours (MWh) delivered. The energy supply contracting market in the residential sector is at a very early stage of development. According to 2019 survey among ESC providers and facilitators, among the main barriers to ESC business there are three that

have relation to the legislation, particularly: “Subsidy / policy uncertainty”, “Lack of support from the government”, and “Low energy prices”, but further detail is not available (QualitEE, 2019).

ESC providers are not allowed to supply heat in a territory, for which a DH company has a license to operate. Although this rule is often reasonable, there are sometimes territories specified in a license, which are not included in the (short-term) DH extension plan. The rule, therefore, provides an unnecessary restriction for ESC. The barrier and a possible solution are summarized below.

Table 36: Energy Supply Restriction

Law/act	
Link to reference	Regulations under the Energy Act
Level	State
Key aspects of legislation	It is prohibited for an ESC provider to supply heat in a territory, for which a DH company has a license to operate.
Barrier description	Buildings not connected to DH cannot conclude ESC with another provider.
Suggestion to overcome the barrier	The restriction can be valid only for buildings either currently connected or planned to be connected in the short term.

3.6 Croatia

3.6.1 Barriers for RES HC Systems related to “Split-Incentives”

According to the data obtained from the last Census in Croatia in 2011 related to the dwelling usage, 89% of the households live in private property or in a co-ownership of the property, 5% live in the property owned by a relative, 3% live in a free-based tenancy property (property is not owned by them nor by the relative), 2% of the households live in the contract-based tenancy (“protected” tenancy), 1% live in sub-tenancy and less than 1% live in the dwellings on other basis.

Additionally, 43% of the occupied dwellings used wood as a main energy source for heating, 28% natural gas, 14% electric energy, 4% fuel oil and 1% other energy sources. However, it is important to emphasize that this is the data from 2011 and the change of shares of the used energy sources is expected, especially for the RES share. These data are shown at Figure 3.

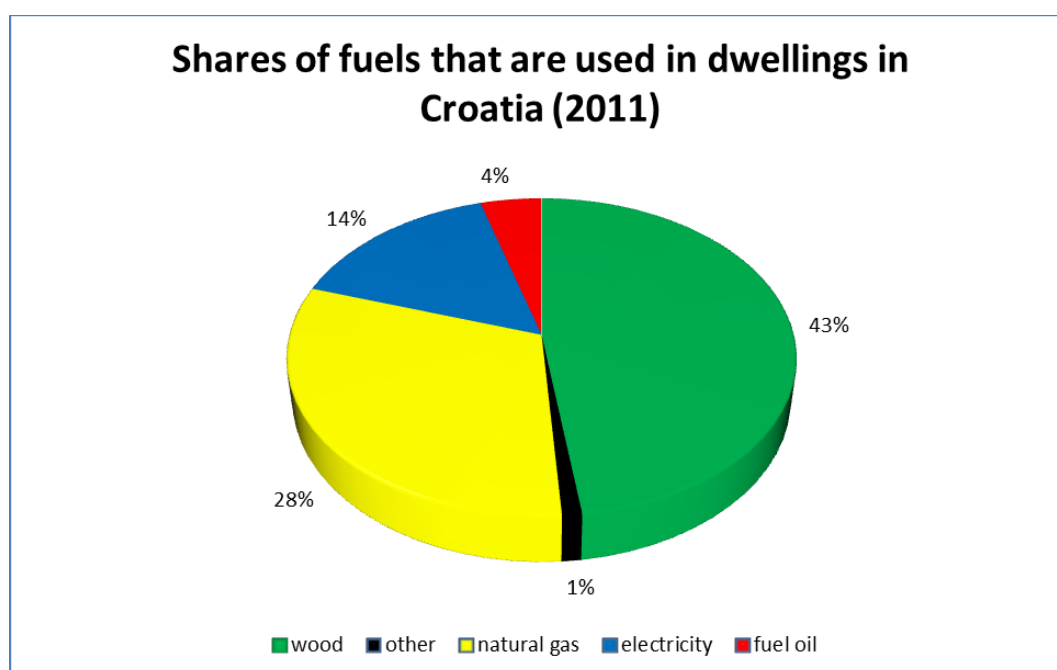


Figure 3: Shares of fuels that are used in dwellings in Croatia

Source: Census 2011

Table 37: Split incentive issue on the ownership and potential improvements of the building and common spaces

The Act on Ownership and Other Real Rights (NN 91/96, 68/98, 137/99, 22/00, 73/00, 129/00, 114/01, 79/06, 141/06, 146/08, 38/09, 153/09, 143/12, 152/14)

Link to reference https://narodne-novine.nn.hr/clanci/sluzbeni/2015_07_81_1548.html

Level State

Key aspects of legislation Act on Ownership and Other Real Rights establishes a general regulation of persons’ belongings and the rules of this Act also apply to the affiliation of things

The Act on Ownership and Other Real Rights (NN 91/96, 68/98, 137/99, 22/00, 73/00, 129/00, 114/01, 79/06, 141/06, 146/08, 38/09, 153/09, 143/12, 152/14)

which are subject to a special legal arrangement unless they are contrary to such regulation. The subject of ownership rights and other real rights may be any movable asset or immovable asset (real estate), except those that are incapable of doing so.

In several chapters, the Act establishes regulation for the ownership of properties, including the multi-owner, multi-family buildings, managing properties and other relevant aspects for the property owners.

Barrier description

According to Article 87, the decision to improve common parts and property devices requires the consent of all co-owners of the property, except for those affairs which are normally considered extraordinary/emergency affairs. This article may represent a barrier if the building should undergo a major renovation and/or improvement of the parts of the building, resulting in expenses exceeding the joint reserve funds. This barrier is especially apparent in the residential historic buildings, where some of the co-owners rent their apartments and are not concerned with the amount of the energy bills, as they are paid by the tenants. As the payments to the joint reserve are the obligation of the landlord/owner of the apartment and not the tenants, owners are reluctant towards the significant improvements resulting in the additional payment increase, as they will not enjoy the benefits of it.

Suggestion to overcome the barrier

Regulatory revision.

Good practice parts (if any)

- The Act specifies the obligation to establish a joint reserve fund for each building, which is funded through the monthly instalments of the co-owners. The amount of the instalment is based on the decision made by the co-owners of the majority of co-ownership shares. If the building is undergoing renovation or requires significant improvements, which are exceeding the joint reserve, it is possible to apply for a loan to fund the building's improvements. As the loan represents a significant financial burden for the building and co-owners, the monthly instalment amount can be increased by the decision of the co-owners of the majority of co-ownership shares in order to repay the loan.
Even if all co-owners did not consent to the renovation of the building and loan application, all co-owners are required to contribute to the costs of maintaining and improving the property and repaying the loan to cover these costs in proportion to their co-ownership shares.
- Act partially recognises barriers mentioned above and provides an exception to the rule.
An exception to this is in the case of co-owners who together have a majority of co-ownership shares and decide to make improvements and they themselves bear the costs. Additionally, those costs can be covered from the joint reserve fund if they are not jeopardizing the regular maintenance needs of the building which are paid out of the reserve, and if these improvements do not go too much to the detriment of the other co-owners who did not vote in favour of the improvements. In cases when the improvement of the building and its parts is necessary, but it is exceeding the joint reserve funds, approval of the co-owners with the majority of the co-ownership shares in the building is sufficient.
- The co-owners determine mutual relations by written agreement (inter-ownership agreement).

Table 38: Split incentive issue on energy renovation of the building

The Energy Efficiency Act (NN 127/14,116/18)	
Link to reference	https://www.hera.hr/hr/docs/SPKP/ZoEU-2014.pdf
Level	State
Key aspects of legislation	This Act regulates the field of energy efficiency, adoption and the implementation of plans at local, regional and national level for improving energy efficiency, energy efficiency measures, energy efficiency obligations, obligations of the energy regulatory authority, transmission system operator, distribution system operator and energy market operators in connection with the transmission and/or transport and distribution of energy, obligations of energy distributors, energy suppliers, in particular energy service activities, determination of energy savings and consumer rights in the application of energy efficiency measures. Energy renovation of the residential buildings according to the national energy renovation programme is amongst the energy efficiency measures regulated within this act.
Barrier description	<p>According to Article 30 of the Act, the energy renovation of an apartment building is carried out in accordance with national programmes for the energy renovation of apartment buildings. Eligible beneficiaries of the energy renovation programme for multi-apartment buildings are the co-owners of these buildings unless otherwise agreed between co-owners as contracting authorities and service providers and energy renovation contractors.</p> <p>The decision to conclude an energy renovation contract for an apartment building is made by the co-owners of the building based on the majority vote of the co-owners of the building, which is calculated by co-ownership shares and by the number of co-owners of the property.</p> <p>Potential barrier related to this act and the split-incentive issue is that only the co-owners of the building, ie. apartment(s) owners, regardless whether they live in the building or not, can decide whether to conduct the energy renovation of the building. In cases when the co-owners are not living in the building and when they are leasing the apartment to tenants, it is possible they will be hesitant towards energy renovation activities or improvement of the buildings, as they do not benefit directly from it through reduced energy bills.</p>
Suggestion to overcome the barrier	Possible amendments to the law in order to obligate co-owners to participate in energy renovation of the building in special conditions eg. very old buildings, moisture, dilapidated facades etc., as it is currently in many buildings in Zagreb, hundred years old with low energy efficiency and high monthly expenses.
Good practice parts (if any)	Due to the mandatory energy labelling of the leased apartments and buildings, potential tenants can decide whether the energy efficiency level of the building is satisfactory for them and decide to move in. However, due to the shortage of apartments on the market, tenants are often left without much choice and energy labelling is more often than not overlooked and considered irrelevant.

Table 39: Split incentive issue on the investment in the energy efficiency measures

The Tenancy Act (NN 127/14,116/18)	
Link to reference	http://www.propisi.hr/print.php?id=731
Level	State
Key aspects of legislation	This Act regulates the rights and obligations related to the lease and use of an

The Tenancy Act (NN 127/14,116/18)

	apartment or part of an apartment.
Barrier description	<p>According to Article 30 of the Act, a tenant may not alter the apartment and common premises and appliances in the building without the prior written consent of the landlord. Additionally, a tenant is obliged to inform the landlord of the necessary repairs in the apartment and in the common parts of the building, which the landlord is obliged to bear.</p> <p>Potential barrier related to this aspect of the Tenancy Act and the RHC is the impossibility of the tenant to invest in energy efficiency improvements of the apartment and/or common areas in the building, which may have a significant impact on the apartment's energy bills (lower bills due to the increased energy efficiency).</p>
Suggestion to overcome the barrier	As the ownership and split-incentive issues are quite sensitive topics, discussing the possible solutions for these issues without thorough analysis can be considered conjecture. The potential suggestion is to analyse and introduce the possibility of altering parts of the apartment by the tenants if it can be proven that it is financially and economically viable for the tenants.
Good practice parts (if any)	The Act states obligatory use of the tenancy agreement between the landlord and the tenant and specifies the main clauses of which the agreement consists. By providing this general agreement framework, both sides are free to expand the clauses and adjust the agreement to their needs.

