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Affordable and Clean Energy for all: Challenges in Balkan Countries

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ABSTRACT

The paper analyses SDG7 indicators of sustainable development in Balkan Countries. Slovenia, Croatia and Montenegro, Serbia, North Macedonia and Bosnia Herzegovina are selected for case study aiming to define the progress towards SDG7 goal- Affordable and clean energy by applying the main indicators set for analysis of situation in terms of affordable and clean energy for all in selected neighbouring countries of former Yugoslavia. The paper also provides policy recommendations based on analysis performed and allows to share good practices in energy policies among neighbouring countries which as different economic development level and Slovenia is EU Member State since 2004 and Croatia since 2013. Other Balkan states are just planning to join EU in the future.

INTRODUCTION

The Agenda 2030 and its 17 Sustainable Development Goals (SDGs) signifies a all-inclusive agenda which is universal and presents self-enforcing related goals of sustainable development. It is universal as all SDGs should be achieved by developed and developing countries by 2030 (UN-GSDR, 2019). It is indivisible as that all 17 goals are equally significant and they all can be achieved just in combination. Another important issue is monitoring of progress towards the SDGs which is also requires considering achievement of Agenda's 2030 goals in all-inclusive way. Energy plays vital role in implementing all 17 SDGs as energy provides opportunities for economic development and social progress and has huge environmental effect. Therefore, energy use is closely linked with economic, social and environmental dimensions of. Sustainability. By promoting sustainable energy development which means increase of energy efficiency and increase in usage of renewable energy sources it is possible to achieve modern economic growth, poverty reduction, improvement in environmental and human health as well as deliver to other related SDGs goals for industries, transport, cities, communities etc.

There is special goal set for sustainable energy development in SDGs, i. e. SDG 7 which calls for guaranteeing complete access to modern energy services by first of all improving energy efficiency and increasing the share of renewable energy in final energy consumption (Eras-Almeida, Egido-Aguilera, 2020). In order to faster the transition to low carbon, affordable, secure and clean energy system, countries have to promote research and development in sustainable energy field and to rise investment in energy- efficient and clean energy solutions. The low-carbon energy infrastructure plays very important role in achieving clean and affordable energy for all goal. All activities in society are dependent on reliable, secure and affordable energy supply. Energy sector covers such important sectors as power, heating and cooling, transport and other final energy consumption sectors as households, services, agriculture, construction etc. Energy permits the well- functioning of all economic sectors and agents. As many EU member states still use of fossil fuels for energy generation, there a number of challenges to securing affordable, secure, reliable and sustainable energy supply in EU (Pach-Gurgul and Ulbrych, 2019). Therefore, the main aims are to reduce total energy consumption by energy efficiency improvement and energy saving in energy generation and final usage sectors by increasing share of renewables in energy mix. This would help to increase the security of energy supply and growth of competitiveness of EU energy sector by providing affordable energy for all inhabitants. These are the main ways in achieving SDG 7 in EU and other countries. Therefore, the increased energy efficiency and a shift towards renewable energy allows to reduce GHG emissions, reduce energy poverty and energy import dependency (European Commission, 2018).

The current COVID-19 pandemic has a significant negative impact on public health, economic and social stability in all world countries (Banaszyk et al., 2021). COVID-19 pandemics also has impact on implementation of Agenda 2030 as well. All three dimensions of sustainable energy development like economic (competitiveness and energy import dependency), social (energy affordability) and environmental (energy efficiency, renewable energy penetration and GHG emission reduction) are affected by COVID-19 health crisis and threatening the achievement of all SDGs. Different regions of Europe are encountering different challenges in implementing Agenda 2030 and SDGs, including SDG7. Therefore, it is important to analyse and compare situation in terms of progress towards SDG7 goals in specific region to know the main challenges of neighboring countries and to learn from their experience and to share good practices in the region.

