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THE ROLE OF GAS INTERCONNECTIONS IN THE ENERGY SECURITY OF SOUTH-EAST EUROPE[3]

The Russian-Ukrainian dispute over the natural gas transit and the subsequent disruptions in natural gas supply to some countries in South-East Europe (SEE) in 2006 and 2009 attracted considerable public and academic attention and it wouldn't be overstated to say that they have changed the direction of the entire energy policy of the European Union. Sixteen years after the first gas crisis, in light of the current energy crises and the military conflict between Ukraine and the Russian Federation, this paper attempts to illustrate the trends in the natural gas sector development in South-East Europe, to evaluate whether and how the role of the Russian natural gas supplies in the region's energy security has changed and to examine what measures have been taken for the security of natural gas supplies in the region over the years. The results show that although the amount of Russian natural gas delivered to the SEE countries still represents the greatest share of their total gas supplies, concerns over possible disruptions have been addressed by developing the interconnectivity in the region and commissioning new infrastructure creating alternative options for the routes and sources of supply. Nevertheless, there is still what to expect in regard to interconnectivity and market integration of the Western Balkans.
Keywords: South-East Europe; Energy security; Security of Natural gas supplies; Economics of Natural gas sector; EU Energy policy
JEL: Q4; F5

1. Introduction

Geographically, South-East Europe (SEE) lies between two parts of the world, both of which play an important role in the global energy economy – the Black Sea region, Central Asia and the East Mediterranean, with their rich energy resources and potential, and the vast energy markets of Western and Central Europe. Thus, the region is becoming an even more important energy resources transit centre. Nevertheless, insufficient attention is paid to the development of the energy potential of South-East Europe itself and its significance for the

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socio-economic development of countries there. For the purpose of this study, South-East Europe comprises six Contracting Parties to the Energy Community Treaty – Albania, Bosnia and Herzegovina, Kosovo[4], Montenegro, Serbia and the Republic of North Macedonia, as well as four members of the EU – Bulgaria, Greece, Croatia and Romania (three-letter country codes (alpha-3) as in (ISO 3166, 2020) are used in the figures for convenience instead of the full official names of the analysed countries).

Countries in the region are neither main energy producers, nor large consumers. Although there are some deposits of fossil fuels, these resources are not significant. The region depends on imports and limited local resources such as hydropower, lignite, as well as biomass energy. The diverse energy scene is characterised not only by market disparities in terms of population, economic development and energy infrastructure, but also by the region's dependence on energy imports (Dineva, 2020).

The region as a whole is a net energy importer, importing about 52 Mtoe in 2018 or about 63% of its total final energy consumption (82 Mtoe) (Dineva, 2020). This number has barely changed over the last 20 years. Local sources provide about 85% of lignite, 20% of oil and 50% of natural gas in SEE. Lignite is widely available in the region, providing a cheap but polluting energy resource and being key for the functioning of the economy for many countries in the region. Although there are certain efforts at a global scale to improve the ecological aspects of the coal industry through "clean coal technologies" (in the USA, India and China in particular) (Zhiznin, Cherechukin, 2019), introducing such technologies in the SEE countries is limited and expensive, and currently does not appear to be an option.

Over the past two decades, natural gas has been considered a cleaner energy substitute for coal in the region, so the efforts of the local governments have been focused on increasing gasification and ensuring that gas supplies meet their country's needs. Due to its geographical location, historically, the region has been an area of geopolitical contentions. Thus, the Russian-Ukrainian dispute over the natural gas transit and the subsequent disruptions in natural gas supply from Russia to some countries, primarily in South and East Europe, in 2006 and 2009 attracted considerable public and academic attention.

These events undermined the historical partnership on energy matters between Russia and the EU. The two gas crises crossed out the previous 40 years of stability and continuity of supply. Both Russia and Ukraine suffered serious damage to their reputations as a supplier and transit countries, respectively, as well as substantial financial losses (Dineva, 2020). European vulnerability and the necessity to increase energy security in Europe have been highlighted by these events and it would not be exaggerated to say that the 2006 and 2009 events have changed the direction of the entire energy policy of the European Union.

Since then, the natural gas security of South-East Europe has been shifted to the top of the energy policy agenda both at the European and national levels. Considering the time elapsed since these events took place, the current escalated situation in Eastern Europe and the new European energy–climate paradigm, it is relevant to follow the developments in the security

[4] This designation is without prejudice to positions on status and is in line with UNSCR 1244 and the ICJ Opinion on the Kosovo Declaration of Independence.

of gas supply measures applied in South-East Europe as well as the possible role of the natural gas in the energy transition of the region.

For the purpose, this study contains a qualitative evaluation of energy security and some quantitative indicators (some problems of the quantitative evaluation of energy security are discussed in details in (Zhiznin et al., 2020)), and includes a discussion of some relevant aspects of the Green deal, examination of the natural gas markets, demand and indigenous production of natural gas in South-East Europe, sources of supply and transportation infrastructure development in the region (existing, planned and under construction).

2. Literature Review

A number of studies have been devoted to the subject of Energy security over the years, including its theoretical formulation and the methods for its assessment.

Frameworks for analysing national energy security policies and performance are suggested by Sovacool, Mukherjee (2011); Winzer (2011); Buzan et al. (1988); Cherp, Jewell (2014).

Baumann, F. (2008); Bohi, D. et al. (1996); Kruyt B. et al. (2009); Labandeira X., Manzano B. (2012); as well as Le Coq C., Paltseva E. (2009), analyse the economic aspect of Energy security and propose indicators for its quantitative evaluation

The European context of Energy security is discussed by Lilliestam, J., Patt, A. (2012); Noel P., Findlater S. (2010); Vicini, G., et al. (2005); Seliverstov S. (2007); Simonija N. A., Torkunov A. V. (2014); Skalamera M. (2015); Zhiznin, S. Z. (2010); Rodríguez-Fernández, L., et al. (2020).