3.6.2 Barriers for RES HC Systems related to Other Legal Issues

Table 40: Issue related to the lack of incentives for the renewable heat generation

The Act on Renewable Energy Sources and High-efficiency Cogeneration (NN127/14,116/18)

Link to reference	https://www.hera.hr/hr/docs/SPKP/ZoOIEiVUK-2015.pdf
Level	State
Key aspects of legislation	<p>This Act regulates the planning and promoting production and consumption of electricity produced in production facilities using renewable energy sources and high-efficiency cogeneration, establishes incentive measures for electricity production using renewable energy sources and high-efficiency cogeneration, regulates the implementation of the system of incentives for electricity production from renewable energy sources and high-efficiency cogeneration, regulates the issues of construction of plants for production of electricity from renewable energy sources and high-efficiency cogeneration on state land, regulates keeping a register of renewable energy sources and high-efficiency cogeneration of projects, project developers and privileged producers of electricity from renewable energy sources and high-efficiency cogeneration, regulates the issue of international cooperation in the field of renewable energy sources and regulates other important issues for the use of renewable energy and high-efficiency cogeneration.</p> <p>Additionally, this Act regulates the issues of construction of a power plant and the acquisition of the status of eligible electricity producer for power plants that use any of the primary forms of renewable energy in the territory of the Republic of Croatia and/or high-efficiency cogeneration.</p>
Barrier description	Incentives for heat production using renewable energy sources are not covered by

The Act on Renewable Energy Sources and High-efficiency Cogeneration (NN127/14,116/18)

	this Act or any other Act of the Republic of Croatia, which may be beneficial for encouraging the use of the RES DH.
Suggestion to overcome the barrier	Include incentivisation of heat production from renewable energy sources in the regulatory framework.
Good practice parts (if any)	Incentives for electric energy production using renewable energy sources and high-efficiency cogeneration, which encouraged the increase and usage of renewables.

Table 41: Issue related to the lack of regulation for the mobile/container boilers

The Construction Act (NN 153/13,20/17,39/19,125/19)

Link to reference	https://www.zakon.hr/z/690/Zakon-o-gradnji
Level	State
Key aspects of legislation	This Act regulates the design, construction, use and maintenance of buildings and the implementation of administrative and other procedures to ensure the protection and space planning in accordance with the regulations governing spatial planning and to ensure the basic requirements for buildings and other conditions prescribed for buildings.
Barrier description	<p>Barrier identified for the RES HC systems within this Act is the lack of definition related to the construction and installation of the mobile/container boilers. Installation of the mobile boiler can be convenient in cases when the central boilers are and will remain underutilised. One example of that are large central boilers installed for the use in new residential areas, which often remain underutilised in the beginning and the usage of mobile/container boilers could be a solution for this issue.</p> <p>According to the Act, construction of a building can be started on the basis of a valid building permit, and it must be constructed in accordance with that permit if by this Act or regulation passed pursuant to this Act is not otherwise prescribed. Article 128 of the Act stipulates that construction of buildings without a building permit can be started only in the case of simple structures and works prescribed by the Ordinance on simple and other structures and works (NN 112/17, 34/18, 36/19 and 98/19).</p> <p>However, the mobile/container boiler is not specified in the aforementioned regulation and the Act remains unclear about the construction and the installation of the mobile/container boiler on the premises, thus leaving it in the grey area.</p>
Suggestion to overcome the barrier	Amend the regulation in order to include the mobile/container boilers, which should promote and increase usage of such units.

Table 42: Issue related to the co-funded activities within the Energy renovation programme

Energy renovation programme for family houses for the period 2014-2020 with a detailed plan for the period 2014 to 2016 and a detailed plan for the period 2019 to 2020

Link to reference	Public consultation: https://esavjetovanja.gov.hr/ECon/MainScreen?entityId=13221
Level	State
Key aspects of legislation	In order to address issues of increasing the energy efficiency of existing single-family homes, reduce energy consumption and consequently energy bills,

Energy renovation programme for family houses for the period 2014-2020 with a detailed plan for the period 2014 to 2016 and a detailed plan for the period 2019 to 2020

Barrier description	<p>Croatian government initiated Energy renovation programme of family houses for the period between 2014 and 2020. This programme is currently in the revision process and the public consultation for the revised parts has finished. This programme is aligned with the current operational programme and it provides framework conditions for co-financing of the integral energy renovation.</p> <p>Eligible co-funded activities will be a renovation of the building's envelope and installation of RES systems (solar thermal collectors, pellet boilers, pyrolytic boilers and geothermal heat pumps). In the updated version of the programme, installation of new, efficient natural gas boilers is not an eligible activity anymore due to the buildings' decarbonisation initiative, which is one of the barriers for the replacement of old boilers.</p> <p>Another barrier within this Programme is the integral implementation of each activity, ie partial restoration of individual parts of the envelope (eg thermal insulation of only one outer wall or installation of only one new window) is not allowed. This represents a barrier for the family house owners who already renovated or replaced part of the house elements, such as joinery.</p>
Suggestion to overcome the barrier	<p>Although the public consultation process has finished, these barriers could be surpassed by including the natural gas boilers and the partial renovation in the programme.</p>

Table 43: Measures to avoid, prevent or reduce the adverse effects of the noise generated by the HC devices

The Act on Noise Protection (NN 30/09, 55/13, 153/13, 41/16, 114/18)

Link to reference	<p>https://www.zakon.hr/z/125/Zakon-o-za%C5%A1titi-od-buke</p>
Level	<p>State</p>
Key aspects of legislation	<p>This Act establishes measures to avoid, prevent or reduce the adverse effects of the noise in the environment on people's health, particularly related to:</p> <ul style="list-style-type: none"> - determination of noise exposure and production of noise maps based on the environmental noise assessment method - providing publicly available information on environmental noise, - designing and publishing of action plans related to environmental noise. <p>This Act shall apply to the assessment and management of noise in human exposed environment, public parksprivate buildings, nature, close to schools, hospitals and other noise sensitive areas.</p>
Barrier description	<p>Barrier identified for the RES HC systems within this Act is the limitation regarding the "silent facade". Silent facade is a facade of a building which, during the particular noise source observation, has a Lden value (measured at 4.0 ± 0.2 m above the ground and 2 m in front of the porch) lower for more than 20 dB compared to the facade with the highest Lden value. Lden (day-evening-night noise indicator) is a noise indicator for total noise interference. This however limits the RES HC systems installation depending on their noise level.</p>
Suggestion to overcome the barrier	<p>These barriers can be surpassed with installation of quieter RES HC systems on the exterior facades, in order not to exceed limitation of more than 20 dB in comparison to the facade with highest Lden value. Fortunately, modern RES HC system do not provide such noise as it was the case with first HC systems.</p>

3.6.3 (Further) Good Practices of Legislation

Table 44: Good practices of legislation

Regulation on the contracting and implementation of energy services in the public sector (NN 11/15)	
Link to reference	https://narodne-novine.nn.hr/clanci/sluzbeni/2015_01_11_212.html
Level	State
Key aspects	This Regulation prescribes the manner of contracting the energy service for the public sector, the obligations of the energy service provider and contracting authority and the content of the energy performance contract, and the budgetary monitoring of the energy service for the public sector energy service contractor.
Description of good practice	Although the regulation aims at the public sector it sets a good starting point for the content of the energy performance contract, which can also be used for the purpose of providing energy service to the multi-apartment buildings and family houses.

Besides of above mentioned, incentive based on carbon credits, similar to Germany and Austria has been implementing in Croatia. Funds obtained from the sale of greenhouse gas emission (EU ETS scheme) are used to implement environmental programs and projects and energy efficiency programs and projects, mostly in household sector and public sector.

3.7 Bosnia and Herzegovina

Residential Buildings in Bosnia and Herzegovina

According to the Typology of Residential Buildings in Bosnia and Herzegovina (hereinafter: BIH) a number of buildings of single-family housing (97.63%) compared to collective housing (2.37%) is significantly higher. However, the number of dwelling units, difference in representation of single-family (66.47%) and collective (33.53%) housing is less expressed. According to the gross surface of residential space, single-family houses dominate (73.71%) whereas other types are present significantly lesser: apartment block (11.49%), multi-family house (8.77%), individual terraced houses (2.81%), attached apartment building in urban blocks (2.51%) and high-rise buildings (0.70%).¹¹

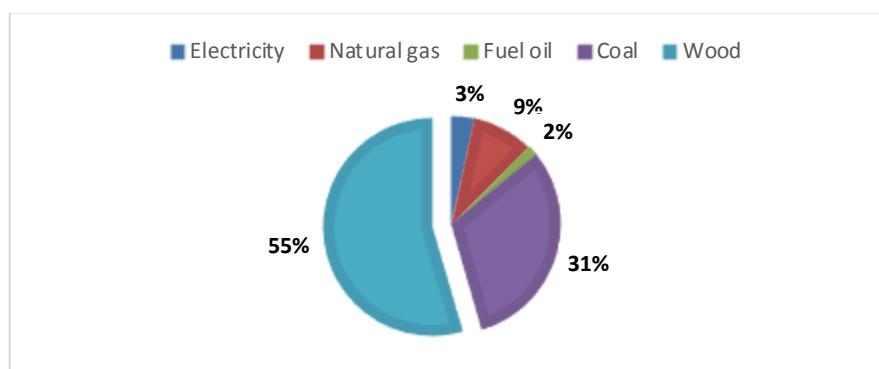


Figure 4: Type of fuel for private/central heating in BIH¹²

The average heated area of residential unit in BIH is 51.2 m² while the average size of housing units in which are cooled during the summer is 39.8 m².¹³ By reviewing statistical data, a great presence of wood as a fuel for the heating system, can be noticed, especially in family houses with the heating system that includes individual hand-firing solid-fuel furnaces, but also in a great number of categories of collective housing buildings (in which also dominate hand-firing systems). The two categories of buildings were using dominantly electric power for heating up spaces (terraced houses and multi-family buildings). A district heating system with coal, crude oil and natural gas, as a fuel for the heating system, is dominant in collective housing buildings. Statistical data show that natural gas is not a dominant fuel in any building category, because it is used only to heat 7% of apartments in BIH. Upon calculating parameters of district heating system, proportional representation of fuels was obtained statistically: crude oil 37.3%, natural gas 47.8% and coal 14.9%.¹⁴

