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MEASURES TO IMPROVE ENERGY EFFICIENCY IN THE WESTERN BALKAN COUNTRIES

Sarajevo, October 2018 Amar Jajetović

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LIST OF ABBREVIATIONS

B&H - Bosnia and Herzegovina

BEEP - Bosnia and Herzegovina Energy Efficiency Project

EBRD - European Bank for Reconstruction and Development

EC- European Commission

EE - Energy efficiency

EEAP - Energy efficiency action plan

ESCO - Energy Service Company

EU - European Union

EU ETS - European Union Emissions Trading System

FB&H - Federation of Bosnia and Herzegovina

GDP - Gross Domestic Product

GIZ - German Society for International Cooperation

IEA - International Energy Agency

IFC - International Finance Corporation

KAEE - Kosovo Agency for Energy Efficiency

KEEP - Kosovo Energy Efficiency Project

KfW - German Development Fund

KrK- Kreditimi Rural i Kosoves Bank

LPG - Liquefied Petroleum Gas

MEEIS - Network for Energy Efficiency in Industry of Serbia

MEEP - Montenegro Energy Efficiency Project

NEEAP - National Energy Efficiency Action Plan

NPEEPB - National Program for Energy Efficiency in Public Buildings

OECD - Organization for Economic Co-operation and Development

REELIF - Residential Energy Efficiency for Low Income Households

RS - Republika Srpska

SEEP - Serbia Energy Efficiency Project

UK - United Kingdom

UNDP - United Nations Development Programme

UNECE - United Nations Economic Commission for Europe

US - Unites States

USAID - United States Agency for International Development

VAT - Value-added Tax

WB - Western Balkan

INTRODUCTION

Energy efficiency (hereinafter EE) becoming an issue that has to be tackled systematically dates back to the 1970s and the United States (hereinafter US) when the oil embargo forced a different perspective to be taken in regard to energy consumption (Solmes, 2009, p. 9). In Europe it started a bit later but the general reason was the fact that the European countries realized that being more efficient with energy spending equals having more available energy without increasing the actual supply, thus saving money as well. This was especially important in the 1970s oil crisis. Ultimately, different countries tried and are still trying different techniques of improving efficiency of their respective energy sectors. Even today, a perfect set of measures has not been found and every country goes through trial-and-error in the process of becoming energy efficient.

Though, the European Union (hereinafter EU) has adopted a somewhat standardized approach to the implementation of EE measures and improvement of the energy sector in general. Through publication of the National Energy Efficiency Action Plans (hereinafter NEEAP), each EU member has to outline specific measures it plans to implement towards achieving set goals in regard to energy saving (European Commission (hereinafter EC), 2018). The long-term goals are set by the EU, while the short-term goals are defined by individual countries. Even though they are not in the EU, the Western Balkan (hereinafter WB) countries (Bosnia and Herzegovina (hereinafter B&H), Serbia, Montenegro, Macedonia, Albania and Kosovo) are also part of the NEEAP program through the Energy Community. Even though they are not legally binded to publish the NEEAPs, the WB countries can suffer sanctions if agreed terms are not met. The NEEAPs are a key part of EE reform and provide great insights in pressing EE issues and what each country plans to do in order to solve them. With recent publishing of B&H's first NEEAP, all WB countries have detailed plans about near future. Analysis of the NEEAPs provides the best insight into a country's state of energy efficiency due to a lack of independent data. Apart from that, analysis of legal, regulatory and institutional framework is the best indicator of the potential a country has in terms of reforming the energy sector and the EE within it since support from the state is vital factor in regard to EE measures implementation. Also, identifying measures already implemented or measures that are currently undergoing implementation and investigation of effects of those measures is a good tool for proposing future solutions. For example, the success B&H had with the renovation of residential buildings in Tuzla-Doboj canton shows that undertaking similar projects is a way forward while the approach to strengthening institutional framework through establishing non-functional agencies and government bodies is something that has to be avoided in all WB countries.

The WB countries being developing countries which are still not close to the EU accession have an underdeveloped energy sector as a whole. These countries show high levels of energy intensity and very high energy-saving potential across all sectors (Johansen, Busz,

Plecas, Islami, Petrović & Myers, 2010, p. 1). Old infrastructure that was built during the communist-era when little to no regard was given to EE coupled with indifference of the WB countries' governments and unwillingness to reform the energy sector are two main issues for the current state of EE. With the situation as it is, specific measures have to be implemented that would launch the energy sector reform which is a pressing issue due to the fact that the WB countries' energy spending will increase significantly in the years to come as they become more developed. Since all six WB countries share a similar history and deal with problems that are alike, a similar strategy can be implemented for all, with some variations based on current development of EE (e.g. Serbia more developed than B&H). EE measures are generally divided into four main segments. Those are improvements in the public sector, residential sector, transport sector and industrial sector.

Public sector is all government buildings as well as all schools and hospital that are run by the state. Public sector due to higher revenues and not being a profit-seeking body has more resources to implement EE measures. It should always act as an example to other sectors in regard to EE.

Residential sector encompasses all buildings where people live, either private houses or apartment buildings. Most of residential buildings in the WB were built in the pre-war period and are very inefficient. With the transition to capitalism, the residential sector transitioned from public to state ownership and thus EE responsibilities fell to homeowners who struggle with satisfying basic life needs and are finding EE measures not something of priority. This makes the residential sector a very challenging task in regard to its reconstruction and becoming more energy efficient. Apart from the reconstruction of existing buildings, important part of residential sector EE is setting the regulations that should be followed in order for them to be energy efficient from the start and to avoid the same issues as existing residential buildings have.

Furthermore, when transport sector is looked at, it is a specific case due to the fact that in order to make it efficient, both the government and the general population have to act. It also suffers from being reliant on infrastructural projects that are not directly connected to energy. EE in the transport sector of all WB countries would improve dramatically if railway networks were rebuilt or if public transport companies started to be managed properly. Also, renewing private vehicles fleet is a crucial step that is unlikely to happen unless standard of living increases. All of this puts a lot of uncertainty in the transport sector and measures implemented can only help so much until larger projects are implemented.

Lastly, industrial sector is always very challenging due to corporate interest being in direct conflict with EE, especially in the WB countries where only quick and short-term solutions are sought. It is difficult to make production companies invest in EE measures by themselves, thus measures that set mandatory energy savings need to be implemented. The fact that the biggest manufacturers in the WB countries are still state-owned makes EE

issues even more difficult to overcome. Even though all four sectors act independently, a strategy has to be made for the energy sector as a whole with adequate measures to support it. Government plays a crucial role through both proper implementation of regulation and laws as well as through focusing on the public sector EE. Most of EE financing has to come from the government and appropriate ways of generating revenue for EE measures have to be implemented, either through different taxes or public funds.

The general overview and assessment of the current state of EE in the WB countries show that even though some countries are doing better than others, all still have a long way consisted of consistent and meaningful work ahead of them in order to reach satisfactory or average EU levels of EE. The research has showed that the causes of low EE across the WB countries are well known and the focus should be on solutions. The main purpose of this master's thesis is to present the current state with respect to EE and suggest what countries should do in the upcoming years and what are the main challenges ahead of them with proposed solutions and approaches how to tackle them. The solutions will be sought by examining the examples of other countries that already went through the reform of the energy sector (the EU countries). Also, the thesis will include an analysis of the future undertakings that the governments have to do in order to be in line with the EU recommendations and directives which serve as a guideline. One of the main research points of the thesis will be whether the improvement of legal framework is the crucial step towards an adequate reform of the energy sector and what exactly has to be done in terms of laws and regulations for the WB countries.

Furthermore, the thesis will include a comparative analysis of measures each country has implemented in different segments of energy sector (transportation sector, public sector, industrial sector, residential sector). It will analyse which country has the most room for improvement in each segment and what are the most important steps that have to be undertaken. The analysis will provide each country with the most optimal way of reforming its energy sector with the aim of lowering energy cost and lowering its energy intensity while improving energy efficiency.

The main goals of this master's thesis are the following:

- to present a detailed and comprehensive theoretical background about energy efficiency and its importance for the WB countries;
- to assess the current state of the energy sector in the WB countries by segmenting it and analysing those segments and the role they play in the overall case of state of the energy sector, weighing the importance of each segment towards further development;
- to analyse the legal framework for energy efficiency implementation and development in each country and what needs to be done to reach satisfactory levels, suggesting changes in laws and regulations for the future;
- to present recommendations what the general public can do to improve the EE of its country in order to support government and its actions;

- to propose measures for the improvement of energy efficiency for the WB countries which will serve as a tool to decrease energy intensity and overall spending on energy in order to improve the economies of the countries in question.

In this thesis, literature review will be used as the main tool for critically assessing the current state of energy efficiency and the energy sector in the WB countries. This will include reports about the state of EE in the WB countries which were done for the purpose of gaining insight about the WB countries in order to be able to propose a strategy for improvement. This method will also be used to examine the examples of other countries which have gone through the energy sector reform that included the improvements of energy efficiency, while reaching some conclusions through comparative analysis of two ends of the spectrum (developed and underdeveloped countries). Analysing secondary data from the national websites dedicated to energy efficiency (e.g. www.energetska-efikasnost.ba) will be used to examine the current processes each country is going through with the purpose of increasing energy efficiency and lowering energy costs. Also, the publications from the EU institutions will be closely looked at for gaining a better insight at the EU's recommendation and demands for the WB countries and their development of EE strategy. This includes the EU Directives pertaining to EE as well as the reports other countries submit (the NEEAP action reports) in order for their energy sector progress to be tracked. These will be used to compare headways countries are making compared to the WB countries.

Analysis of the existing laws and regulations will be conducted to gain an understanding to what extent the governments, and their lack of interest in regard to energy efficiency, are responsible for the current state in the WB countries. Study by Johansen et al. (2010) showed that not only do countries lack the legal framework regarding EE, there is also a severe lack of sanctions for non-implementation of energy efficiency measures. By looking at past examples and existing legal frameworks of other countries, this thesis will propose both laws and regulation; and sanctions which should be put in place for non-implementation. The analysis and suggestions will be given mainly based on the examples of the other countries and how they solved the legal issues regarding energy efficiency and energy sector.

This master's thesis will be structured in a way that firstly the concept of EE will be explained by going through the general information about EE and explaining the historical context of EE in the whole world as well as focusing on the EU. EE gap as well as barriers and drivers to EE will then be discussed. Next, each of the WB countries will be analysed in detail by going through their respective institutional and legal frameworks, as well as their public, residential, transport and industrial sectors. Synthesis of the analysed countries will follow. After discussing each WB country, measures to improve EE will be proposed in a way that each of the four main sectors will be looked at. Also, financing of EE and proposal for the improvement in the WB countries will be discussed.

1 INTRODUCTION TO ENERGY EFFICIENCY

1.1 Concept of energy efficiency

EE as a concept and a part of energy policies worldwide has become a pressing issue in the last couple of decades. This is especially true for more developed countries which have less and less room for real economic growth. Because of that, they turn to reducing the amount of resources needed for producing the same economic output, rather than increasing the output itself. And this is what EE essentially is - requiring less energy for performing the same function (International Energy Agency (hereinafter IEA), 2017). EE is a key concept to ensure a reliable and sustainable energy system in the future and is something every country in the world can achieve regardless of its access to energy sources. EE is differently defined in different literature as well as depending on what branch of science is in question. Irrek and Thomas (2008) define it as the ratio between energy benefit gained and energy used. Energy benefit being any kind of output made using energy, it means that the more benefit gained for less energy, a country or any other entity is more energy efficient. So basically, EE is a relationship between benefits and expenses. Energy efficiency can be evaluated at different levels, from country-wise EE, to the efficiency of a toaster in a home or the efficiency an imported car. This makes EE difficult to define since it is such a broad concept and requires all-encompassing actions. The definition in the EU Energy Efficiency Directive shows how broad of a concept it is. It states that EE is the ratio of output of performance, service, goods or energy, to input of energy.

EE can be improved at all steps, from the production of energy to end usage. This is why establishing and implementation of energy strategies is so difficult since everything has to be taken into account. If production of energy in inefficient, not matter how efficiently it is spent, the chain as a whole will always be inefficient. This makes EE a huge market, with global investments ranging from $310 billion to $360 billion in 2012 (European Parliament, 2015). Even so, many opportunities for substantial improvement of EE are missed due to various barriers. Improved EE brings many advantages for the subject in question. First of all, it reduces energy bills which is important to everyone from households to large industrial companies. It directly increases spending power of everyone which can lead to more jobs and more consumption to boost the economy. Also, with increase in energy efficiency, a country can lower import of energy and rely more on its domestically produced energy. The environment is also very sensitive to EE since EE directly influences potential pollution in form of reduction of greenhouse gases emission. As a chain reaction, it improves the quality of air and reduces health effects which greatly improve quality of life of the general population which should always be the main goal. The main problem is with all this is that in order to achieve efficiency, sensible investments have to be made that will generate adequate return on investment and be cost-effective in the long term.

Concept which comes together with EE is energy intensity. It serves as a way of measuring country's EE by calculating the ratio between a nation's expenditure of energy unit per unit of Gross Domestic Product (hereinafter GDP) (Kahan, 2016). Country being low on energy intensity implies it has low cost of converting energy to GDP, the economic output. When talking about some current examples, Netherlands is a country with outstanding EE and low energy intensity, while Russia is a country which still struggles with the implementation of EE regulations and still has rather high energy intensity (Enerdata, 2016). Energy intensity often increases as a country's economy grows since more energy is used to facilitate that growth. Most often, especially in less developed countries, energy used disproportionately increases compared to economic growth and this is the most important point when it comes to decreasing energy intensity, managing to maintain economic growth with limited increase in energy consumption. This is what developed countries excel at. For example, China has for a long time struggled with high energy intensity, but in 2016 it managed to decrease its energy intensity by 5.2%, meaning it achieved its economic growth with minimal increase in energy consumption. China is a good example of how to facilitate economic growth without spending disproportionate amount of energy. The main issue with using energy intensity as a way of measuring EE of a country is the fact that it does not indicate what exactly is inefficient. It can point to general state of affairs in a country or a specific segment within a country, but it cannot say specifically where the inefficiency or efficiency occurs. Also, it is unable to provide a base for possible recommendations on implementation of EE measures. It is also unable to provide information about possible savings with adequate energy and EE strategy. Energy intensity as a way of measuring EE is to be used only with the goal of outlining the general state of a country or any other entity in regard to its EE.

Apart from the obvious economic advantage to having a highly energy efficient country and society, environmental benefits play a strong role as well. Spending less energy, especially in areas where non-renewable energy sources are still not widely used (e.g. road transportation), has a positive effect on both the environment and the public health of a society. Generally, the examination of EE is divided into following areas: residential sector, public sector, service sector, industrial sector and transportation sector. Improvement of each of these sectors is a necessity for reaching an energy efficient state. Different countries struggle with different areas, but some issues are present worldwide. For example, two-thirds of buildings built today are built with no regard to EE (IEA, 2017). Given the fact that a lot of infrastructure today is outdated, not adapting new projects to be energy efficient is something that will produce consequences for decades to come. Solmes (2009, p. 14) argues that the first step toward reaching EE is not standardizing new projects to be energy efficient, but upgrading existing systems to increase their efficiency.

Both governments and people are becoming more aware of the benefits which will arise with increased EE, regardless of the sector where it is implemented. The most important

and the most obvious reason why EE is an important concept is that is saves money (Alliance to Save Energy, 2012). It is estimated that an average US household spends around $5,550/year on energy. With proper steps taken like buying energy-efficient appliances and making home improvements on EE, resources can be saved. This is especially important today where households regularly use numerous appliances which require energy. This ranges from toasters to light bulbs. Money saving does not concern only households, but also the government of a country and all the companies operating within a country. By reducing energy cost of business operations, companies save money which can be used to boost the economy itself, either by employing more people or by making their exports more competitive on foreign markets. Investments in EE can also be beneficial on the domestic market as reduced energy costs can lead to a decrease of the price of a good or service which makes a company cheaper than the competition.

1.2 Historical context of energy efficiency

1.2.1 The world

EE in its core has been important since the first use of energy in industry. It dates back to the use of steam engines where more efficient engines had an advantage over less efficient ones. The first time EE became a vital aspect was during the World War II (heinafter WWII) since lack of fuel was a significant issue for all sides in the war (Fawkes, 2016). After the WWII, beginning of organized conservation of energy started in the 1970s after the first oil crisis caused by the oil embargo aimed against the US due to its foreign policy towards the Middle East. Thus, the energy prices rose dramatically and the logical next step was to try to spend less energy while not slowing down the economic growth. Apart from the economic growth concerns, the world realized that EE was important because leading energy sources are finite sources which have to be conserved as much as possible until the human population transfers to mostly renewable energy sources (Weintraub, 2000, p. 1).

The 1970s were also a period when the first policies and regulations were introduced to tackle EE. For example the US, given its geographical size, had and still has an issue with excessive energy spending in the transport sector. It was tackled by implementing measures like tax credits for hybrid vehicle buyers, "gas guzzler tax" or setting the minimum average "miles-per-gallon" rating for a manufacturer (Allcott & Greenstone, 2012, p. 8). This resulted from the realization by the world governments that without its direct intervention companies will not take into account EE of their products and will only focus on maximization of profit and revenues. On the other hand, post-WWII in many parts of the world was under different communist regimes. The communist governments had very limited awareness about EE, mainly due to having planned economy. The residential buildings were built by a system of fast construction with EE as a concept not being taken into account (Šumarac, Todorović, Đurović-Petrović & Trišović, 2010, p. 98).

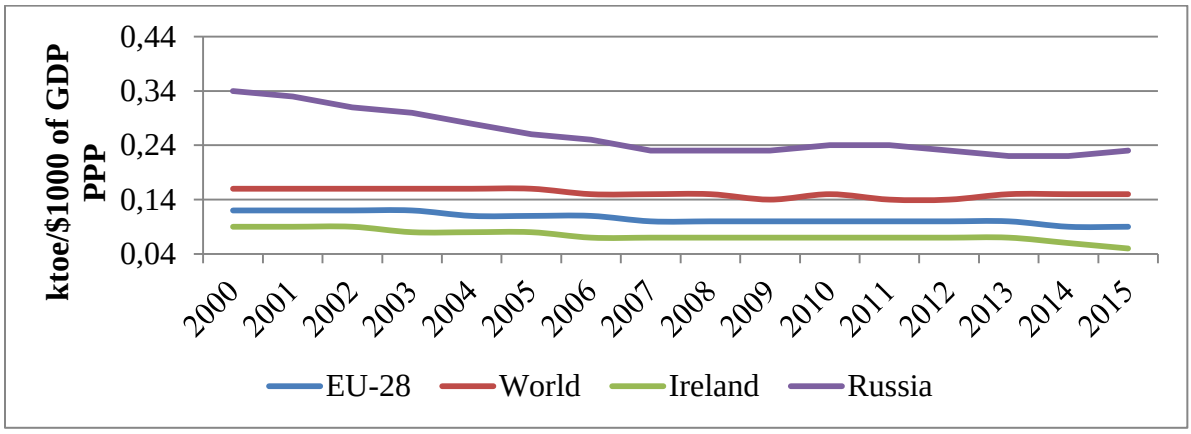
The main goal was to finish as much buildings as quickly as possible in order to make available housing to as much of the population as possible. The consequences of mentioned system of construction are felt even today in the countries which were under communist regimes. The fact that Russia, regardless of if being one of the world superpowers, is extremely energy inefficient proves this claim. Today, most of the developed world has adopted EE programs and has adequate institutional and regulatory framework to support the EE measures. The EU has tackled the issue the most seriously and at the same time it has the toughest job given the amount of countries within it, all with different systems and states of the energy sector.

1.2.2 The European Union

When the EU is considered, it has taken a much more serious and responsible approach towards EE and its importance to society and to the Union as a whole. Unlike the US which mostly controls its EE and energy expenditure by imposing laws and regulation towards companies, the EU sets goals which should be reached during a given period.

After some failed attempts at reaching energy efficient EU like the Lisbon strategy from 2000, the Europe 2020 strategy was launched. It was the first comprehensive and well-focused strategy which put more focus on energy and EE as an important part of energy management. It set goals which are to be achieved by member states from 2010 to 2020. As stated by the EC, "The Europe 2020 strategy is the EU's agenda for growth and jobs for the current decade. It emphasizes smart, sustainable and inclusive growth as a way to overcome the structural weaknesses in Europe's economy, improve its competitiveness and productivity and underpin a sustainable social market economy" (EC, n.d.). In its core purpose, it has a similar mission like the Lisbon Strategy, but is wider in scope. When the energy sector is considered, it set goals of lowering greenhouse gas emissions by 20% compared to 1990 levels, to increase energy coming from renewables to 20% and to increase EE by 20% (EC, n.d.). These goals are translated to national targets so each country can check its progress. The Europe 2020 strategy is a bigger success than the Lisbon Strategy and some goals have already been reached even though there are still a few years to go. As stated by Eurostat in 2016, reduction of greenhouse gases emission has reached its goal in 2013 already while still continuing to drop. Other indicators like the share of renewable energy or final energy consumption are guaranteed to reach their goals if progress continues. Also, as can be seen in Figure 1, the EU has steadily been decreasing its energy intensity in the last 20 years, with some countries like Ireland having extremely low intensity. On the other hand, countries like Russia which is not in the EU and does not have to follow EU policies, are still lagging behind in terms of energy intensity.

Figure 1: Energy intensity of the EU-28 compared to the world



Source: Adopted from IEA (n.d.).

This data shows the success of the Europe 2020 strategy and thus goals to reach until 2030 were proposed which set targets for 2030 in regard to energy. It set much more optimistic goals since Europe 2020 goals were reached so quickly. As stated by the EC (n.d.), the Energy 2030 strategy goals include a 40% cut in greenhouse gas emissions compared to 1990 levels, at least 27% share of renewable energy consumption and at least 27% energy savings compared with the business-as-usual scenario. Unlike the Europe 2020 strategy, goals for 2030 do not directly tackle EE, but EE is guaranteed to improve if aforementioned three goals are reached. Climate change is the main issue the EU wants to fight. Policies proposed to reach 2030 goals include improved EU Emissions Trading System (ETS), new indicators for the competitiveness and energy system security as well as new governance systems. Both goals and policies for achieving Europe 2030 are ambitious, but if the EU continues at current pace there should be no issues.

Since these strategies are difficult to enforce across the whole EU and since the countries do not have a real incentive to reach set goals, what the EU did was issue directives which are legally binding for all EU member states. The 2012 Energy Efficiency Directive established set of binding measures which have a purpose of helping countries to reach Europe 2020 goals, mainly reaching 20% EE target (EC, n.d.). The 2012 Energy Efficiency Directive replaced the 2004 Directive and the 2006 Directive which dealt with energy issues, but the 2012 Directive was the first to directly tackle energy efficiency. More recently, in 2016, the EU issued an update to the Energy Efficiency Directive which followed proposed goals for 2030. The update was needed to make sure 2030 goals, which are more demanding, are met on time. Basically, under the Directive, all EU countries are obligated to use energy more efficiently from the production of energy to its final consumption. In order to achieve more efficient use of energy, set of measures and policies are introduced. For example, the Directive mandates the public sector of the EU member states to purchase only energy efficient buildings, products and services. Also, the EU governments must renovate at least 3% of the building floor space they occupy. Energy

auditing is taken very seriously under the Directive as governments have to provide incentives to small and medium-sized enterprises to undergo energy audits, while large companies are obligated to perform energy audits in order to identify ways of improving EE (EC, n.d.). Apart from these measures and policies, general energy savings goals are set under the Directive. The success of the Europe 2020 strategy shows just how effective the 2012 Energy Efficiency Directive was and how well focused its policies and measures are.