Most of the available literature, however, does not cover South-East Europe as one region, but either discusses the EU Member States in the region, or the so-called Western Balkan countries. Studies which do consider the region as one whole and are of particular relevance to this paper are Giamouridis, A., Paleoyannis (2011); Dickel, R. et al. (2014); Afgana, N. A. et al. (2007); Franki, A., Višković, A. (2015); Morningstar, R. L., et al. (2020); Kovács, K. (2017); Khalova, G. O., et al. (2019); Cohen, G. (2019), which analyse energy security and policy in South-East Europe in particular.

3. Methodology

This is an analytical study, which represents a mixed methods research, combining quantitative and qualitative research methods. The results obtained through this combination can enhance the comprehension of the objects of study and possibly clarify questions that are challenging to address by applying only one method (Lopez-Fernandez, Molina-Azorin, 2014). This approach is appropriate for interdisciplinary studies such as the energy policy and security examination, which comprises economic, policy and security elements.

3.1. Qualitative methods

The qualitative analysis in the paper is performed through a comprehensive data review of the most recent sources regarding the sources of supply and the existing and planned infrastructure for natural gas transportation and storage. The main sources of information are official government publications and communications of the European Commission and notifications of the Transmission system operators. These data are complemented with press releases, news and other online announcements.

A map of the interconnections in SEE is used to illustrate the current state of interconnectivity in the region. The information used for the creation of the map is compiled from ENTSO-G Transmission Capacity Map 2019, the Gas Transmission System Operators of the SEE countries and reliable media publications.

3.2. Quantitative methods

The quantitative data for the analysis of Primary energy supply and natural gas demand and supply sides are presented in graphical and table forms.

Data for the total primary energy supply are collected from the IEA opensource database (IEA,2021). Natural gas consumption and proven gas reserves are compiled using CIA World Factbook data (CIA World Factbook data, 2021). Natural gas prices in the SEE countries are collected from Eurostat (Eurostat, 2021).

Gazprom Export official information is used for crating Table 1 containing the natural gas quantities supplied by Gasprom in 2019. The estimations for potential gas reserves in the region are compiled from governmental press releases and open source information.

In order to make some estimations of the overall energy security, two of the widely used indicators for measuring energy diversity and concentration are applied for the region of South-East Europe: the Shannon-Wiener Index (SWI) and the Herfindahl-Hirschman Index (HHI). The formulas for calculating the two indicators (Park, Bae, 2021; Chalvatzis, Ioannidis, 2017) are as follows:

$$\text{HHI}=\sum_{i=1}^{n}(s_i \times 100)^2 \quad (1)$$

$$\text{SWI}=-\sum_{i=1}^{n} s_i \times \ln s_i \quad (2)$$

where s_i is the share of primary energy supply of each available energy source in the total primary energy supply and n is the number of options. The HHI index highlights abundant energy resources and the lower the value of the HHI, the higher the diversity. The higher the value of the SWI index, the higher the diversity.

4. Some Relevant Aspects of the European Green Deal

A brief overview of the EU Energy policy and, more precisely, the European Green Deal as a framework which would determine the direction of this policy in the next decades will give

a context to the analysis of the role of natural gas in the energy mix of the South-East European countries.

Since the presentation of the EU Green Deal in December 2019, a number of legislative proposals, including in the energy sector, have been developed by the Commission (e.g. *the EU strategy on energy system integration, Renovation Wave for Europe, Hydrogen strategy for a climate-neutral Europe, etc.).* As part of the Green Deal, *the European Climate Law* (Regulation (EU) 2021/1119) (in force since June 2021) sets a binding target of achieving the reduction of net greenhouse gas emissions by at least 55% by 2030 compared to 1990 and envisages EU climate neutrality by 2050. This requires current greenhouse gas emission levels to drop substantially in the next decades.

In order to adapt its current legal framework to the 2030 and 2050 ambitions, the EU is working on the revision of its climate, energy and transport-related legislation under the *Fit for 55 package,* which also includes a few new proposals (European Council, 2021). There are several new developments which are worth noting here:

- EU level goal of at least 40% renewable energy sources by 2030 according to the 2021 proposal for revision of *the 2018 Renewable Energy Directive* (European Commission, 2021a);
- Binding targets at the EU level for reducing primary and final energy consumption by 2030 – 39% and 36% accordingly according to the Commission's proposal (European Commission, 2021b) for recasting the whole *2018 Energy Efficiency Directive* (Directive (EU) 2018/2002);
- Introduction of the Carbon border adjustment mechanism (CBAM) for prevention of the risk of carbon leakage and under which EU importers will have to buy carbon certificates equivalent to the carbon price under the EU's carbon pricing rules. The mechanism is planned to progressively become an alternative to the EU's Emissions Trading System (ETS);
- Reduction of the overall emission cap and of the surplus of emission allowances in the carbon market, which will lead to declining in the number of free allowances for all sectors over time, as envisaged in the new revision of the EU ETS Directive (Directive (EU) 2018/410).

One of the measures intended to facilitate the redirection of finance towards environmentally sustainable activities on the territory of the EU is *the EU Taxonomy Climate Delegated Act* (Regulation (EU) 2020/852) (formally adopted in June 2021). In order to clarify which economic activities most contribute to reaching the environmental goals of the European Union, the Commission has identified a list of 88 activities which are considered environmentally sustainable as well as detailed criteria they have to meet in order to be labelled as a green investment.