The Balkan region requires attention as it consists of several neighboring countries having the similar pasts but now progressing in different ways as intended states towards sustainable development goals. Until 25 June 1991 the Socialist Federal Republic of Yugoslavia consisted from six republics that made up the federation - Bosnia and Herzegovina, Croatia, Macedonia, Montenegro, Serbia (and Slovenia). Since 2004 Slovenia has joined European Union (EU) and in 2013 Croatia joined EU. Bosnia and Herzegovina, North Macedonia, Montenegro and Serbia are independent states also planning EU access in the future. The Balkan countries have many problems linked with high corruption, weak institutions, unemployment and other social problems (Krivokapic, 2020) however there are positive trends of social-economic progress in this region.

There are several studies dealing with results of implementing Sustainable Development Goal (SDG) 7, i. e. to ensure access to affordable, reliable, sustainable and modern energy in various countries and groups of countries (Guler et al., 2018; Marinakis et al., 2017; Nefytou et al., 2020; Papapostolou et al., 2017) however there are no comparative studies for Balkan region countries, former Socialist Federal Republic of Yugoslavia states though it is very important to compare their paths of reaching affordable, reliable, sustainable and modern energy and define the advantages of joining European Union which distinguishes with strict environmental and climate change mitigation policies including policies targeting sustainable development of energy sector.

The paper aims to overcome this gap and analyses development of SDG7 indicators in Balkan countries former Yugoslavia republics. The analysis performed allows to find the best performing countries in selected region and to define the main drivers of success. The policy recommendations to fasten implementation of SDG7 goal were developed based on best practices and achievements. The rest of the paper is structured in the following way: section 1 presents the background of the study based on literature review, section 2 introduces methods and data; section 3 provides case study results; section 4 concludes and provides policy recommendations and future research guidelines.

1. LITERATURE REVIEW AND STUDY BACKGROUND

There are big differences between developing and developed nations in achieving SDGs goals and implementing Agenda 2030. These differences can be clearly see in analysing progress in achievement of SDG 7 between developing and developed countries (Ari, Sari, 2017). For developing countries green house gas (GHG) emission is a big challenge as these countries are in developing path and need to increase energy consumption to ensure economic growth (Cherp et al., 2018; Hnatyshyn, 2018). At the same time these countries do not have enough resources to implement new energy efficient clear technologies based on renewable energy sources. Implementation of renewable energy sources requires high investments in infrastructure, storage options etc. (Gielen et al., 2019; Yan et al., 2020; Batinge et al., 2019) Another important issue is households sector, where energy consumption is based on solid fuels including biomass and waste having negative health impact and high carbon content. In developing countries energy poverty is also key issue (Streimikiene et al., 2021)

European Union has implemented wide range of climate change mitigation policies in energy sector and have set targets to increase energy efficiency, the share of renewable energy (RES) in final energy consumption and reduce GHG emissions by 2020, 2030 and 2050 (Tagliapietra et al., 2019). These policies are linked to promotion of energy efficiency and use of renewable energy sources (Siksnyte et al, 2019). The EU has target to upsurge energy efficiency by 20% in 2020 and by 32.5 % in 2030.

Based on the newest data, provided by EUROSTAT, in 2019 results for achieving SDG7 goal and main targets was negative in EU (European Union, 2021). These negative trends are related to increase of primary and final energy consumption energy consumption per-capita in households since 2014. This does not allow to reach e energy efficiency increase by 32.5% for 2030. The increase in energy consumption had negative impact on increase of energy import dependency in EU during the same period (European Union, 2021). However, there are positive trends in increase of energy productivity. In any case, The COVID-19 pandemic will influence achievement of SDG 7 and it is expected that energy consumption will fall.

The share of renewable energy sources in final energy consumption was continuously rising and EU will reach the share to 32% by 2030. This has positive impact on reduction of greenhouse gas emissions intensity of energy consumption and GDP. The EU has goal to increase the share of RES in final energy consumption to 20% by 2020 and to 32% by 2030. The EU highpoints the importance of RES to achieve EU goal of decarbonising of the EU energy system. Use of renewable energy has been growing continuously in the EU. Its share has doubled since 2004. By 2019, this the share of RES increase from 9.6% (2004) to 19.7%. It is expected that EU will achieve target to have 20% of renewable in final energy consumption by 2020 however the progress seems to slow to meet the 32% of renewables in final energy consumption target by 2030.