In 2007, first National Energy Efficiency Action Plans (NEEAP) were delivered. They are another instrument the EU implemented to track and improve progress of EE across EU-27 countries plus Norway and Croatia. Every three years countries issue their NEEAPs in order to show their progress towards reaching set targets. This allows continuous tracking of each country and their development and implementation of EE. The NEEAPs are closely linked to the EU EE Directive 2012 which mandated EE improvements within the EU. It was implemented in 2012 and was preceded by the Energy Services Directive 2006. This directive is the first one that established legally binding measures for improving EE in all sectors (Build Up, 2012). This was an important step because now the member states were legally responsible for EE and results can be shown through the NEEAPs. Also, non-member states like the WB countries also submit their NEEAP, but to the EC. They are used as a tool to follow progress towards accession to the EU and even though not legally binding, sanctions can be imposed if the NEEAPs are not published on time.

All of this shows that the EU has taken EE and its importance in society and economy extremely seriously. The steps it takes show persistence and determination to reach the set goals. The Lisbon Strategy was the first attempt and even though it was a failure, it was used as a lesson in order to establish the Europe 2020 which is showing outstanding results. The EU can be taken as an example to the whole world on how to approach EE and similar topics which do not have economic growth as the main goal, but improvement and conservation of environment and society of its member states.

1.3 Energy efficiency gap

The EE gap being the potential for the improvement of EE or the difference between the highest possible level of EE and the current or realized level of EE was first coined as a term in a paper by Hirst and Brown (1990) which talks about closing the EE gap and what barriers are there to achieve an energy-efficient state. It is important to mention that the gap concerns only the level of EE that is cost-efficient to implement, not the absolute highest level of EE achievable. Häckel, Pfosser and Tränkler (2017, p. 415) define the EE gap as “the difference between the actual level of investment in EE and the higher level that would be cost-beneficial from the consumer's (i.e., the individual's or firm's) point of view”.

The EE gap represents how much room for improvement there is in order to reach the optimal levels of EE. The gap is different in different countries and in different sectors and

subsectors. Though, extending the gap is beneficial since it broadens the possibility for improvement. Developed countries are constantly trying to extend their gap, mainly by improving their energy management (Backlund, Thollander, Pal & Ottosson, 2012, p. 394). EE gap is an important concept since it represents the potential a given entity has in regard to EE improvements. Everything that is being done in regard to EE is done to tackle the EE gap and to make it narrower. The EE gap has become a popular concept with recent worldwide implementation of strategies which are meant to tackle climate issues, pollution and energy consumption in general, mainly the EU with its Europe 2020 strategy or the US with their plans to drastically reduce energy consumption in the near future. Understanding the EE gap and its size is crucial step towards reaching these goals.

Though, many argue that the gap is overstated and that there is not as much room for cost-efficient improvement as claimed, but the fact that market failures like imperfect information or regulatory failures exist and regularly happen is a clear sign that there is a sizeable EE gap (Gillingham & Palmer, 2014, p. 22). The EE gap exist because market failures exist and this needs to be understood in order to reach the optimal EE levels. For example, energy price distortion is a very strong cause of EE gap, since even though optimal EE investments are made at one moment, they become suboptimal in another moment when there is a sudden spike in energy prices. Allcott and Greenstone (2012, p. 4) argue that imperfect information is the main cause of the EE gap. Imperfect information is regarded as "investment inefficiency" and as such causes suboptimal investments when achieving EE is concerned. For example, homeowners not being aware of how inefficient their current heating system is, and how much it could be improved with basic investment is a type of imperfect information which causes the EE gap. Similar can be applied to companies which are not informed about the new machine that uses significantly less energy and in turn keep the current and inefficient machine. Financial and environmental consequences are inevitable. There are numerous ways to overcome imperfect information which are discussed in the following chapters. The gap is an important concept to consider when EE improvements are being looked at. Bridging the gap through identifying investment inefficiencies and applying adequate policies is the way forward, but the gap has to be understood first and analyzed. Drivers for achieving EE and bridging the EE gap should not be ignored and barriers which will inevitably occur have to be overcome.

1.3.1 Drivers of investments in energy efficiency

When drivers for achieving EE are looked at, Cagno, Trianni, Worrell and Miggiano (2014) divide them into four main categories:

- regulatory,
- economic,
- informative,
- vocational training.

Regulatory drivers have become quite strong recently with developed world fighting climate change and the pollution of the environment. Through strict regulation countries are obligated by law to implement EE measures which have a purpose of achieving a set of predetermined goals (e.g. Europe 2020). And within countries, governments implement different policies and regulations which are directed to different entities like manufacturing companies or car-owners so that the goals can be reached. So basically, the EU is macro-regulating and countries have to implement micro-regulation which corresponds to respective state of their energy sector. Legal liability through effective policies and regulations is a strong driver but it has to be adequately enforced. Some other regulatory drivers include increase of energy tariffs or external energy auditing which is prevalent in industrial sectors which are energy inefficient. By providing energy auditing, governments drive change in the way private entities approach EE. Also lately, companies have recognized the need to be perceived as a green company by the public and this need acts like a driver and is becoming stronger as time passes and the general population becomes more aware of importance of EE. In the Netherlands' industrial sector, the main driver for EE for companies in chemical, metal, food and paper sector is maintaining the image of a green company (Trianni, Cagno & Farné, 2016, p. 1540). Having an image of a green company is an example of internal regulatory driver.

Furthermore, economic drivers are probably the most obvious ones when it comes to EE. In a capitalist society cutting cost is one of the everlasting goals and cost of energy can be reduced through its more efficient usage. This is especially the case in the developed world where there is less and less room for real economic growth so countries and private entities turn to lowering their operating cost as much as possible. Economic drivers, apart from cost reduction from lower energy usage, are also subsidies that can be obtained with the improvement of EE. Since it is very difficult to engage private entities EE investment, governments often provide subsidies to those entities which reach certain level of EE. If subsidies are significant enough and justify the investment, this driver for EE can be very strong. Trianni, Cagno and Farné (2016, p. 1543) argue that economic drivers are the strongest driver to EE, especially external economic drivers like subsidies and public investments. Economic drivers are even stronger in countries which deal with some form of economic crisis and where any form of financial help or reduction of cost is of vital importance. Some examples today include Italy or the WB countries.

Informative drivers to EE are also becoming more important in the recent years. The most important aspect of informative drivers is EE awareness. Awareness is almost always the first step towards improving EE. Knowing what EE is and its benefits comes before actually analyzing what is the best approach towards reaching high levels of EE. When general population as well as companies have gained awareness of EE and its importance, the knowledge they gained acts as a driver to becoming energy-efficient. Raising awareness is most often done through comprehensive campaigns mostly done by the state. Availability of information, as in having access to information about EE and how it can be

implemented, plays an important role as well. These are all external informative drivers, while internal informative drivers like having ambitious staff and management plays a crucial role as well. Having staff and management which is willing to take action in regard to EE is what separates great from exceptional organizations.

Vocational training drivers as the fourth category have their role in becoming energy-efficient. Training of staff, management or any other subject which plays a part in the energy sector of an organization leads to improvements in EE. Gaining practical and theoretical knowledge of how to be energy-efficient will allow continuous engagement in not just becoming energy-efficient, but staying energy-efficient as new technologies emerge.

1.3.2 Barriers to investments in energy efficiency

Apart from drivers to EE, barriers to EE are also an important aspect which has been discussed since EE became a mainstream issue. Overcoming or weakening barriers to EE is monumental to having worthwhile EE investments. There are barriers in every segment of EE, from barriers which affect the government, to barriers with which an ordinary citizen has to deal with. Timilsina, Hochman and Fedets (2016, p. 205) categorized barriers to EE as follows:

- economic barriers,
- information barriers,
- technical barriers,
- institutional barriers and
- split incentive.

There are countless barriers to EE, but this categorization simplifies them and focuses into sensible parts. Just like with drivers, economic and financial aspect of EE is also the greatest barrier to achieving efficient use of energy. First and foremost, high upfront investment required to implement EE measures is the main barrier that any organization or person faces. For example, changing their heating system for an average homeowner might prove to be too expensive even though a new system would decrease energy costs. One of the ways to overcome this barrier is turning to financial institutions for capital. Though, capital to be used for EE is expensive (high interest rate) unless subsidized by some organization or the state. This issue is prevalent in all energy sectors and organizations have to come up with innovating ways of financing their investments. High upfront cost of EE investments is the reason why there are so many incentive and subsidy programs available. Another economic barrier that is present in certain industries is simply having energy savings at low priority due to low energy spending in total. There is lack of incentive to implement EE measures. This is where regulation and adequate policy has to happen in order to overcome this barrier.

Next, there are information barriers. Information barriers are just the opposite of informational drivers. They represent the lack of awareness and availability of information regarding EE and its importance, as well as the implementation know-how. This barrier is widespread in underdeveloped and developing countries where there are no informational campaigns and the general population and well as the industry are oblivious to what EE can provide them in terms of reduced cost, especially in mid to long-term.

Furthermore, technical barriers like the lack of skilled staff or the lack of technology and supplies needed to implement EE measures are widespread. Even though an entity opted for making an investment to improve its energy use efficiency-wise, the unavailability of materials or technologies in the local community acts as a barrier. Import is an option, but often too expensive. As countries develop and as awareness of EE increases, materials and technologies are likely to become more available. Technical barriers are mostly present in the industrial sector where production processes are likely to be disrupted by any changes made. This is why manufacturing companies actively try to avoid EE measures implementation. It is a rational fear since newer technologies require reconfiguration of production processes which combined with an inexperienced staff can lead to serious issues. Also, incompatibility of new and energy-efficient technology with the existing systems is a serious obstacle which makes it very difficult to accept new technologies (Wang, Li, Liao & Fang, 2016, p. 591). Everyone, but especially organizations are often unwelcoming to new technologies since they bring uncertainty and a higher chance of error.

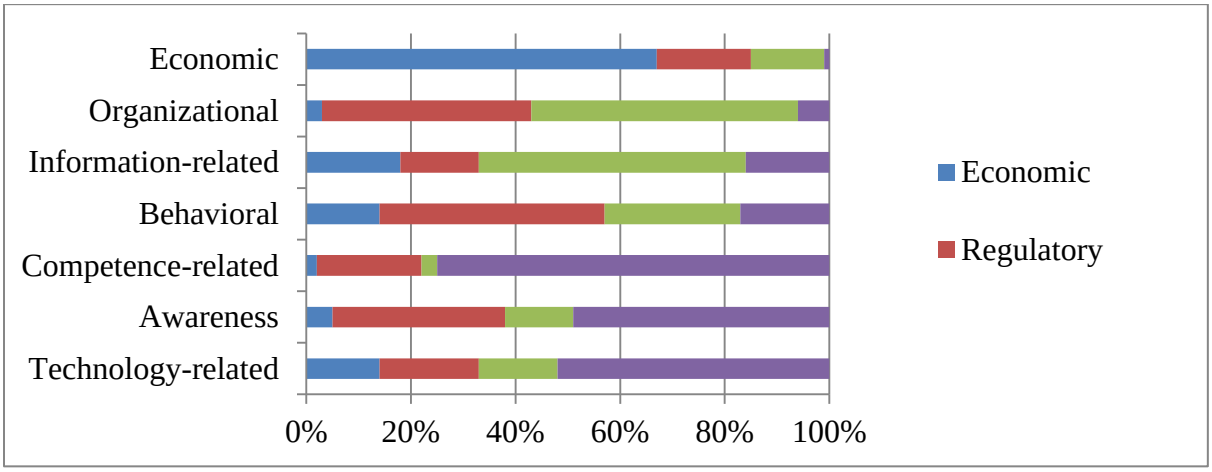
Barriers which are often dealt with by the non-Western world are institutional barriers. These range from inability to obtain the required permits to the lack of adequate policies which would facilitate EE programs. Political obstruction is the main type of institutional barrier and it can take various forms. For example, the lack of adequate measures and legislation which would support improvements in EE through political indifference is a common barrier. This makes it difficult for the willing entities to implement EE measures, but it also enables entities which are on the extremes when it comes in inefficiency to continue with their malpractice (Langlois-Bertrand, Benhaddadi, Jegen & Pineau, 2015, p. 32). Institutional barriers should not exist since public institutions and government should act as the main driver of EE improvement, rather than one of the main obstacles towards reaching satisfactory EE levels. Also, in many countries, even though there are policies in place, they are uncoordinated and are a confusing to comply with.

Furthermore, split incentive as a barrier happens when an entity does not have an incentive to reduce energy consumption since it is not the one paying the bills (rentor), but rather the building owner. In order to overcome this barrier some agreements have to be made between building owner and consumers of energy, i.e. the ones who pay for it.

As can be seen, drivers and barriers to EE are closely connected. When a barrier is overcome, it often becomes a driver. For example, when a model for financing an EE

investment is found, the possibility of becoming more energy-efficient with affordable financing starts to become a likely option. Basically, a driver is tackling the barrier. For example, in the case of EE awareness, lack of it is a barrier, while high awareness is a driver. Different types of drivers affect different barriers at varying intensities as represented in Figure 2.

Figure 2: Effect of EE drivers on EE barriers



Source: Adopted from Trianni, Cagno and Farné (2016).

Ultimately, all of these are drivers and barriers towards closing the EE gap. When the WB countries are looked at, barriers are still prevalent to drivers (as will be shown in upcoming chapters) and change in this relationship is something to strive for.

2 EVALUATION OF CURRENT STATE OF ENERGY EFFICIENCY IN THE WB COUNTRIES

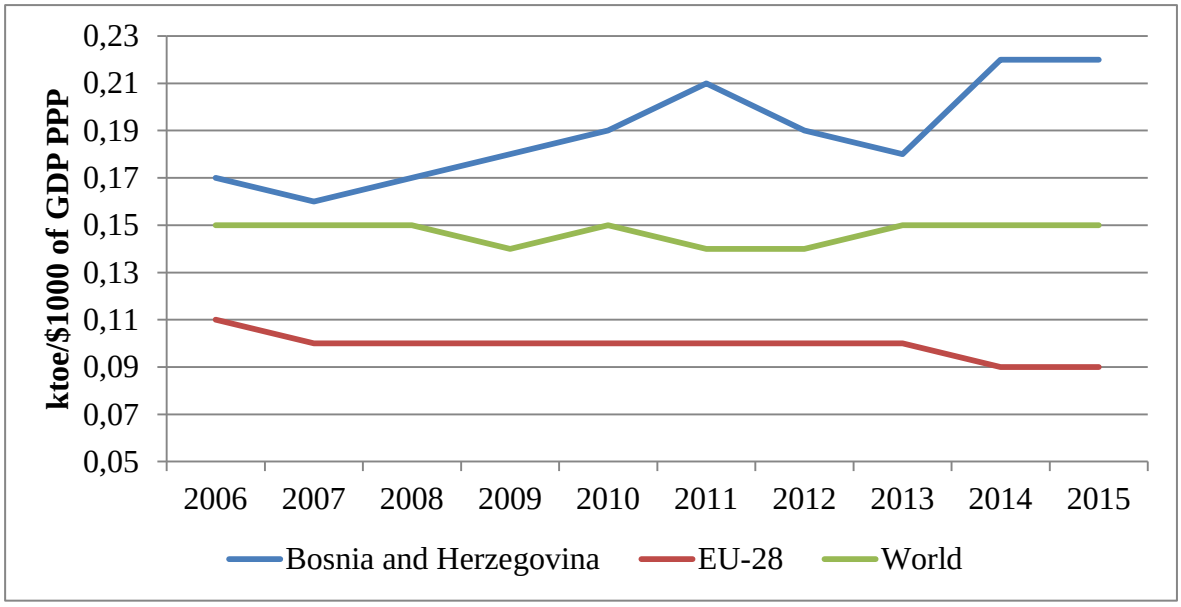
2.1 Bosnia and Herzegovina

2.1.1 Institutional and legal framework

Bosnia and Herzegovina (B&H) arguably has the most underdeveloped EE out of all WB countries. It was at the centre of the Yugoslav wars and has suffered the most damage which includes damage in the energy sector and energy infrastructure. Since the war ended, B&H has struggled to improve its EE and energy intensity mainly because there was next to no interest to actually do it. One of the main issues B&H has is its political and ethnical divide which makes any action extremely challenging. Energy policy in its two entities, the Federation of Bosnia and Herzegovina (hereinafter FB&H) & Republika Srpska (hereinafter RS) is managed separately which causes lack of coordination and in turn has a negative effect on energy policy development. This divide ultimately splits B&H into two countries with similar issues but different approaches and different institutional and legal framework. Only a limited number of issues and matters are handled on a

national level and even those have to be agreed upon by the entities (Hanjalić, Van de Krol & Lekić, 2008, p. 322). Basically, energy policy, including EE policy, is a responsibility of entities and not the state as a whole. When looked from the perspective of the EU and its requirements regarding energy policy, B&H is still in an early stage of preparation with some progress made over the last couple of years. The first time B&H published a strategy on a national level was in early 2018 when the first NEEAP was formed. B&H was under a lot of pressure from the EC for delaying its NEEAP and was close to suffering significant consequences. Though, at the moment there are Energy Efficiency Action Plans (heinafter EEAP) on entity level. Both entities have their own EEAP for the period 2016 – 2018. It is important to stress that the same bodies which are in charge of EE in both entities are also in charge of the funds and they serve a purpose of promoting EE to the public and improving it. All of this political mess and lack of coordination and will to improve has caused B&H to spend 20% of its GDP on energy which is about three times higher than the US or the EU average (United Nations Development Programme (hereinafter UNDP), 2014.) This shows high energy intensity which has to be addressed as soon as possible. Movement of B&H energy intensity can be seen in Figure 3.

Figure 3: B&H energy intensity 2006-2015



Source: Adopted from IEA (n.d.).

Being 20% more energy intensive in 2015 than in 2006 is a worrying prospect. One of the steps B&H has taken to tackle this problem in the future is joining the financing of Bosnia EE Project (hereinafter BEEP) which is financed by the International Development Association.

2.1.2 Public sector

When looking at the public sector which is a starting point for the improvement of EE, we can see numerous issues in B&H. First of all, vast majority of current public sector buildings (institutions, schools, hospitals, etc.) were built during Yugoslavia and its communist regime when EE was not taken into account as much as it should have been. B&H relies on the buildings from the past which in turn causes it to have subpar infrastructure and issues which come with outdated buildings. Though, the public sector as a part of the whole energy sector has gone through the most reform in terms of EE improvement. Lack of data regarding current energy expenditure and savings potential in the public sector in B&H makes it difficult to form a correct picture of the current state of the public sector. In 2010, Johansen et al. in a comprehensive study estimated that there is a potential of 35-40% energy savings in B&H public sector (p. 21). This potential is recognized by foreign funds and organizations which are continually trying to help B&H on its path of developing a more energy efficient public sector. In 2014, Swedish Embassy and the UNDP B&H signed an agreement worth €3.7 million which will serve as a co-financing tool in the area of energy saving for public sector buildings (UNDP, 2014). Purpose of this project is the implementation of the Energy Management Information System which will be used to manage around 5,000 public buildings in the country. This project is a joined project between the FB&H and RS.

Also, in 2016 the B&H Energy Efficiency (BEEP) project started with the implementation of EE measures (window replacement, thermo isolation, heating system improvement, etc.) in 23 public buildings, mainly schools and hospitals, in Sarajevo Canton, Zenica-Doboj Canton, Una-Sana Canton, Herzegovina-Neretva Canton and Tuzla Canton (BEEP, n.d.). Until mid-2017, all planned renovations on the public sector buildings with available funds were finished and that was the end of the first phase of the BEEP project. Second phase, which started in February of 2017, had a purpose of measuring EE in renovated schools. In the end, this was a rather successful project which showed that with appropriate funds and willingness of people involved, improvements are possible. The results can be seen on Appendix 1. This is just a small step in the right direction since there are hundreds more public sector buildings which are in need for renovation. With proper funding and proper management, all of them can be adapted in the future.

2.1.3 Residential sector

EE in the residential sector also has numerous issues. Similar to the public sector buildings and infrastructure, the residential buildings were mostly built during the communist regime in the 60s and 70s with little to no regard to EE and how that will effect energy consumption of those buildings at the time they were built as well as today. This caused residential sector to be the highest consumer of energy in buildings in B&H with 220 kWh/m² (Singh, Limaye & Hofer, 2014, p. 6). For comparison, according to the EU

legislation, 95 kWh/m² is the highest allowed consumption in the EU. Johansen et al. with local consultants in a 2010 study concluded that with ambitious investments, there is a potential of 60% energy saving in the residential sector in B&H (p. 13). This is a significant figure which, if achieved, would change the situation dramatically. But realistically, potential savings range between 20% and 40% (Nebiu, 2017, p. 2). Out of total energy consumed in the residential sector, over 50% is used for space heating and cooling and that is where most savings can be achieved.

Since the end of the Yugoslav wars, very little was done for the improvement of the residential sector EE on the territory of B&H, but in the last several years, some projects have started. For example, in June 2017, UnicreditBankBiH and the European Bank for Reconstruction and Development (hereinafter EBRD) have signed an agreement worth €12 million for financing loans intended for improvement of EE in households (Radio Sarajevo d.o.o., 2017). €7 million are to be used in the FB&H and €5 million in RS. Reasoning of the EBRD is that the need for investments in EE is unfulfilled and that improvements in this area will be of great use for the environment, while the population will get better living conditions. This agreement will cause loans to be more affordable which is expected to drive investment in regard to household EE.

Another step in the right direction in B&H is the EE Action Plan for Tuzla Canton financed by the United States Agency for International Development (hereinafter USAID) and Residential Energy Efficiency for Low Income Households (hereinafter REELIF) which was launched in 2016. As stated by Tuzla Canton (2016). Its plan is to:

- reduce CO_2 emissions,
- reduce heating needs in the residential sector,
- increase comfort,
- keep costs the same or reduce them in the upcoming 5 years,
- reduce the amount of furnaces in Tuzla Canton by increasing EE and
- increase the share of renewable energy sources.

This project is estimated to cost €47 million and will yield significant results. In Table 1, it can be seen how many objects are included in the project.

Table 1: Objects included in the REELIF project

Municipality	Number of residential buildings
Banovići	114
Kladanj	30
Čelić	6
Gradačac	46
Sapna	5
Teočak	1
Kalesija	16
Srebrenik	32
Živinice	63
Lukavac	139
Gračanica	51
Tuzla	470
Total	**973**

Source: Tuzla Canton (2016).

Tuzla Canton is the first canton that implemented a project of this scope and is something other parts of B&H should look up to in the future since the residential sector is in an urgent need for reform.

3.1.4 Transport sector

After the residential sector, the transport sector is the largest consumer of energy in B&H with 29% (Johansen et al., 2010, p. 34). With rising income levels and general economic output of B&H, the transport sector is at a high risk of becoming a needlessly large part of the total energy consumption. This is likely to happen because some to none EE measures are being adopted and the amount of personal vehicles is in the rise. Granić, Zeljko, Moranjkić, Martinez, Olano and Jurić (2008, p. 5) in the report about the energy sector in B&H stated that the transport sector represents just over 20% of total energy consumption with high likelihood of having an even higher share in the future. EE in the transportation sector is at a very low point and energy intensity is high mainly due to the lack of EE awareness of drivers and low standard of living.

New cars are expensive and buying them is the only way of becoming more energy efficient while having a personal vehicle. In B&H, 90% of vehicles are more than 12 years old (BIHAMK, 2016), with almost 20% being over 20 years old. These vehicles are high pollutants and are much more energy intensive than newer vehicles. The fact that B&H has the highest amount of vehicles per household while having extremely low amount of

passenger-kilometers per capita (kilometers travelled by passengers, excluding drivers) is very worrying. This shows that even if we disregard the fact that people of B&H are driving inefficient cars, there is a lack of effort to transport as many individuals possible with a single vehicle. Most people drive by themselves.