Natural gas and nuclear energy were not included in this list as they appeared to be the most controversial aspects of the taxonomy over which the EU countries are divided. However, considering the recommendations of the Technical expert group (TEG) advising the European Commission on sustainable finance (European Commission, 2020) and *the*

Technical report of the Joint Research Centre (JRC) (European Commission Joint Research Centre, 2021), on February 2nd the Commission presented the final version of the Complementary Delegated Act of the EU Taxonomy Regulation which covers nuclear and gas activities (European Commission, 2022). The document acknowledges both energy sources as contributing to the transition to climate neutrality. However, the positions of the Member States regarding the Delegated Act are fundamentally different. While some countries are strictly against the inclusion of these activities in the Taxonomy, others are disappointed from treating nuclear and natural gas as transitional fuels as well as from some of the conditions envisaged in the document.

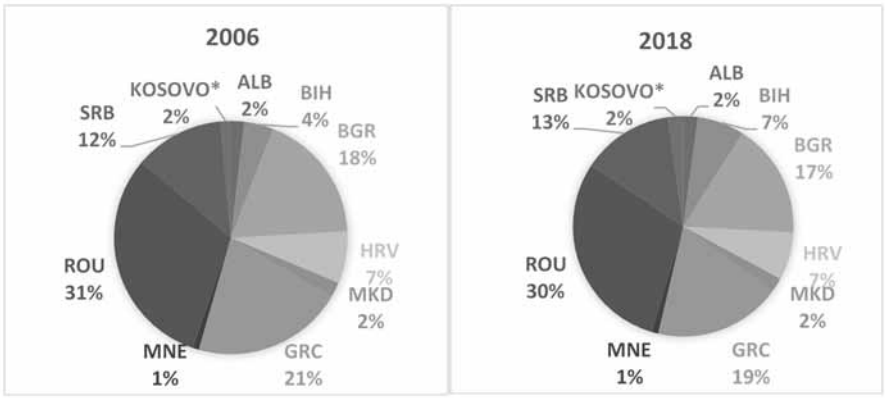
5. Results And Discussion

5.1. Composition of the Total primary energy supply in the region

The countries with the largest population and GDP in the region are Romania, Greece, Bulgaria and Serbia are also, as might be expected, the largest energy consumers (Figure 1). About 90% of the SEE's total primary energy supply (both in 2006 and 2018) is used by these four countries and they play a substantial role in the formation of the region's average calculations. On the other hand, Montenegro, Kosovo, Albania and the Republic of North Macedonia are the countries with the least contribution to the region's primary energy supply.

Figure 1

Total primary energy supply contribution in SEE for 2006 and 2018



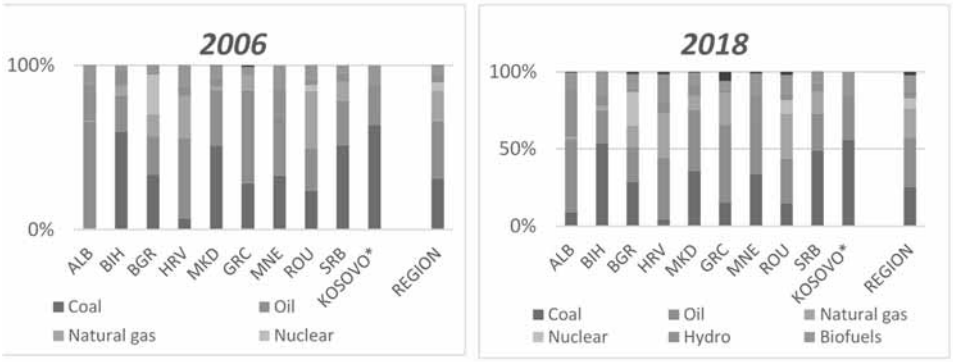
Source: Author's own calculations based on IEA Energy Statistics data.

The overall total primary energy supply (TPES) in South-East Europe has decreased by 13% – from 130.96 Mtoe in 2006 to 113.91 Mtoe in 2018 (IEA, 2021). Such a negative trend is observed in most of the countries in the region and their reduction percentage ranges from -9.5% in Bulgaria to -28.9% in Greece. There are a few countries, however, which have increased their primary energy supply – Albania (17%), Bosnia and Herzegovina (43.5%), Montenegro (10.5%) and Kosovo (13%) (IEA, 2021).

In the globalised and highly interdependent modern world, the diversity of energy resources is becoming a more and more important aspect of energy security. The EU has adopted a long-term strategy for energy diversity within the context of decarbonisation policies in order to reduce its reliance on fossil fuels. Figure 2 shows the composition of SEE's total primary energy supply in 2006 and 2018.

Figure 2

Total Primary Energy Supply by source in %, 2006 and 2018



Source: Author's own calculations based on IEA Energy Statistics data.

Two of the widely used indicators for measuring energy diversity and concentration are applied for the region of South-East Europe: the SWI and the HHI (as described in more details in the Methodology Section). Seven primary energy sources have been considered in the calculations for the region as a whole: coal, oil, natural gas, nuclear, hydro, biofuels and renewables. However, this number varies from n=4 to n=7 for the individual countries, depending on the composition of their TPES.

The region considerably improved its energy sources diversity with an increase of SWI by 10.3% and a decrease of HHI by 15.5% since 2006. To a large extent, this improvement is connected to two factors:

- First, the substantial decrease in coal (by approx. 1/3) and oil (by approx. 1/4) consumption and the decreasing trend in natural gas use (Figure 2);
- Second, the introduction and wider use of renewable energy sources in all countries in the region (although "*Other RES"* do not appear in the official energy statistics for Kosovo* for 2018, the country's first major wind farm started operation in late 2018 and 2019), but especially in the EU Member States in the region, and this growing trend (considering the present decarbonisation policies) will probably contribute to the further diversity improvements in future (Figure 2).