The EU has goal to reduce its dependency on energy imports, which consists of natural gas, crude oil and coal imports. Therefore, the EU has goal to become more energy independent through increase of inland domestic energy production mainly relaying on renewable energy sources.

Energy poverty indicators like the share of people who are unable to keep their home adequately warm was declining in EU up to 2019. AS SDG 7 emphasizes the need for affordable energy for reasons of social equality and justice, EU has implemented policies to tackle with energy poverty. These policies are targeting renovation of residential buildings and support to implementing renewable energy micro-generation technologies in residential buildings. These measures allow to reduce energy poverty in long-term as short-term measures consist of social support for low income population (Azam et al., 2016; Shindina et al., 2018; Androniceanu et al., 2020). In EU the lack of access to affordable energy is linked with low income and high energy expenditures which are caused by energy inefficient residential buildings. In 2012, the share of people unable to keep their homes adequately warm was 6.9% and in 2019 it reduced to 3.5% (European Union, 2021).

Therefore, for analysis of progress towards SDG7 - “affordable, reliable, sustainable and modern energy for all” by 2030, it is necessary to monitor indicators showing progress in energy consumption per capita and energy poverty indicators, energy import dependency and indicators addressed also in EU climate and energy package and frameworks, such as the share of renewables in final energy consump-

tion, energy productivity and GHG emissions. In next section of paper indicators framework was developed to assess and compare progress of selected Balkan countries (Slovenia, Croatia and Montenegro, Serbia, North Macedonia and Bosnia Herzegovina) in implementing SDG 7 by 2020.

2. DATA AND METHODOLOGY

The main approach applied in this paper – comparative assessment of dynamics of the main SDG 7 indicators in six neighboring Balkan countries. Based on sustainable development framework, developed by IAEA (2005), the set of indicators to monitor affordable, reliable, sustainable and modern energy for all was selected.

In Table 1 the main SDG7 indicators selected are provided and described.

Table 1. SDG7 indicators to monitor progress of achievement of SDG7

Indicator	Description
Final energy consumption in households per capita, kgoe/inhabitant	This indicator measures how much energy each citizen consumes at home, excluding transport. Data are not temperature-adjusted, so variations from year to year are due in part to weather.
Energy productivity	This indicator measures the amount of economic output produced per unit of gross available energy (GAE). Gross available energy represents the quantity of energy products needed to satisfy all demand of entities in the geographical area under consideration. Economic output is either given as euros in chain-linked volumes to the reference year 2010 at 2010 exchange rates
Share of renewables in final gross energy consumption	This indicator is defined as the share of renewable energy consumption in gross final energy consumption, according to the Renewable Energy Directive (43). The gross final energy consumption is the energy used by end consumers plus grid losses and power plants' own consumption
GHG emissions per capita, tCO2/inhabitant	This indicator is applied to measure SDG. Target 7A: Integrate the principles of sustainable development into country policies and programmes and reverse the loss of environmental resources. Indicator 7.2 Carbon dioxide emissions, total, per capita provides total GHG emissions in CO2 eq divided by total population of the country.
Energy import dependency	This indicator shows the share of a country's total energy needs that are met by imports from other countries. It is calculated as net imports divided by the gross available energy (GAE). Energy import dependency = (imports - exports) / gross available energy.
Population unable to keep their homes adequately warm, %	This indicator monitors access to affordable energy throughout the EU. The data are collected as part of the EU Statistics on Income and Living Conditions (EU-SILC) to monitor the development of poverty and social inclusion in the EU. Data collection is based on a survey, which means that indicator values are self-reported.

Source: created by authors

SDG 7 requires to ensure access to affordable, reliable, sustainable and modern energy. Six selected indicators represent the main issues of SDG: environmental, social and economic.