Also, what represents an important issue for B&H transportation sector is underdeveloped railway network. B&H has, after Albania, the lowest density of railway network in the region (World Bank, 2010). This and outdated trains together with other parts of infrastructure cause people to stay away from railway transport and use their personal vehicles which are the worst possible choice when considering energy efficient transport due to low number of passenger-kilometers. Another pressing issue which has a direct effect on inefficient transportation sector is limited usage of public transportation. Unorganized network coupled with poorly regulated pricing strategy and old vehicles discourage population from using public transport. Overall, Johansen et al. (2010, p. 30) estimate 8% savings potential in B&H transportation sector. So far, very little has been done to actually reach this potential. Also, the World Bank B&H Energy Sector study from 2008 estimated that the fuel consumption of the transport sector would increase by 5% every year which could be lowered to 4.5% with appropriate EE measures. Unfortunately, those measures were never implemented.

3.1.5 Industrial sector

Manufacturing/industrial sector is also at a limited level of development and has up to 30% savings potential according to Johansen et al. and their study done in cooperation with the World Bank (2010, p. 27). While not so good compared to the EU average, B&H is in a good spot compared to other WB countries regarding energy intensity in the industrial sector. Industrial sector accounts to 25% of total energy consumption (Harbaš, 2017) and given the fact that the industrial production in B&H is very limited, this is troubling information. It confirms the fact that the industrial production is extremely energy intensive when compared to developed countries. The general reason why the industrial sector is in a state it currently is, is the fact that manufacturing companies have no real incentive to become more energy efficient. The state does not incentivize EE like other states do, thus there is no reason for companies to invest resources into becoming more energy efficient. Also, B&H is not a part of the EU Emissions Trading Scheme (hereinafter EU ETS) which in turn makes companies somewhat complacent about EE improvements. Bottom line is, without adequate involvement of the state, investments in EE are just not worth it for manufacturing sector companies in B&H. For example, in the EEAP published for FB&H, there are some proposed measures for improvement of the industrial sector. Those range from improving industrial process to improving energy characteristics of the buildings in the industrial sector. These are all well-formed measures in theory, but they are very difficult to implement due to the lack of incentives towards companies which are part of the industry.

2.2 Serbia

2.2.1 Institutional and legal framework

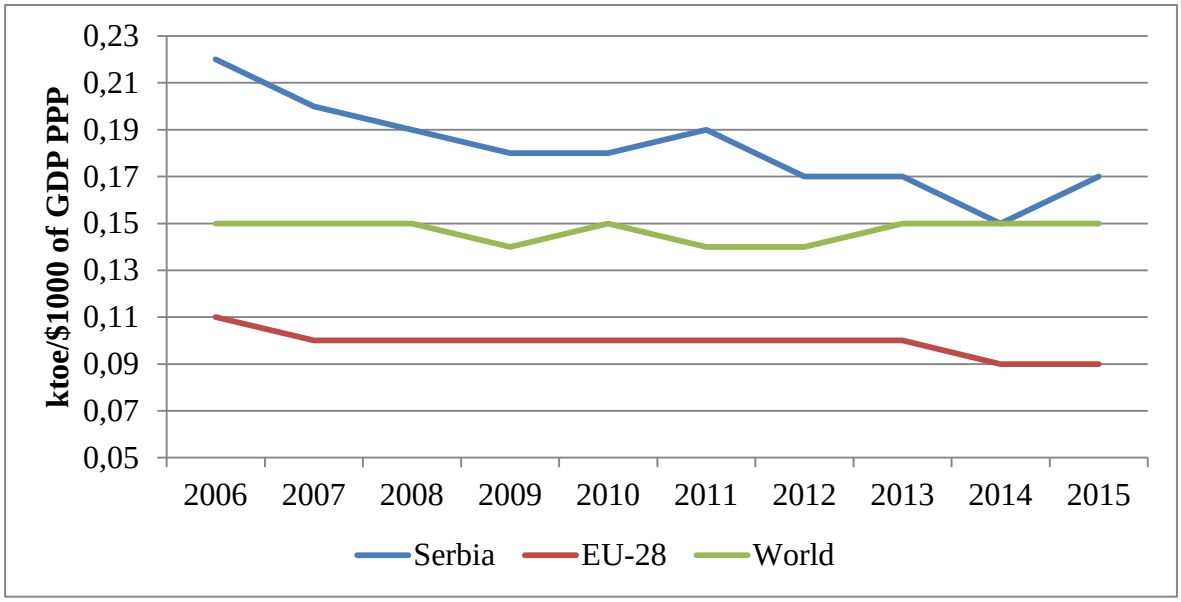
Out of all WB countries, Serbia has the most developed EE system. But still, there is a long way to go to reach satisfactory EU levels. Just like B&H, most of Serbia's infrastructure was built in the Yugoslav era under the communist regime. Little to no regard was given to EE and its importance on resource savings. Everything was built fast and with no thought about the future and because of that, consequences are felt today. Another setback for Serbia's infrastructure was the NATO bombing in 1999 which damaged it extensively. Serbia started recovering in 2003, when also the energy sector started improving. Serbia developed its energy strategy as well as set up its market-based framework which is enforced by an independent regulator. This served as a great tool to improve outdated practices, as well as reforming publically owned energy companies. Today, Serbia has twice as high energy consumption compared to the average Organization for Economic Co-operation and Developement (hereinafter OECD) country (Energetski Portal, n.d.).

Serbia and its improvement of EE are in a direct relation to the Europe 2020 agenda which challenges Serbia tackles with action plans published on a national level (Rajaković & Batas Bjelić, 2012, p. 268). Serbia has submitted three NEEAPs which track the development and future plans for country's EE. The latest NEEAP was released in the early 2017 (Third Nacionalni plan za energetsku efikasnost for Republic of Serbia (NEEAP-3 Srb), Sl. glasnik RS, no. 01/17). It sets a goal of saving 9% of total energy consumption (compared to 2008 levels) in 2018. In Appendix 2, the complete list of goals set can be seen. Appendix 2 shows that Serbia fulfilled 93% of planned savings for the 2010-2015 period. Even though the goal was not reached, it is still impressive when compared to other countries from the region. But, the most challenging period is about to come because 50% of planned energy savings for the 2010-2018 period have to be reached in the 2016-2018 period. This is doable if measures proposed are implemented on predetermined deadlines and if the most economical measures are introduced.

Experience in Serbia showed that the most important sectors in need for improvement are the residential and the public sector. Improvement of these is a condition for reaching set goals. As far as legislation is considered, the Law on Efficient Use of Energy from 2013 (though applicable from 2015) was a major step of Serbia toward becoming an energy efficient country (Popović, 2015). Its main goals are increasing security of the energy supply and its efficient use, increasing competitiveness, reducing negative effects on the environment and incentivizing responsible behaviour toward energy (Zakon o efikasnom korišćenju energije, Sl. glasnik RS, no. 25/2013). This law set Serbia apart from other WB countries. Also, it is important to mention that Serbia also has the Energy Law which was introduced in 2011. Serbia being a contracting party to the Energy Community Treaty, it is obliged to introduce the EU EE legislation. As shown in Figure 4, Serbia has been steadily

improving its EE in the last 15 years, but more needs to be done in order to come closer to the EU levels.

Figure 4: Serbia energy intensity 2006-2015



Source: Adopted from IEA (n.d.).

2.2.2 Public sector

The public sector in Serbia, mainly schools and hospital, are of major concern for Serbian authorities in regard to EE, given their amount across the country. The lack of insulation, damage to buildings and outdated heating, air conditioning and hot water systems are the main contributors to high energy consumption. The public sector of Serbia has been a part of most EE projects, mainly because its implementation is the easiest given the fact that the state is responsible for the public sector buildings. There is a nationwide EE Project in Public Buildings which focuses on 6,500 schools and kindergartens. Its main goals are improving the legal framework, introducing instruments to estimate the scope for saving costs and energy, setting up an advisory and information platform, training janitors (German Society for International Cooperation (hereinafter GIZ), n.d.). Similar to the BEEP in B&H, Serbia has the Serbia Energy Efficiency Project (hereinafter SEEP) which started as early as 2004. It has gone through two phases with around $55 million of funding spent (Solujić, 2017, p. 12). Its scope included 90 schools and medical buildings. After two phases, final result was reductioon of energy consumption from 301.5 kWh/m² to 159.3 kWh/m². Making building spend half the energy than before is a great result with arguably limited funding. Table 2 below shows detailed information about energy savings (Petrović Bećirović & Vasić, 2012, p. 42).

Table 2: Energy savings results from the SEEP project

Indicator of energy consumption	Schools	Health Care Insitutions	Social Care Institutions	Clinical Center Niš	Overall
Energy consumption before (kWh/m²)	251.9	331.1	290	376.4	301.5
Energy consumption after (kWh/m²)	128.3	175.8	170.6	173.3	159.3

Source: Adopted from Solujić (2017).

In December of 2016, the UNDP and GIZ signed a memorandum of understanding to join forces in further facilitating Serbia's potential to save energy in the public buildings through implementing EE measures (Balkan Green Energy News, 2016b). One of the major features of this memorandum is introduction of data collection on energy consumption in buildings. It will include 15 to 20 thousand buildings. Since data collection and availability of data was one of the major issues in the energy sector in Serbia, this is a sizeable step in the right direction for EE improvements in the public sector.

2.2.3 Residential sector

When taking a look at the residential sector of Serbia, similar issues as in B&H can be seen. Communist "residential blocks" (as seen in Appendix 4) are a prevalent type of households across all of Serbia. Their advantage is accommodating a lot of people, but when it comes to energy concerns, mainly EE, they score very low.

Johansen et al. with their local consultants estimated that Serbia has the potential of saving 17% of total energy consumption in the residential sector (2010, p. 13). The same study showed that out of all WB countries, Serbia by far spends the most energy in the residential sector (around 130,000 TJ) and at the same time the residential sector is the highest energy consumer out of total energy consumption. Out of total energy spent in the residential sector, the most goes on space heating and cooling, and that is where funds should be invested with the goal of improving EE. Professor Dragoslav Šumarac, president of the Engineering Chamber Assembly of Serbia, in an interview for eKapija in 2016, stated that €1.6 billion of investments are needed for Serbia's residential sector and its refurbishment. As he calls it, EE of Serbia’s residential sector is a project of national importance. He also argues, that high price of electricity is to blame for the current situation, because it is difficult to incentivize someone to change their energy source when electrical power can be obtained for such a low price.

In March of 2017, the project sponsored by GIZ named Advisory on Energy Efficiency in Buildings, which lasted nine years, was concluded (EKOlist, 2017). It states that project's most important result is the fact that Serbia managed to position itself as the residential sector EE leader in the WB. Direct result of this cooperation is the fact that 150,000 MWh of primary energy was saved and CO_2 emission has been lowered by 30,000 tons a year. In Serbia, the objects built after 2012 have to have so-called energy passport which implies the object was built with taking into account EE, among other things. With direct result of the GIZ project, 1,500 energy passports have been issued. All of this shows that with targeted investments and committed work a lot can be achieved to improve residential energy efficiency of a country, which has historically proven to be the toughest task of an energy strategy.

2.2.4 Transport sector

By energy consumption in the transportation sector, Serbia is around the world average, with 25% share of the total energy consumption. Johansen et al. in a study from 2010 (p. 30) estimated that there is 16% energy savings potential in Serbia's transportation sector. In order to reach this potential, elaborate energy strategy has to be implemented, especially in regard to the public transportation strategy. In 2017, average age of personal vehicles in Serbia was 13-14 years, while over 500,000 vehicles were over 20 years old (Mondo, 2017). This shows that extremely high number of vehicles is highly polluting and energy inefficient. Given the fact that most of the Serbian population is a low income population, it is difficult to impose changes like limiting how old a vehicle can be to be registered. Thus, what Serbia is supposed to do is to increase demand for public transportation so people move away from using their personal vehicles, which are often faulty.

Apart from the age of personal vehicles, in a 2017 journal article, Petrović, Patrović and Pajković concluded that some of the main factors contributing to unfavorable position of the transportation sector in Serbia are: uncontrolled and often illegal import of foreign vehicles, improper vehicle maintenance, lack of awareness on adequate use of vehicles, poor technical control. These issues are from the user side, but from the state side, some issues are: underdeveloped and outdated road network, inappropriate infrastructure (especially in central cities), inadequate traffic management technology, frequent traffic congestion despite low level of motorization.

If Serbia continues on this path, as estimated in the Energy Sector Development Strategy of the Republic of Serbia for the Period by 2025 with Projections by 2030 (2016), the transportation sector will consume 2.5 million toe (ton of oil equivalent) of energy, while if appropriate EE measures are implemented, this figure can be as low as 2 million toe. This is a significant saving which could have strong impact in the future and on Serbia's path of accession to the EU. In November 2017, the World Bank approved €100 million loan for purpose of the Enhancing Infrastructure Efficiency and Sustainability Program. It will allow Serbia to better maintain 8,000 kilometers of roads (eKapija, 2017). Even though this

is just a small step towards the transportation sector reform, it is still an improvement which will have a positive effect on Serbia's path toward becoming more energy efficient country. When Serbia's rail transportation is considered, it is estimated that €5 billion are needed to improve the rail transport in Serbia. This is a long-term investment which is very ambitious but will yield great results and will bring Serbia closer to the EU levels.

2.2.5 Industrial sector

EE in industrial/manufacturing sector in Serbia is its weakest link when it comes to development and state of EE. Many larger companies and larger manufacturers are from Yugoslavia period which implies outdated technology and infrastructure which is highly energy inefficient. What is unique for industrial EE is that it is closely related to economic efficiency and Serbia is a great example of that. Investment to improve old technology and restructure infrastructure might be more costly than paying for the extra energy costs caused by an inefficient production. This is where the state should intervene with regulations and incentives. Johansen et al. in 2010 (p. 27) estimated that Serbia has 12-18% savings potential in its industrial EE. One of the main issues on Serbia's industrial sector is the lack of knowledge and awareness of just how much EE is important and what the extent of potential savings really is.

One of the first steps Serbia has taken is targeting improvement of EE in its industry by forming the Network for Energy Efficiency in Industry of Serbia (hereinafter MEEIS) in 2002 (Jankes & Stamenić, 2012). From 2002 to 2006 it existed as a project of the EE Agency of Serbia. In 2006, the MEEIS was established as an independent sector at the Innovation Center of Engineering Faculty in Belgrade. The main purpose of the MEEIS or the reason why the MEEIS was formed is to recognize and implement measures and technologies for improving EE in the MEEIS member companies. It adapted its strategy based on different needs of different companies. Today, the main goal of the MEEIS is keeping track of comparative statistics about energy consumption in the member companies, engineer training and consultancy services in area of EE and energy management. Keeping track of statistics and educating engineers is what developing countries like Serbia need because without having reliable data about the current energy consumption, it is impossible to make successful strategies on how to progress.

An example in Serbia of a successful implementation of EE measures is a dairy Eko-mlek from Kaonik. With the help of a bank loan, in 2010 the company started the production of a new and energy efficient production line for dairy products (eKapija, 2014). This loan was the first one in Serbia provided with EE grant in cooperation with the German Development Fund (hereinafter KfW) and the EU funds. The amount of loan was 700.000 with included 15% grant with very low interest rate. After the project was done, Eko-mlek reduced energy consumption per one ton of milk produced by 60% (Energetski portal, 2014). This investment showed that it is possible to become energy efficient in Serbia and that there are institutions willing to help.

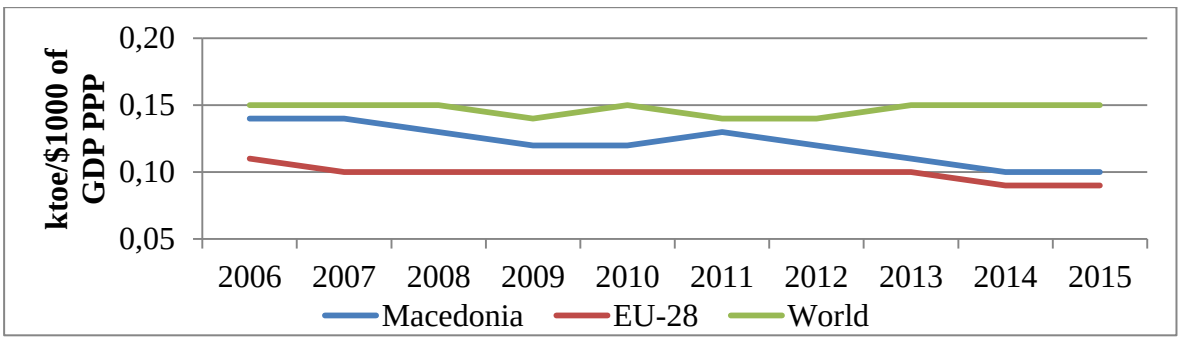
2.3 Macedonia

2.3.1 Institutional and legal framework

Macedonia being another country which has a history of being under the communist regime (Yugoslavia) has similar symptoms to B&H and Serbia when it comes to the energy sector and EE as a part of the sector. An outdated infrastructure and old technology act as an anchor to Macedonia and its energy sector. In a report done by Kanevche and other contributors in 2010, named the Energy Development in the Republic of Macedonia until 2030, the first objective stated is "maintenance, revitalization and modernization of the existing and construction of new, modern infrastructures for the purposes of energy production and utilization". After that immediately comes the improvement of EE as another objective that urgently needs to be accomplished. This shows that experts essentially agree that energy inefficiency which comes from outdated infrastructure should be a top priority when it comes to the energy sector reform. Even the official website of the Energy Agency of the Republic of Macedonia says it puts special emphasis on EE. All of this shows that there is awareness and clear intent to solve the problem, but it is also important to establish what has been accomplished so far.

Macedonia issued three NEEAPs, with the latest one issued in 2016 for the period until 2018. It included review of the second NEEAP and it showed that Macedonia achieved 99.12% planned saving for the period until 2015. Similar scenario is expected of the third NEEAP and its implementation. In Appendix 7, planned saving can be observed. Other policies and regulations which serve as a guideline for EE reform in Macedonia are the EE Strategy 2010-2020 and the National Energy Action Plan 2010-2018. Macedonia also has the Energy Law which was put into power in 2011 and was amended in 2012 and 2013. The Energy Law represents a giant step in the right direction because it sets out a regulation how energy issues can be approached and what has to be taken into account while dealing directly or indirectly with the energy sector. Movement of energy intensity which stared plummeting in 2010 shows the success of the Energy Law as can be seen in Figure 5.

Figure 5: Macedonia energy intensity 2006-2015



Source: Adopted from IEA (n.d.).

Issues with the energy sector and EE are obvious given the fact that, for example, energy costs alone consume 10% of municipal budgets in Macedonia (UNDP, 2014). In order to change these state of things, The Green for Growth Fund provided a loan to Halkbank Skopje which will be used for EE measures. The first loan was given in 2010, while the latest extension of €10 million was given in January 2017 (Balkan Green Energy News, 2017c). This is estimated to result in energy savings of almost 50,000 MWh/year in addition to significant reduction in CO_2 emission. This arrangement has already helped thousands of Macedonians to save energy costs. When looking at the future, Macedonia is expected to set up an EE fund as well as energy service company, both of which are instrumental to becoming an energy efficient country.

2.3.2 Public sector

The public buildings in Macedonia are significant consumers and purchasers of energy. They date back to former Yugoslavia and the communist rule which gave little regard to constructing energy efficient or green buildings. Thus, there is a lot of work to be done in order to improve EE of the Macedonia public sector, but it is an important step due to the amount of energy spent by the public sector which was estimated in 2014 (p. 13) by a report by the World Bank to be around 475,314 MWh/year. In the recent years, the government of Macedonia has been preparing the National Program for Energy Efficiency in Public Buildings (hereinafter NPEEPB) in order to achieve EE in public buildings. Also, the NPEEPB has the purpose of meeting strategic targets and deadlines outlined in its Energy Development Strategy until 2030, as well as the EE strategy until 2020. The government of Macedonia has decided that it would act as an example of starting the EE reform since the public sector is the only sector where the government can directly improve EE, while other sectors require raising awareness apart from issuing new legislation or regulations.

While the NPEEPB is being prepared, Limaye and Meyer with the support of the World Bank issued a report called the Financing Options for the NPEEPB in the Former Yugoslav Republic of Macedonia, 2012–18 (2014). As stated by the title, the World Bank assessed financing options for the NPEEPB and how to achieve set goals which can be seen in Appendix 8. As shown, the education and health sector as a part of the public sector are the largest consumers of energy and therefore require the most investment, around €80 million combined. These are sizeable investments but EE investments are guaranteed to pay off at some point in the future and the government of Macedonia should recognize that.

2.3.3 Residential sector

In Macedonia, there is 10% energy savings potential in the residential sector (Johansen et al., 2010, p. 13). Just like with Serbia and B&H, method of fast-building with no regard to EE is what characterizes the residential buildings in Macedonia. Consequences are still felt today and are the biggest obstacle toward having an even remotely energy efficient

residential sector. Out of the total energy spent in the residential sector, just over 60% is spent on space heating and cooling. This is something that is a rather ordinary situation. Macedonian residential sector consumes over 2.6 million MWh every year, which amounts to over 41% of total energy consumption in the country.

To combat this rather high residential sector consumption, Macedonia adopted the Rulebook on Energy Audit and Energy Performance of Buildings in 2013 with training the first 250 auditors in the early 2014 who would oversee and check if the rules are followed as adopted (Dukovski, 2015, p. 2). This Rulebook is a direct reaction to the EU Directive 2010/31/EU on the energy performance of buildings. This is one of the most complex directives issued by the EU and it requires cooperation between multiple parties in order to achieve set goals. Writing the legislation is not enough. Macedonia managed to follow the directive and release the Rulebook in three years. After that, it is all about adequate implementation.

When it comes to EE projects in the residential sector in Macedonia, one project stands out. It is the Residential EE for Low-Income Households by USAID. The project aimed at improving EE in three apartment blocks, two in Skopje and one in Kumanovo, for the total of 57 apartments (Dukovski, 2015). It was a rather small project, but its main purpose was not the scope of the project, but to show what results EE measures are able to produce if implemented appropriately and that investment in EE are worthwhile. Before the project, it was projected that the annual saving would amount to 413 MWh/apartment, but after the project when monitoring was done, it was observed that the actual savings were 328 MWh/a. Given the fact that before the project, consumption per apartment was 787 MWh, savings of around 40% was a good result. There is still a long way to go in reconstructing Macedonian residential sector after this project. Though, after its implementation it caused a chain-reaction in Macedonia with more projects starting across the whole country.

2.3.4 Transport sector

As far as the transportation sector is concerned, Macedonia has similar issues as B&H and Serbia. Old personal vehicles with high consumption in addition to underdeveloped railroad transport and public transport is a losing combination for a country which is looking to achieve an energy efficient transportation sector. Report by the IEA (p. 240) in 2008 showed that out of the total energy consumption, 21% is spent for the transportation purposes. Even though this is not a high percentage when compared to the WB countries, Johansen et al. in their report for the World Bank (2010, p. 30) estimated that Macedonia can potentially save 17% of the total energy consumption from the transportation sector. This is the highest estimated figure out of all WB countries which means that Macedonia has to put the most effort into transport and EE of the transport sector. The same report showed that around 98% of energy is spent on the road transportation and given the fact that the road transportation is the least efficient mean of transport there is a lot of room for improvement.