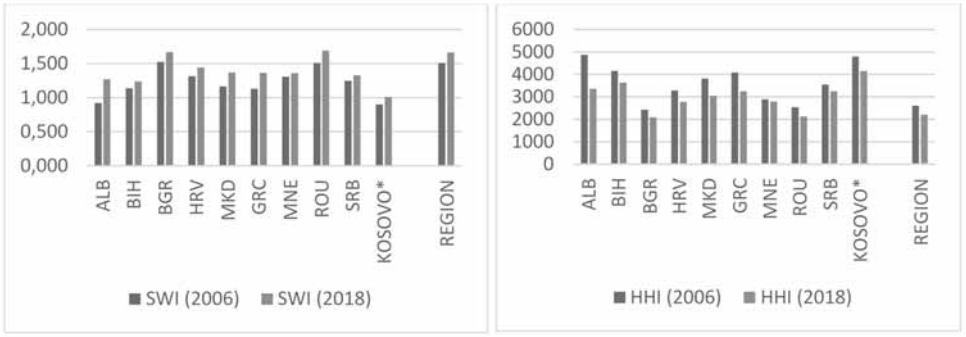
Despite the considerable reductions in the use of coal and oil, both fuels are still dominant in the TPES structure of the region (Figure 2).

Romania and Bulgaria are the counties with the most diverse and balanced fuel mix as they use a maximum of seven energy sources available in the region, including nuclear power.

This is also depicted in their SWI and HHI indexes (Figure 3). They are also respectively first and third in terms of shares in the regional TPES (Figure 1).

Figure 3

The SWI and HHI of SEE in 2006 and 2018

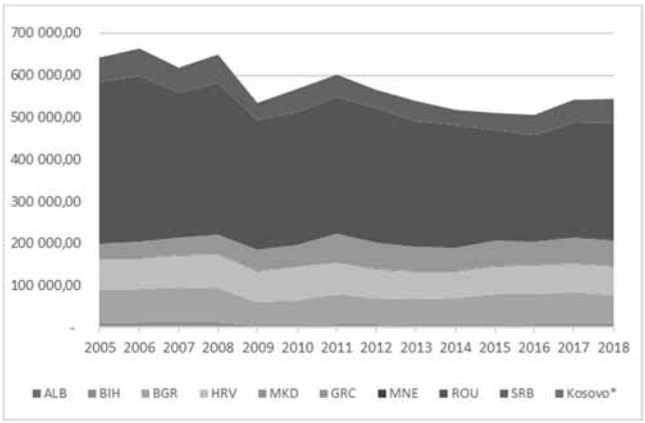


Source: Author's own calculations based on IEA Energy Statistics data.

Kosovo, Bosnia and Herzegovina and Albania are the countries with the least diverse energy mix, mainly due to their heavy reliance on one or two sources – coal and/or oil. They are also the countries with the smallest shares in the total primary energy supply of the region – each of them is accountable for 2%. Croatia also has a 2% share in the regional TPES, but its fuel mix is much more balanced, and this is reflected in the indicators.

Figure 5

Natural gas final consumption in SEE (TJ), 2005-2018



Source: Compiled by the author based on IEA Energy Statistics data

Albania, Greece and the Republic of North Macedonia have achieved the greatest improvement in their energy sources diversification over the period 2006-2018, by decreasing HHI respectively by 30.9%, 20.4% and 20.0%, and increasing SWI by 37.5%, 20.6% and 17.6% (Figure 3). The least progress in terms of diversification have Montenegro

(decreasing HHI by 3.5% HHI and increasing SWI by 4.1%) and Serbia (decreasing HHI by 8.5% and increasing SWI by 6.8%) (Figure 3).

There has been an overall negative trend in the natural gas final consumption in the region since 2005 (Figure 5), as the difference between the gas consumed in 2005 and 2018 is about 15%. This tendency is valid for all individual countries in the region, as only some minor increase is observed in Albania.

5.2. Sources and routes of natural gas supply

Natural gas enters South-East Europe either via pipelines or as liquefied natural gas (LNG) via LNG terminals. The largest share of gas imports comes from Russia. A detailed examination of the natural gas infrastructure in the region – existing, under construction and planned, as well as the current and potential sources of supply are further provided.

Russian supplies

The main natural gas supplier of the SEE countries is Russia. It made its first deliveries to the region (and more precisely – to Bulgaria) in 1974. Until recently, the region used to receive Russian supplies exclusively via the pipeline system through Ukraine.

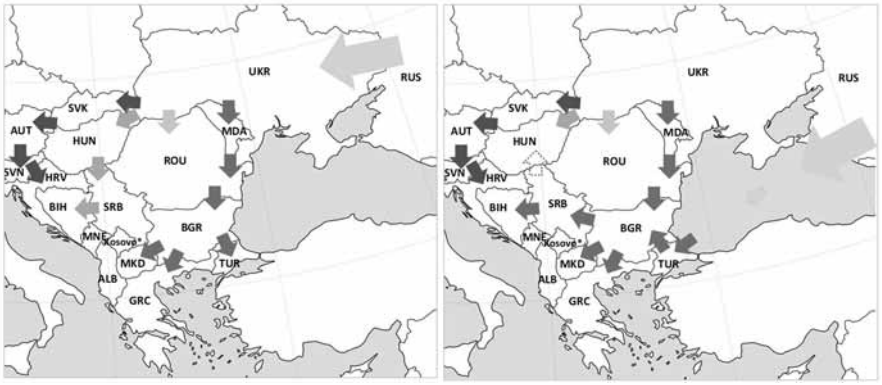
The Soyuz gas pipeline along the Orenburg-Western border of the USSR route was built after the signing of the Orenburg Agreement. It was put into operation in 1980 and its design capacity is 26 Bcm/y. The gas transported through this pipeline has been delivered in South-East Europe in 3 directions – to Slovakia (from there, it could be transported to Slovenia and Croatia via Austria), to Hungary (from there, it could be transported to Serbia and Bosnia and Herzegovina) and to Romania.