Environmental issues or sustainable energy aspects are addressed by the three indicators: energy productivity, share of renewables and GHG emissions per capita. These indicators are interrelated as the main way to reduce GHG emissions from energy use are increase in energy productivity and increase in the share of renewables in energy mix.

Energy consumption per capita and indicator of population unable to keep their homes adequately warm provides information on energy affordability or address social issues.

Energy import dependency indicator addresses reliability of energy supply and deals with economic issues.

It is necessary to stress that increasing the EU energy productivity is one of the main pillars for reaching an affordable, reliable, sustainable and modern energy system as envisaged in SDG7. Efficient energy systems reduce energy consumption and costs, decrease energy dependencies and diminish the environmental and climate impacts related to energy supply and use.

Further these indicators will be collected for 6 Balkan countries EU-27 average during 2014-2020 period to define the main trends and the differences in these trends. The reasons for differences will be further discussed and policy implications will be provided for countries lagging in their progress towards affordable and clean energy to all goals set by Agenda 2030.

3. DISCUSSION OF RESULTS

In this section the main SDG7 indicators for Balkan countries former Yugoslavia states were collected from EUROSTAT (2021) and IEA databases for 2005-2020 period. Some indicators were available just from 2014 like in the case of energy productivity GHG emission data was not available in EUROSTAT for North Macedonia, Montenegro, Serbia and Bosnia and Herzegovina therefore to ensure data compatibility all GHG emission data for all Balkan countries including Slovenia and Croatia was collected from International Energy Agency database (IEA, 2021).

In Figure 1 dynamics of final energy consumption in households per capita in six countries is provided..

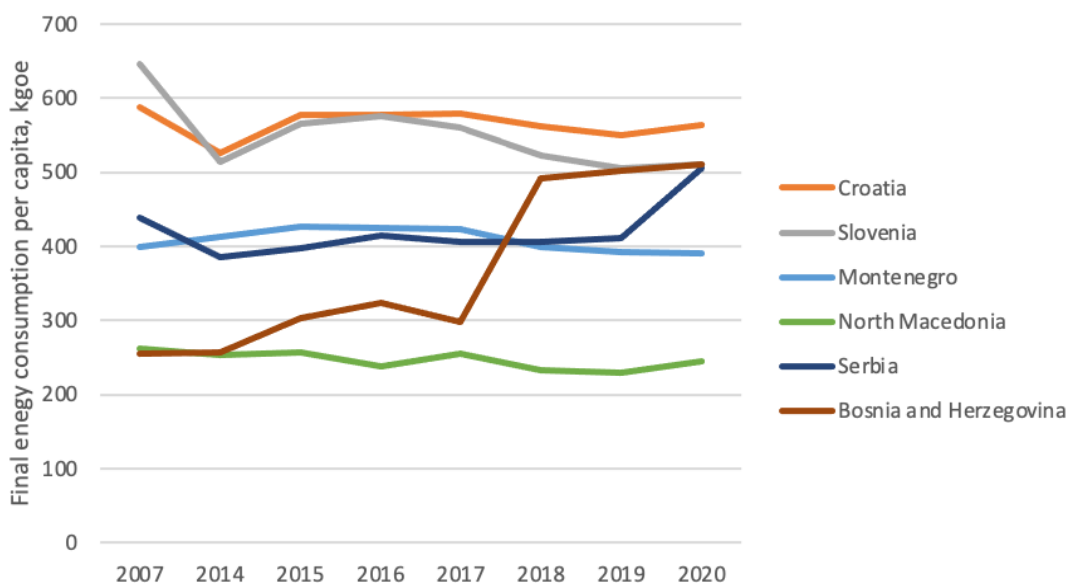


Figure 1. Dynamics of households' energy consumption per capita in Balkan countries