¹¹ Typology of Residential Buildings in Bosnia and Herzegovina, Dragica Arnautović-Aksić, Mladen Burazor, Nijaz Delalić, Darija Gajić, Petar Gvero, Džana Kadrić, Milovan Kotur, Erdin Salihović, Darko Todorović, Nermina Zagora, Sarajevo 2016

¹² Building Renovation Strategy for BiH

¹³ Survey on Household Energy Consumption in BIH 2015, Agency for Statistics of Bosnia and Herzegovina

¹⁴ Typology of Residential Buildings in Bosnia and Herzegovina, Dragica Arnautović-Aksić, Mladen Burazor, Nijaz Delalić, Darija Gajić, Petar Gvero, Džana Kadrić, Milovan Kotur, Erdin Salihović, Darko Todorović, Nermina Zagora, Sarajevo 2016

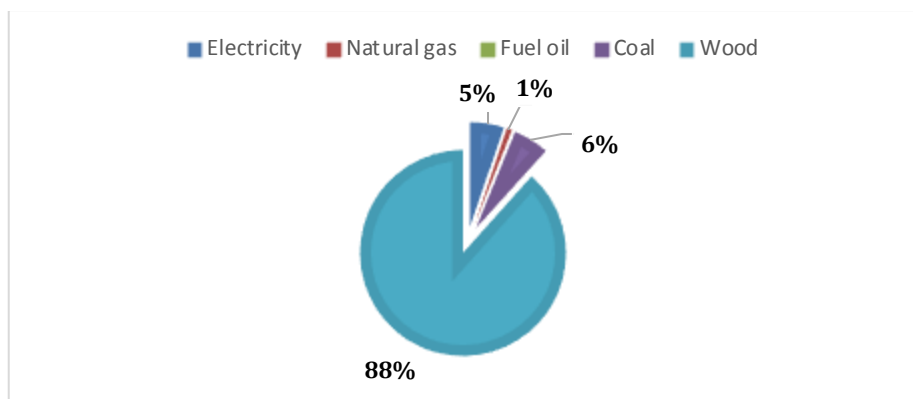


Figure 5: Type of fuel for room heating in BiH¹⁵

The heating system in Sarajevo Canton¹⁶

The systems of heat production and distribution in the Sarajevo Canton can be classified into three groups, based on the source and means of distribution:

- The District Heating System (DHS) managed by both public and private companies engaged in heat production and distribution.
- Central boiler rooms not owned by any of the distributors and which produce heat from natural gas, electricity, and liquid and solid fuels. A significant number of public institutions and buildings as well as commercial structures are thus supplied with heat. This group also includes a number of newly built residential buildings with major heat consumption.
- Individual stoves which use gas, coal, firewood, pellets and electricity. This group includes individual houses as well as residential buildings which are not connected to DHS operated by one of the distributors.

Gas is currently the primary fuel in the district heating system of Sarajevo Canton. As DHS mainly covers residential buildings, this heating system is mostly used in three urban municipalities (Novi Grad Sarajevo, Novo Sarajevo and Centar Sarajevo). In the overall energy consumption in Sarajevo Canton, gas accounts for 53.2% (with 29.7% used in the DHS), followed by firewood with 17.5%, coal lignite with 13.05%, brown coal with 7.7%, electricity with 6.0%, fuel oil with 1.6%, and pellets/briquettes with 0.95%.

3.7.1 Barriers for RES HC Systems related to “Split-Incentives”

Multi-tenant, multi-owner split incentives (MSI) is the main type of split incentives that affects the building sector in Bosnia and Herzegovina (hereinafter: BiH). The projects in the apartment buildings can only be realized if consensus is reached by all decision-making parties. Consequently, the energy

¹⁵ Building Renovation Strategy for BiH

¹⁶ Feasibility Study on Expanding and Improving the District Heating System in Sarajevo Canton, UNDP 2019

renovation of residential buildings as well as heating/cooling systems replacement in the Federation of Bosnia and Herzegovina (hereinafter: FBiH) is not directly regulated by a specific legal document, however, this area is partially mentioned in the laws that regulate condominium ownership and the manner of managing residential buildings. Also, the Law governing the implementation of energy efficiency measures does not offer specific solutions needed for major improvements in the housing sector.

Law on Real Rights of the FBiH¹⁷

The Law on Real Rights of the FBiH regulates the right of ownership of real estate, including condominium ownership in apartment buildings and the way of managing and maintaining common parts of buildings and installations. According to the Law, condominium owners are obliged to sign a contract on mutual relations of condominium owners and to choose a representative of condominium owners. The Law also defines the common parts of a building and the obligation to maintain it regularly through a manager appointed by the condominium owners.

Table 45: Law on Real Rights of the FBiH

Law on Real Rights of the FBiH	
Link to reference	https://advokat-prnjavorac.com/zakoni/Zakon_o_stvarnim_pravima_FBiH.pdf
Level	Entity
Key aspects of legislation	Real rights
Barrier description	According to the Law on Real Rights of the FBiH the multi-apartment buildings that are owned by the condominium owners the all measures on the common parts of building can only be realized if consensus is reached by all decision-making parties to take any measures.
Suggestion to overcome the barrier	In order to facilitate the implementation of the building renovation strategy and heating/cooling system improvement, it is necessary to revise and adopt the laws governing the management of buildings. The adoption of decisions by at least half the majority of approvals from the total number of condominium owners will enable further measures for the building's improvement.
Good practice parts (if any)	The consent of all owners is not required if owners who jointly have the majority of ownership parts decide to make improvements, and if they will bear the costs themselves or these costs can be covered from the reserve, without jeopardizing the possibility of regular maintenance being met from the common fund, provided that these improvements will not be to the detriment of the outvoted owners.
How could the good practice parts be strengthened (if so)	Enhancing the condominium owner's awareness of energy efficiency measures and the benefits of their implementation. By enhancing awareness and understanding of EE, information, education and promotion activities, it will enable citizen's willingness to invest in heating/cooling system replacement or other EE measures.

¹⁷ "Official Gazette of the FBiH," No. 66/13 and 100/13

Law on the maintenance of common parts of a building and building management of Canton Sarajevo¹⁸

Based on the aforementioned the Federal Law, the Cantonal Laws on the management of common parts of buildings were adopted and the conditions for performing the duties of building manager were prescribed. The Law defines the following features:

- common parts of the building, relations of condominium owners, management of common parts of the building, decision making of condominium owners
- obligations of public companies, City of Sarajevo, municipalities, owners of new buildings, investors and other persons in managing and maintaining common parts of the building,
- supervision over the application of this law and the penal provision.

According to the Law on the maintenance of common parts of a building and building management, maintenance of common parts of a building are performed by the company in charge of managing the building; however, the order of works that are to be performed as part of regular maintenance are determined by law and technical regulations, as well as by flat owners based on the need and condition of the building.

Table 46: Law on the maintenance of common parts of a building and building management of Canton Sarajevo

Law on the maintenance of common parts of a building and building management of Canton Sarajevo	
Link to reference	https://www.paragraf.ba/propisi/kantona-sarajevo/zakon-o-upravljanju-zajednickim-dijelovima-zgrade.html
Level	Cantonal
Key aspects of legislation	Condominium owners, maintenance of common parts of a building and building management
Barrier description	According to the Law on the maintenance of common parts of a building and building management of Canton Sarajevo the collective residential buildings that are owned by the condominium owners the all measures on the common parts of building can only be realized if consensus is reached by all decision-making parties to take any measures.
Suggestion to overcome the barrier	Redefining the legal and organizational framework for the management of common parts of collective buildings with condominium owners.
Good practice parts (if any)	The law foresees the minimum amount of monthly fee per 1m ² of useful floor space of the apartment, in order to maintain the building and its infrastructure. The minimum amount of the monthly fee is used to cover the costs of compensation to the representative of the condominium owners and the rest constitute a common reserve. These funds are not sufficient for larger thermal insulations of the building shell or for a replacement of old boilers towards RES Systems
How could the good practice parts be strengthened (if so)	Taking into account that the minimum amount of the monthly fee is not sufficient for a replacement of old boilers towards RES systems, it can be increased with the aim to energy efficiency measures implementation.

¹⁸ Official Gazette of Canton Sarajevo 03/12

3.7.2 Barriers for RES HC Systems related to Other Legal Issues

Law on Spatial Planning and Use of Land of the FBiH

The Law on Spatial Planning and Use of Land of the FBiH level partially transposed the provisions of Directive 2010/31/ EU on the energy performance of buildings. On the basis of the aforementioned Law, bylaws were adopted enabling the implementation of certain technical measures of energy efficiency in buildings. Bylaws adopted on the basis of the Law are:

- Rulebook on conditions for persons performing energy certification of buildings,¹⁹,
- Rulebook on energy certification of buildings²⁰,
- Rulebook on technical requirements for thermal protection of buildings and rational use of energy²¹,
- Rulebook on the technical properties of ventilation, partial air conditioning and air conditioning in buildings²²,
- Rulebook on the technical properties of heating and cooling systems of buildings²³,
- Rulebook on minimum requirements for the energy performance of buildings²⁴.

Table 47: Law on Spatial Planning and Use of Land of the FBiH

Law on Spatial Planning and Use of Land of the FBiH	
Link to reference	http://jpcfbih.ba/assets/files/zakon_o_prostornom_planiranju.pdf
Level	Entity
Key aspects of legislation	Spatial planning, use of land and energy efficiency of buildings
Barrier description	<p>FBiH was legally bound to adopt the FBiH Spatial Plan within two years from the date of entry into force of the Federation Law on Spatial Planning and Land Use, 29 i.e., in the first half of 2008. However, even though more than twelve years have passed since that deadline expired, to date the FBiH Spatial Plan has not been adopted.</p> <p>According to the Rulebooks of the Law, the existing buildings have to get energy certificates in the case renovations, rental or sale/purchase. Consequently, in any other case for existing buildings, there is not any obligation to use REC systems or replace old and not efficient HC systems.</p>
Suggestion to overcome the barrier	The Proposed FBiH Spatial Plan for the period from 2008 to 2028 should be adopted by the House of Peoples of the FBiH Parliament. As soon as the FBiH Spatial Plan is adopted, the drafting of spatial plans for special-purpose areas of

¹⁹ Official Gazette of FBiH, 28/10,59/11 and 29/12

²⁰ Official Gazette of FBiH, 50/10

²¹ Official Gazette of FBiH, 49/09

²² Official Gazette of FBiH, 49/09

²³ Official Gazette of FBiH, 49/09

²⁴ Official Gazette of FBiH, 81/19

Law on Spatial Planning and Use of Land of the FBiH

interest for FBiH should commence, reserving space for potential construction of energy capacities of interest for FBiH.