Another route of the Russian gas transit to South-East Europe through Ukraine is Romania (via Moldova). The construction of the Transbalkan pipeline began in 1986 and it has been supplying gas to Bulgaria, Greece, the Republic of North Macedonia and Turkey through the territory of Romania (Gazprom Export, 2021b).

After the commissioning of the TurkStream, the function of the Trans-Balkan Pipeline changed. Since January 1st 2020, Bulgaria has been receiving Russian gas through the new entry point Strandzha 2, at the border between Bulgaria and Turkey (Darik news, 2019). Additional gas quantities enter Bulgaria through this new entry point in order to be transported further to Greece, the Republic of North Macedonia and Romania.

In July 2019, it was announced that the second branch of the TurkStream will pass through Bulgaria, Serbia and Hungary (BTV Novinite, 2021). Although this project, along with Nord Stream 2 (some geopolitical and economic aspects of this project are presented in (Zhiznin, Timokhov, 2019)), have been included in the US Countering America's Adversaries Through Sanctions Act (CAATSA), on January 1st 2021, Serbia officially commissioned the Balkan stream at its territory (Gazprom Export, 2021a).

Figure 8
Russian Natural gas supply to SEE prior and after to the commissioning of TurkStream and its continuation Balkan Stream



Source: Compiled by the author.

To summarise, 9 out of 11 countries in South-East Europe are receiving natural gas from Russia – Albania, Montenegro and Kosovo being the only exceptions (Table 1).

Table 1
Natural gas quantities supplied by Gazprom to SEE countries, 2019

Country	Imports from Russia (bcm), 2019
ALB	0
BIH	0,18
BGR	2,39
HRV	2,82
MKD	0,29
GRC	2,41
MNE	0
ROU	1
SRB	2,09
Kosovo*	0
REGION	**11,18**

Source: Compiled by the author based on Gazprom Export official data.

Caspian supplies

The Southern Gas Corridor is a relatively new route which was assigned with the mission to shift the balance of natural gas trade flows and diversify the supply portfolio not only in South-East Europe, but in the European Union as a whole. Being a priority project of the EU, this complex system of pipelines has been constructed for less than 5 years and aims to increase and diversify the energy supply by transporting gas from the Caspian region.

Since the end of 2020, the Southern Gas Corridor has been able to bring a further 16 Bcm/y (of which 6 Bcm are for the Turkish market and the remaining 10 for South Europe) from the Shah Deniz field in Azerbaijan through the South Caucasus Pipeline and its expansion, the

Trans-Anatolian Natural Gas Pipeline (TANAP) and the Trans Adriatic Pipeline (TAP) to the European markets. The total length of the pipeline system is more than 3,200 kilometres and costs about US$40 billion (Southern Gas Corridor, 2021). There are plans to include also the Trans-Caspian Pipeline (TCP), which could enable the export of Turkmen gas. However, the inclusion of Turkmenistan and Iran in this corridor is only speculative at this stage.

The first Azeri gas was delivered to Greece and Bulgaria on December 31st 2020. It has entered Greece at the connection point between TAP and via the Greek national transmission network. At first, Bulgaria will receive gas through the existing gas link between Bulgaria and Greece (the Kula-Sidirokastro pipeline) and afterwards, gas will flow through the planned Bulgaria-Greece Interconnector (IGB). The current contracts envisage delivery of 1Bcm/y to Greece and Bulgaria each, and 8Bcm/y to Italy (S&P Global Platts, 2020).

Moreover, Croatia, Albania, Montenegro, Bosnia and Herzegovina and possibly Kosovo may have the opportunity to receive natural gas through the Southern Gas Corridor in future via the proposed Ionian-Adriatic Pipeline (IAP). However, this project is still at a very early stage, so realistically, these Western Balkan countries are not expected to benefit from the Azeri gas anytime soon (a more detailed analysis regarding the planned gas pipeline projects in SEE is presented further below).

The Southern Gas corridor was, without doubt, a very technically challenging project, spanning seven nations, and there are huge expectations regarding its impact on the European gas market. Nevertheless, it is controversial to what extent it would be commercially meaningful in the future, considering the new EU energy and environment goals and the fact that the role of natural gas in the future energy mix is still being debated.

Moreover, the energy security purpose of the SGC could also be questioned to a certain degree, taking into account the participation of Lukoil with a 10% share in the project, as well as the possibility for Gazprom to book capacity in the expansion of the Trans Adriatic Pipeline (TAP). TAP was granted a third-party access exemption under the EU 2009 gas directive (Regulation (EC) No 715/2009) only for its original capacity of 10 Bcm/y (1/2 of the planned extended capacity of 20 Bcm/y), which gives permission to the Azeri gas suppliers to fully book this capacity (Stein, 2019).

This raises questions about the EU energy strategy coherence and whether the investments in the Southern Gas Corridor could not have been better allocated to energy efficiency measures in Central and South-East Europe, where countries are most vulnerable to any future gas import disruptions (Stein, 2019).

5.3. Regional interconnectivity

South-East Europe has been perceived as the weakest link in the quest for European Energy security. The region used to be characterised by the absence of interconnecting gas infrastructure, allowing gas to flow not only between the economies of the region but also between South-East Europe as a whole and the rest of the European Union.