As one can notice from Figure 1 the highest final energy consumption per capita was in Croatia during almost all investigated period. The lowest final energy consumption per capita was in North Macedonia. Montenegro distinguishes from other Balkan countries with stable final energy consumption level per capita. Final energy consumption per capita in Montenegro is in the average between countries having the highest final energy consumption per capita like Croatia, Slovenia and the lowest final energy consumption per capita levels like North Macedonia. The sharp increase in final energy consumption per capita can be noticed in Bosnia and Herzegovina during investigated period. As final energy consumption

per capita is an indication of the aggregate energy consumption of societies and high value of it usually means a high standard of living and urbanization of the society, however it is often being considered as an indicator of an energy-inefficient society. Therefore, high final energy consumption per capita levels of Croatia and Slovenia in comparison with North Macedonia indicates higher economic development and standard of living in Croatia and Slovenia. These countries are already EU Member States and also implementing various EU regulations of energy efficiency improvement. At the same time the increase in final energy consumption per capita in Serbia and Bosnia and Herzegovina can indicate trends of energy-inefficient consumption.

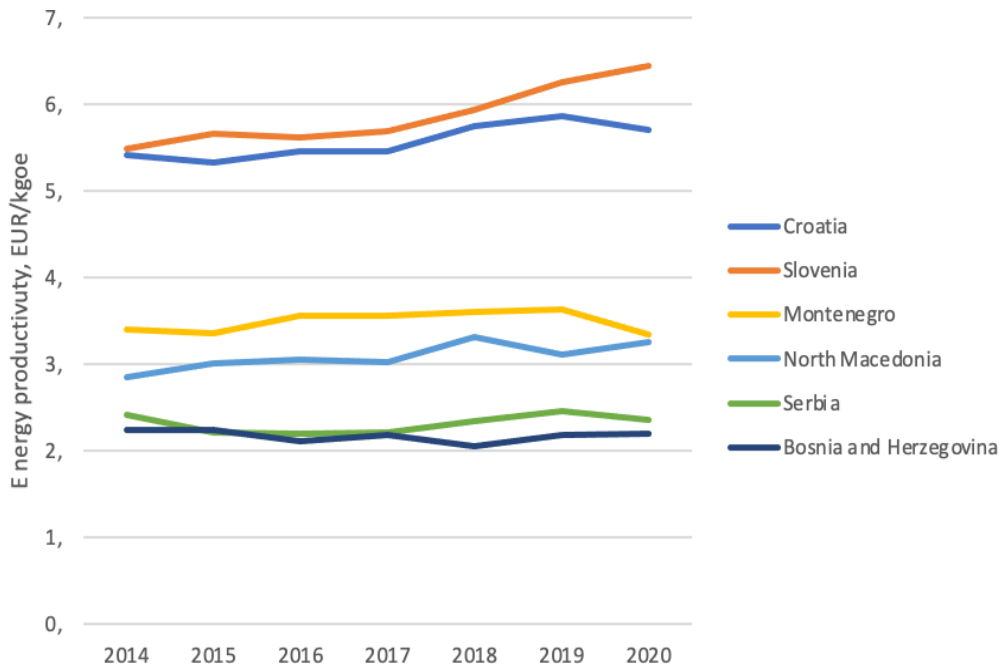


Figure 2. Dynamics of energy productivity in Balkan countries

Source: EUROSTAT, 2021.