Macedonia has organized public transport only in larger cities like Skopje or Kumanovo while smaller cities only have taxi transport. This makes Macedonia very inefficient country with very low amount of passenger-kilometers which are one of the main indicators of EE in a given transportation sector. As already mentioned, Macedonia has an underdeveloped railroad network but there are some indication that situation could improve. It was announced in October of 2017 that the Macedonian Railways Transport and the Public Enterprise Macedonian Railway Infrastructure plan to use funds provided by the EBRD to install an integrated Energy Management Information System which would allow them to collect the information about energy consumption of the railroad network. The project is worth around €59 million. These improvements in railroad network, coupled with future regulations regarding private vehicles are what Macedonia needs to acquire energy efficient transportation sector.

2.3.5 Industrial sector

The industry of Macedonia has gone through drastic changes after the fall of Yugoslavia. Industry output has declined, just like in other former Yugoslavia countries, and has yet to fully recover. Large companies which operated under full potential are now just barely functioning and are extremely energy inefficient. The fact that they are operating on a fraction of their full potential, coupled with the fact that the manufacturing companies were not built with EE in mind, makes them very energy intensive. The industry of Macedonia is five times more energy intensive than France or the United Kingdom (hereinafter UK) (Energy Charter PEEREA - Protocol on Energy Efficiency and Related Environmental Aspects, 2006), which shows just how behind it is compared to the developed countries. The main industrial consumers of energy, both electric and thermal, in Macedonia are: metallurgy, rubber and plastic products manufacturing, textile industry and the food industry. These are all industries which operate on a large scale and would benefit highly from adequate investments in EE.

What hit Macedonia the most is political tensions with Greece which was its main trading partner. Subsidies for EE are limited and companies struggle to find a reason to implement energy efficient changes, mainly due to their cost and little regard to long-term goals. The data on energy in the industrial sector in Macedonia is very limited and as such poses problems into identifying exact EE issues. This lack of data is causing Macedonia to be lost in regard to finding the right measures which would mobilize companies to act. Macedonia is simply not aware how much it could benefit from improvements in EE (United Nations Economic Commission for Europe (hereinafter UNECE), 2017).

In mid-2015, Macedonia, together with the Global Environment Facility and with the United Nations Industrial Development Organization launched a project with a purpose of catalyzing market transformation for industrial EE and accelerating investments in the best practices and technologies (Regional Environmental Center, 2015). Its main goals are strengthening Macedonian policy, regulatory and institutional framework, developing the

market and scaling up investments in EE. Funding of the project amounts to around $7.3 million and is provided by the Global Environmental Facility and national financing through institutions and banks. The scope of the project is very wide and requires cooperation from all levels of both the government and the industrial sector. With adequate implementation, there is no doubt it will yield results and will help reach Macedonia's goal of 9% energy savings target proposed in the EE Strategy by 2020.

2.4 Montenegro

2.4.1 Institutional and legal framework

Montenegro is the least populated country in the WB and at the same time the smallest consumer of energy. Though, the situation changes when per capita consumption is looked at. Since the late 2000s, Montenegro has been steadily improving when it comes to energy consumption and energy intensity. As shown in the third NEEAP from 2016, energy intensity went from 10,798 MJ/€000 to 8.199 MJ/€ (NEEAP-3 Mon). Even though this is reduction of over 20%, Montenegro is still far more energy intensive compared to more developed countries. Montenegro just like other ex-Yugoslavia countries has old infrastructure which was built around 40 years ago and shapes the energy sector today. The county also went through the independence movement in 2006 when it seceded from Serbia which marked a new era for Montenegro and at the same time its energy sector.

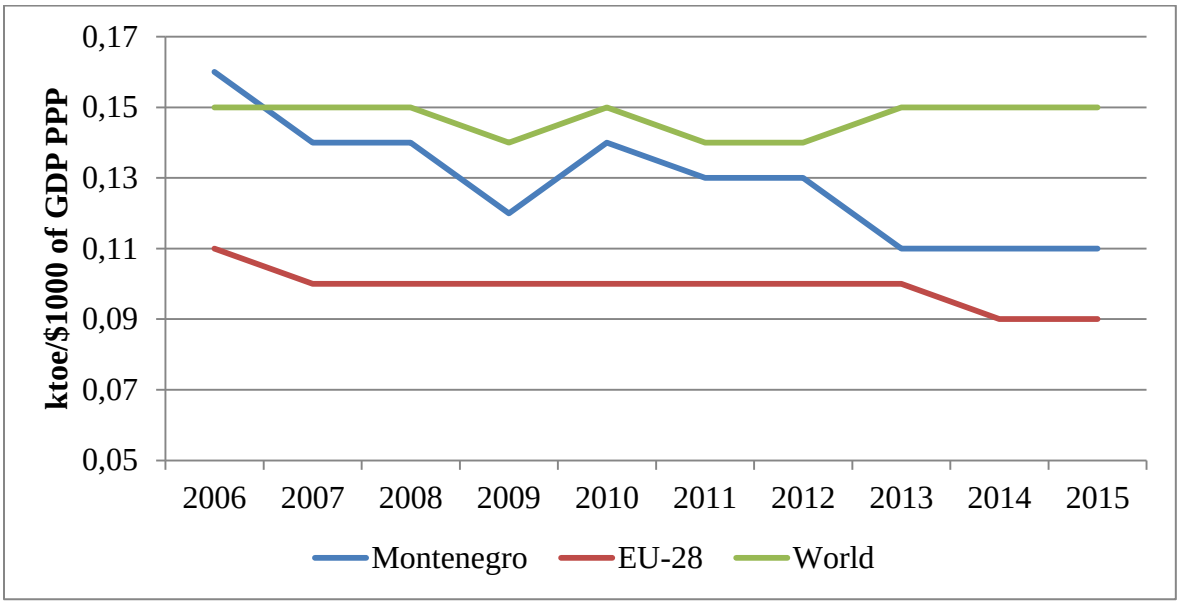
Montenegro has always been aware of EE which is proven by the fact that its first state budget in 2006 contained an EE fund which had a goal of supporting EE programs and projects (Energetska efikasnost, n.d.). In 2009, the Montenegrin Ministry of Economy established the Directorate for EE which is responsible for implementing EE policy. This Directorate is the main part of the Montenegro institutional framework for EE. The Montenegrin Official Gazette in 2010 published the Law of EE which was a turning point for Montenegro energy sector. The law shaped the concept of EE development, goals for improving EE, guidelines for accomplishing set goals and deadlines for finished projects. This law showed that Montenegro is serious when it comes to efficient use of energy. All that was left was its implementation. In order to achieve implementation, some strategies had to be formed. As an extension to this law, the Law on Energy Efficient use of Energy was published in 2014 whose main concern is reducing total energy consumption of the country.

Montenegro has issued three NEEAPs so far, with the third one published in 2016. Publishing of the NEEAPs was in line with the EU directives. The third NEEAP contains plan for the period 2016-2018. Also, it contains new goals and measures as well as the assessment of measures which were proposed in the second NEEAP. Most of the measures were either partially of fully implemented, while some remained unimplemented, but kept as something to be achieved in the future. Some of the main goals of the third NEEAP are further implementation of the EE law in respect to completing regulatory and institutional

framework, raising EE awareness of the public and improving EE monitoring system (Sekulić, 2016, p. 7).

The Montenegro Ministry of Economy in 2015 published the Energy Development Strategy of Montenegro by 2030 which acts as a long-term action plan. It updated existing one which covered period until 2025. It determines long-term development goals, directions for development of energy infrastructure, financial resources for the implementation, etc. To sum up, Montenegro has come a long way when it comes to EE strategy and setting adequate goals. Movement of energy intensity as shown in the Figure 6 proves the point.

Figure 6: Montenegro energy intensity 2006-2015



Source: Adopted from IEA (n.d.).

Also, as showed in the NEEAPs, around 70% of measures planned are either partially or fully implemented which is a good result, but still not what the country strives for if becoming energy efficient is its goal, as well as accession to the EU.

2.4.2 Public sector

Schools, hospital, public institutions and other public sector buildings of Montenegro are large consumers of energy and have been a part of numerous projects in regard to improving EE. Energy consumption of the public sector in Montenegro has never been measured separately. The public sector buildings were always bundled with other building so projecting a clear picture of current state of EE in public sector is difficult. The government of Montenegro is aware that the public sector should be the leader in EE measures implementation, as stated in the third Montenegro NEEAP. It states that the public sector should with its actions positively affect citizens of Montenegro and subjects

from the other sectors and that with its purchasing power it can have a strong effect on the energy sector of Montenegro. It lived up to these claims over the last decade with the implementation of some very important projects which shaped use of energy in the public sector today. Montenegro with its EE Program (hereinafter MEEP), which first started in 2009 reconstructed dozens of public sector buildings which became energy efficient (Balkan Green Energy News, 2017f).

As a part of the MEEP, the EE Program in Public Buildings was launched in 2012 and should finish in 2020. So far, the program covered 43 buildings, mainly educational and health institutions, with the plan to include public institution buildings in the future. Out of aforementioned 43 buildings, after their reconstruction, 39 of them showed huge energy savings after the post-project monitoring. At the cost of €34.5 million, energy savings amounted to 15,528,648 kWh which is around 49% savings (Balkan Green Energy News, 2017a). This project showed what becoming energy efficient means and just what the scale of savings that can be achieved with adequate investments. Also, apart from the energy savings, people who work in reconstructed institutions showed increased satisfaction with work conditions which will affect their work performance. By the end of 2017, €4.5 million was invested for reconstruction of four schools and health care facilities.

Even though reconstructions are doing their work, Montenegro has yet to implement a centralized system for energy management, as well as a functional database which would keep track of the energy consumption the in public sector. Measures like these have a strong effect on EE, even though it is not apparent as much as actually renovating buildings. It is up to the Ministry of Economy of Montenegro to accomplish this as soon as possible.

2.4.3 Residential sector

The residential sector in Montenegro is rather small due to rather low population of the country, but it still takes a sizeable portion out of the total energy consumption in Montenegro. As far as potential savings are concerned, Johansen et al. (2010, p. 13) estimated that there is around 10% savings potential in the Montenegro residential sector. It is fairly consistent with other WB countries. Also, over 60% of energy is spent on space heating and cooling, while appliances come second with just under 20%.

Montenegrin institutions for EE are aware that when it comes to the residential sector, raising public awareness of EE is the most important part in the process of having an energy efficient residential sector. As stated in the third NEEAP from 2016, measures that have been implemented, though only partially, are information campaigns and the network of EE info centers, and also marking of energy efficient appliances. These two measures help, but need to be implemented better if Montenegro wants to see some real results.

A measure that was proposed in the second NEEAP and was fully implemented as planned is the financial support to EE investment done by the homeowners. This was done through subsidizing loans used for EE, similar to what was done in B&H with Unicredit Bank. There is an active project in Montenegro called Energy Wood which is currently going through its third phase (Balkan Green Energy News, 2017d). What it does is it subsidizes the loans by making them interest-free to all citizens who use it to install a biomass heating system which is more energy efficient and has less negative effect on the environment than conventional heating systems used in Montenegro like heating with wood. During previous two phases of the project, 775 biomass heating systems were installed with the help of the Luxembourg Development Cooperation Agency and the Government of Norway. Another project that has a goal of improving the residential EE in Montenegro is MONTESOL (Energetska efikasnost, n.d.). It is done in cooperation between the Ministry of Economy and the United Nations Environment Program. Basically, similar to Energy Wood project, it subsidizes loans used for installing solar water heating systems. Project like this are a step in the right direction since households are often reserved when it comes to investments in EE because of the sheer cost of such investments. This is where the state has to step in with subsidies to encourage people to have energy efficient homes. This is especially important in countries like Montenegro or any other WB country, where its residents have rather low incomes and find EE not as important as some other expenses they come across daily. As stated in the third NEEAP published by the Ministry of Economy, these programs that help people financially are estimated to save 1.13 ktoe of energy until 2018. This is around 1.5% of the total energy consumed in the residential sector, but given the scope of these projects which are rather narrow and target limited percentage of population, it is a substantial figure.

2.4.4 Transport sector

When it comes to the transportation sector EE, Montenegro is struggling to achieve any significant improvement in the last decade. From five measures proposed in the second Montenegro NEEAP, two have not been implemented at all and other three were just partially implemented. Even the ones that were implemented are the ones that are performed by the state of Montenegro, while measures regarding the general population are falling behind. The government of Montenegro partially implemented criteria for public procurement of vehicles, meaning that the vehicles purchased for the government needs have to satisfy certain criteria regarding EE. This is something positive, but when it is considered how small of a percentage government vehicles take out of the total amount of vehicles, it will not change much. Though, it is a place to start and to act as an example.

A measure which is of critical importance for reforming the transportation sector is the implementation measures regarding infrastructure in relation to EE. This is a measure proposed in the second NEEAP, but was not implemented and as such has become a measure proposed in the third NEEAP to be achieved until the end of 2018. It is unlikely

that much will change until set deadline. Just like in other WB countries, the main issues in transportation sector are age of personal vehicles, underused and underdeveloped railroad, as well as underutilized and underdeveloped public transport.

In 2017, average age of vehicles in Montenegro was almost 15 years, while 49 thousand vehicles or around 25% are older than 20 years (Jovanović, 2017). Most of these vehicles are imported and are often defective and extremely polluting. It is really difficult to lower age of vehicles because that is directly related to standard of living in a country, which is something energy institutions have no power over. What can be done is organizing campaigns about energy efficient behaviour in traffic. Some campaigns were done in Montenegro, but not as much as was planned. Issues in transportation will become more pressing as time passes, because more and more vehicles are being registered, while the age of vehicles in not decreasing. When 2016 is looked at, there was an over 5% increase in registered vehicles compared to 2015 (MONStat, 2017). This trend is likely to continue and structural changes have to be implemented as soon as possible. Amount of passenger kilometers is a statistic which shows just how inefficient transportation sector in Montenegro is. In 2015, Montenegro had around 80 million passenger kilometers, while country like Luxembourg which is of comparable population had 418 million passenger kilometers (MONStat, 2017). This shows how Montenegro fell behind developed countries when it comes to EE and that some radical changes have to be done as soon as possible. But, without doubt, it will be challenging.

2.4.5 Industrial sector

The industrial sector of Montenegro is very specific and mostly revolves around one company and that is KAP aluminium smelter. This company in 2008 singlehandedly consumed 39% of the total energy consumed in Montenegro (Johansen et al., 2010, p. 23). It is also responsible for extremely high energy intensity of Montenegro which is almost three times higher than any other WB country. In 2008, the industrial sector of Montenegro consumed almost 350 ktoe of energy, while in 2009 that number dropped to around 170 ktoe. This may seem like an extreme case of improved EE, but actually the only reason for this drop is reduced production of KAP and to some extent Nikšić steel factory. Even though this drop happened, these companies and their respective branches of industry kept their majority share of the total energy consumption as can be seen in Figure 7.

Figure 7: Share of total energy consumption by industry in Montenegro

Source: Adopted from the Ministry of Economy of Montenegro (2013).

As is the case with already described WB countries, Montenegro industry is also from the communist era where only production and it being quick counted. EE was not taken into account and the example with KAP is perfect for showing the long-lasting consequences of subpar infrastructure and just how devastating it can be to a county's energy sector. And not much can be done because of the KAP's importance to Montenegro industry.

The Ministry of Economy since the first NEEAP proposed measures to improve EE in the industrial sector. They mostly revolved around the implementation of an energy management system which in itself is just the first step towards solving EE issues. The problem is that nothing has been done in that regard and deadlines are just being postponed continuously. Thus, real changes which would make a difference are not in sight. Reconstruction of KAP and Nikšić steel factory should be the main goal, but since both of them are in serious financial issues lately, it is not to be expected that much will change in this part of the energy sector in Montenegro. Though, it is important to move from starting point where the industrial sector has been for decades.

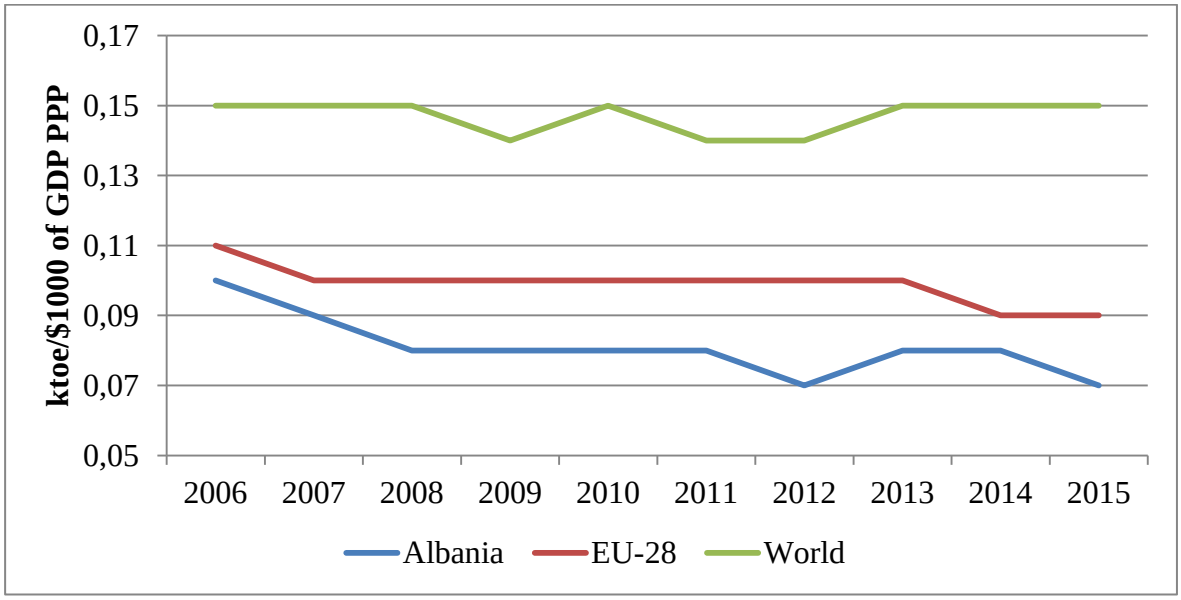
2.5 Albania

2.5.1 Institutional and legal framework

Albania is the only WB country which was not a part of Yugoslavia, but nonetheless it was also a part of the communist regime from the end of WWII until the early 90s. Even though the leadership differed, principles regarding the energy sector and EE were essentially the same. Importance was given mainly to fast construction of infrastructure and buildings which mainly had in mind the quantity of production while the quality was put aside. Thus, Albania faces many challenges regarding improvements in EE caused by outdated infrastructure which is putting an unnecessary strain on the economy of the country. Though, Albania is one of the few non-EU countries which have very low energy intensity due to the fact that it is one of the least developed countries in Europe.

Maintaining the level of energy intensity as shown in Figure 8 will be a challenge in the future as demand for energy increases rapidly.

Figure 8: Albania energy intensity 2006-2015



Source: Adopted from IEA (n.d.).

Being one of the poorest countries in Europe is not helping and is only slowing the reforms needed. Albania has started to take EE somewhat seriously in the late 2000s, when the first steps were taken. These were mainly driven by the EU Directives which were related to EE. The first move Albania did was the release of its first NEEAP in 2009 which covered the period 2010-2018 (EC, 2009). It covered proposed measures across all EE sectors with a clear strategy. As stated in the NEEAP, its implementation is supposed to impact energy consumption reduction, increase of security of energy supply, emission reduction, increase of real income for the population and improvements regarding energy intensity which is likely to become an issue in the near future as the country develops.

While examining the NEEAP, it is clear that Albania copied measures which are considered best practice for EE improvements. It was not adapted to the case of the country in question. At the end of 2018, when the implementation of measures is to be examined, it will most likely be observed that only a few measures were implemented as planned and that most will just be prolonged with a deadline somewhere in the future. This happens with other countries as well which publish NEEAPs mainly to satisfy the EC and the Energy Community with limited intention of actually implementing the said measures. Apart from the NEEAP, back in 2005, Albania adopted the Law on EE (Dibra, 2014). This was the first version of the Law and it was a complete failure. Implementation was non-existential as the law was not enforced at all. To counter this, in 2015, a new version of the Law on EE was adopted. It addresses the issues with the first version of the law and added some new guidelines which are intended to serve as a base for future actions regarding EE.

Also, in 2015, the Power Law was adopted. Its main goals are regulation of the legal framework regarding electricity and its supply. This will most certainly have an effect on EE in the country as the electricity is the most important energy source.

2.5.2 Public sector

Data about the public sector EE in Albania is lacking, but situation is strongly influenced by the pre-1990s public buildings which are still used today and are inefficient in terms of energy consumption. The government of Albania should, as soon as possible, conduct EE audits and perform data collection regarding energy consumption of all of its institutions to gain a better picture so adequate actions can be performed. Audits are one of the measured proposed in the NEEAP from 2010-2018, but implementation is still not at a satisfactory levels. So far, the data for public buildings has been coupled with buildings in general. Though, in a comprehensive study done by the EC in 2012 called Energy Efficiency in Buildings in the Contracting Parties of the Energy Community, it was estimated that potential annual savings for schools and hospitals in Albania is 515.4 GWh or €35.4 million. Schools and hospitals do not account for the whole public sector, but this is still a substantial figure for a country the size of Albania.

The government of Albania is generally doing very little in regard to EE in the public sector. Given the fact that the public sector should always lead the battle against inefficiency in a country, the government in Albania and institutions in charge of EE are doing a very poor job in setting the example for other sectors and other subjects. For example, the only measures proposed in the first Albanian NEEAP which concerns the public sector is defining stronger standards for new public buildings. This is a worrying fact, since the main problems in the public sector stem from existing buildings. Implementation of measures which would target the existing public sector buildings would have been a much better path that would actually yield results. This way, Albanian public sector and EE of it are not looking good.

2.5.3 Residential sector

After B&H, Albania has the most potential for energy savings in its residential sector out of all WB countries (Johansen et al., 2010, p. 13). At the same time, this means that Albania has the second least efficient residential sector. Latest data showed in the 2010 EEAP which dates back to 2008 estimates that 49% of the total energy consumption is spent within the residential sector (Republic of Albania, 2009). This shapes the sector as a huge consumer of energy and the fact that it is inefficient means that a lot of energy is actually wasted. Furthermore, Johansen et al. with the help of local consultant estimated that there is over 30% of energy saving potential in Albania residential sector. This implies very ambitious policies and investments.

The main issue of residential sector in Albania is capital constraints, mainly in low-income households which are abundant. This prevents the sector from developing and reaching its full potential. This is something that has to change at a higher level and the energy sector can only do some actions to improve the situation. The International Finance Corporation (hereinafter IFC) conducted a study (2014) and found that 54% of all electrical energy in Albania is spent in the residential sector. This clearly shows potential for savings and estimates say that $300 to $700 million is needed to properly reform the residential sector. For a country like Albania, this figure is simply not possible to invest, but it does not mean that nothing should be done. What the IFC did to alleviate the issue is starting the Albania Residential EE Project in 2010. The project works in cooperation with the local financial institutions to provide loans for homeowners who are implementing EE improvements. The project is supported by four Albanian banks: Credins Bank, Besa Fund, NOA and Societe Generale. As of June 2013, 2,500 loans were issued with the purpose of improving EE. Loans amounted to $10 million. This measure is the only one which concerns existing building.

All other measures proposed in the NEEAP are targeted at regulating new purchases, ranging from labelling energy efficient appliances to informative campaigns. Even though this is the cheapest option and in a way a "safe" road, it will not do much for EE of the residential sector. The fact that 90% buildings in Albania are constructed before 1990 (communism era), says enough about the importance of renovating those buildings that are the largest consumers of energy (IFC, 2014). The state of Albania has to start taking a bigger part in residential EE as soon as possible, even though the costs are very high. Government regulation and incentives rarely prove as a bad move. One step at a time is what Albania and its residential sector need..