Good practice parts (if any)

In the FBiH every new building has to have an energy performance certificate when applying for the final permit. Energy performance certificates are the most visible aspect of the new regulation concerning the energy performance of the buildings of FBiH.

Law on Energy Efficiency of the FBiH²⁵

At the beginning of February 2017, the FBiH enacted the Law on Energy Efficiency, which had been in the process of adoption since 2013. The main purpose of the FBiH Energy Efficiency Law is to:

- (i) reduce negative impacts on the environment;
- (ii) ensure a more secure energy supply;
- (iii) meet the energy needs of end-consumers; and
- (iv) fulfil international obligations assumed by BiH in terms of reducing emissions of greenhouse gases through the use of energy efficiency measures.

The FBiH Energy Efficiency Law prescribes the following:

Indicative goals of FBiH in terms of energy efficiency improvements must be determined by the ActionPlan for Energy Efficiency. Furthermore, since FBiH is divided into Cantons, each Canton must enact a plan of energy efficiency which will further be used as a baseline for programmes of energy efficiency improvement enacted at the local government level. As for the measures for energy efficiency, the authorities and institutions in the public sector must:

- (i) perform annual analyses of energy consumption;
- (ii) perform energy audits and obtain the certificate on energy efficiency;
- (iii) implement the measures for energy efficiency and adopt the programmes for improvement of energy efficiency; and (iv) introduce and implement criteria for energy efficiency in performing public procurement procedures for goods and services.

Table 48: Law on Energy Efficiency of the FBiH

Law on Energy Efficiency of the FBiH

Link to reference	https://advokat-prnjavorac.com/zakoni/Zakon-o-energetskoj-efikasnosti-FBiH.pdf
Level	Entity
Key aspects of legislation	Energy efficiency

²⁵ Official Gazette of FBiH, 22/17

Law on Energy Efficiency of the FBiH

Barrier description	The Law on Energy Efficiency in the FBiH does not prescribe the obligation of condominium owners of buildings to implement energy efficiency measures. There was also no mention of a way of making a decision on undertaking works or financing the implementation of EE measures and changes in the way of heating in apartment buildings. Lack of by-laws for implementation of the Law on Energy Efficiency in FBiH.
Suggestion to overcome the barrier	In order to take advantage of activities in energy efficiency in buildings, it is necessary to issue by-laws as soon as possible and to do so as prescribed by the FBiH Law on Energy Efficiency.
Good practice parts (if any)	<ul style="list-style-type: none"> • The use of RES is considered as an energy efficiency measure and in this respect, legal and natural persons that use RES may benefit from funds intended for energy efficiency projects. • Advertisements for sale or rent of buildings or their parts must include an indicator of the energy characteristics of such space. For new buildings or change of intended use of old ones, investors must have energy efficiency certificates.
How could the good practice parts be strengthened (if so)	Enhancing public awareness of RES and EE. By enhancing awareness and understanding of EE, information, education and promotion activities, it will enable citizen's willingness to invest in heating/cooling system replacement or other EE measures.

Law on cooperatives of BiH²⁶

The Law on cooperatives of BiH defines the cooperative as a form of organization of voluntarily affiliated members - cooperatives to meet their common economic, social and cultural needs and aspirations, through shared ownership and democratically controlled business. Resources that the cooperative receives as subsidies of the state, NGOs and other resources can be used only for the material investments or for permanent working capital. The unions of cooperatives can be established in order to improve activities of cooperatives and protect their interests as well as other business and professional organizations.

Table 49: Law on cooperatives of BiH

Law on cooperatives of BiH	
Link to reference	http://extwprlegs1.fao.org/docs/pdf/bih146355.pdf
Level	State
Key aspects of legislation	Cooperatives
Barrier description	Key barriers for the development of energy cooperatives in Bosnia and Herzegovina are insufficient political support and possible resistance from the public.

²⁶ Official Gazzete of BiH, 18/03

Law on cooperatives of BiH

<p>Suggestion to overcome the barrier</p>	<p>Enhancing joining and forming energy cooperatives, in order to mitigate or eliminate both barriers in the future. The first step would be to identify and inform key potential stakeholders and future cooperative members as well as to select the technology that would be applicable.</p>
<p>Good practice parts (if any)</p>	<p>The first crowdfunding campaign of finance citizen energy projects in order to increase the number of similar initiatives in the future was conducted. The aim of this campaign is to invest in solar energy for the needs of the Public Institution for Placement of Persons with Mental Disabilities „Drin“, Fojnica. During the campaign, the citizens financed the renewable energy sources through group financing.</p>
<p>How could the good practice parts be strengthened (if so)</p>	<p>The opportunities for strengthening the good practice are international organizations in BiH that would be willing to support financially these kinds of initiatives.</p>

3.8 Slovenia

At present, Slovenia is facing a significant shortage of public rented housing, which makes access to suitable housing difficult. The problem of difficult access is particularly noticeable in young, socially disadvantaged and other marginalized groups. The 2017 data state the need for an additional 9,167 public housing rentals, 599 housing units, and 540 nursing homes. We are in a situation where:

- there is a lack of housing in locations where the demand for housing is highest;
- lack of rental housing, especially those that would allow more vulnerable groups to address the housing problem;
- the share of private housing is very high, which affects the physical condition of the housing stock;
- the building stock is aging - does not meet the energy and functional standards of modern society and increases the cost of living;
- there is no interest on the part of investors to invest in housing in the public interest;
- support for the development of the rental market in existing legislation is not sufficient, with a lack of balanced measures to put in place an efficient housing supply system;
- the mobility of the population is low - in terms of the willingness to change housing according to needs over a given period of life.

In order to ensure a balanced supply of suitable housing, it is also important to activate an existing but uninhabited housing stock and thus at least partially increase the size of the occupied housing stock. Statistics show that the number of dwellings in Slovenia exceeds the number of households. In Slovenia, about 20% of the housing stock is unoccupied, with the number of vacant apartments in Ljubljana increasing from 22,300 (17.8%) to 24,400 (19.0%) between 2011 and 2018. Some of the vacant apartments are unfit for occupancy or vacant due to inappropriate location or unsustainability, and many homeowners are reluctant to place their apartments on the rental market even because they fear that a tenant who does not pay rent and expenses or otherwise violate the tenancy agreement from the apartment.

As of January 1, 2018, there were 852,200 dwellings in Slovenia, of which 680,000 were inhabited, 152,200 were vacant and 20,000 were holiday homes. In 80.8% of the inhabited dwellings their owners were residents. There were 7.7% of rented apartments and 11.5% of occupied apartments.

Most dwellings are owned by employees (48%) and retirees (43%)

More than 80% of the occupied dwellings were homeowners. There were 7.7% of rented apartments and 11.5% of occupied apartments. User flats are flats in which none of the tenants owns, but at the same time the flat is not rented. The owners of such apartments may be relatives, friends or other natural persons. These may also be dwellings owned by deceased relatives and for which hereditary procedures and entries in official records have not yet been completed.

By far the most rented dwellings were in three- or multi-dwelling buildings (90%). The number of rental apartments is noticeably decreasing. Both the number of apartments rented on the free market (in 2011 there were 16,800 and in 2018 12,800), as well as the number of non-profit rented apartments (in 2011 there were 45,400 and in 2018 - 39,800). The number of flats owned by public sector entities decreased from 36,100 to 33,400 from 2011 to 2018.

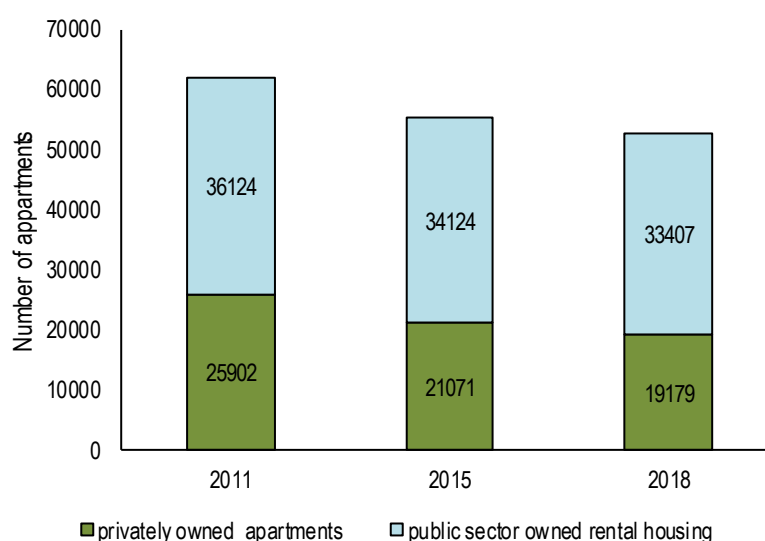


Figure 6: Rented apartments by type of owner

The vast majority of all dwellings (92%) are privately owned. The majority of dwellings were owned by employees (48%) and pensioners (43%). Public sector legal entities owned 5.4% of dwellings and the remainder (2.6%) was owned by private companies and other owners.

Only residents aged 65 and over lived in 115,900 apartments. In more than half of these apartments only one person lived. According to the previous censuses, the number of such dwellings is increasing: in 2011, there were 64,600, and in 2018, it was already 74,800.

There were no more than 172,200 uninhabited dwellings. This is an upper limit, since it is possible that certain dwellings are officially uninhabited but in fact inhabited, but for various reasons the occupants did not register. More than half of the uninhabited dwellings were either old (built before 1945) or without any element of basic infrastructure (toilets, bathrooms, heating, electricity, water supply) or used for holiday purposes.