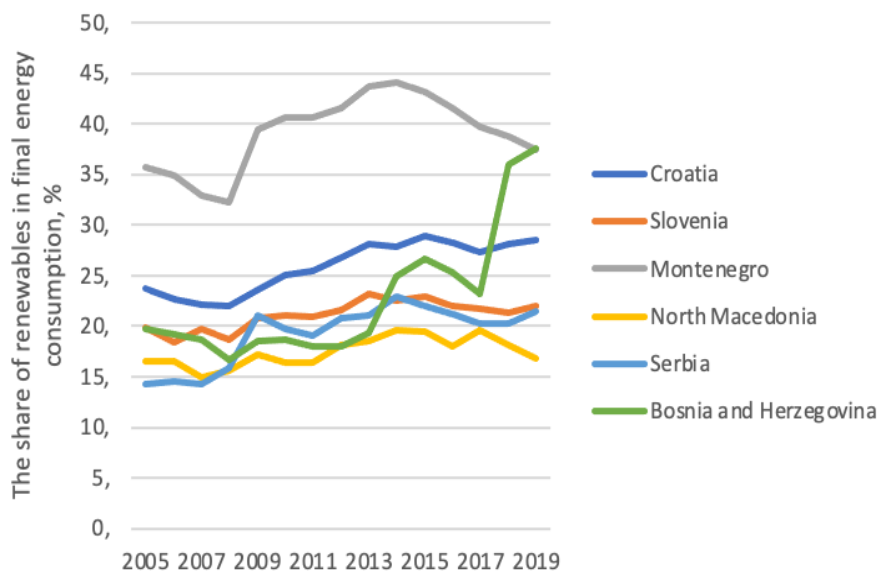


Figure 3. Dynamics of the share of renewables in final energy consumption in Balkan countries

Source: EUROSTAT, 2021.

As one can see from trends presented in Figure 2, Slovenia and Croatia have almost three times higher energy productivity than Serbia and Bosnia and Herzegovina. Montenegro and North Macedonia have almost twice lower energy productivity in comparison with more advanced Balkan countries like Slovenia and Croatia. Also it is necessary to stress that energy productivity was increasing in Slovenia and Croatia during investigated period while in other Balkan countries having low energy productivity it was stagnating. In Montenegro even some decline of energy productivity can be noticed in recent years. Analysis of trends of the share of renewables in final energy consumption in Balkan countries provided in Figure 3, shows that Montenegro distinguishes with the higher share of renewables, though it was declining since 2015. On opposite, the share of renewables in final energy consumption were increasing in Bosnia and Herzegovina and in 2020 it reached the share similar to Montenegro, i.e. above 37%. In Croatia the share of renewables in final energy consumption was continuously increasing during investigated period. The lowest share of renewables was in North Macedonia during all investigated period and even decreased in the recent years to 16%.

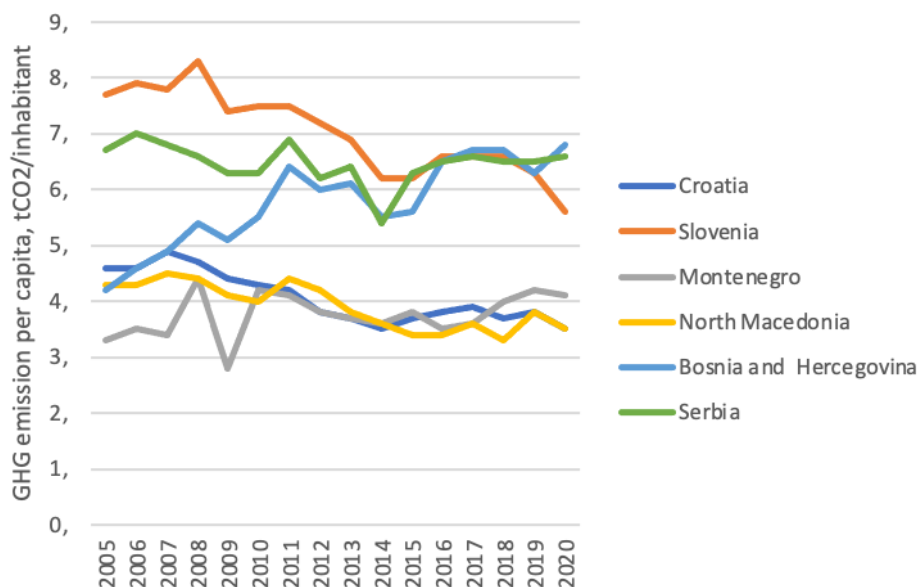


Figure 4. Dynamics of GHG emissions per capita in Balkan countries

Source: IEA, 2021.

As one can see from data given in Figure 4, the highest GHG emissions per capita in 2020 were recorded in Bosnia and Herzegovina followed by Serbia. It is necessary to stress that Slovenia had the highest GHG emission per capita in 2005 however country shows positive trends of GHG emission reduction as they have decreased during investigated period from 7.7 to 5.6 tCO₂/capita. The lowest GHG emissions per capita in 2020 were in North Macedonia and Croatia (3.5 tCO₂/capita) following Montenegro (4.1 tCO₂/capita). In addition, in countries having the lowest GHG emissions per capita the trends of increase of this indicator can be noticed.