2.5.4 Transport sector

The transportation sector is rather specific in the case of Albania. As the review of EE of Albania which was done by the EC in 2013 shows, the transportation sector in the early 90s amounted to between 10% and 20% of the total energy consumption while in 2005 the percentage went to 42% which a significant margin. This rise started in 1998 and did not stop until 2009 and the economic recession. The economic recession hit demand for energy in the transportation sector. Consumption dropped from 760 ktoe in 2008 to 405 ktoe in 2009. It is still recovering.

In the NEEAP, it is stated that €6.68million are to be invested to implement proposed EE measures in the transportation sector. These include labelling system for new cars, boosting share of public transportation, improvements in the railway network, introducing levy on CO_2 emission and achieving energy efficient driver behaviour. These measures are standard measures which were used for all the countries already mentioned above. The reason behind this is that developing countries like Albania or any other developing

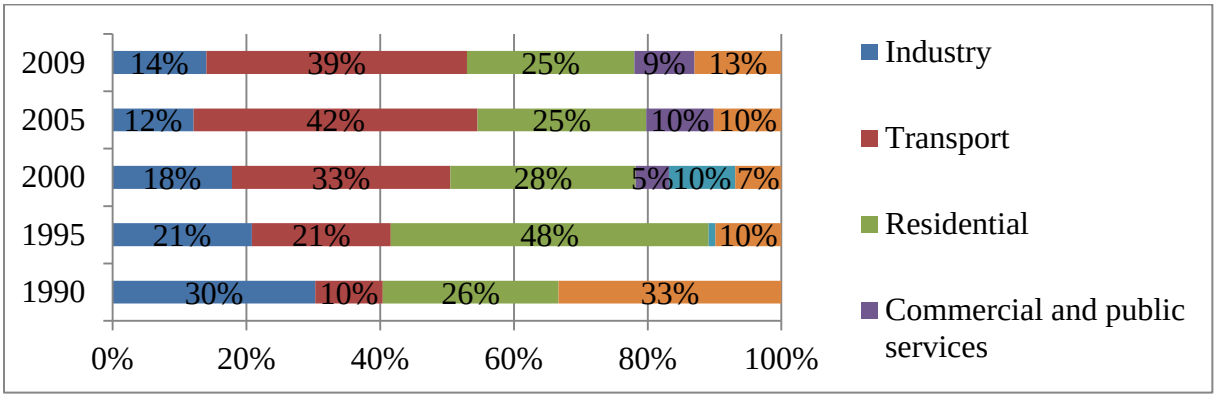
country have the same issues. Those are mainly old personal vehicles and ineffective railroad network. These two combined cause the sector to be very energy inefficient.

Since changing personal vehicle structure in a country is extremely difficult since it is not a direct issue of a deficient energy policy, but is rather a reflection of economy of a given country, what Albania should focus is its railroad network and public transportation. These two are the best tools to increase amount of passenger kilometers which is one of the best indicator on EE of the transportation sector. In early 2017, two major railway projects were approved in Albania. They have the goal of renovation and improvement of the Tirana-Duress and the Tirana-Rinas railway (Invest in Albania, 2017). The total value of projects is €86.4 million and they have the goal of supporting Albania's national economic development which is connected to the improvements in the energy sector. This shows that the state does recognize the issues, but everything is being done very late. Investments like these should have been done a long time ago as they are guaranteed to pay-off over time.

2.5.5 Industrial sector

Albania is not a very industrially active country, and energy consumption in the industrial sector reflects that. This is especially true when the state in the last decade is compared to the communism period where industry was rather strong, though still inefficient. In 1990, the industrial sector of Albania consumed 30% of total energy in the country, while in 2009 that number dropped to 14% (Energy Charter, 2013) as can be seen from Figure 9.

Figure 9: Distribution of energy used by sector in Albania



Source: Adopted from Energy Charter (2013).

What is even more worrying is that most of the industrial activity is done with the infrastructure from the communism era when level was much higher. This leads to the conclusion that no matter how inefficient the industry was before the 1990s, it was still more efficient than today. Amount of energy per unit produced is higher today and that is something to be improved through EE measures. Highest consumers of energy within the industrial sector are the iron industry, the steel industry and non-metallic mineral industry

(EC, 2013). Though, in the NEEAP it is stated that the food industry is the largest consumer of energy with 19.9%.

Albania has a general problem with serious lack of reliable data available and even the data that exist is conflicting depending on the source. This was recognized by the Albanian institutions when the NEEAP was being drafted since the first measure for industrial sector is the one where auditing the industry should be performed. They estimated that annual reporting of energy consumption will lead to savings of 12 ktoe. This measure is directly linked to the EE Law and is mandated by it. Other measures include modernization of technology or improvements like better motors, air conditioning systems or ventilation. These are measures that cannot be implemented without willingness of companies. Little to no progress was achieved regarding measures proposed in the NEEAP for the industrial sector. Albania has to start auditing companies as soon as possible and when adequate data becomes available it has to set clear laws and regulation with the goal of having a more energy efficient energy sector.

2.6 Kosovo

2.6.1. Institutional and legal framework

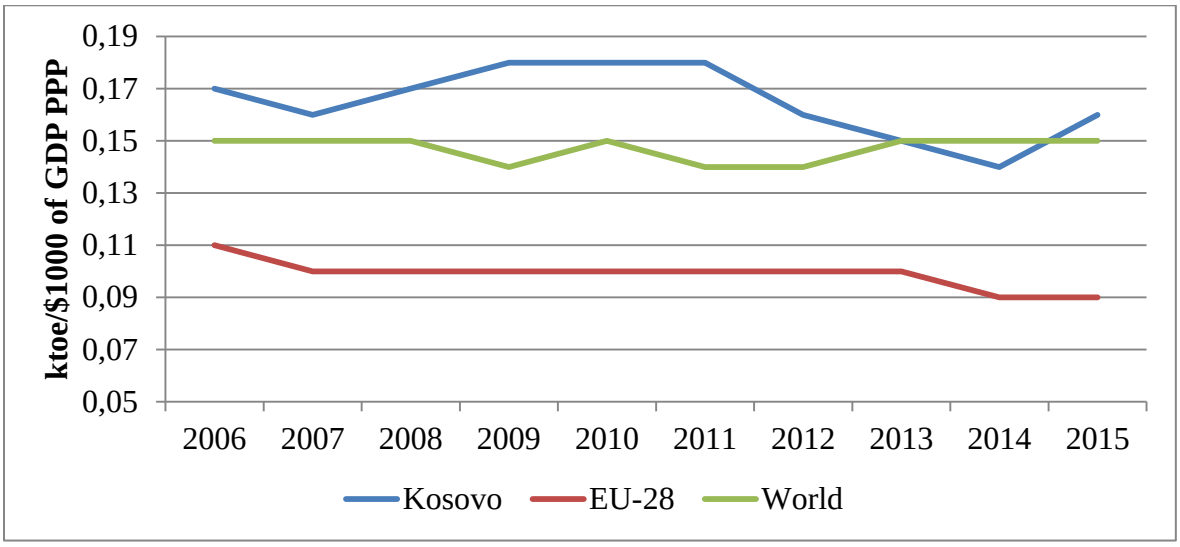
The WB as a region has been unstable over the last 25 years, but Kosovo is currently the most unstable country in the region. This is caused by political tension between Kosovo and Serbia due to its controversial independence movement and Serbia's categorical denial of Kosovo's independence. This reflects on the energy sector in Kosovo which is not in a state it wants to be in. Because of the fact that Kosovo was an official part of Serbia up until February 2008, it shares similar issues as Serbia since the energy sector was governed by the same bodies ever since Yugoslavia broke apart.

When it comes to the regulatory framework in regard to EE, Kosovo adopted all the important laws, but quality of implementation is arguable. Back in 2004, the Energy Law was passed and its basic principles included energy strategy, energy programs, rules for achieving EE and the use of renewable sources of energy, etc. (Ligji për Energjinë (Kosovo Energy Law), Ligji nr. 2004/8). This was the first serious step toward reforming the energy sector which was still more or less the same as before the Yugoslav wars. During the following years, laws on electricity and construction were passed. In 2011, the Kosovo Energy Law was introduced. The law regulates the issue of EE, preparation and approval of EE plans, determination of roles, duties and responsibilities of the institutions. Also, it addressed obligations set by the EC Treaty regarding EE (Ligj Për Efiçiencën e Energjisë (EE Law), Ligje nr. 04/L-2016). EE in Kosovo is regulated by the Ministry of Economic Development and under it there is an executive institution called Kosovo Agency for Energy Efficiency (hereinafter KAEE). KAEE implements policies and drafts action plans among other obligations like guiding other subjects toward achieving wanted levels of EE (KAEE, 2017).

Kosovo released the Energy Efficiency Action Plan (hereinafter KEEP) in 2011 and it covers the period from 2010 until 2018, similar to Albania. Measures proposed in the KEEP are supposed to achieve, among other things, increase in the overall EE knowledge, increasing capacities of EE institutions, licensing of experts on EE auditing and monitoring and assessing project regarding application of EE measures (Ministry of Energy and Mining, 2011). Kosovo has issued two NEEAPs, with the most recent one covering the 2013-2015 period. The NEEAPs try to follow the KEEP, but in shorter time periods. Another significant step when it comes to strategizing within the energy sector is Kosovo was publishing of the Energy Strategy of Republic of Kosovo in 2017. It clearly states all the challenges which are in front of Kosovo energy sector and tries to propose a strategy to combat those challenges. What is important for EE in Kosovo is that one of the five main strategic objectives is fulfilment of targets and obligations related to EE. This shows that the Ministry recognizes the importance of EE as an integral part of functional energy sector of the country.

To sum up, Kosovo has a reasonable regulatory and institutional framework regarding EE, as well as developed strategy. What is left is implementation and that is the most important step. The fact that energy intensity of Kosovo started increasing in 2014 (as can be seen in Figure 10), calls for a quick reaction in order to keep it under control as demand for energy rises.

Figure 10: Kosovo energy intensity 2006-2015



Source: Adopted from IEA (n.d.).

2.6.2 Public sector

Similar to Albania, Kosovo does not have separate data on the public sector energy consumption or state of EE in the public sector. Also, there is very limited data on energy spending in the public sector buildings in general. Though, in the NEEAP, there is a

proposed measure for energy auditing for all the buildings and the public sector is a part of that measure. The only issue is that the measure is yet to be fully implemented. What Kosovo also plans to implement in the public sector is improving EE through efficient lighting in the public sector. Even though this is a reasonable measure, it is very limited in scope and is unlikely to yield any substantial results. As is stated in the NEEAP, concrete results of the measure are to be assessed after the implementation and monitoring. This shows serious lack of planning and insight. There is no expected savings amount and it feels like this measure was proposed just for the sake of it. Though, it will be easier to discuss when proposed measures are assessed at the end of 2018.

The World Bank estimated that there is 49% savings potential in Kosovo central government buildings (World Bank, 2013). In order to reach some or all of this potential, the World Bank in cooperation with the Western Balkans Investment Framework funded Kosovo with $31 million through the Kosovo Energy Efficiency and Renewable Energy Project which has a goal to reduce energy consumption and fossil fuel use in the public buildings. The World Bank sees a purpose here since these investments will lead to savings in energy consumption which will in turn provide more financial space for developmental priorities which Kosovo should strive for. This project was approved in 2014 and will include 19 public buildings in Kosovo (Ministry of Economic Development, 2017). EE in Kosovo public sector is at a worrying stage at the moment but project like the one mentioned above give hope that change will happen. As like in other countries, the public sector in Kosovo has to lead with example when it comes to EE. Other subjects are likely to see higher importance in EE when the government is doing it and when it shows results. But to show results, energy auditing has to be implemented as soon as possible.

2.6.3 Residential sector

The residential sector in Kosovo is a significant consumer of energy, especially electricity. Out of all electricity used in the country, 57.6% is consumed by residential buildings (Rashani & Mahdavi, 2015, p. 782). This fact alone shows how important proper EE measures are in residential sector. Just 10% savings which can be done with moderate investments would be substantial for the energy sector as a whole.

Kosovo does not have reliable data on distribution of energy consumption within the residential sector but it is safe to assume that space heating and cooling is the highest user of energy just like in other WB countries and this is where measures should be mainly targeted at. Though, as showed in the World Bank study from 2010, Kosovo together with Albania has the lowest energy consumption of energy per square meter of living area. Even though this at first seems like Kosovo may be more energy efficient than other WB countries, the truth is different. What this actually means is that Kosovo still has not reached plateau in household energy spending. Residents are still not using many household appliances and are often heating just one or two rooms, not the whole household. This means that Kosovo has to act fast with EE measures because energy

consumption will skyrocket when Kosovo starts developing faster. Implementing adequate measures now will have great impact in the near future. Kosovo somewhat recognized this potential issue and as a result has a proposed measure on labelling energy efficient household appliances in the NEEAP. The fact that this measure is the first one proposed for the residential sector shows the weight it carries.

Given the fact that residential sector is very difficult to reform because of the financial status of its citizens, especially low-income households, Kosovo plans to focus on implementing measures which mainly target raising of awareness among the population. Also, energy auditing will play a major role in Kosovo's strategy of reforming the residential sector for it to become more energy efficient.

The IFC (2014) estimated that €1.12 billion are needed to optimize the residential sector and to reach 46.1% energy saving potential. It is not realistic to actually invest this amount, but it shows just how compromised the state of EE in the residential sector is. The EBRD in October 2017 provided a €2 million loan to Kriditimi Rural i Kosoves (hereinafter KrK) microfinance institution in Kosovo with the goal of supporting households to save energy and money (Balkan Green Energy News, 2017b). This will allow KrK to provide low-interest loans to individuals who wish to make their households more energy efficient. Also, the Kosovo Sustainable Energy Project, which is also an EBRD project, helped 3,100 homes to reduce their energy bills (Metering, 2017). Total of €12 million were disbursed as of 2017 for EE measures, mainly in the residential sector. Funds were disbursed through local financial institutions. These projects are the ones that make the biggest difference in Kosovo residential sector and even though they are good news, it is worrying that all the positive news comes from foreign organizations, while local government does basically nothing. With this pace, the residential sector in Kosovo will take decades to reach the current EU levels of EE.

2.6.4 Transport sector

According to the second NEEAP of Kosovo, the transport sector consumed 27% of the total energy used in Kosovo in 2012. After the residential sector, it is the highest consumer of energy. When the transport sector is examined itself, road transport is overwhelmingly the highest user of energy with over 95% of the total energy spent. This is typical for developing countries with outdated railroad network, poorly managed railroad companies and limited accessibility to public transport since it exist only in larger urban areas. First NEEAP envisioned 1.4 ktoe of energy savings in the transport sector with proper implementation of proposed measures.

Due to the lack of data and inability to gather data, it is unknown if this goal was reached. The problem of the lack of data occurs regularly in Kosovo energy sector and transport is no different. It is extremely difficult to implement adequate measures if there is no way to assess whether the previous measures were successful or not. This is something Kosovo

should work on. In the report done for the World Bank, Kosovo turned out to be the only WB country for which Johansen et al. were not able to estimate potential energy savings. The EU also recognized how much the transport sector has fallen behind in Kosovo.

The improvement of the transport sector has been outlined as one of the main parts of the Stabilization and Association Agreement between the EU and Kosovo which is the first serious step toward the accession to the EU (EU External Action, 2017). As far as the measures proposed in the second NEEAP are concerned, Kosovo did not plan anything out of the ordinary. It went with the standard measures like improving EE through information campaigns, systematic inspections of technical conditions of vehicles and improving public transport in Priština. Even though only three measures are planned to be implemented, they are probably the best ones Kosovo could implement regarding the transport sector. The most important one being inspections of technical conditions of vehicles since people tend to drive very old vehicles which are extremely polluting and energy inefficient. It is difficult to convince people to buy new vehicles, but with proper regulation it is possible to achieve that only properly conditioned vehicles are being driven. As far public transport in Priština is concerned, it is a positive measure, but more focus should be put to introducing public transport in other urban areas of Kosovo.

The Ministry of Economic Development of Kosovo recently started a project worth €600,000 which has a goal of studying EE potentials of the transport sector. This project will help Kosovo get a better picture of its transport sector so in the future measures can be implemented more efficiently and effectively. In late 2015, the European Investment Bank together with the EC announced an €82 million investment package for Kosovo railway modernization (Global Railway Review, 2015). Even though this is not directly connected to the energy sector, it will most certainly help Kosovo to become more energy efficient since more people will opt for railway transport which in turn increases amount of passenger kilometers.

2.6.5 Industrial sector

As of 2012, the iron and steel industry is the biggest user of energy within the industrial sector of Kosovo (Second Plani i Veprimit i Kosovës për Efiçiencë të Energjisë for Kosovo (NEEAP-2 KV), OG 07/159, 2013). It surpassed the food industry which is a close second. Out of the total energy spent in Kosovo, 12% is spend by the iron and steel industry which is a substantial figure and given the fact that those industries operate with manufacturing plants which are over 30 years old, there is a considerate savings potential in the industrial sector. Kosovo is another WB country with highly inefficient ore extraction industry, but still an industry which is very important to the economy of a country. Johansen et al. with their local consultants in 2010 (p. 27) estimated that Kosovo has 5-15% energy savings potential in the industry sector. This large interval shows just how unreliable energy data is in Kosovo and how hard it actually is to assess the current situation.

The second NEEAP includes two very broad measures for improvement of the industrial sector of Kosovo. The first one is improvements of small-to-medium enterprises and the second one is improvement of industrial enterprises. Projection is that these two measures will save 8.5 ktoe of energy (NEEAP-2 KV). The first problem with these measures is that they are not specific. There is no clear goal and what will be done to reach that goal. It seems like it was only put in the NEEAP for the sake of it, without any actual willingness to perform the necessary actions. Also, even though 8.5 ktoe of energy is projected to be saved, there is no way to know if those projections are reached at the end of a given period. The same problem happened when the measures from the first NEEAP were analyzed and it was concluded that it is unknown whether the projected savings were achieved since there was no way of calculating the data. Energy audits are also a priority for the industrial sector of Kosovo. Similar to the transport sector, there was a project worth €800,000 for studying potential for savings through EE in the industrial sector of Kosovo with similar goals. It is a useful study to get a better perspective on the current situation. The issue with the industrial sector in general is that it is often dependent on actions of companies which are mainly profit-seeking. It is no different in Kosovo. Just as other ex-communist countries, Kosovo and its industry went through privatization and if it is not financially viable for companies they will not implement EE measures. That is where the state has to step in with adequate regulation as well as incentives for being energy efficient.

2.7 Synthesis of analyzed countries

After going through each WB country, differences between countries in regard to the state of development of the energy sectors and EE are obvious. B&H still appears the worst in almost every aspect, while Serbia is doing the best. But, even though Serbia is doing the best, it is still quite underdeveloped when compared to the EU countries. What all WB countries have in common is being part of some form of communism regime before the 1990s and going through a devastating war in the 1990s. Even though the war cannot be an excuse for the current state of the energy sectors since over 20 years have passed since it ended and a lot could have been done during that time, it is a fact that it set the WB countries behind and that they are still recovering. The infrastructure was demolished and is still being rebuilt, companies ceased to exist and relationship between the countries which were once a common market was severely damaged, thus harming their respective economies and exports. This caused companies and factories to have much lower production than before the war, while still being the same in size and similar in terms of energy needed to maintain them. In turn, energy intensity skyrocketed (e.g. KAP Montenegro) without a solution to the problem.

The communist and socialist regimes under which all WB countries were and its complete disregard of EE, is also one of the reasons for the state of the energy sector today. This is especially true in the residential sector where everything was built fast and to house as many people as quickly as possible. So today, the WB countries have extremely inefficient

residential sectors which are next to impossible to renovate since they shifted from public to private property and investment by homeowners is needed. With the current standard of living and level of disposable income they have, large-scale renovation is unlikely to happen. As mentioned earlier, the fact that in Serbia €1.6 billion is needed to renovate the residential sector shows just how desperate the situation is. The public sector is in a similar position since most public sector buildings were built in the 70s and 80s and experience the same issues EE-wise as the residential sector. Though, since the public sector is financed by the government, some improvements across all the WB countries can be seen. In Table 3 potential savings for all WB countries across four sectors can be seen.

Table 3: Potential savings by sectors depending on level of investment

Country	**Public sector**	**Residential sector**	**Transport sector**	**Industrial sector**
Bosnia and Herzegovina	20%	20-60%	8%	10-30%
Serbia	n.a	17%	16%	12-18%
Montenegro	30%	10%	10%	15%
Macedonia	15%	10%	17%	18%
Albania	30-35%	30%	10%	25-30%
Kosovo	20-30%	10-30%	n.a	5-15%

Source: Johansen et.al. (2010).

The transport sector is probably the most helpless sector in basically all WB countries. Average age of vehicles is well beyond 10 years and with the current economic situation it is highly unlikely it will change in the near future. Measures that the WB countries are taking are not enough to change the situation for the better. This coupled with extremely underdeveloped public transport and outdated railway network with trains which are literally falling apart makes it hard to be optimistic.

When it comes to the industrial sector, it mostly revolves around manufacturing companies which are operating at very low efficiency due to outdated technology and production methods which were formed several decades ago while all WB countries were under the communist regimes. The largest companies which have the most output are very often state-owned and there is lack of political will when it comes to imposing mandatory changes which would improve EE. Whole economies of the WB countries are dependent on companies which are very energy intensive and extremely polluting to the environment.

Measures that the WB countries have taken so far (since after the fall of Yugoslavia and the fall of Albania communist regime) mostly revolve around short-term solution without any clear strategy which would cover an extended period of time. Not being in the EU and thus not having to comply with the EU strategy, regulations and policies like the Europe 2020 or the Directives which are legally-binding makes the WB governments reluctant to

implementing EE measures. Though, the EU through the EC has some influence over the WB countries when it comes to improvement in their respective energy sectors. For example, B&H was facing serious sanctions from the EC if they had not released their NEEAP. But, the fact that B&H waited until 2018 to release its first NEEAP shows that some countries are doing the bare minimum in regard to EE and it is mostly done to please the EU or the EC and not to actually improve the situation in the country. Through analysis of each country's NEEAP, similarity between the NEEAPs and proposed measures included in them is a clear sign that the purpose of the NEEAP is not actually to analyze the situation within a given country and based on that propose solution, but rather just to go formally through with it. In Tables 4 and 5 planned savings and latest achieved savings observed from the latest NEEAP of each WB country can be seen.

Table 4: Planned savings according to the latest NEEAPs (ktoe)

Country	Target period	Public sector	Resi sector	Tran. sector	Ind. sector	Other	Total	% of total consumption
Bosnia and Herzegovina	2010-2018	n.a	124	16	107	38	285	8.90%
Serbia	2010-2018	134	140	211	267	0	752	9.00%
Montenegro	2010-2018	n.a	1.13	n.a	n.a	32.58	33.71	4.68%
Macedonia	2010-2018	14.65	20.10	26.89	57.59	31.99	151.22	9.24%
Albania	2010-2018	n.a	37	52	42	37	168	8.81%
Kosovo	2010-2012	n.a	12.80	1.40	8	9.75	31.95	2.70%

Source: Latest NEEAP of each WB country.