Table 50: Dwellings by year of construction and occupancy

	Before 1946	1946-1970	1971-1990	1991-2010	After 2010
Total	171.843	201.945	314.054	140.263	24.076
Occupied	121.230	167.762	263.556	111.374	16.083
Uninhabited	50.613	34.183	50.498	28.889	7.993

Table 51: Occupied dwellings by type of building

	Occupied apartments	Average heated area [m ²]	Residents	Residents [%]	Private households
Total	680.005	84,8	1.992.810	100,0	798.474
Single-family house	369.094	106,2	1.246.729	62,6	457.026
Two-family house	40.343	81,0	114.426	5,7	44.889
Multi-family house	250.685	54,8	577.184	29,0	272.944

	Occupied apartments	Average heated area [m ²]	Residents	Residents [%]	Private households
Non-residential building	19.883	75,2	54.471	2,7	23.615

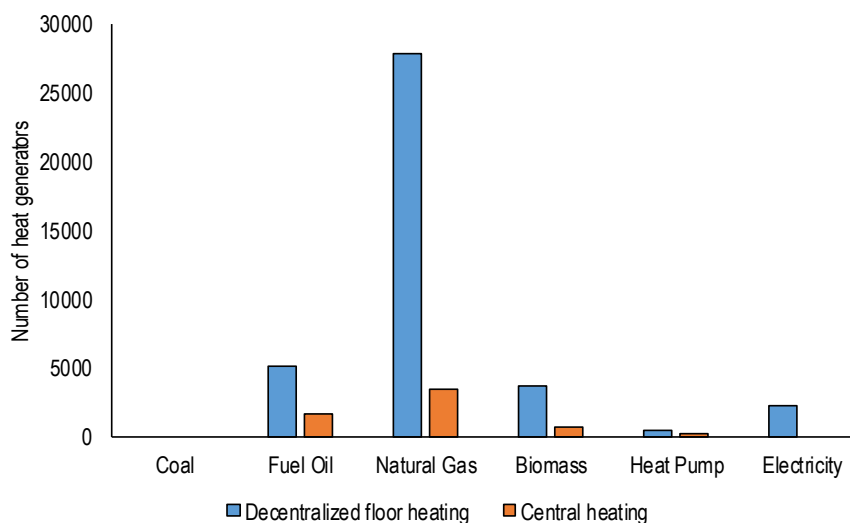


Figure 7: Structure of heat generators by energy source in multi-family buildings

Resolution on the National Housing Program 2015-2025

In December 2015, the *National Assembly extended the Resolution on the National Housing Program 2015 - 2025*²⁷ (NSP), which is one of the key documents for solving housing problems in the future in the formulation of an active housing policy. In designing the program, the guiding principle was the public interest in long-term quality housing for all residents. The NSP pays particular attention to young people, the elderly in the more vulnerable population groups.

The NSP is being stopped from constitutional provisions for the state to create opportunities for citizens to obtain suitable housing in a presented document that is waived in actual housing care situations. With it, the state creates that it has used the actual written choices of re-housing for all residents in the set general goals for actual residential care. It focuses specifically on the quality of life of vulnerable, best-performing populations, young people in the elderly. The document operates operationally within the framework of the Action Plan for a period of 5 years, which enables the implementation of the implementation by the institutions in the projects defined by the housing program.

The NSP thus retains the long-term goals announced by the general public with a broader level of consensus:

²⁷ <http://www.pisrs.si/Pis.web/pregledPredpisa?id=RESO114>

- the supply of suitable housing;
- easier access to housing;
- quality and functional housing;
- increased residential mobility of the population

The main provider of public housing policies is the *Housing Fund of the Republic of Slovenia*.

Youth and housing

In order to prepare and implement measures for improving the housing problem of young people, I. 2016 Working Group on Youth for Pilot Projects Established under Resolution on National Housing Program 2015-2025. The working group, led by the Ministry of the Environment and Spatial Planning, is composed of representatives of the SSRS, the Youth Office of the Republic of Slovenia, the Youth Council of Slovenia, the Student Organization of Slovenia, the Community of Municipalities of Slovenia, the Association of Municipalities of Slovenia and the Association of Urban Municipalities of Slovenia.

Currently there are two pilot projects within the Youth Working Group in implementation:

- Provision of affordable rental housing for young people, envisaged in the ReNSP Action Plan 2015-2025, i. "Youth Rentals". The USSR provides its own available rental apartments that are furnished and rented at a non-profit rental, and the project can also involve local communities with their apartments.
- The construction of the "Gerbichev Youth Community", which envisages 110 housing units.

Pilot projects will test the various forms of residence of young people from group rent to housing communities and cooperatives, and the positive results will - after analysis - be translated into housing legislation.

3.8.1 Barriers for RES HC Systems related to “Split-Incentives”

Housing management is defined in detail by the *Law of Property Code, Housing Act* and the *Rules on management of multiple dwellings*. For multi-proprietary real estate, the building is managed by a manager chosen by the condominium owners. A building must have a manager if it has more than two storey owners and more than 8 individual parts. The manager is determined by the condominium owners. The manager of a multifamily building is thus the proxy of the condominium owners, who, on their behalf (with their authority), performs and represents them in the operations related to the management of the multifamily building. The manager can be a legal or natural person who is registered to manage real estate. This can also be one of the condominium owners. The appointment of a manager is part of the regular management business, which means that more than half of the condominium owners require the appointment. If the manager is not designated, each floor owner may propose that he be appointed by the court in a non-civil procedure.

Regular management

Management is divided into regular management and operations that go beyond regular management. Regular management includes the operation, maintenance of the building, the appointment and dismissal of the manager and the supervisory board, and the rental of common parts. Regular management also includes the installation of additional dividers, meters and counters. Routine management means entering into operations that ensure the execution of the basic purpose of the building; if it is an apartment building then a residence; in the case of business, the pursuit of business activity. It is also about providing supplies and services for the common parts and for the

individual parts, if the building does not have individual connections, housekeeping, cleaning of common areas, fire protection, etc.

Routine management includes routine maintenance, which means ensuring and maintaining the living conditions in accordance with the regulations on construction of buildings. For maintenance, condominium owners must adopt a maintenance plan for a minimum of one year and a maximum of five years. The plan is prepared by the manager and must include the maintenance work that will be done and the way the money is provided by making payments to the reserve fund. All decisions regarding regular management require the consent of most condominium owners, who together hold more than half of the joint ownership. If the individual condominium owner disagrees with the adopted decisions, he is nevertheless obliged to follow the decisions and settle all obligations. Where condominium owners do not take the necessary decisions necessary to perform emergency maintenance, any owner may propose that decisions be taken by a court in a non-judicial proceeding and, if successful, the costs of the proceeding shall be borne by the condominium owners who voted against the proceeding. The same applies if the owners do not accept the maintenance plan.

The condominium owners are obliged to conclude a contract on mutual relations. It regulates the management and use of a multi-dwelling building. With this contract, they determine the costs and obligations that are borne by the condominium owners and the method of forming a reserve fund in case payments are below the legal limit. They also agree on the use and management of common parts, the purpose of the use of individual parts in condominium ownership and specific restrictions on the use of individual parts in condominium. They regulate the appearance of owners in legal transactions, the use of individual parts in condominium for special purposes and the protection of the building as a whole. They define special services that go beyond the operating framework of the building (such as security, concierge, etc.) and define the need for consent from the owners if the use of the dwelling is changed for other purposes. Last but not least, they determine the method of informing condominium owners about management matters.

Decision-making of condominium owners

Condominium owners can make decisions at the owners' meeting, at the repeated owners meeting or by signing a charter. They make decisions with more than 50%, more than 75% or with 100% unanimity.

With the agreement of more than 50% by joint ownership, the condominium owners decide on all activities of regular management. These are: operation, maintenance of the building, appointment and dismissal of the manager, appointment and dismissal of the supervisory board, rental of common parts, adoption of the maintenance plan, deciding on possible increased payments to the reserve fund, adoption of house rules, installation of additional measuring devices that allow indirect determining consumption.

More than 75% approval is required for the conclusion of a contract of mutual relations, for the performance of a permitted activity in a part of a dwelling, for the protection of a building and for the implementation of improvements for which a building permit is not required, and for the execution of construction works and improvements for the removal of architectural barriers, even when they need to obtain a building permit. The elimination of architectural barriers is to ensure unhindered access and use of the building (eg ramps, mechanical lifting devices, adjusting the joinery or construction work, which are determined by the rules governing the universal construction and use of facilities to ensure universal use of the building).

With the consent of all, an agreement is adopted on the determination or change of joint ownership, a change in the relationship between common and individual parts, restrictions on the use of individual parts (ban on the use of housing for other purposes), restrictions on the use of common

parts (prohibition on the use of common parts for other purposes), agreement on designation of special common parts and joint ownership of special common parts, use of the dwelling for other purposes, for all construction works and improvements for which a building permit is required, and for the appointment of a manager in buildings where this is not legally required.

The role of managers in the energy renovation of buildings

Managers of multifamily buildings play an important role both in raising awareness and informing condominium owners of the benefits of energy renovation, and in deciding whether to invest in individual energy efficiency measures and in deciding to undertake comprehensive energy remediation of a multifamily building. Managers have all the information that gives an overview of the energy consumption of each apartment building, and they also have the information to compare between apartment buildings. Therefore, managers are often the initiators of comprehensive energy renovation of multi-family buildings.

The role of the manager is also very important during the preparation phase for the investment (project preparation, contractors' bidding, decision support, call for tenders), as well as during the implementation of the investment. An appropriately qualified manager can promote a large number of comprehensive energy renovation of multi-dwelling buildings and, on the other hand, ensure the quality of the investments made.

Table 52: Housing Act in Slovenia

Housing Act	
Link to reference	http://www.pisrs.si/Pis.web/pregledPredpisa?id=ZAKO2008
Level	National
Key aspects of legislation	<p>The Housing Act regulates property relations in multifamily houses, management in multifamily houses, residential tenancy relations, and the privatization and privatization of socially-owned apartments and dwellings.</p> <p>The Housing Act defines the conditions for assistance in obtaining a dwelling, the manner of determining rents, the incentives for investing, maintaining and renting dwellings, and the powers and tasks of municipalities and the republic in the housing field.</p>
Barrier description	(A) fund may be insufficient, (B) a single owner can object to perform a new RHC installation
Suggestion to overcome the barrier	By using an ESCO.
Good practice parts	<ol style="list-style-type: none"> (1) The Housing Fund of the Republic of Slovenia will establish a public tenancy service, which will rent apartments on the market and rent them out as public. As an advantage for the owners that they would not have to rent - the public service will pay the rent to the owner, find a tenant, ensure that the apartment will be returned in its original form. The Ministry expects rough estimates , so that between 20,000 and 30,000 (out of 170,000 officially empty) apartments could be marketed. (2) The manager's term of office is limited to five years (current permanent contracts will be automatically converted into five-year contracts by law), and the owners will decide on the manager by a 50% majority. (3) Managers will need to open a separate fiduciary account for each building reserve fund, and they will only be able to manage the reserve fund together with the condominium owners. The costs will no longer be divided by the number of occupants of the dwelling, but by the area

Housing Act

of the dwellings.

- (4) The new housing law announces a change in non-profit rent to cost as one of the main measures, as it has been estimated to be too low for years. However, because it is so low, it does not allow housing funds to maintain a public rental housing fund, nor to invest in the construction of new public housing.