As one can notice from Figure 5, North Macedonia has the highest indicator of energy import dependency and it was increasing during investigated period by reaching almost 54% in 2020. Croatia and Slovenia also have quite high energy import dependency however it was declining in recent years. The same trends are characteristic to Montenegro, Serbia and Bosnia and Herzegovina. In 2020 the energy import dependency made about 29% in these countries.

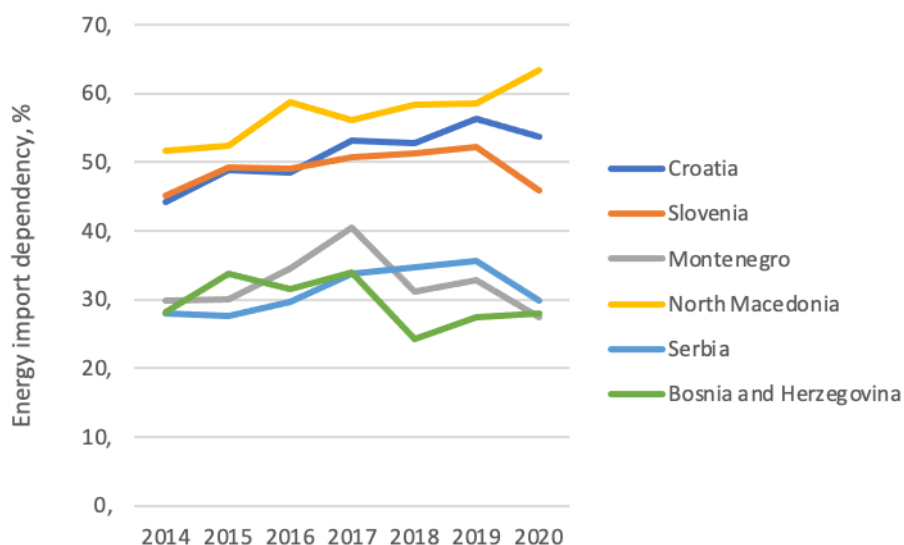


Figure 5. Dynamics of energy import dependency in Balkan countries
Source: EUROSTAT, 2021.

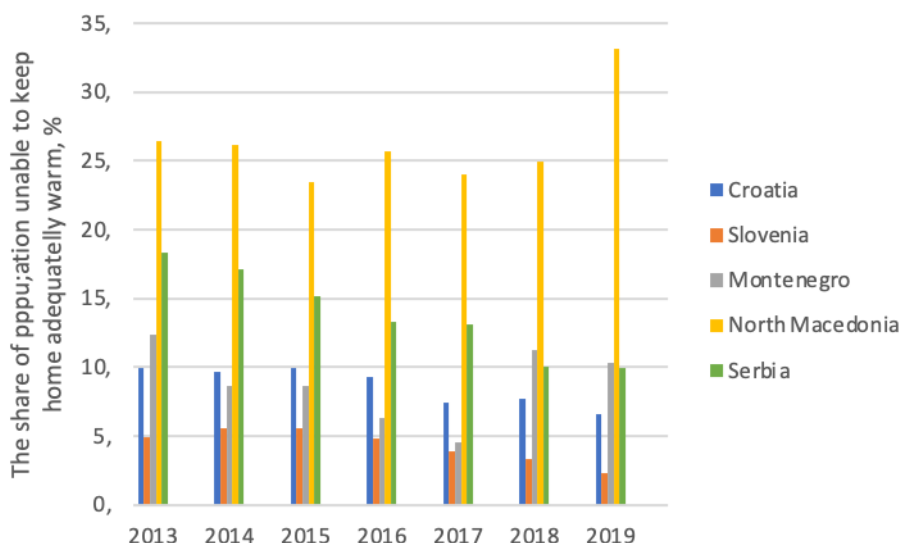


Figure 6. Dynamics of the share of population unable to keep their home adequately warm in Balkan countries
Source: EUROSTAT, 2021.