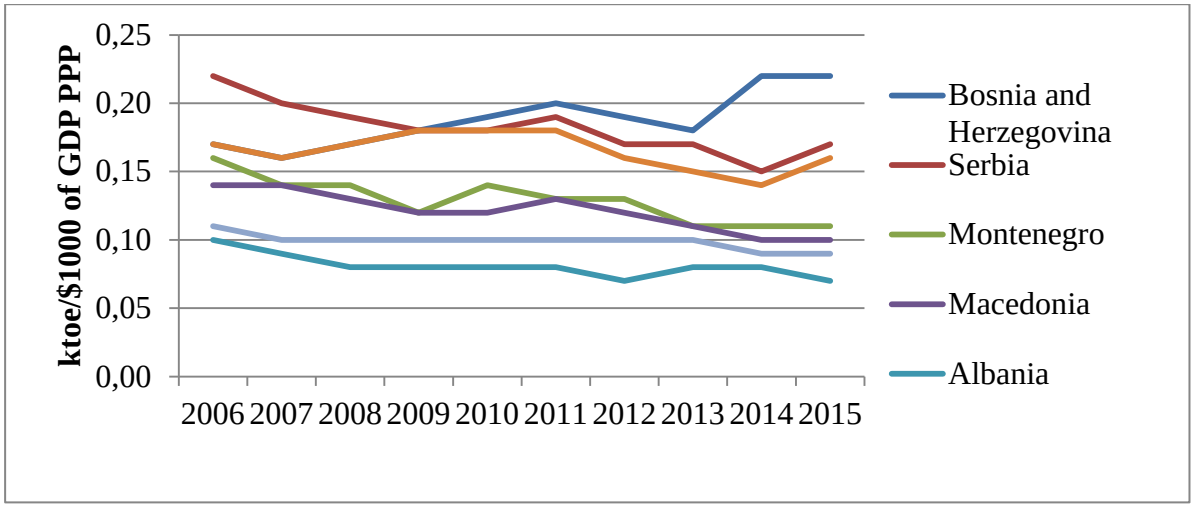
Table 5: Achieved savings according to the latest NEEAPs (ktoe)

Country	Target period	Public sector	Res. sector	Tran. sector	Ind. sector	Other	Total	% of total consumption
Bosnia and Herzegovina	2010-2015	n.a	50	6	8	60	124	3.88%
Serbia	2010-2015	80	109	72	47	0	308	3.69%
Montenegro	2010-2015	n.a	0.53	n.a	na	14.25	14.78	1.98%
Macedonia	2010-2015	13.90	11.38	19.52	22.20	13.97	80.97	4.95%
Albania	n.a	n.a	n.a	n.a	n.a	n.a	/	/
Kosovo	n.a	n.a	n.a	n.a	n.a	n.a	/	/

Source: Latest NEEAP of each WB country.

NEEAPs have a section about progress of proposed measures in previous NEEAP and the fact that sentence "measure not implemented" happens way too often is a sign on what is going on. There is a systemic issue, apart from perhaps Serbia and to some extent Montenegro and Macedonia, where everything is done except the execution. For example, Kosovo has had very well developed institutional and regulatory framework supported by well thought-out strategy for a quite some time, but the actual results are still lacking. Still, it is far ahead of B&H which still does not have an EE law or a clear energy strategy. The fact that Serbia and Macedonia reached over 95% of their planned savings for the period until 2015 while B&H does not even have a clear strategy of what is wants to achieve, shows there is a serious gap between stages of development of energy sectors between some of the WB countries. Changes in energy intensity since 2005 in Figure 11 clearly show how each country is progressing and how effective implemented measures are.

Figure 11: WB countries energy intensity 2006-2015



Source: Adopted from IEA (n.d.).

Given the difference between development of the energy sector and levels of EE achieved among the WB countries, different approaches are to be taken by each country. Countries like B&H still have to go through the most basic steps like forming all the required policies, regulations and institution as well as starting state-wide EE projects. Also, there is an example of Kosovo which does have adequate regulations and institutions, but only because it used to be a part of Serbia. After its secession, the regulatory and institutional framework remained while measures are severely lacking. Unlike Serbia or Montenegro, some countries are still heavily relying on donations from international institutions like the World Bank or other foreign funds. Some domestic financing and planning which will be clearly targeted focused has to happen similar to the Tuzla Canton residential sector project, but with state funding. On the other hand, Serbia for example is ready for some serious EE projects which will have strong effects on its energy sector. It has everything required to start those projects from adequate institutions to clear energy strategy, only

adequate measures and execution of those measures are needed. The less developed WB countries should look up to more developed ones and learn from their actions and try to reach their level of EE development.

3 MEASURES TO IMPROVE ENERGY EFFICIENCY

3.1 Public sector

3.1.1 Public institutions

Public institutions being all buildings run by the state within a country on all levels take up a significant part of energy expenditure. The main reason is the size of those buildings and the fact that most of them in the WB were built around 40 years ago. Also, given the fact that the state (public administration) is often the biggest employer in the WB, it is clear that EE of public institutions should be a great concern and that proper measures are to be implemented as soon as possible. For example, in B&H 192.000 people are employed in public administration (Center for Civil Initiatives, 2017). That is every fourth employed person in the country. Since most of them work inside public buildings and use energy provided by public buildings, it is clear that a sizeable amount of energy spent every year is spent by buildings used for public administration. This issue is present in all other WB countries with overemployment in the public sector and thus excessive expenditure of energy in the public sector. As already mentioned, reform of the public sector is always the first step taken when trying to improve EE. The public sector sets an example for other sectors in regard to EE measures because governments are not driven by profit, but by wellbeing of their citizens.

As argued by Ruparathna, Hewage and Sadiq (2016, p. 1033), institutional buildings are a key indicator or the socio-economic development of any nation. The reason why is the fact that funding of EE projects is relatively easier within public sector due to easier monitoring and implementation of measures. If public sector is not energy efficient, it is almost certain that none other is. Outside donations by various international organizations are very often targeted at improvement of public administration buildings because they can more easily monitor implementation of the project and how the money was spent since there is no corporate interest present and there is less fear of being accused of favouritism. Generally, the main issue with improving public sector EE in the WB is the size of it and the fact that is was built long time ago. This is a problem because it is, relatively speaking, less expensive to build a new building according to EE standards, than to renovate existing ones, especially given their amount. But, because there is already an excess of public buildings, renovating existing ones is the only way to improve public sector EE. This includes improvement of isolation, ventilation systems, switching to more efficient energy sources, implementation of adequate data collection systems, etc. This is all very expensive

and requires significant dedication and smart spending, especially given the situation the WB countries are in.

The first step toward implementation of adequate measures in public sector buildings is realization by the WB countries' governments and people in charge just how important EE is and just to what extent would energy efficient public sector be beneficial in the long term. What is often overlooked is the importance of local authorities in regard to public sector EE (Annunziata, Rizzi & Frey, 2014). Local authorities are the ones who should suggest measures for the buildings under their jurisdiction and they are the ones who should act according to the current situation and according to wanted benefits after potential EE measures implementation. Though, it is difficult to have a clear picture of the benefits when a way of measuring the current situation is lacking. This is a problem all WB countries face – lack of data collection regarding EE. Thus, proper data collection and examination of EE indicators should be the first step for WB countries public sector.

Good energy policy is built on good data and continued data collection is the key toward reaching an energy efficient state. For example, is the US EE data collection has been under-funded for decades now and there is a lot of pressure on its Congress to improve the funding due to the fact that it has become obvious that improper data collection is dragging EE improvements (American Council for Energy-efficient Economy, 2017). The main data collection point for public sector administration buildings should be space heating, space cooling and lighting (IEA, 2013). Energy consumption and performance by these three is a solid indicator of the level of EE. One of the possible solutions for the issue is employment of a data collection agency which would perform the data collection, or making a governmental body which would perform data collection and propose adequate solutions and measures based on the collected data. Another reason why data collection is so important in public sector is the fact that there are relatively low amount of public buildings compared to, for example, residential buildings and it would be possible to perform an energy audit for each building separately. This would lead to better results and issues would be tackled for each building separately. This would increase efficiency of EE measures significantly. Public sector relies on micro level data which proved to have strong impact when used appropriately to implement measures (Ambrose & James, 2017, p. 159).

A persistent issue for the WB countries and their respective public sector's EE is not so much identifying issues and proper measures for those issues, but implementation of said measures. As can be seen in each country's NEEAP, even with serious lack of data, issues are clearly identified with adequate measures proposed. What is lacking is the next and most important step, implementation. After countries go through data collection and get a better overview of the issues for each building, what is needed next is funding to implement appropriate measures. This is where energy institutions should step in, given they are properly funded by the state. Renovating buildings, especially public sector

buildings which tend to accommodate large amount of people, is an expensive feat and without adequate regulation which would commit authorities to spend on EE, it will often be put aside. Proper EE law and EE governing body are crucial for stable and adequate funding. The WB countries ignore the funding issue because foreign donators like the World Bank, the EBRD or KfW often donate resources for EE improvement of public sector buildings. But, relying on donators is not enough and never will be enough. There is also a danger that the same donators will over time get tired by the lack of engagement from the WB countries' authorities and reduce donation or even stop them completely.

The WB countries have to start funding EE both on state and local levels. Without adequate budget from both levels of government, EE in public sector will have a hard time reaching satisfactory levels. EE in developing countries is rarely a politically active topic and is guaranteed to be put on the side by the top government officials. For example, what Croatia tried to do and is still doing to promote EE, especially in public sector, is employing EE experts in their respective institutions and ministries and appointing them to lobby upwards (i.e. policy makers) about importance of EE with hope that they will recognize the need for improved EE and thus make it an active political topic (Bukarica & Robić, 2013, p. 417). This is what Croatia was doing before it joined the EU and similar approach should be done by the WB countries if some improvement is to be seen. Public sector is almost always the first sector to become energy efficient and by providing budget for EE, this is where it is most likely to end up at. Montenegro has recognized the issue of not having adequate EE expert which could influence policy-making. It is talked about in the current NEEAP. Some local governments have employed energy managers which control energy policy, but on a national level the support is still severely lacking.

Basically, public sector and especially administration buildings should be the easiest task in regard to EE improvement. After proper data collection actions are undergone, what if left is funding and proper renovation of buildings with the resources at disposal. There is no need for raising public awareness like it would be in residential or transport sector which is a demanding and expensive task. Providing budget from state and local authorities with donations from international institutions would expedite public sector energy reform vastly. This would cause a chain reaction to other sectors because public sector would in a way lead as example. Ultimately, none of these measures can be done without proper institutional and regulatory support. What the WB countries have a habit of doing is making laws and making institutions like EE agencies, but nothing is done past that. Law is passed but is not enforced and EE agencies have zero power or willingness to improve the status quo. Though, public sector and administration buildings within it will continue to be renovated in the future from foreign donations, but that is a suboptimal solution which will bring no solid results and will take longer than optimal.

3.1.2 Schools and hospitals

Schools and hospitals as a part of public sector act similarly to public administration buildings, except they are higher in quantity. Since almost all education and healthcare in the WB countries is state-run, the sheer number of buildings is vast. These are buildings which are rather big and often thousands of people work or spend time in them. This leads to significant energy spending on a yearly basis. Hospitals are especially energy demanding because they work non-stop and given their purpose they are under more strict rules regarding ventilation, sterility or the use of armamentaria. This makes hospitals have higher needs for energy (Wang, Li, Liao & Fang 2016, p. 588). Given the fact that many of schools and hospitals were built in the communist era and that only some of them were renovated since then, it is a worrisome prospect just how much energy is wasted due to improper EE measures. Poor insulation, old and damaged windows, poor heating and cooling, all lead to an inefficient public sector. All this puts a lot of strain on the state since a lot of resources are spent simply because of the poor state of the buildings. Schools and hospital are often part of international donations which are used for EE improvements. These donations have also a humanitarian note since renovated schools and hospitals are not only energy inefficient, they quite regularly have such bad insulation that even with heating they cannot be heated. The WB countries cannot forever rely on foreign investments to make their schools and hospital efficient and comfortable. Adequate measures have to be implemented sooner rather than later.

Similar to public administration buildings, data collection is a very important measure for schools and hospitals EE. Employments of a data collection agency or starting a government data collection agency are some of the options. Due to a rather high number of schools and hospitals and given the fact that most of them were built in a similar fashion, in this case using macro data would probably be a better solution mainly because of the price. It would be too expensive to evaluate each building separately. Instead, schools and hospital could be bundled based on the type of construction and their current state. Data would be analyzed and most appropriate renovations would be identified for each building.

The WB countries should focus on performance-based approach where evaluation results can be compared based on different performance indicators (Salleh, Kandar & Sakip, 2016, p. 213). This is useful for the WB because there are large number of schools and hospitals which need renovation and benchmarking them against each other could prove helpful in order to reach similar results without overinvestment in some and underinvestment in others. For example, in one of the latest EE projects in Greece where 10 school buildings were renovated, usage of software for data collection proved to be crucial for both analysing the current situation and monitoring results after EE measures were implemented (Katsaprakakis & Zidianakis, 2017). This “modern” approach would save costs in the long term in the WB countries as well and it would not be needed to evaluate each building

separately before individual renovations. For example, getting the material for a bundle of schools would be cheaper than buying it for each one.

Two main savings potential points for schools and hospitals are reduced heating and cooling loads as shown in numerous other projects in the region and globally. To be specific, building envelope insulation and replacement of inadequate openings are the main tasks. In some cases, construction of green roof as a passive measure could be implemented, if it is shown that such investment would be worthwhile. Some other measures include installation of new doors and windows with insulated frames which are very important due to the fact that windows are often very poor quality and let cold air inside which does not help EE. Ventilation strategy is another aspect of EE which plays an important role, especially in large buildings like schools or hospitals. In the WB countries and other developing countries, the most common way of ventilation is opening the window (happens regularly in developed countries as well). In some cases that is the best solution, while in others is makes a building very inefficient. This is something to always think about before starting EE projects.

One of the main barriers to implementing these measures is rather high initial investment with long payback period. This is an unfavourable situation, but still with every day that passes without implementation of EE measures, energy is wasted. For example, in China, 73% of survey respondents said that long payback period is the main reason they opt-out from the EE investment (Erhorn-Kluttig & Mørck, 2005). Workaround for this issue is to have more modest investment, but with lower savings. Even though this might not be optimal in long-term, limited funds of the WB countries might cause this to be the only possible option. In a project with lower initial investment, the most important aspect is to put more emphasis on cost-effective approach, meaning to do as much of the renovations as possible with resources as limited as they are. Realistically speaking, it is unfair and impossible to ask the WB countries to fully renovate all schools and hospitals and make them ultra-efficient like some schools in Canada or Western Europe are, but it is reasonable to expect frequent projects which would aim at 15-20% energy savings with added benefit of not having the cases where rooms were cold regardless of active heating and thus making them uncomfortable. These low-savings projects are popular in the US and have proved to have great short-term effects and decent long-term effects.

Issue with the WB is the fact that most schools and hospital are state-run and all responsibility the improve EE is on the state. With the situation as it is in the aforementioned countries, there are much more pressing issues like unemployment or ineffectiveness of social programs which cause EE to be an ignored issue. There was a recent project financed by the World Bank which renovated 20 schools in B&H. Measures were implemented with the goal of reducing energy bills, reducing greenhouse gas emissions as well as improving quality of life inside the buildings. The project cost around €4.5 million (BEEP, 2018). This is a substantial figure and something that local

governments in the WB countries would have trouble funding on their own. This is another reason why the WB governments should focus on low-investment renovations. The ultimate goal should be to encompass as much schools and hospitals possible with some renovation, rather than limited buildings with full renovation.

This is where government budgeting and EE funding comes into play again. If decent level of EE is to be reached, the WB countries cannot rely only on donations. Budget for EE has to be set both on state and on local levels. Optimal solution would be setting up an effective EE agency which would, using a predetermined budget, analyze and benchmark all schools and hospitals in the respective countries and propose a plan for renovation. The agency should consist of energy experts who would know how to outline the issue to the policy-makers with clear results and saving potentials. With this comprehensive approach, there is a chance that political will would shift and that more EE measures would be implemented. For most WB countries, even implementation of some measures would be better than the situation that is today. Since schools and hospitals are one of the most important institutions in today's society, making them feel comfortable for anyone using them should be one of the priorities. On top of all of this, EE measures will pay-off in the long-term.

3.2 Residential sector

Residential sector is often the highest consumer of energy in a country, especially in the WB countries with low EE buildings. This puts a lot of strain on the energy sector of a country, as well as on the residents who have to pay higher energy bills due to improper insulation or low-quality windows. Given the sheer size of residential sectors, excess resources spent on energy accumulate over time. What makes residential sector different from public sector is the fact that most investments and actual changes to EE have to be done by the actual residents rather than the state. This makes improvements in residential sector very challenging because standard of living is not at the highest levels in the WB countries and people are reluctant to spending money on having a more energy efficient home while their basic life needs like food or general wellbeing of their families is in question. This consideration is a sentence to residential sector that any changes to it that would make it more energy efficient are going to happen slowly and will be limited in scope.

In order to have actual and meaningful improvements in EE, the most important aspect that has to improve is the economies of the WB countries which will in turn improve standard of living of general population and allow them to have more disposable income to spend on EE. Important distinction in residential sector is the difference between improving existing residential buildings and making residential buildings that are going to be built in the future adequately. Different approach and EE strategy has to be defined for each of these subsectors while not forgetting that both of them are equally important and have significant impact on EE of both residential sector and of the whole energy sector.

3.2.1 Improvements in existing residential buildings

Arguably the most important measure that has to be implemented in order to improve the state of existing residential buildings (i.e. communist-era buildings) is raising EE awareness of the general population. Unfortunately, residents of inefficient buildings in the WB have to take act by themselves and improve EE of their homes. This is somewhat recognized by all countries covered in this thesis as can be seen in their respective NEEAPs and APEEs. For example, in the FB&H, the APEE for the 2016-2018 has gone so far as to propose a measure of implementing the topic of EE in the curriculum of elementary schools. This measure is yet to be implemented. It would allow young population to have increased knowledge of EE which would in turn allow them to make better decisions when they get to the age when making decisions about housing. But, only educating elementary school students is not enough if the state wants to raise awareness of EE. Current decision-makers have to be educated as well, because they are making the change at the moment and they have the greatest impact for short-term EE of residential sector.

Comprehensive campaigns have to be launched nationally as well as locally. They would have the goal of encouraging residents to implement EE measures in their homes by teaching them of proper investments and what they get back - saved money through lower energy bills. Albania is one of the best out of the six countries regarding awareness campaigns. They have started with the program in 2007 and are still doing it. As argued by Bichard and Thurairajah (2013) after they examined the effects of a behavior change strategy in the UK which has the goal of motivating home owners to invest in energy-saving, it is key to act on time during the decision-making process of home owners and to campaign in context of affordable materials and installation costs. These findings are easily translatable to the WB countries where the population is even more cost-sensitive and would most likely opt-out of energy-saving measures if they cost too much. They also concluded that face-to-face communication of benefits gained by implementing EE measures is very important and yields results. In the case of the WB countries and the existing residential buildings, this would mean going door-to-door and communicating energy-saving methods. This is something to consider since it could prove to be effective, especially if key information was put on a flyer which would be handed out to homeowners for them to further examine what they would get if they change their windows or improve insulation on their house.

Casado, Hidalgo and Garcia-Leiva in a study they conducted in 2017, concluded that the communicated message should have specific information, not just generic. With specific information communicated, homeowners are much more likely to invest in EE. Also, information has to include both behaviour guidelines as well as economic benefits in order to be effective. In the context of the WB countries, these campaigns would have the best effects if done through mass media like TV or radio. Ads on mass media are still relatively

cheap compared to what they would cost in Western Europe (ZIGT, 2014) and are something energy agencies could develop and implement if a reasonable budget was appropriated by national and local authorities.

Projects conducted by cooperation of local banks and international organizations like the World Bank or the EBRD where these organizations subsidize loans used by citizens to improve EE also proved effective. As mentioned before, these projects regularly occur in all WB countries but sometimes they have limited response by the population. One of the main reasons is the lack of communication between the banks and the customers. Customers have to be better informed about these kinds of opportunities, especially in countries where there is an alarming need for EE investments. What the WB countries could do is finance projects like these. That would potentially be more effective due to increased ability of the state to advertise these kinds of projects. Installation of better insulation, energy efficient water-heaters or better doors and windows is an expensive task. If the state would subsidize these loans so investments became interest-free, EE measures would most certainly be implemented more often. Communication of projects in cooperation with local banks could be done through aforementioned flyers. Combining information about the importance of EE with information on how to finance EE investment would be effective and would resonate better with homeowners.

Another measure that is already a standard measure in developed world is labelling of energy efficient household electrical appliances like refrigerators, dishwashers or washing machines. For example, in Canada 49% of electrical appliances currently in use have the ENERGY STAR label which is label for energy efficient appliance in Canada (Radpour, Mondal & Kumar, 2017, p. 951). This shows that significant market penetration of energy efficient household appliances is possible and that homeowners are likely to buy the ones which use less energy and in turn reduce energy bills. The problem in the WB countries is the fact that this measure is rarely present and when it is, the implementation is poor and limited. Even if homeowners wanted to buy efficient appliances, appliances not being labelled make it more difficult to distinguish them apart from inefficient ones. Manufacturers tend to label their appliances as energy efficient, but that is not reliable information. The state has to intervene and set clear standards on what constitutes an energy efficient appliance and to label them according to those standards. This is a serious issue because the WB countries are still very behind developed world in terms of usage of household appliances and as time passes, it is inevitable that the amount of household appliances each home has will increase drastically (Johansen et al., 2010, p. 16). This will put more strain on energy bills and buying energy efficient appliances will prove helpful.

The fact that WB countries still have rather low number of household appliances per household provides an opportunity to be proactive. If people start buying energy efficient appliances now, in 10 or 20 years there will be less EE issues in individual homes. In regard to water heating, recently in the WB countries using solar panels for water heating

has become more popular. For example, in B&H households which implemented water heating with solar panels have decreased their electricity bills by up to 40% (Klix d.o.o., 2018). This is a significant amount and implementation of this measure should spread more rapidly, but as experts in the field say, people are not thinking rationally when it comes to energy spending. This is another sign that educating general population about EE is the most important step towards improving existing residential buildings and their EE.

3.2.2 Regulation for new buildings

Regulations for new buildings and the standards they have to satisfy in an important step toward reaching energy efficient state. The WB countries should know this better than anyone simply by learning from the mistakes made in the pre-war period. It is often argued that it is cheaper to construct an energy efficient building than to renovate existing inefficient building in order to make it efficient. With so much research done in the last couple of decades and with so many clear data on energy efficient measures saving significant amounts of money, making new buildings with strong care for EE should be an imperative for all WB countries. The reason why even new residential buildings are often built with limited regard to EE is the fact that those who build new residential buildings are not the ones that will be paying the energy bills in the future. They simply sell newly-built apartments and their job is done. They do this because making a building energy efficient costs money because of higher quality insulation, better doors and windows, etc. It is irresponsible behaviour, but it is happening regularly. In these cases, the state has to intervene and prevent this from happening. Buildings built today will most likely be in use until after 2050 and they present a good opportunity to save energy in the long term. Investments in EE today are guaranteed to pay off during the lifetime of the building. The sooner EE in new construction becomes the norm, the better residential sector will perform in regard to EE. Not only will energy bills be lower, overall quality of life will improve as well. In nearly all OECD countries there are minimum EE requirements for new buildings in form of either building codes or by setting standards (IEA, 2008a). This is something the WB countries should look up to and implement themselves.

The best way of dealing with issues of constructing new buildings and the best way to ensure that all newly-built residential buildings will be built with regard to EE is by making it a law. The law would include clear regulations on what minimal requirements for new buildings included in the general building code. EE would be regarded with the same importance as safety standards of new buildings. Also, this law would include clear guidelines on what any new residential building, or any building for that matter, should have with the goal of EE improvements.

First of all, insulation is probably the most important aspect, especially in the WB countries where four different seasons are standard, meaning summers are hot and winters are cold. It is important to be able to keep constant inside temperature during all seasons. Insulation is best ensured with clear regulation of how the building envelope, meaning

parts of the building which surround heated and cooled parts, should be constructed. These most often include quality of windows and their ability to let in light or their ability to keep the cold air outside as well as what the minimum of insulation to be used in the building's walls.