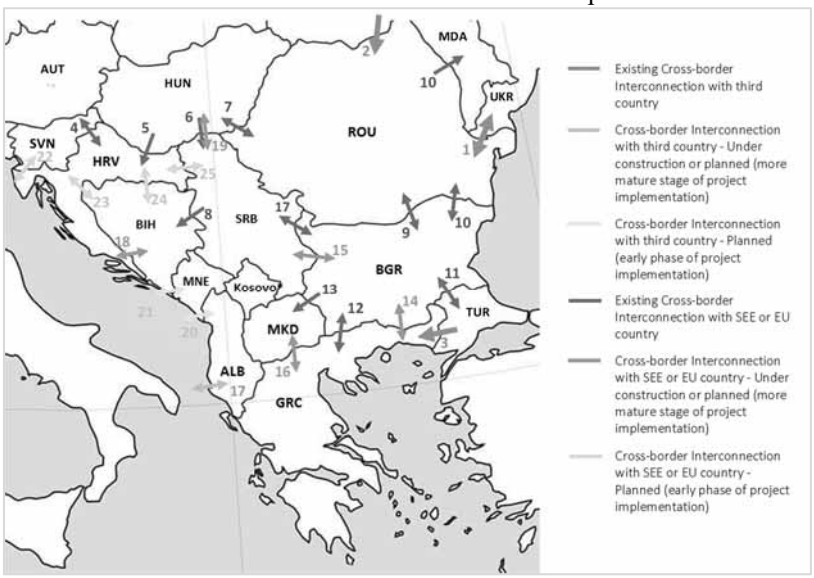
However, the gas infrastructure map of the region has substantially changed over the last decade. Apart from the numerous long-distance gas pipelines (already commissioned or

planned), a number of smaller-scale developments have been realised in SEE, which could have a greater impact on the region's gas market.

A potential game-changer in the SEE are the gas interconnections between the individual countries (existing and planned). At present, there are 14 existing cross-country interconnection points in the region, as well as more than 12 under construction or planned, which are discussed below. Regional cooperation is perceived as an important segment of the Energy Union and a rational response measure against potential supply disruptions by increasing market liquidity and interconnectivity. As a rule, the European Commission provides coordination and partial financial support through its financial instruments, such as the Connecting Europe Facility (CEF), which considers the Projects of Common Interest (PCI) lists (CEEP, 2018).

Figure 9

Interconnections in South-East Europe



Source: Compiled by the author based on ENTSO-G Transmission Capacity Map 2019, information from the Gas Transmission System Operators of the SEE countries and reliable media publications.

Romania

The Romanian gas network is connected with the gas networks of four out of its five neighbouring countries (there is no interconnection with Serbia). Historically, Romania used Tekovo (UKR)/ Mediesu Aurit (ROU) (*Interconnection (IC) 2 in Figure 9)* and Isaccea (ROU)/ Orlovka (UKR) *(IC 1 in Figure 9)* interconnection points at the border with Ukraina to receive gas supplies from Russia and transit the negotiated quantities further to a few other countries in the region.

After the implementation of a project for the upgrade of Isaccea, from January 1st 2020, there is also a possibility for gas to flow in a direction from Romania to Ukraine and Moldova (Elliot, S., 2019; Romania Insider, 2021b).

The Arad (HUN)-Szeged (ROU) gas pipeline *(IC 7 in Figure 9)* was officially inaugurated in 2010 and provided a bi-direction gas flow between Hungary and Romania. The interconnection contributes to improving the security of gas supply not only in Romania, but in Central and Eastern Europe.

The interconnector between Romania and Moldova *(IC 10 in Figure 9)* was commissioned in 2020. Its aim is to ensure a higher level of gas supply security in Moldova and the North-East part of Romania. So far, however, it has been used at a very low capacity (HiQSTEP, 2014).

Negru Voda 2,3 (ROU) /Kardam (BGR) interconnection points *(IC 10 in Figure 9)* are part of the Trans Balkan Pipeline supplying Russian gas to Bulgaria through Ukraine and Romania and have been modernised in 2019 in order to provide bidirectional flows. Since April 2021, the Russian gas is delivered to Romania from the TurkStream through the territory of Bulgaria. A second reverse flow interconnection between the countries, Giurgiu (ROU) – Ruse (BGR) interconnection *(IC 9 in Figure 9),* was constructed in 2016. It is expected that when the Interconnection Greece-Bulgaria *(IC 14 in Figure 9)* is completed, natural gas from Azerbaijan and LNG from the Greek ports will also reach Romania (Romania Insider, 2021a).

Bulgaria

The Bulgarian gas network is connected with the gas networks of all its neighbours, including Romania, through the two interconnections described in the previous section.

The existing interconnection point with Greece is Kulata (BGR) /Sidirokastron (GRC) *(IC 12 in Figure 9)*, which provides a bi-directional flow of natural gas after the modernisation of the compressor stations in 2016. Prior to that, Russian gas had been transported only from Bulgaria to Greece (Elliot, 2021).

In addition, the Interconnection Greece-Bulgaria (IGB) *(IC 14 in Figure 9)* has been under construction for several years. The project is viewed as important for providing diversification of sources and routes of natural gas supply not only to Bulgaria but for the whole region. Upon completion, SEE countries will be able to receive natural gas by various means and suppliers, including from Azerbaijan (and possibly other neighbouring countries in the future) through the Southern Gas Corridor, from the deposits located in the Eastern Mediterranean by the LNG terminal in Alexandropoulos (Greece) as well as from other global LNG suppliers.

Strandzha (BGR) / Malkoclar (TUR) *(IC 11 in Figure 9)* has been the exit point for Russian gas through the Bulgarian gas network to Turkey for many years. After the construction of the TurkStream, as of January 1st 2020, the entry point for the Russian supplies was changed from Negru Voda (ROU)/ Kardam (BGR) *(IC 10 in Figure 9)* to Strandzha 2 (BGR)/ Malkoclar (TUR) *(IC 11 in Figure 9)* (WEC, 2020).