Table 53: Rules of management of multiple dwellings

Rules on management of multiple dwellings

Link to reference	http://www.pisrs.si/Pis.web/pregledPredpisa?id=PRAV8674
Level	National
Key aspects of legislation	This Rules regulate the legal form of condominium ownership, in particular the conditions, establishment, acquisition and termination of condominium ownership, the rights and obligations of condominium owners and condominium applicants, the condominium organiser and the manager, the management of the property, the owners' association, the exclusion of condominium owners, the provisional condominium ownership of the sole owner of the property and the condominium law out-of-court proceedings.
Barrier description	<p>Building managers are generally legally obliged to carry out maintenance measures and improvements to their buildings. This gives them the opportunity to use this obligation also for measures that serve to decarbonise buildings. However, a few legal changes must first be made for this.</p> <p>Measures to reduce energy consumption generally relate to minor improvement measures only. Managers are therefore not always obliged to implement them. A clearer formulation in the Housing Act would be desirable, so that such measures can also be carried out as maintenance work when there is no tendency to damage. This would make it easier to switch to more climate friendly heating systems in line with achieving the climate targets.</p>
Suggestion to overcome the barrier	The law should therefore extend the period during which the rent can be increased because of such maintenance and improvement work; this would mean that the increases would be correspondingly lower and would not impose an excessive burden on the tenants. As it is already the case in the Non-Profit Housing Act, the period should be 20 years and should be flexible.

3.8.2 Barriers for RES HC Systems related to Other Legal Issues

Table 54: Incentives for climate non-friendly technology

Public call for household incentives for gas condensing boilers

Link to reference	https://www.ekosklad.si/prebivalstvo/pridobite-spodbudo/seznam-spodbud/kondenzacijski-kotli/kondenzacijski-kotli-subvencija
Level	State
Key aspects of legislation	Incentives for climate non-friendly technology
Barrier description	The Eco Fund gives incentives for gas condensing boilers for households who connect to existing gas heating network. While directing investments in dense areas to centralized heating systems is advised, it is not advised to support

Public call for household incentives for gas condensing boilers

	investments for fuel energy sources. In 2019 this resulted in more than 1,500 of supported investments for gas heating networks and only 5 for district heating network.
Suggestion to overcome the barrier	Exclude incentives for gas condensing boilers.

Table 55: Incentives for households who deal with energy poverty

Incentives for the reduction of energy poverty

Link to reference	https://www.ekosklad.si/prebivalstvo/pridobite-spodbudo/zmanjsevanje-energetske-revsine
Level	State
Key aspects of legislation	100 % incentives for the reduction of energy poverty
Barrier description	The Eco Fund covers 100% share of investments for households who deal with energy poverty. The only thing left that households have to pay is tax. Due to this obstacles it can happen that 75% condominium agreement is not possible, since the households under the microscope cannot even afford to pay the tax.
Suggestion to overcome the barrier	Eco fund should cover 122% share of investments for households who deal with energy poverty.

Table 56: Issue related to the lack of regulation for the mobile/container boilers

Building Act

Link to reference	http://www.pisrs.si/Pis.web/pregledPredpisa?id=ZAKO7108
Level	State
Key aspects of legislation	This Act regulates the design, construction, use and maintenance of buildings and the implementation of administrative and other procedures to ensure the protection and space planning in accordance with the regulations governing spatial planning and to ensure the basic requirements for buildings and other conditions prescribed for buildings.
Barrier description	<p>Barrier identified for the RES HC systems within this Act is the lack of definition related to the construction and installation of the mobile/container boilers. Installation of the mobile boiler can be convenient in cases when the central boilers are and will remain underutilised. One example of that are large central boilers installed for the use in new residential areas, which often remain underutilised in the beginning and the usage of mobile/container boilers could be a solution for this issue.</p> <p>According to the Act, construction of a building can be started on the basis of a valid building permit, and it must be constructed in accordance with that permit if by this Act or regulation passed pursuant to this Act is not otherwise prescribed.</p> <p>The mobile/container boiler is not specified in the aforementioned regulation and the Act remains unclear about the construction and the installation of the mobile/container boiler on the premises, thus leaving it in the grey area.</p>
Suggestion to overcome the barrier	Amend the regulation in order to include the mobile/container boilers, which should promote and increase usage of such units.

3.8.3 (Further) Good Practices of Legislation

Those have already been published in Deliverable 2.1 “Policy framework conditions assessment and outlook for sustainable heating and cooling in selected European regions”.

3.9 Serbia

In urban areas, district heating systems have been developed. There are a total of 60 such systems in Serbia and all are owned by local governments. In the last few years, there is a trend that investors who build multi-family and mixed-use (residential-commercial) buildings invest in heating (and cooling) systems, where apartments and commercial premises are sold on the market while retaining their local heat source and engaged in energy production and supplies. In such cases, a license is issued by a local government. Unfortunately, the Law on Energy Efficiency, which prescribes the way energy entities operate, is not fully operational, and the problem is that although there is an Energy Inspectorate institution (since 2014), there are no named energy inspectors in reality.

The total number of households in Serbia is 2,420,000 with 180,000,000 m² of living space. Household heating distribution by technology and energy source is shown in Figure 9.

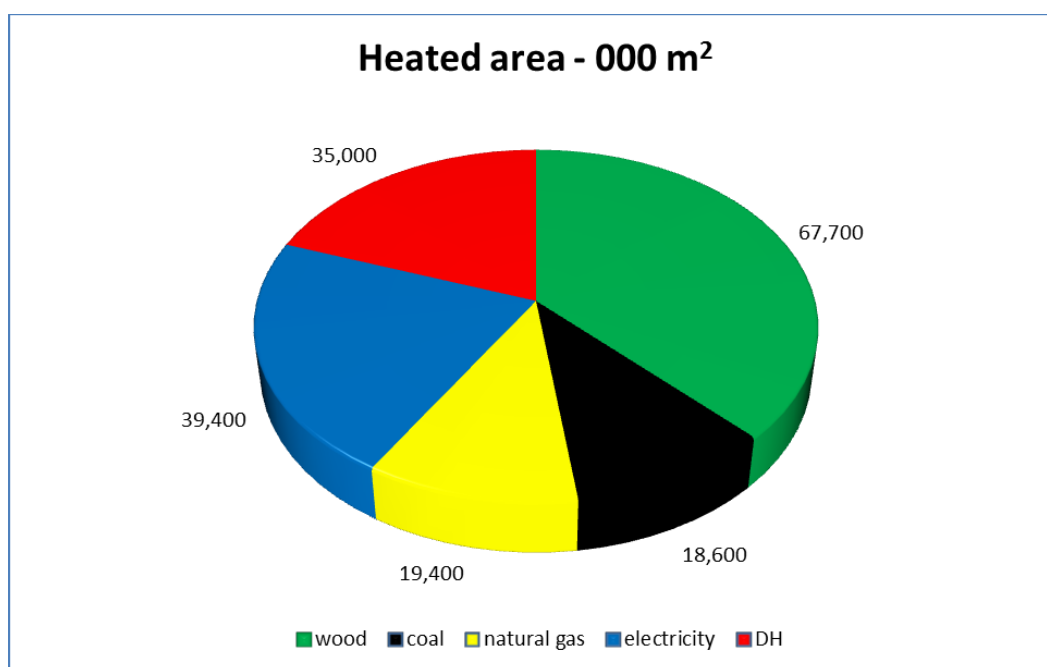


Figure 8: Distribution of heated surface depending on heating and fuel technology - Serbia

Source: (Survey conducted in February 2020 - DH Companies, Energy Managers from Serbian Cities, 2020)

The diagram shows that 119,000,000 m² of living space is heated using coal, electricity and firewood. The problem is that electricity is produced mainly from coal of very poor quality and low heat output. For this reason, thermal power plants in Serbia are designated as the largest pollutant emitters and the largest environmental pollutants. Another serious problem is that a significant proportion of household heat is obtained by burning firewood in old, inefficient fireboxes.

Analysing the situation in the town of Šabac, it can be concluded that out of a total of 21,000 households in the urban part of the city, 7,500 households are connected to district heating, 2,800 use natural gas in their own small boilers and 10,700 households use wood, coal and electricity. The number of households using heat pump technology and modern wood pellet boilers is negligible. There is no exact data, but it is estimated that the share of such households is about 1% to 2% of the total number of households.

There are 20,000 households in suburban areas and rural settlements. These households use firewood and agricultural residues in their own small fireplaces. Exact statistics on the way of heating and fuel used are not made on the territory of local communities, not even for Šabac, but it is estimated that about 10% of households, mainly in suburban settlements and settlements in the western part of the administrative territory of the city have individual centralized heating systems and most use individual fireboxes (furnaces and stoves). The use of heat pump technology, electricity and coal is negligible.

3.9.1 Barriers for RES DH Systems related to “Split-Incentives”

Citizens prefer ownership of buildings over leases

Considering the historical heritage and life habits, we find that the citizens of Šabac, as well as the citizens of Serbia, prefer ownership of residential space over renting. In this way, the legislation in Serbia was also established. Rental of apartments, in practice, exists in the urban part of the city and suburban settlements, while in rural settlements there is no example of leasing housing. The owners of the apartments are usually citizens and in very few cases the municipality appears as the owner of the apartment and these are examples of so-called social housing (beneficiaries are persons belonging to a group cared for by social welfare institutions). Social housing tenants only pay for utility costs. There is no example of one owner of a multi-apartment building from whom more other citizens rent apartments. The Tenancy Law and Housing Policy in Serbia details the situation in Serbia. Document Tenancy Law and Housing Policy in Serbia²⁸ details the situation in Serbia.

Social housing is specifically defined by the National Strategy on Social Housing²⁹ and the Law on Social Housing³⁰

In most of these apartments, the owners are also tenants, but part of the apartments are rented or even there are no tenants. It is interesting that citizens who live permanently in rural settlements or small neighbouring municipalities buy apartments and thus invest long-term ownership in apartments, but do not live in or rent the apartments.