Also, defining the standard for heating systems is another crucial aspect in order to achieve EE. In order to avoid demanding exactly what type of heating is to be used due to the fact that purchasing power is not on such high levels in the WB, only defining the minimum effectiveness and efficiency of heating or cooling system would be enough. This would allow lower wastage of energy and would save money for the tenants. Some other important guidelines could include minimum use of renewable sources or energy, passive cooling or heating, automatic controls, air filtering and ventilation. These could be applied in special cases where they would have greater impact on that exact building.

Of course, making the law and publishing it is the easy part. Enforcement of the law is the challenging part. How to ensure that new residential buildings are following new regulation and that new residential buildings are in fact energy efficient? One of the options is making the statement of building's EE state part of mandatory documentation while filling for construction permits. It would be enforced by either establishing a government body or certifying private companies to perform testing on EE of new buildings. They would examine the construction plans and based on them predict whether a given new building will satisfy predetermined EE standards. This is something Serbia has done with its Law on Planning and Construction from 2009 where it defined regulation and guidelines for any new construction. In it, EE of new building plays an integral part. What is interesting in the published law is the fact that if the person in charge of giving the permits (i.e. minister for building construction affairs) disallows new construction due to the fact that they do not meet minimum requirements, there is no possibility of appeal. The only way is to either sue the state or change the building plans. The latter is much easier. Similar law like in Serbia should be implemented in all WB countries if their goal is to have energy efficient buildings. Setting regulations and making EE a standard part of building codes will save a lot of money, time and trouble in the future. Though, writing a law is just a start. Enforcement is what is actually important. Thus, having licensed companies perform EE testing and authority's ability to recognize potentially energy inefficient building is key to avoiding of having any new and energy inefficient residential buildings.

Furthermore, EE of new buildings is also directly influenced by awareness of the general population. For example, with the existing knowledge about the importance of having energy efficient home, potential homeowners while shopping for a new home are more likely to choose a home with more EE measures implemented. With more people educated, home sellers will more often be inquired about what EE measures they implemented while constructing a residential building or a house. This is likely to make them have no other

choice but to start caring about EE more and to use better materials which have an effect on EE of a building. The goal should be to educate population to that extent that they do not differentiate between the importance of EE of a home and other common characteristics of a home like location or type of floor.

There has to be some difference between informational campaigns for current homeowners and potential ones. For raising awareness of potential homeowners the best option would be for the state to partner up with local banks in order to educate them. Local banks because new homeowners tend to take a loan in order to finance their new home and that is the place to reach most of them. Including information about the importance of EE in regular bank flyers or putting posters on bank windows are some of the possibilities. Since buying a home is a life-changing investment, potential homeowners are looking for any new information that will help them make a decision and they would most certainly be interested in what added value energy efficient home provides. Also, general awareness rising, as already explained in the section above, would be beneficial to future homeowners as it would be to people who already own a home and are looking for ways to improve it.

To sum up, making new residential buildings energy efficient is mainly reliant on proper regulatory framework which would change existing buildings codes by updating them with adding EE as an obligation rather that an option. But, even though some WB countries like Kosovo have appropriate laws on construction of new buildings which include EE, they still lack proper enforcement by the authorities. This is something that has to be taken very seriously because it will be much harder to renovate inefficient buildings in the future than it would be to make them energy efficient when constructed. Educating the population is important as well.

3.3 Transport sector

Ever since EE became a widely debated energy issue, transport EE has been at the forefront as one of the great contributors to poor EE (Moriarty & Honnery, 2012, p. 2). The optimal set of measures to improve transport EE have been debated for decades and consensus is that there is no universal solution. Every country has to adapt its strategy to its respective situation. The WB countries are all fairly similar given their history and the state of their transportation sectors. A similar general strategy could be applied to all six countries. Old vehicles with very poor public and railway transport in turn produce a highly inefficient and polluting transport sector. Also, poorly organized and poorly used public transport coupled with its availability only in bigger cities brings EE in transport sectors to even lower levels. The WB countries recognize issues with transport EE and include in their NEEAPs appropriate measures to fix the issues, though implementation is lacking as usual. For example, Macedonia in its most recent EEAP has four measures proposed for the transport sector. Two are for improvement of the road transport, one is for the public transport and the last one is for the railway transport. This confirms that the

main problems are clearly identified and measures, even though limited in scope, are proposed in a correct manner.

What makes transport sector special is the fact that issues it deals with are very complex and require complex solutions. There is no simple measure to overcome challenges associated with excess energy use in transport sector (IEA, 2010b, p. 7). Each subsector within transport sector requires completely different strategy due to very different set of problems each of them has to address. And most importantly, strategies for different subsectors have to be aligned since they are dependent on one another. Limiting use of personal vehicles makes no sense if well-organized public transport does not exist. The fact that the WB countries are relatively poor does not help and is a huge barrier to achieving energy efficient transport sector.

3.3.1 Road transport

There are numerous measures which can be implemented in road transport sector in order to improve its EE. It all depends on the country and the current situation transport sector is in, as well as the funding potential. It mostly depends at what level of implementation of EE measures the sector is. There have recently been talks about Germany possibly banning gas and diesel vehicles (Petzinger, 2018) and imposing that measure in a country like Kosovo would be nonsensical, while Germany has reached levels of EE and reduced pollution to such extent that these kind of drastic changes make sense. The WB countries have to start from the beginning since currently there are almost no serious measures or limitations imposed in regard to road transport. People still drive over 20-year-old cars which are in questionable state since testing is not performed properly which causes irregular vehicles to often pass annual testing.

One of the most limiting factors in overcoming age of vehicles is standard of living of the WB population. People are having trouble with satisfying their basic human needs and car replacement is not their priority. Though, driving improperly maintained and extremely polluting vehicles should not be an option, regardless of economic state of a country or of an individual. Measures are already present in all WB countries and technical characteristic that a vehicle has to satisfy each year upon registration are clearly defined. The problem is the enforcement of the regulation and the fact that testing is often done by questionable subjects who approve vehicles which do not deserve it. There are a few ways how this could be regulated. Firstly, auditing companies which perform testing to check whether there are any irregularities with their testing methods is a possibility worth considering. Also, what Croatia did in 2017 is announcing that from mid-2018 police officers will conduct testing of the vehicles on the road (24sata, 2017). This means that if the police visually suspect that a vehicle is potentially improperly maintained, they reserve the right to test it on the spot with adequate measuring devices and to remove it from traffic if it does not satisfy the minimum requirements. This measure is mandated by the EU and is something that the WB countries should consider implementing in order to reduce the

amount of improperly maintained vehicles on the road which are very inefficient and highly polluting.

Proper incentives have proven to be very effective tool in regard to improving EE of road transport (IEA, 2010b, p. 34), particularly when the main goal is renewal of national road vehicle fleet. Newer vehicles tend to have better fuel economy and lower fuel consumption which are essential to improve EE of transport sector (Hao, Liu & Zhao, 2017, p. 248). Thus, implementing measures towards reducing the average age of the vehicles has to be one of the priorities of the WB countries. Going back to incentives, there are plenty which can be introduced. What countries often do, especially in the EU, is reducing the cost of registration of energy-efficient vehicles. Also, disincentive for inefficient vehicles can be imposed. EURO standards would be the benchmark. Under EURO-2 - disincentive, over EURO-6 - incentives. Macedonia has planned in the EEAP to implement this measure until 2020 in order to renew its national fleet. Furthermore, registration period of vehicles is another financial incentive that could help with renewal of personal vehicle fleet. Depending on the situation in a given country, regulating that vehicles have to be registered every three years (instead of yearly) if the vehicle is under X years old. Though, serious legal and regulatory changes are needed in order to implement these measures. Cooperation between energy institutions and policy-makers has to exist.

Furthermore, what the WB countries have in the recent years been doing is regulating how old a vehicle can be or what EURO standard it has to have in order for it to be eligible for import. In order to import a used vehicle to B&H, it has to have EURO-4 standard since 2016. Import of used vehicles decreased by 30% after this measure was imposed (6yka, 2016). This is a clear signal for countries like Serbia which still have the requirement of EURO-3 (Carina, n.d.), which is rather inefficient and polluting standard. Importation of used vehicles from countries like Germany or France has become a widespread occurrence in the WB countries. The fact that imported vehicles are often the ones which are not eligible for the Western Europe roads any more makes the WB a dump for inefficient and highly polluting vehicles and in order to stop this from happening, aforementioned measures have to be implemented as soon as possible. On the other hand, what drivers in the WB have started doing by themselves is installation of liquefied petroleum gas (hereinafter LPG) as a fuel. This is very popular already in the WB, but people opt-out because of high initial cost. LPG is cheaper and less polluting than using petrol and has become increasingly popular worldwide. In 2010, there were 12.7 million LPG vehicles in the world (Tettehfio, Apreko, Bolu & Amoakohene, 2014, p. 1). People who drive more than average should certainly consider this change. The fact that it reduces CO_2 emissions by 30% and is around 50% cheaper per liter than traditional fuel shows that improvement is significant.

“Car free days” is another interesting measure that some local communities could consider implementing. It would work so that on a predetermined day (i.e. a Saturday or a Sunday)

the event would promote usage of public transport and eco-friendly transportation like bicycles. This event is held all over the world with satisfying results. The main purpose of this measure or event is promoting of EE and green transport. Actual energy savings are secondary. It hopes to show people who were reluctant to use public transport or to go by foot or bicycle that there are plenty of benefits in doing so. They are more likely to implement their personal "car free days" after it. Due to limited public transport in larger cities, this measure would be implemented in smaller places where people could get around on foot or bicycle. Local authorities in the WB should consider this measure.

After residential sector, transport sector is another one where promotion and rising awareness of EE is extremely important. People in the WB tend to look at car purchases as a one-time expense and are not thinking in the long-term and all the fuel costs that are inevitable, not to mention having better living conditions with less polluted air. Apart from educating people what having an energy-efficient car means, educating them about eco-driving is another important aspect. Driving courses should have in their curriculum information about optimal gear changing, avoiding vehicle idling (newer vehicles have this implemented), avoiding rapid acceleration or deceleration, driving at efficient speeds (between 60kmph and 90 kmph). These measures are projected to reduce, on average, fuel consumption by 10% (IEA, 2010b, p. 37). Sending flyers to trucking and other transport companies with tips on eco-driving would have a significant effect on their spending and on the environment.

3.3.2 Public transport

Public transportation in the WB countries is at worryingly low levels of development. First of all, there is an abundant issue of outdated vehicles and infrastructure (e.g. tram rails) which coupled with bad pricing strategy is a deterrent for usage of public transportation and that is one of the main reasons why people turn to personal vehicles. Also, the WB has an issue of public transport being present only in bigger cities while population in smaller cities has no option of using public transport. Though, even in bigger cities public transport is not the way it should be and some locations are still not accessible via public transport, thus people have no other choice than using personal vehicles. In short, investments and reorganization are required to achieve satisfactory efficiency and effectiveness of public transport. Measures that relate to the improvement of public transport are not directly aimed at the improvement of EE. Meaning, even though improvements in public transport and services it provides do not make it more energy efficient, they make the whole transport sector more efficient since less people use personal vehicles and thus passenger-kilometers increase.

In order to improve EE of transport sector, structural changes in public transport are much more important than measures that improve EE of buses or trams. First of all, a serious issue in all WB countries is the fact that public transport companies are almost always very poorly managed and the competition cannot do much because public transport companies

are mostly state-owned and have exclusive rights on usage of existing infrastructure like tram rails. An example of a poorly managed state-owned public transport company is GRAS in Sarajevo where the company only for value-added tax (hereinafter VAT) owns over €11 million (Uprava za indirektno-neizravno oporezivanje BiH, 2018), while total debt is around €60 million. It is at the brink of bankruptcy where there will be serious consequences for people of Sarajevo. The company has an extremely bad reputation because of improperly maintained vehicles, overemployment (i.e. nepotism) and very poor service. Pricing strategy is also rather illogical and inefficient. The only reason why GRAS is in this situation is poor management. In 2016 in a town of Vrbas in Serbia, public transport simply stopped working one day because the company in charge was too much in debt. It was also a public company (N1, 2016).

Often the first reaction of the public is that public transport should be privatized, but that is not necessarily a good option. Private companies are profit-seeking which means that profit will be put in front of service and the best possible service is what public transportation should strive for. Well-managed public company should outperform any private company in regard to public transport. Public transportation in the WB countries has to go through serious reform for its citizens and ultimately for its energy sector for it to be even remotely viable and useful. People are very likely to choose public transport as way of travelling each day if adequate state of vehicles, public transport system and pricing strategy are implemented. What will not change is the speed of public transport which is often slower than private transport. But, as Moriarty and Honnery (2012, p. 2) argue, the ability of people to read or even work during transportation instead of being focused on driving dismisses the fact that private transport is superior to public transport due to the speed of transport. Adequate measures and improvement of public transport would most certainly increase the number of passengers compared to how much people use it today.

Since measures for improvement of transport sector through improving public transport are not directly energy-related, they encompass a rather broader scope and are more complex. And most importantly, they require serious government engagement primarily due to the fact that public transport companies are state-owned. The WB countries in the EEAPs almost never mention public transport. There is merely some mention that something should be done and that public transport is dragging transport sector down in terms of EE, but no concrete measures are proposed. Energy agencies and government institutions in charge of energy policy have no say in public transport reform and measures and can only hope that local authorities which run public transport companies do something to escape unfavourable situation public transport is in today. This applies to all WB countries. Local authorities have to step in with drastic changes to its approach to public transport companies which are currently riddled with corruption, nepotism, overemployment, etc. Basically, management of these companies has to improve. Though, there are also some EE measures that can be implemented like renewing the vehicle fleet and putting more

emphasis on electric vehicles like trams or trolleybuses instead of regular buses. Urban fuel consumption is very high in general and any measures would help.

3.3.3 Railway transport

Intercity transport, especially in the WB countries which are all too small for air transport, is most efficiently done by railway transport. The situation here is similar to public transport where only secondary effects of improved railway network are effects regarding EE. Investments in railway network are seen as investments in infrastructure rather than in EE. Regardless, EE of transport sector would benefit greatly from railway network reform and reform of railway companies in all the WB countries since none of six has even a decent network at the moment. Similar situation is with companies in charge of railway transport. They are mostly state-owned and mismanaged, just like public transport companies.

So far, the WB countries have mostly relied on foreign investments or donations when it comes to rebuilding of extremely outdated railway network, but still they are not close to EU levels. There are frequent railway network renovations, especially in Serbia, but still it is not happening at the right pace. Efficiency and usage of railway network is best analyzed through comparing passenger-kilometers. For example, Montenegro as the best country in this regards with just over 200 passenger-kilometers is still far behind Austria which has around 1,100 (Johansen et al., 2010, p. 37). But, that is still much better than B&H or Kosovo which are almost at zero. This is an alarming issue and a reform strategy has to be outlined as soon as possible. Though, it is too much to expect from the WB countries to achieve level of railway network that some of the Western European countries have. The cost is extremely high and there are much higher priorities for the WB countries at the moment in regard to infrastructure. What governments need to do is propose a clear strategy of railway network reform that will be followed and properly financed.

Bošković and Bugarinović (2015, p. 848) argue that there are four most important segments when considering restructuring of South-Eastern Europe railways and those are:

- reform of market institutions and legislation relating to the railway sector,
- restructuring of the incumbent,
- railway liberalization and
- financial agreements between the state and companies acting on the railway market.

Some WB countries are better than others is this regard. For example, Macedonia is the only country with independent regulatory body which answers to the parliament. Also, Macedonia was the first country that started unbundling of railway network with a privatization process of railways which started in 2011 (Johansen et al., 2010, p. 31). Other WB countries should follow the example of Macedonia. Apart from the aforementioned most important segments, Mandić, Jovanović and Bugarinović (2014) suggest that ranking different railway projects and acting based on the rankings is the best solution. Either way,

substantial investments have to be made in order to restructure the WB railway network which has barely changed since the communist era. It should be one of the priorities in regard to infrastructural reform and will have great effect of EE. What energy sector can do is try to influence decisions of policy-makers through energy agencies and agencies responsible for railway transport. Benefits would be all-encompassing and would speed up economic recovery.

3.4 Industrial sector

As can be seen from the analysis of individual countries and EE of their industries, it is clear that situation is very poor. Most of the manufacturing infrastructure was built in the communism era and EE was not a priority. Though, demand was there and companies were at least operating at high capacity. Today, EE is even worse due to the fact that demand has dropped significantly but companies have remained huge and are mostly underutilized today. As already mentioned, the best example is KAP from Montenegro where majority of energy spent in the industrial sector is spent by one company. Literally one company has made whole sector multiple time more inefficient when compared to other WB countries, but because of its production volumes and importance for Montenegro's economy, little is being done to change the situation. Sizeable investments are needed and that is one of the main reasons for the lack of them. Manufacturers just do not see financial viability in such investments.

As Johansen et al. in their 2010 comprehensive study of the WB EE predict, industrial production in all countries is expected to increase in the future with privatizations and general expansion of economy. This will especially be true in currently non-existent industries and those that are barely operational. When production increases, energy consumption has potential to spike due to inefficient equipment that is often obsolete and very poorly maintained. To avoid these issues with inevitable increase in industrial production that will come in the following years, measures and regulatory changes have to be implemented. The government plays the biggest role because companies are unlikely to invest in EE by themselves. Strict measures that demand mandatory action from manufacturers with no preferential treatment have to be implemented. What the EU did was the implementation of the EU ETS, though with some issues. Thus, the WB countries are still not ready for such a commitment. Even more developed countries like Latvia had a lot of trouble with implementation of EU ETS (Ozolina & Rosa, 2012, p. 334).

Anyhow, reform of the WB industrial sector and the way energy consumption is managed within it has to happen soon since the amount of wasted energy will only increase over time. It is no doubt this will be a serious challenge for all countries given the fact that even much more developed countries often have the most trouble with achieving EE in their respective industries. Cost of the implementation of EE measures is often higher than the excess energy costs that come from being energy inefficient, at least in the short-term. On the other hand, Fan, Pan, Lie and Zhou (2017) state that EE measures always have a

positive effect on financial performance if implemented adequately. But, since long-term perspective is not something that the WB countries find great importance in, as can be seen from numerous already mentioned examples, government needs to intervene to speed up the process. Brazil is a good example where the government was promoting industrial EE for decades, but until it invested extra resources and imposed mandatory measures that have to be implemented, there were very limited results (Santana & Bajay, 2016).

Similar to public sector, energy auditing and data collection is one of the first measures that have to be implemented in order to reform the WB industrial sector and its current inefficiency. It is very difficult to propose specific measures when there is no reliable data upon which conclusions could be made. At the moment there is almost no data on industrial energy spending and even when there is data available it varies greatly between different sources. This situation creates an uncertainty within the sector where there is no clear picture of what is currently going on. The state should impose mandatory energy audits for all large consumers in order to get a better look at just how energy intensive they are and what can be done to improve it. Also, the fact that energy consumption is closely linked to greenhouse gas emissions, mainly CO_2, decreasing energy intensity of large consumers would create an added benefit of improved living conditions. Identifying companies that would have to go through audits would be defined in EE Law (not all WB countries have it) in terms of annual consumption of energy by a company.

When energy auditing is mentioned, a problem of who will finance those audits often arises. Historically, countries have often financed energy auditing of large consumers fully (Santana & Bajay 2017, p. 63). It can either be done using public funds or through tariff rebates. This shows that governments worldwide recognized that proper audits are the key for EE of their respective industries. Auditing teams would have to be trained and specialized for auditing industrial processes.

With adequate audits and data collection, next step would be setting up minimum energy performance standards for companies. This would mostly include energy performance of equipment. Tax incentives could be implemented to ease the procurement of energy efficient equipment through proper legislative reform. What is also important is state's engagement in regard to educating companies about EE. Since the WB countries and companies in its industries are not very familiar with energy efficient processes and how EE state is reached, education would certainly prove helpful and would guide companies in the right direction. After the initial assessment of the market and minimum energy performance standards set, imposing mandatory EE targets would follow. The targets would consist of energy savings that have to be completed in a predetermined time period. What is important to mention is the fact that when it comes to industrial EE, apart from making industrial processes energy efficient, it is also important to have energy efficient buildings. Office buildings and industrial buildings in general tend to be large and are large

consumers of energy which is used for heating or cooling. Making buildings energy efficient would be included in annual targets.

A measure that is never mentioned in any on the EEAPs of the WB countries is change in energy prices for industries. Currently energy prices are too low and are often subsidized for large consumers like KAP in Montenegro (Johansen et al., 2010, p. 28). Having low energy prices for industrial sector acts as a disincentive for companies who are in need for EE improvement. Though, there are arguments that complete liberalization of energy markets (i.e. electricity) is a better solution than government intervention. This is an important issue that needs to be addressed in all WB countries. Some are ahead of others but most recognize the need for a permanent solution. For example, there have recently been talks about the urgency of liberalization of electricity market in B&H. The EU is putting a lot of pressure for a solution in the near future.

The issue with industrial sector is that there are many barriers to implementation of EE measures. Companies within industrial sector oppose EE because by mandating EE the state is influencing their decision-making which is not something companies prefer. They are profit-seeking organizations and being less polluting is not one of their main goals, especially when it hits their profitability. A regular situation, especially in the WB countries, is that manufacturing companies that are the highest polluters and highest energy consumers are often protected by the state. Protection stems from the fact that they are often still state-owned and have not been gone through privatization process. Also, high-producing companies have high bargaining power and it is hard to force them to act. It is also difficult to penalize them for non-implementation of measures since they take up significant percentage of country production and are vital for the economy of a country. This makes government reluctant when it comes to mandating EE implementation.

Another barrier is financing EE projects and it is often the main hurdle. This is an excuse that companies have been using ever since EE became more prominent issue. Also, companies often have concerns that the implementation of EE will negatively affect quality of products (Lunt, Ball and Levers, 2014, p. 387). This is a reasonable claim, but is something that can be resolved with adequate planning and optimization of production processes. Furthermore, lack of data and knowledge about EE is an abundant barrier in the WB countries. Industries are simply not aware of how much excess energy they are spending due to inefficiency and they do not know exactly what has to be done to stop being as inefficient as they are. Large WB companies are extremely opposed to change in general, but especially when it comes to changes like EE improvements which are often regarded as something that should be done only to comply with the state, rather than as an actual improvement of production process. Also, there is a severe lack of sense of urgency which is a dangerous prospect when companies are as energy intensive as they are in the WB countries.

In conclusion, EE in industrial sector is not any different than in the other sectors already covered. EE measures in the WB industrial sector are non-existent and the production processes are very much the same as they were in the 1960s or 1970s which is a worrying proposition. When each country's EEAPs and measures proposed for the industrial sector are analyzed, it is obvious that industries operate at a very inefficient level because measures proposed are the ones that have been present in the EU countries for around 20 years. Also, the issues that are prominent in the industrial sector are not something that should be dealt with today, but something that should have been dealt with decades ago. Again, one of the main culprits is the governments who take almost no actions to change the dire situation in which all WB countries are at. Laws have to be changed and mandatory measures have to be imposed before the inevitable expansion of industrial production in the upcoming years.

3.5 Financing energy efficiency

Finding appropriate funding is a challenge for any investment in developing countries like the WB countries are. This is especially true for EE because it is not seen as a mainstream issue and the governments and private subjects are reluctant to spending money on EE measures with more pressing issues present. The WB countries have so far largely relied on foreign donations and low-interest-rate investments. This method of financing was often used in the public sector renovations, mainly for schools and hospitals. Though, foreign funding often has a humanitarian note attached to it and will likely continue when it comes to public sector reform, but reforming other sectors like residential or industrial sector will not come from abroad. Domestic solutions have to be formed and implemented.