Information provided in Figure 6 shows that the highest energy poverty indicators expressed by the share of population unable to keep homes adequately warm were in North Macedonia and the negative trends of this indicator development can be observed since 2018. Energy poverty in North Macedonia reached 33% IN 2019. n Serbia though the share of population unable to keep homes adequately warm was second highest among Balkan countries it was continuously declining and decreased from 18% to 10% in 2019. The lowest share of population unable to keep homes adequately warm during investigated period was in Slovenia and it was continuously declining during investigated period by reaching 2.3% in 2019. In Croatia the share of population unable to keep homes adequately warm has decreased from almost 10% in 2013 to 6.6% in 2019. In Montenegro this energy poverty indicator has decreased from 12% to 10% during the same period.

CONCLUSIONS AND POLICY IMPLICATIONS

Conducted analysis of energy poverty indicators development during 2016-2020, indicated positive trends according to SDGs 7 goals in EU Member States (Slovenia and Croatia) linked to ensure access to affordable, reliable, sustainable and modern energy. However, other Balkan Countries like North Macedonia, Montenegro, Bosnia and Herzegovina and Serbia are showing quite different results in approaching SDGs targets for energy. Slovenia is the EU member state since 2004 and has achieved the best results in approaching SDG7 goal based on selected SDG7 indicators. Slovenia and Croatia (the EU Member state since 2013) have the highest energy productivity and lowest share of population unable to keep home adequately warm. According to other SDG7 indicators Slovenia and Croatia have the highest energy consumption per capita and the highest energy import dependency after North Macedonia. In addition, all SDG7 indicators have positive trends in Slovenia and Croatia however other Balkan Countries like North Macedonia, Bosnia and Herzegovina and Serbia are significantly lagging according to energy productivity and energy poverty expressed by the share of population unable to keep their homes warm and what is most important the trends are not positive as energy productivity was declining and energy poverty was increasing during investigated period.

Renewable energy share was increasing in Croatia and Slovenia however Montenegro and Bosnia and Herzegovina had the highest share of renewables in final energy consumption in 2020. One can notice that though in Slovenia and Croatia energy import dependency was decreasing in North Macedonia it was increasing though it was the highest among the Balkan countries. According to GHG emissions per capita Balkan countries can be grouped in two clusters: low GHG emission per capita countries showing the trends of increase of this indicator, i.e. North Macedonia, Montenegro and Bosnia and Herzegovina and countries with high GHG emission per capita indicators showing the trend of decrease Serbia, Croatia and Slovenia. The main policy implications for Balkan countries can be developed for EU Member States countries and countries planning to join EU in the future as these countries have different SDG7 indicators and even different trends of these indicators.

For Slovenia and Croatia the main policy recommendations are to increase use of renewables and reduce of energy import dependency. Though the trends are positive however countries need to pay more attention to energy reliability and sustainability dimensions and strengthen policies in this field. For North Macedonia the main policy recommendations are linked to addressing energy poverty issues and dealing with energy import dependency which might cause major problems for secure and affordable energy supply in the country. For Serbia, Bosnia and Herzegovina and North Macedonia another major issue is very low energy productivity including absence of positive trends, therefore countries need to implement policies' and measures to ensure energy efficiency improvement. The example of EU policies to promote energy efficiency might be useful for these countries.

The study has limitations as just limited period data 2005-2020 or 2014-2020 was used to analyse trends of SDG7 indicators in Balkan countries. Also, limited number of environmental and energy poverty indicators was analysed and compared between Balkan states. This is due to limited availability of indicators for Balkan countries available at EUROSTAT. The future research is necessary to address these issues by using new data on SDG7 indicators and providing comparative assessment of Balkan Countries. The policy analysis and more advanced multi-criteria decision adding models should be applied for ranking of Balkan countries in terms of approaching SDG7 targets.

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