Kireevo (BGR)/ Zajecar (SRB) *(IC 13 in Figure 9)* is the first interconnection point between Bulgaria and Serbia. It operates officially since January 1st 2021, when Serbia commissioned the Balkan stream at its territory. There is a possibility for reverse flow, but so far, the interconnection has been used for transporting gas from TurkStream to Serbia.

There is also a project for the construction of the bi-directional Gas Interconnection Bulgaria-Serbia (IBS) *(IC 15 in Figure 9)*, which will connect the gas transmission systems of Bulgaria and Serbia. The aim of the pipeline is to contribute to the diversification of sources and routes in SEE by ensuring a link for Serbia to the Southern Gas Corridor, the deposits in the Eastern Mediterranean through the LNG terminal in Alexandropoulos (Greece), as well as other global LNG suppliers, through the Gas Interconnector Greece-Bulgaria.

Bulgaria is also transiting gas (at present mainly Russian gas) to the Republic of North Macedonia through the Kyustendil (BGR)/ Zidilovo (MKD) interconnection point *(IC 13 in Figure 9)*.

Greece

Greece has gas interconnections with Bulgaria (see the section about Bulgaria above) and Turkey.

The Ipsala (TUR) / Kipi (GRC) *(IC 3 in Figure 9)*at the border with Turkey is the entry point for natural gas through the Interconnector Turkey-Greece (ITG), linked with TANAP, part of the Southern Gas Corridor. The interconnection currently provides the delivery of gas from Azerbaijan and will allow possible future supplies from other countries in the Caspian region. Currently, there is no possibility for a reverse flow at this interconnection.

There is also a project for connecting the Greek gas transmission system with the system of the Republic of North Macedonia *(IC 16 in Figure 9)*in order to diversify gas supplies to the latter (see the section about the Republic of North Macedonia below).

The Republic of North Macedonia

In addition to the existing interconnection with Bulgaria via which the country receives its gas supplies from Russia *(IC 13 in Figure 9)*, the government of the Republic of North Macedonia signed an intergovernmental agreement with Greece for the construction of a cross-border gas interconnector (Petrushevska, 2021).

The interconnection point is planned to be located at the border Evzoni (GRC)/ Gevgelija (MKD) *(IC 16 in Figure 9)*. Further, the interconnection can be linked with the Trans-Adriatic pipeline, part of the Southern Gas corridor. According to some sources, the section of the pipeline on the territory of the Republic of North Macedonia is already completed (Newman, 2021).

Bosnia and Herzegovina

Bosnia and Herzegovina has one existing gas interconnection point *(IC 8 in Figure 9),* which until recently provided the country's gas supplies from Russia through the Beregovo (UKR) – Horgos (SRB) – Zvornik (BIH) import route crossing the territory of Ukraine, Hungary and Serbia. After the commissioning of the TurkStream, as of 2021, gas quantities have been delivered to Serbia through the new pipeline.

There are three planned interconnections with Croatia: two of them are Slobodnica (HRV) - Bosanski Brod (BIH) *(IC 24 in Figure 9)* and the Interconnection Croatia-Bosnia and Herzegovina (west) *(IC 23 in Figure 9)*, and the third with the most mature project implementation – the Southern Interconnection *(IC 18 in Figure 9)*, which will enable gas to flow from IAP to Bosnia and Herzegovina (Plinacro, 2019).

The bidirectional Interconnection Bosnia and Herzegovina – Croatia South is expected to provide an alternative gas supply route for the country and to expand its capacity. The pipeline will be connected to two other import routes: Dravaszerdahely (HUN) – Imotski (HRV) and Murfeld (AUT) – Rogatec (SVN) – Imotski (HRV) (Western Balkans Investment Framework, 2021). The interconnection is also expected to ensure diversification of sources and routes for Bosnia and Herzegovina. In addition to the access to the Central and West European markets, the interconnection will enable supply from the Southern Gas Corridor if the IAP project is implemented and from LNG sources through the terminal in Krk (Croatia). If the IAP implementation is postponed, there is a plan to extend the pipeline further 54 km on the Croatian territory. Commissioning is planned for 2024 (Energy Community, 2021).

Croatia

The Croatian gas network is connected to the networks of Slovenia and Hungary and has access to the LNG international market through its terminal in Krk. The traditional route for receiving gas deliveries from Russia is through pipelines crossing the territories of Ukraine, Slovakia, Austria and Slovenia, which connect to the gas transmission system of Croatia at the Rogatec interconnector *(IC 4 in Figure 9)* on the border of Slovenia and Croatia. An upgrade of the interconnection was performed in 2019 in order to substantially increase the transmission capacity between the two countries and to provide a reverse flow from Croatia to Slovenia. The upgrade also ensured better connection between one of the largest gas hubs in Europe – Baumgarten and the Croatian LNG terminal (Plinovodi, 2021).

A second route for gas deliveries was established in 2011 through the construction of the Donji-Miholjac (HRV) – Dravaszerdahely (HUN) pipeline *(IC 5 in Figure 9)* between Croatia and Hungary. This route consists of a pipeline which delivers gas from Hungary to Croatia and its main purpose was to connect Croatia with the Central and West European markets (Center for Energy Studies, 2014).

In addition to the planned interconnections with Bosnia and Herzegovina (see section Bosnia and Herzegovina above), Croatia is also participating in projects for the construction of a second interconnection with Slovenia (the Interconnection Croatia-Slovenia (Umag (HRV) – Koper (SVN) *(IC 22 in Figure 9)* and interconnection with Serbia *(IC 25 in Figure 9)*. Both

pipelines are considered important for the regional security of supply but are still in an early stage of development (ENTSO-G, 2020).