Financial side of EE measures is one of the main barriers for implementation and decreasing energy intensity of countries. Ever since the world has started seriously tackling EE problems, financing has been a difficult problem to solve. There have been numerous different approaches by different countries and most of them have proven not to be successful. For example, in 2001 Romania set up a revolving fund with the help from the World Bank, but until 2006 only 16 projects were financed (Prassad Painuly, 2009). This happened due to the change in the market conditions which were unaccounted for. The case of Romania shows that countries should be careful when dealing with funding issues of EE projects. Careful analysis has to be conducted beforehand. A well-established project can yield great results, while a failed project can cause loss of funds and future reluctance to similar endeavours which postpones improvements in EE even more. Upfront cost of EE implementation is a major barrier for both home and business projects and financing projects and solutions have a role of minimizing these costs and encouraging homeowners and business owners to invest in EE.

As with any other EE issue, financing solutions have to start from the government and its intervention and solutions. For this to happen, appropriate institutions have to be set up with adequate regulations to support them. Serbia for example has all the appropriate

energy laws which allow for further development of financing options. Both its Law on Efficient Use of Energy and the Energy Law act as a base for appropriate measures which would tackle funding issues. For example, in its Law on Efficient Use of Energy, there is a section that states how financing of EE will be done and for what purposes. After stating the purposes it defines financing source as follows:

- Serbia's national budget,
- budget of autonomous province (Kosovo) and units of local government,
- the EU funds and other international funds,
- donations,
- loans from international financial institutions,
- other sources which are in compliance with the law.

How all of these are appropriated is decided by the Ministry of Mining and Energy. All of these points are directly connected to the Energy Law as a whole and act as a legal framework which will allow financing of energy projects. On the other hand, B&H has neither of these and developing and financing projects is next to impossible without adequate legal framework.

Without guidelines on how the appropriation of resources is to be done, financing EE projects by the state will not happen. All WB countries have to catch up to at least the level that Serbia is at for any further actions to be possible. Serbia with the established Energy Efficiency Agency that has already gone through some serious project is also an example for other WB countries, especially B&H and Kosovo, on what institutional framework should look like in a country which wants to start with the implementation of serious EE projects. Serious EE projects require long-term dedication and prolonged financing from the government. In order for these projects to happen, a multi-year budget has to be adopted that could finance the projects. With current regulatory and legal framework, most WB countries are unable to endeavour into such projects. Currently, most financing from the government is done on the short-term and is mostly focused on regular maintenance instead of on renovation and reconstruction. Without large-scale, all-encompassing project there is no reaching energy efficient state.

A very important aspect in regard to financing EE projects is good relationship between local banks and the government. Banks have the resources which homeowners or businesses need and government is there to subsidize cost of financing (interest). So far in the WB countries, this kind of financing was exclusively done between local banks and international institutions like the World Bank of the EBRD. Some examples have been described in the analysis of individual countries. How this is generally done is that international institutions with their funds help with financing the loan. Providing loans with lower interest rate is not the only way to help with financing loans. Taking a loan that will be used for EE measures in a household or for a business can be accompanied with getting a certain percentage of incentive bonus on top of the requested amount. Also,

writing-off part of the debt if the loan was actually used for EE is a popular method. These projects have had a decent success, but the main issue with them is the fact that often they are narrow in scope. For example, sometimes all the loan-taker gets is free project documentation. This is simply not enough of an incentive, especially in the WB countries where EE awareness is at very low levels. This is something that can change if the government intervenes.

Setting up a fund which will be used for helping with loan payback for both homeowners and business owners is a great way of financing EE measures. For example, in B&H there is a case of the Development Bank of FB&H which was founded by the Government of FB&H. It offers loans with interest rates of 3-4% with 8-year payback period (Federal ministry of energy, mining and industry, 2017). The problem is that these loans are not primarily intended for EE and thus are rarely used for such purposes. Though, this is a good example of how financial institution for financing EE measures should operate. What the FB&H could do is either form a specific department within the Development Bank that would focus on EE or partner up with local commercial banks and subsidize interest for loans used to improve energy efficiency. This applies to all WB countries. Energy efficiency measures are expensive and financing through banks is often the only option, thus helping with paying back the loan is a great incentive. Coupled with mandatory implementation of EE measure, projects like these could prove to be successful. There is a great example in Lithuania with The Lithuania Energy Efficiency Housing Pilot Project from 1996. It incorporated the government and international funds and partnering up with a local bank which served only as an agent (Taylor, Govindaralaju, Levin, Meyer & Ward, 2008, p. 205-212). They financed the loans through decreased interest rate, partial VAT exemption and providing grants. In five years, 226 projects were completed with some even resulting in 50% reduced energy consumption. There were zero defaults on the loan. This shows that with well-planned cooperation of governments and local banks great results can be reached.

Another way of generating EE financing for the WB countries which currently does not exist is setting up a market so Energy Service Companies (hereinafter ESCOs) are able to establish themselves in the WB countries. ESCOs act as an institutional mechanism involved in delivery of energy efficiency investment (Taylor et.al., 2008, p. 131). They are an important part of private sector participation in EE measures implementation in a country. They mainly specialize in energy auditing of a given building or industrial process and based on the audit adequate solutions are proposed which include financing methods, often from their own funds. In 2015, ESCO market in the EU was estimated to be worth €2.4 billion with most of the member countries having active ESCO markets (Bertoldi & Boza-Kiss, 2017, p. 345). ESCOs act as an agency for implementation of EE measures.

Legal framework in some of the WB countries currently does not allow entrance of ESCOs (Federal ministry of energy, mining and industry, 2017). ESCOs need to be recognized by

the government since their operations are often closely related to the government and the two have to work together. ESCO markets are often driven by market forces. These include increasing energy costs, growing awareness, development of partnership, etc. (Bertoldi & Boza-Kiss, 2017). Also, ESCO markets tend to form when adequate policy measures are implemented followed by proper regulations and financial solutions. Appropriate actions from the WB countries' governments to allow entry of ESCOs on the WB market will open up many possibilities for financing EE measures, both by private and legal entities. ESCOs are for sure the future of the WB. As energy markets mature and as demand for energy efficiency investments increase, ESCOs will start forming and will improve the financing situation when EE measures are concerned. But again, support from the governments is needed through legislature and adequate policies to enable establishment of ESCOs.

Measures that involve financing EE have to be financed as well. Funding loan subsidies or starting public sector renovation projects require substantial investment that the WB countries have a hard time allocating from their budgets. This is solved by implementing revenue sources that would have a purpose of financing EE projects. Most often revenue is generated through energy taxes and environmental taxes. At the moment, only Serbia and Macedonia have some form of energy, environmental taxation or transport tax. Though, most revenue is collected through energy tax (EC, 2018). Other WB countries do not have an established revenue streams which are intended for financing EE measures. Energy tax is a helpful measure because apart from the fact that it generates revenue for the state, it also acts as an energy saving incentive due to increased energy costs by both household and industrial companies. Also, politically, it is much safer to impose energy tax which has a goal of financing EE measure rather than increasing VAT or income tax. At the EU level, there is a minimum amount of energy tax per type of energy set and member states can only go above the minimum level (EC, 2018). The WB countries can use the EU minimum levels to help them set energy tax in their respective countries.

Furthermore, carbon tax is a measure that is widely used as a revenue steam from energy reforms. Some WB countries like B&H do not have carbon tax but have included possibility of implementation in its EEAP. Carbon tax could be imposed for large industrial consumers of energy according to predetermined rules as well as to users of personal vehicles through registration of the vehicle. In the EU, the practice in the recent years is to base price of the vehicle registration based on how polluting the vehicle is rather than on the value of the vehicle, as is the case in all the WB countries today. Apart from energy tax and carbon tax there are air protection fees or environment fees. All the WB countries already have those but some improvements could be made to optimize the system and revenue allocation gained from the fees which are currently collected from vehicle registration, plastic bag fees, packaging fees, etc.

The aforementioned taxes and fees are one of the best and most reliable ways of generation revenue which is to be used for implementation of EE measures, both on state and local

level. The added benefit of the implementation of taxes and fees is that they cause increased energy savings. Though, with the standard of living as it is in the WB countries, governments have to be careful not to overburden citizens and companies with too much tax. The tax collected is to be appropriately allocated and budgeted across all levels within a country.

CONCLUSION

In conclusion, EE in the WB countries is an issue that is not taken as seriously as it should be and real consequences are still to be felt when countries and their economies start expanding more rapidly together with energy spending to facilitate that growth. Energy sector and its efficiency are so underdeveloped that these consequences are bound to happen due to the fact that in order to achieve satisfactory energy efficiency with the current state, investments that no WB country can undertake are required. This is especially true in sectors where private investments are needed since standard of living and disposable income do not allow homeowners or personal vehicle owners to spend money to become more energy efficient due to their limited ability to afford even the basic necessities. What makes the situation even more difficult is the fact that the WB countries are at the very beginning of EE development with slight variations between them. Countries like B&H do not even have basic regulatory framework or institutions which would guide energy efficiency development and lack of these blocks any real serious projects or strategies from being developed. With no strategy, concrete measures also cannot be implemented. At the moment, the WB countries focus on localized and rather small one-off projects which mostly get funded by international institutions. Even though they do yield some results, on the grand scale it is negligible. The lack of planning and focus is evident in all WB countries and energy sector needs all-around reform with different approaches to different sectors.

Analysis of public sector showed too much reliance on foreign donations and investments by all WB countries. Given the fact that it is often argued by experts that public sector should lead as an example for other sectors in regard to EE improvements, the WB governments are very reserved when it comes to the intervention in public sector and EE indicators of its buildings, mainly schools and hospitals. Lack of funding and lack of willingness to allocate funding is the main reason. Whole EE strategy should revolve around public sector doing reforms first and publicizing them to general population. Renovating buildings which are frequented by large amount of people should act as an advertisement the importance of EE. With clear goals and willingness to improve public sector, donations are likely to increase as well. Public sector has to start a snowball effect in regard to EE.

On the other hand, residential sector of all WB countries is held back mostly by old residential buildings which were built with no regard to EE. Private ownership of

apartments and houses makes financing difficult and thus progress is sluggish. As the NEEAPs of each WB country show and as past experiences of countries that have already gone through the "starting" phase of EE reform, raising EE awareness is the key and that is something the WB countries should focus on. Convincing the general population that money spent on EE improvements in money well-spent is something to strive for. This would increase EE investments and coupled with strict regulation for construction of new residential buildings, residential sectors in the WB countries would become more efficient and more ready for future which most certainly brings higher consumption.

Similar to residential sector is transport sector where private investments are crucial due to the amount of inefficient personal vehicles. The research showed that transport sector is best improved by setting strict regulations which control import of vehicles based on their age and emission standard rating as well as the sales of new vehicles. The main reason is past practices of the EU members which showed great results over time. The analysis of each country showed that their lack of organized railway transport and public transport is what is mostly causing the transport sector to be inefficient. All information lead to the conclusion that reform of transport sectors is above simple EE measures and requires large infrastructural projects and improved governance of public companies which deal with transport.

In regard to industrial EE, all analysis points to burning need for improved regulatory and legal framework which is to be targeted at the highest consumers of energy. Unless they are faced with fines for non-implementation or non-compliance, the WB companies are not going to implement EE measures or change their infrastructure due to heavy focus on short-term results. Though, there is serious conflict of interest in all WB countries since companies which are the highest spenders of energy are almost exclusively state-owned so there is lack of interest for EE improvement.

During every step of the research, it is evident that parties involved in EE improvements are extremely uneducated on basic principles of EE and what it has to offer. It is not only awareness that is lacking, but systemic lack of knowledge of what basic EE measures are how these measures are implemented. There is not nearly enough public discourse about importance of adequate energy management and what it has to offer, from money-saving to cleaner environment and better living conditions. Thus, inescapable conclusion is that in order to start with more serious EE strategy, all WB countries are recommended to launch all-encompassing EE awareness campaigns which would bring it closer to the general population as well as to business entities with high energy consumption. Some methods of undergoing campaigns have been proposed in the thesis. With awareness on reasonable level, investing resources would make more sense for all parties involved.

Another issue that kept coming up during the analysis of the WB countries' energy sector is extreme lack of data collection and energy auditing. This proved to be very similar to the lack of awareness since lack of both of these is a huge hurdle to even starting with the

energy sector reform. Throughout the research inconsistency of data across different sources occurred. Proposing appropriate measures is very difficult for the WB countries when they have population that does not know how EE would benefit them or when they do not know where to put their focus since there is no data on energy consumption. Given the situation as it is, best measures to improve the WB countries' EE are the most basic measures that serve as a foundation to actual measures that would be more focused. The NEEAPs are a start, but are not enough. The lack of reliable data was a serious limiting factor to the research for this thesis and precise measures which would tackle niche problems cannot be proposed. After appropriate data collection is done across all sectors, more accurate measures can be proposed. Until then, the WB countries should focus on the basics and on the improvements inside the public sector.

If the WB countries continue to act as they have been acting for the last 20 years, in the close future not much is likely to change. When closer look is taken at how the WB countries, especially less developed ones like B&H or Albania, deal with EE issues and demands from the EU and from the EC, it is obvious that everything done is not done to actually improve energy sector and its efficiency, but only to satisfy expectations and to avoid sanctions or penalties. The best example is B&H which only recently issued its first NEEAP, years after it was supposed to. And the main reason why it was published was intensified warnings from the EC. Optimism is lacking when it comes to the WB energy efficiency and there is a great danger that situation will only get worse with inevitable increase in energy demand across all sectors that comes along with the economic growth. Unless immediate action is taken by everyone involved. The fact that in 2018 some countries state that one of their main goals in regard to EE is setting up an Energy Efficiency Agency says enough about the state of EE in the WB countries. That should have been done long ago.

The region is very unstable and there is little political will to focus on EE when there are other, arguably more important issues that policy-makers deal with. Lack of awareness and knowledge about EE makes already complacent public unwilling to put pressure on the state to start reforming the energy sector. While examining why each sector performs poorly, is could be seen that the energy sector is also indirectly suffering because of underdevelopment of others segments of the state. For example, investments needed to make railway transport viable and significantly increase amount of passenger-kilometers in the WB countries is enormous and is highly unlikely to happen anytime soon. Thus, prediction can be made that transport sector will keep being inefficient in years to come. What the WB countries can hope for when it comes to EE reform is the accession to the EU which might be the only chance of more serious implementation of EE measures. The EU accession brings with it numerous obligations which include energy sector as one of the more important aspects of the EU. Croatia is a good example of a country which was similar to the current WB countries before to became an EU member. Situation did not become perfect after the accession, but progress was sped up significantly. When the

NEEAPs of Croatia and for example Macedonia and compared, levels of sophistication behind proposed measures are completely different. Lack of political action by the WB governments can possibly be stopped by EU regulation and obligations that come with it. The only question is whether the WB countries like B&H or Albania, which are not expected to join the EU soon, can wait that long and whether energy sector will be ruined beyond repair until then.

Current systemic lack of proper regulatory, institutional and legal framework which proved to be a pressing issue throughout research for the thesis does not allow for serious EE reform. I propose similar research to be conducted when the WB countries undergo basic EE improvement. Clearer picture of the current state is needed as well as higher awareness of the general population in order to tackle EE issues more adequately and without waste of resources. Waste of resources and imperfect strategies are to be expected, but their impact should be lessened as much as possible with constructing good base for EE reform in form of basic regulatory, legal and institutional framework. What the WB countries should hope for is that these changes come before the EU accession, since waiting that long could be too damaging to energy sectors each country.

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APPENDIXES

Appendix 1: Results from BEEP - first phase

Name of the object	City	Energy class before EE measured implementation	Energy class after EE measured implementation	Energy consumption before EE measure implementation kWh/m2	Energy consumption after EE measure implementation kWh/m2
JU OŠ Crnići	Stolac	C	B	116	49
JU SŠ JurajDalmatinac	Mostar	C	B	126	60
ZU Dom Zdravlja	Jablanica	D	B	156	55
JU SŠ Konjic	Konjic	D	B	163	55
JU OŠ Zahid Barudžija	Vogošća	E	B	195	51
JU Prva osnovna škola	Zavidovići	E	B	188	49
JU IV Osnovnaškola	Mostar	B	A	94	40
ZU Općabolnica	Tešanj	C	B	120	62
JU OŠ Fra DidakaBuntića	Čitluk	B	A	86	34
OŠ H. Kreševljaković	Kakanj	D	B	161	47
OŠ Hašim Spahić	Ilijaš	F	B	260	71
OŠ Musa ĆazimĆatić	Zenica	D	B	138	61
JU OŠ Srednje	Ilijaš	D	B	150	88
JU Srednja mješovita škola	Žepče	C	B	110	50
JU Srednjaškola	Čapljina	E	A	187	40
KC Mostar Psihijatrija	Mostar	D	A	137	45
JZU UKC Tuzla	Tuzla	E	B	185	49
UKC Ortopedija Sarajevo	Sarajevo	E	B	195	56

Source: Adopted from BEEP (n.d.).

Appendix 2: FB&H EEAP planned savings

Indicative energy savings goals in 2018 (PJ)			**8.31 PJ**	
Indicative energy savings goals in 2015 (PJ)			**3.08 PJ**	
	Sector goals (PJ)		**Energy savings achievied in 2015 (PJ)**	**Expected energy savings in 2018 (PJ)**
Sector	**2015**	**2018**	**Total (bottom-up)**	**Total (bottom-up)**
Residential sector	n/a	3.43	1.46	3.43
Services	n/a	1.11	1.78	1.11
Industry	n/a	3.23	0.33	3.23
Transport	n/a	0.54	0.13	0.54
Total (PJ)	3.08	8.31	3.71	8.31
Total (ktoe)	71.89	198.48	88.61	198.48
% of consumption (92.33 PJ)	**3.34%**	**9.00%**	**4.02%**	**9.00%**

Source: Adopted from First EEAP for FB&H.

Appendix 3: RS EEAP planned savings

Indicative energy savings goals in 2018 (PJ)			**3.77**	
Indicative energy savings goals in 2015 (PJ)			**1.40**	
Sector	**Sector goals (PJ)**		**Energy savings achievied in 2015 (PJ)**	**Expected energy savings in 2018 (PJ)**
	2015	**2018**	**Total (bottom-up)**	**Total (bottom-up)**
Residential sector	0.57	1.75	0.65	1.75
Services	0.18	0.5	0.72	0.5
Industry	0.59	1.25	0.01	1.25
Transport	0.06	0.27	0.14	0.27
Total (PJ)	1.40	3.77	1.52	3.77
Total (ktoe)	33.43	90.04	36.30	90.04
% of consumption (41.66 PJ)	**3.34%**	**9.00%**	**3.63%**	**9.00%**

Source: Adopted from First EEAP for RS.

Appendix 4: Blok 63, New Belgrade, Belgrade, Serbia

Source: Mapio (n.d).

Appendix 5: Serbia NEEAP planned savings

National planned savings goal for 2018			0.7524 (Mtoe)				
National planned savings goal for 2015			0.3975 (Mtoe)				
Division of goals by sectors	Sector goal (Mtoe)		Achieved savings in 2014 (Mtoe)		Projected saving 2015 (Mtoe)	Savings plan in 2018 (Mtoe)	
	2015	2018	Using top-down method	Using bottom-up method		Using top-down method	Using bottom-up method
Residential sector	0.077	0.140	0.109		0.131	0.278	
Public sector	0.062	0.135	0.075	0.005	0.096	0.158	
Industry sector	0.156	0.267		0.047	0.057	0.123	
Transport sector	0.103	0.211		0.072	0.087	0.194	
Total (Mtoe):	0.398	0.752	0,184	0.124	0.370	0.752	
			0.308				
Total (GWh):	4623	8750	2.143	1.443	4.303	8.750	
			3.586				
Percent (%) (compared to Eu Directive reference consumption of 8,411 Mtoe)	4.70%	9%	3.69%		4.43%	9%	

Source: Adopted from NEEAP-3 Srb.

Appendix 6: Montenegro NEEAP planned savings

	Achieved energy savings (ktoe) **2015**	Estimated energy savings (ktoe) **2018**
Buildings	12.80	28.10
Households	0.53	1.13
Services	1.45	4.48
Industry	N/D	N/D
Transport	N/D	N/D
TOTAL	**14.78**	**33.71**

Source: Adopted from Third NEEAP for Montenegro.

Appendix 7: Macedonia NEEAP planned savings

National planned savings goal for 2018			147.24 (ktoe)			
National planned savings goal for 2015			80.06 (ktoe)			
Division of goals by sectors	Sector goal (ktoe)		Achieved savings in 2014 (ktoe)		Savings plan in 2018 (ktoe)	
	2015	2018	Using top-down method	Using bottom-up method	Using top-down method	Using bottom-up method
Buildings	5.61	18.24	19.00	5.00	78.00	5.11
Residential sector	8.69	20.10		13.90		29.17
Public sector	9.05	14.65	22.00	11.38	36.00	15.52
Commercial sector	4.19	7.86		5.57		7.62
Industry sector	4.19	57.59	70.00	22.2	59.00	41.37
Energetics	35.06	5.89		3.40		7.24
Transport sector	2.80	26.89	11.00	19.52	82.00	42.67
Total (ktoe):	**14.65**	**151.22**	**127.00**	**80.97**	**255.00**	**148.72**
Percent (%) (compared to Eu Directive reference consumption)	4.89	9.24	7.77	4.95	15.59	9.09

Source: Government of Republic of Macedonia (2016).

Appendix 8: Macedonia NPEEPB financing and savings goals

Sector	Heated floor area	Tot. Energy Consumption	Specific Energy Consumption	Tot. Energy Cost	Specific Energy Cost	Potential Energy Savings	Potential Cost Savings	Investment Needed	Payback Period
Units	m2	MWh/year	KWh/m2	000€/year	€/m2	MWh	million €	million €	years
Health	487,967	136,219	283	11,965	24.5	45,399	3.6	25.0	6.9
Education	1,464,735	270,244	202	23,544	16.1	88,259	7.8	54.9	7.0
Social care	220,459	48,547	229	4,809	21.8	17,587	1.9	10.3	5.5
Minicipal admin.	75,420	16,594	241	1,593	21.1	5,317	0.5	3.9	8.0
State admin.	17,363	3,710	214	481	27.7	1,356	0.2	1.2	6.9
Total	**2,265,944**	**475,314**	**200**	**42,392**	**18.7**	**157,918**	**14.0**	**95.3**	**6.8**

Source: Adopted from World Bank (2014).

Appendix 9: Albania EEAP planned savings

National indicative annual energy savings target 2018 (ktoe)		168		
National intermediate indicative annual energy savings target 2012 (ktoe)		26		
Measures to improve energy efficiency planned for achieving the target	Annual energy savings expected by 2012 (ktoe)	Annual energy savings expected by 2018 (ktoe)	Annual CO2 emissions reduction by 2012 (kgCO2/year)	Annual CO2 emissions reduction by 2018 (kgCO2/year)
Measures in residential sector	5	37	2,693	19,925
Measures in tertiary sector	5	32	7,345	47,008
Measures in industry	6	42	13,117	91,816
Measures in transport	8	52	24,680	160,420
Measures in agriculture	2	5	5,448	13,620
Total energy savings expected	**26**	**168**	**53,282**	**332,789**

Source: Adopted from Republic of Albania (2009).

Appendix 10: Kosovo EEAP planned savings

Indicative energy saving target: 31ktoe		
Period	**2010-2012**	
Sector	**%**	**ktoe**
Residential	40	12.8
Services	30	9.6
Industry	25	8
Transport	4.5	1.4
Agriculture	0.5	0.15

Source: Adopted from First EEAP for Kosovo.