There is no law that requires tenants to invest in building maintenance. Obligations of the owner of the apartment and the tenant of the apartment are based and contracted in everything according to the Obligation Relations Act³¹, as well as all other relations between the owner of the apartment and the tenant. In the standard form of the contract, the owner of the apartment assumes the obligation to maintain the apartment in proper condition and bear the costs of repairing the installations (heating, plumbing, electrical installations) as well as the investment costs in improving the quality of the building, including improving the energy performance of the building. On the other hand, the tenant is obliged to pay for utilities, including heating / cooling services, as well as minor repairs to appliances and installations resulting from the regular use of things. In case the tenant pays for the

²⁸ <http://www.toknowpress.net/ISBN/978-83-65020-15-4.pdf>

²⁹ <http://stanovanje.gov.rs/doc/propisi/Nacionalna%20strategija%20stanovanja.pdf>

³⁰

https://www.osobesainvaliditetom.rs/attachments/023_ZAKON%20o%20socijalnom%20stanovanju.pdf

³¹ https://www.paragraf.rs/propisi/zakon_o_obligacionim_odnosima.html

investment costs in improving the quality of the installations or energy performance of the building (for example, thermal insulation of the facade or roof, replacement of windows, replacement of the heating system, etc.) and in agreement with the owner, in that case the owner of the apartment is in the obligation to reimburse the costs.

Analysing the relationship between the owner-tenant and the division of the obligation, it is clear that the owners are in conflict of interest. Since they do not bear the cost of heating / cooling and electricity and have an obligation to invest, homeowners have no interest in investing in energy efficiency measures and in replacing existing heating / cooling systems with the introduction of modern renewable energy technologies. Even when there is a reason to replace a device, such as a malfunction that cannot be repaired, homeowners will sooner decide to purchase a new device that uses traditional technology, or fossil fuel, because such devices are less expensive than technologies that they use renewable energy. Conflicts of interest in homeowners motivate tenants to rent flats with lower energy consumption and lower heating / cooling costs, if possible.

Restrictions on the performance of the heating installation

Multi-family buildings in Šabac, which were built until 2005, are obligatory connected to district heating. These buildings are characterized by common vertical distribution pipelines and the measurement of the delivered thermal energy in the heat substation, as well as the fact that there is no centralized hot water heating in any building. All apartments have built-in electrical storage devices for sanitary water heating of 50 to 80 liters with electric water heaters with individual power of 2 kWe. In buildings built after 2010, the concept has been changed by having distribution pipelines installed in corridors outside the living space and calorimeter housed in the floor cabinet for each apartment. These buildings also do not provide centralized heating of sanitary water.

After 2005, a number of newly constructed buildings, up to 2,000 m² in size, were connected to the gas distribution network, and gas boilers were installed in each of these buildings for heating and hot water heating (no electric water heaters in these apartments).

Therefore, citizens were buying apartments in multi-family residential buildings connected either to district heating or to the gas distribution network. In all these cases, homeowners invest in heating installations and have an obligation to maintain the heating system, and tenants are required to pay heating costs, specifically the costs of natural gas and electricity, and tenants in apartments connected to district heating pay for heating service according to invoices from PUC Toplana-Šabac.

Restrictions on the way collective action is decided

Adoption of the Law on Housing and Maintenance of Buildings³² (2016) introduced the possibility and obligation to improve the energy performance of the building, as well as to finance the reconstruction of heating / cooling installations as well as subsidize these activities by local governments. In multi-family residential buildings, energy efficiency measures or replacement of old inefficient heating systems is implemented as a collective action under the aforementioned Law. The heating installation and the building facade are common parts of the building and in order to repair or replace inefficient technical systems, it is necessary to motivate a qualified majority of homeowners who vote on the implementation of the measure to be implemented. The required

³² https://www.paragraf.rs/propisi/zakon_o_stanovanju_i_odrzavanju_zgrada.html

number of votes is 2/3 for the measure to be accepted and to be binding on all owners of special parts of the building. The law does not prescribe an obligation to maintain or improve the energy performance of buildings, meaning that building owners are under no obligation to upgrade (energy) the properties of buildings or to install new more efficient technologies unless there has been a devastation of a building or technical installations of a nature that could endanger the health or property of tenants or citizens generally.

The importance of the Housing Act is that it recognizes the improvement of the energy performance of buildings and the energy rehabilitation of buildings as a public interest and provides for the possibility for local governments to subsidize the implementation of measures and reconstruction of the HC system, as well as the transition to renewable energy sources in privately owned buildings. Local governments need to establish transparent criteria for the award of subsidies.

Table 57: Good practice example Housing and Maintenance of Buildings Act

Housing and Building Maintenance Act	
Link to reference	https://www.paragraf.rs/propisi/zakon_o_stanovanju_i_odrzavanju_zgrada.html
Level	State
Key aspects of legislation	<p>The law provides that homeowners should set up residential communities in multi-family buildings. Housing communities are legal entities that jointly decide on issues of interest to all members of the community, such as maintaining buildings, improving the energy performance of buildings and reconstructing common installations and connections to infrastructure utility systems.</p> <p>Each residential community hires a professional manager or selects a homeowner within the residential community to perform the manager's job. The manager represents the building, proposes and organizes the implementation of measures related to the maintenance of the building. In Šabac, 380 residential communities were registered.</p> <p>Housing communities may apply for incentives to invest in upgrading the energy performance of buildings or reconstructing installations to incorporate energy efficient devices and renewable energy technologies. The decision to invest in a residential community is made by a 2/3 majority vote of the owners of special parts of the building (apartments, garages).</p>
Barrier description	<p>This law only allows for the possibility but does not prescribe the obligation to improve the energy performance of buildings or to introduce renewable energy during the reconstruction of installations.</p> <p>In addition, this law does not take into account the opinion of tenants who are motivated to support measures that contribute to reducing heating / cooling costs, unlike landlords who are not motivated to invest in energy efficiency and more efficient technologies.</p> <p>Energy efficiency measures to improve the energy performance of buildings refer to the common parts of the building but not to the parts of installations in apartments such as the installation of heating in each apartment individually. As a consequence, the housing community cannot vote on the installation of thermostatic valves and cost allocators on apartment radiators, therefore that is the choice of each homeowner individually. In order to be technically sustainable the distribution of heat consumption requires the installation of thermostatic valves on 65% of the heated surface and the measurement and control of energy consumption.</p>
Suggestion to overcome	To anticipate amendments:

Housing and Building Maintenance Act

<p>the barrier</p>	<ul style="list-style-type: none"> - which will set timeframes in which all residential communities are required to implement energy efficiency measures in order to achieve energy savings and reduce primary energy consumption through the introduction of efficient renewable energy technologies. - which would qualify majority to be ½ of the owners of the special parts of the building instead of 2/3 of the votes. - which will allow tenants to vote and participate in financing measures to improve the energy performance of the building in which they rent the apartment.
<p>Good practice parts</p>	<p>Since 2010, the Šabac City Administration has launched a thermal insulation project as a collective action of citizens interested in participating in the project. Citizens organized into residential communities within one building were offered subsidies for energy efficiency measures. Energy efficiency measures included the thermal insulation of the building and were subsidized with 50% of the city's funds and the homeowners paying the remaining 50% of the investment costs. Forty four residential communities with about 1,500 apartments have passed through this project, ie close to 100,000 m2 of living space has been thermally insulated. This project was implemented at the level of local self-government and lasted until the end of 2018.</p> <p>However, the project was not supported by the Republic of Serbia, so in 2019 the funding model was changed. Under the new financing model, local energy company "Toplana-Šabac" has taken on the role of ESCO and provided funding for the project. The proceeds are secured by a loan from the EBRD with a repayment period of 12 years. For 12 years, homeowners will repay the investment in the same monthly annuities with money from achieved energy savings. The measurements of thermal energy consumption showed that the applied energy efficiency measures provide savings of 30% - 35% (the measures did not include replacement of windows and reconstruction of heating installations), but also that the package of thermal insulation measures and installation of thermostatic valves and dividers provides savings of up to 45%.</p>
<p>How could the good practice parts be strengthened</p>	<p>The co-financing model can be improved by introducing a local budget fund for energy efficiency and renewable energy. The local budget fund could finance part of the cost of investing in energy efficiency and reconstruction of existing HC installations such as fees, technical documentation, financing costs. By introducing a local budget fund and creating conditions for ESCO, market and incentive mechanisms are combined and optimized to help accelerate the implementation of projects, to improve the energy performance of buildings and replace inefficient traditional technologies with new, more efficient renewable energy technologies.</p>

Table 58: Good practice example Act on efficient use of energy

Act on efficient use of energy

<p>Link to reference</p>	<p>https://www.paragraf.rs/propisi/zakon_o_efikasnom_korisecnju_energije.html</p>
<p>Level</p>	<p>State</p>
<p>Key aspects of legislation</p>	<p>Local governments are committed to providing incentives for the use of renewable energy in district heating and local centralized heating / cooling systems (biomass, solar, geothermal energy).</p>

Act on efficient use of energy

Barrier description	Local governments are not supported by the state administration, they have not recognized the need for promotion of renewable energy and the Law does not set clear criteria for who can be, and under what conditions the beneficiary of the subsidy. Although the Law was passed in 2013, there is no example that it was implemented in local governments in Serbia.
Suggestion to overcome the barrier	Incentives should be provided for investment in new RHC systems as well as for the reconstruction of existing inefficient HC systems. Local governments are not motivated to provide subsidies due to lack of money in local budgets. The barrier can be overcome by reimbursement of funds by the state administration towards local budgets for projects implemented. The funds would be refunded after the investment cost and achieved effects statement was delivered.
Good practice parts	In one of the suburban settlements in the northern part of Šabac, the boiler room was reconstructed, which previously had installed heating oil boilers. The project involved the installation of a 500 kW boiler that burns wood chips. Two public buildings are heated from the boiler room and the operation of the boiler room is managed by PUC "Toplana-Šabac". Based on the decision of the city council, heating costs are subsidized in such a way that users pay only for fuel (wood chips). The cost of the service excludes the cost of fuel procurement and all other operating expenses as well as depreciation costs. Heating costs have been reduced to 25%.
How could the good practice parts be strengthened	Companies in the city area that are identified as environmental pollutants pay taxes to the local budget in proportion to the negative environmental impact (the "polluter pays" tax collection model). This environmental tax could be diverted to subsidize fossil fuel replacement with renewable energy projects. To do this, it is necessary to amend the acts at the state level concerning the use of funds collected from environmental taxes.

Table 59: Law on Social Housing

Social housing act

Link to reference	https://www.osobesainvaliditetom.rs/attachments/023_ZAKON%20o%20socijalnom%20stanovanju.pdf
Level	State
Key aspects of legislation	The law supports the construction of social housing in accordance with the National Social Housing Strategy for the needs of vulnerable and marginalized groups. Support funds are allocated at the state and local level. Different ways of financing the construction of apartments by public funds, loans with incentives to be provided by the state administration and local administration, as well as public private partnership in the field of housing are recommended.
Barrier description	The law provides for financial support for housing construction for social housing purposes, but without firm commitments and a clearly defined way of financing.
Suggestion to overcome the barrier	The barrier can be overcome by introducing an obligation to reimburse funds to local budgets for projects implemented from the state budget. Given that public funding is fundamental, it is also necessary to introduce the obligation that energy systems must use fully renewable energy sources or that the share of renewable energy be prevalent.

3.9.2 Barriers for RES HC Systems related to Other Legal Issues

Challenges within the local energy sector

According to the Law on Energy³³, regulatory role over energy activities, the production, distribution and supply of heat (and cooling) is assigned to local governments and the regulatory role over the production and distribution of electricity and natural gas is assigned to the Agency of the Energy of the Republic of Serbia³⁴ (AERS). However, in addition to the regulatory role, local government units are the founders of public energy utilities that manage district heating, and in addition own public energy-supplied buildings. These three roles lead to conflicts of interest and often local governments have no interest in investing in new technologies and in the application of renewable energy, as these technologies are more expensive than traditional technologies using fossil fuels (use of natural gas).

Regulatory body in charge of thermal energy (cooling), when setting the price of a heating service, often gives priority to a lower cost of thermal energy over the operating costs of an energy entity. In that case, the energy company's market operations may be jeopardized or the energy company may not provide sufficient revenues sufficient for developing and modernization of the heating system.

Table 60: Challenges in local energy

Act on public properties	
Link to reference	https://www.paragraf.rs/propisi/zakon_o_javnoj_svojini.html
Level	State
Key aspects of legislation	Local governments are the founders and owners of local energy companies involved in the production, distribution and supply of heating energy (and cooling). Ownership of distribution networks and energy facilities belongs to local governments.
Barrier description	<p>Too complicated procedure for the realization of projects related to the development of district heating and cooling networks. Local governments have conflict of interest as owners of public buildings and as users of heating services and as regulators of energy heating and cooling activities.</p> <p>Financing the development of the heating and cooling system should be the responsibility of the local administration.</p>
Suggestion to overcome the barrier	The law should provide for an independent regulatory body for local energy affairs that will not fall under the jurisdiction of the local administration, and local energy companies should take ownership of energy facilities and infrastructure and plan the development of energy systems while respecting the interest and strategic goals of local government.

³³ https://www.paragraf.rs/propisi/zakon_o_energetici.html

³⁴ <https://www.aers.rs/>

Table 61: Law on Energy Efficiency

Act on efficient use of energy	
Link to reference	https://www.paragraf.rs/propisi/zakon_o_efikasnom_koriscentju_energije.html
Level	State
Key aspects of legislation	<p>This law recognizes the role of municipal energy managers and energy managers in energy companies tasked with monitoring and analysing energy consumption. In addition, it is the responsibility of energy managers to propose energy efficiency measures, participate in the development of energy efficiency programs and the development of action plans. In energy companies, energy managers participate in the development of the company's business program. The law provides for the position of energy manager only in municipalities with more than 20,000 residents.</p> <p>One of the key tasks for energy managers is to prepare projects for the replacement of traditional heating and cooling systems with new, more efficient devices and systems that use renewable energy. The reports that the energy manager draws up include energy efficiency indicators, financial cost-benefit analysis and a CO_{2eq} reduction calculation.</p>
Barrier description	The law does not clearly define the position of energy manager, which is why they are not able to perform their tasks in full capacity. The municipal energy manager is responsible only for public buildings as well as for utility systems including district heating and cooling, thus they could indirectly monitor and plan the development of district heating and cooling systems, but without directly affecting the activities of citizens who wish to connect their buildings to district heating network and without directly affecting collective action.
Suggestion to overcome the barrier	Public sector costs for energy are about 7% of all budgetary costs and utilities, where the largest item is heating costs, exceed 10% of the family budget. Energy cost management should be given priority, which means that the position of energy manager within the local administration should be given importance through the obligation of setting up an energy management department within the local government. The Department of Energy Management is a good solution because energy efficiency measures are multidisciplinary and in that case have the greatest effects.
Good practice parts	<p>From 2016, Šabac introduced the position of energy manager. By the end of 2019, there were 100 municipal energy managers in Serbia out of a total of 285 in the energy sector. It is estimated that about 600 energy managers are needed in Serbia.</p> <p>Municipal energy managers collect data on energy consumption and archive data using the national ISEM service.</p>
How could the good practice parts be strengthened	Energy managers can carry out their tasks at full capacity only with the support of the decision makers, which means that direct communication with the decision makers (the mayor) and the city council is required.

Law on Planning and Construction³⁵ recognizes the importance of energy efficiency and increasing the share of renewable energy in total energy consumption. The focus of the law is to improve the energy performance of buildings and to reconstruct and construct new more efficient technical systems. This matter has been elaborated in more detail through two by-laws: the Rulebook on the Energy Efficiency of Buildings³⁶ and the Rulebook on the Conditions, Content and Manner of Issuing the Certificate of Energy Performance of Buildings³⁷.

Table 62: Energy performance of buildings

Rulebook on energy efficiency of buildings	
Link to reference	https://www.paragraf.rs/propisi/pravilnik_o_energetskoj_efikasnosti_zgrada.html
Level	State
Key aspects of legislation	The Rulebook prescribes the methodology for calculating the required final energy and primary energy, the method of classifying buildings by energy class.
Barrier description	<p>All buildings built after 11/20/2016 must be in the energy class “C”, i.e. thermal energy consumption must be less than 60 kWh/m²a for new buildings and 70 kWh/m²a for existing buildings. This criterion is valid for multi-dwelling buildings and for single-dwelling buildings the criterion is 65 kWh/m²a for new buildings or 75 kWh/m²a. The classification of buildings is done solely according to the calculated heat losses through the facade of the building. The Rulebook sets clear energy efficiency criteria for both technical systems and devices.</p> <p>However, in order to obtain a permit for reconstruction or energy rehabilitation, it is necessary to implement energy efficiency measures that will improve the energy performance of buildings for one class to more.</p> <p>The methodology for classification by energy classes does not take into account:</p> <ul style="list-style-type: none"> - the energy needed to heat sanitary water, cooling or electricity, - reduction of energy consumption does not take into account the replacement of the device with a more efficient device or the replacement of the use of fossil fuels with renewable energy. <p>Therefore, the Rulebook does not motivate homeowners and buildings owners to invest in renewable energy and more efficient building and cooling technologies. On the other hand, exclusion from the budget, improvement of technical systems could make it impossible to improve the energy performance of a building by one class.</p>
Suggestion to overcome the barrier	Effects of using more efficient technologies and motivating investors to use more efficient technologies with a higher share of renewable energy should be included in the methodology of energy consumption calculation and

³⁵ https://www.paragraf.rs/propisi/zakon_o_planiranju_i_izgradnji.html

³⁶ https://www.paragraf.rs/propisi/pravilnik_o_energetskoj_efikasnosti_zgrada.html

³⁷

https://www.paragraf.rs/propisi/pravilnik_o_uslovima_sadrzini_i_nacinu_izdavanja_sertifikata_o_energetskim_svojstvima_zgrada.html

Consumer protection law³⁸ should be mentioned because it has an impact on the way heating and cooling systems are used, especially in multi-family residential buildings. The challenge this law carries is that it does not recognize the efficient use of energy as a public interest. This law places the interests of the individual above the interests of the community and makes it difficult to organize initiatives aimed at implementing collective action regarding the implementation of energy efficiency measures and the substitution of fossil fuels for renewable energy. Energy services are too complex to receive the same treatment as consumer goods. Also, energy companies are complex systems and the challenge that is difficult to overcome is identifying an energy company with trade. In Serbia, the Consumer Protection Act is a serious barrier to the development of district heating and cooling and the implementation of other legislation that does not provide energy services. Extremely bad examples are court rulings that allow homeowners not to pay for a heating service because they do not want to use that service without the technical conditions for these owners' apartments to be excluded from common heating installations.

3.9.3 Good Practices of Legislation

The Regulation on the periodic examination of the heating system³⁹ prescribes the scope of examination, the manner and time limits between the two inspections, as well as the manner of reporting the performed inspection. Two criteria were set in relation to the period between the two examinations:

- thermal power of the boiler unit in the heating installation,
- type of fuel (biomass, fossil fuels - liquid, gaseous, solid).

Inspection reports, energy efficiency indicators and pollutant emission information will allow boiler owners to make an informed decision about replacing old, inefficient appliances with new and more efficient ones, and will motivate them to use renewable energy.

For the same reason, the Regulation on the periodic examination of air-conditioning systems⁴⁰ was adopted. Cooling systems exceeding 12 kW are monitored once every 5 years. The Inspection report, in addition to the energy efficiency indicators and measured operating parameters, contains recommendations for improving the efficiency of the air-conditioning system.

³⁸ https://www.paragraf.rs/propisi/zakon_o_zastiti_potrosaca.html

³⁹

https://www.paragraf.rs/propisi/pravilnik_o_kontroli_sistema_za_grejanje_i_o_blizim_uslovima_koje_moraju_da_ispunjavaju_ovlascena_pravna_lica_za_kontrolu_sistema_za_grejanje.html

⁴⁰ <http://www.pravno-informacioni-sistem.rs/SlGlasnikPortal/eli/rep/sgrs/ministarstva/pravilnik/2016/82/1/reg>

An example of good practice is the City of Šabac's Energy Policy⁴¹. This document was adopted by the Šabac City Assembly in June 2018. The main goals set out in this document are:

- Efficient use of energy and fuels,
- Implementation of sustainable renewable energy technologies,
- Support to local economy development,
- Environmental protection,
- Improvement of quality of life of Šabac citizens,
- Energy independence.

For the time being, Šabac is the only city in Serbia that has adopted such a document, which provides a framework for a strategy for local energy development and an orientation towards increasing the share of renewable energy sources. One of the measures that has been in force since January 2020, relying on the aforementioned document, is the amendment of the Rulebook on determining the amount of compensation for connection to the district heating network⁴², which exempts payment of fees for all owners of buildings less than 50 m away from the district network heating. This was a way to motivate as many citizens as possible to connect their buildings to the district heating network and to reduce the number of individual fireboxes burning fossil fuels.

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<http://sabac.rs/images/pages/SlList/%D0%A1%D0%BB.%D0%BB%D0%B8%D1%81%D1%82%20%D0%B1%D1%80.12%20%D0%BE%D0%B4%2006.%20%D1%98%D1%83%D0%BD%D0%B0%202018.pdf>

42 <https://toplanasabac.rs/wp-content/uploads/2020/01/Pravilnik-o-odre%C4%91ivanju-visine-naknade-za-priklju%C4%8Dak-na-toplovod.pdf>

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