Croatia is also planning to connect to the TAP pipeline through a possible connection point with the IAP at Ploce *(IC 21 in Figure 9),* which will enable supply from the Caspian region (Incergo, 2021).

Serbia

The Serbian gas network is connected with the networks of Hungary, Bosnia and Herzegovina and Bulgaria. Prior to the commissioning of the TurkStream and its continuation to South-East Europe – the Balkans Stream, Serbia used to receive its gas supplies from Russia through the Ukraine-Hungary route, which enters the Serbian transmission system at Kiskundorozsma *(IC 6 in Figure 9)*. However, from January 1st 2021, Serbia has been receiving gas from the Southern direction through the new Kireevo (BGR)/ Zajecar (SRB) interconnection point with Bulgaria *(IC 17 in Figure 9)*. One more interconnection point is planned to be established with Bulgaria through the construction of the Gas Interconnection Bulgaria-Serbia (IBS) *(IC 15 in Figure 9)* (see the section about Bulgaria above).

The continuation of the TurkStream from Serbia to Hungary is under construction and, upon completion, will enable Hungary to receive Russian gas from the Southern route (Enerdata, 2021). The interconnection point with Bosnia and Herzegovina is the only entry point for gas supplies to the latter (see the section about Bosnia and Herzegovina above).

Albania, Montenegro and Kosovo

Albania, Montenegro and Kosovo are the three countries in the region which at present do not have gas interconnections with their neighbouring countries. However, two of them – Albania and Montenegro – are planning to connect to the Southern Gas Corridor by constructing interconnection points between their prospective gas networks and the TAP or IAP transportation systems *(IC 17 and 20 in Figure 9).*

The most advanced in this respect is Albania, whose government signed in July 2021 a cooperation agreement with the Trans Adriatic Pipeline (TAP) AG and the local Albgaz Sh.a. for the construction of a gas exit point with a possibility for bi-directional outside the TAP's compressor station near the town of Fier *(IC 17 in Figure 9)* (TAP, 2021). The new gas exit point is considered a pivotal element of Albania's energy and gas infrastructure development and will provide access for Albania and potentially for some of its neighbouring countries to the gas reserves in the Caspian region.

A lot of diverse projects and ideas for new interconnections are present in the region; however, most probably, only some of them will be realised in the near future. Upon completion, these interconnectors are expected to bring greater flexibility and integration of the gas markets in the region.

5.4. Projects for the interconnection of the gas infrastructures of more than two countries in South-East Europe.

Ionian Adriatic Pipeline (IAP) project

Following the recent commissioning of the Trans Adriatic Pipeline (TAP), several countries in SEE actively promote the development of the Ionian Adriatic Pipeline (IAP) – another gas pipeline project that may provide them with a connection to TAP.

The project aims to establish a new supply route for natural gas along the Adriatic coast. The length of the planned bi-directional pipeline is 500 km and it would pass through the territories of Albania, Montenegro, southern Croatia and Bosnia and Herzegovina (Ionian-Adriatic Pipeline, 2021). The planned annual capacity is 5 blm Bcm and the estimated total cost of the project is 620 mln euros (Serbia Energy, 2020).

In August 2016, Croatia, Albania, Montenegro, Bosnia and Herzegovina and the representatives of the State Oil Company of Azerbaijan (SOCAR) signed a Memorandum of Understanding on a project for the constriction of IAP (Serbia Energy, 2020). Later on, in 2019, four energy companies from these SEE countries agreed to establish a joint venture for the construction of IAP, where each company will hold an equal stake (Ralev, 2019). So far, Montenegro and Albania have received joint financial support in the amount of 2.5 mln euros from the Western Balkan Investment Framework (WBIF) in 2017 for the conceptual design of the project IAP (New Europe, 2017).

However, it is still arguable when and even whether there will be sufficient additional quantities of natural gas for Albania, Montenegro, Croatia and Bosnia and Herzegovina, although the Shah Deniz consortium insists on the future increase of TAP's capacity to 20 Bcm. Moreover, the project is still in a very immature stage and there are many variables around it, including the sources of financing of such a significant infrastructure project that includes countries with relatively limited financial abilities. It is debatable whether the EU would commit to funding such a project, considering the new direction towards a fossil-free energy future. The possible time of implementation of the project has not been announced yet, which also leads to doubts about the likelihood of seeing the Ionian Adriatic Pipeline commissioned soon.

There are two more natural gas pipeline projects in South-East Europe which have been supported by the EU – the e and the Bulgarian-Romanian-Hungarian-Austrian (BRUA) Natural Gas Transmission Corridor Projects. The so-called BRUA project is considered to be a part of the Vertical Corridor and an extension of the Southern Gas Corridor through the Greece-Bulgaria Interconnector (IGB) (EIA, 2017). A linking pipeline is also proposed to be constructed in order to connect BRUA with potential offshore sources in the Black Sea. Eastring is planned as a bi-directional gas pipeline interconnector with an annual capacity of 20-40 Bcm, passing the territories of Slovakia, Hungary, Romania and Bulgaria. However, it might be the case that both the Eastring project and BRUA have lost their momentum.

EastMed project

The Eastern Mediterranean (EastMed) project refers to a combined offshore/onshore natural gas pipeline, which aims to connect the East Mediterranean resources to Greece via Cyprus and Crete (IGI Poseidon, 2021). The almost 2 000 km pipeline is currently designed to transport 10-20 Bcm/y from the gas reserves to Greece and consequently to Italy and South-East Europe (through the Poseidon and IGB pipelines) (IGI Poseidon, 2021). The estimated total cost of the project is around 6 billion euros (Reuters, 2020b). It is expected to be the longest underwater pipeline in the world.

Although the EastMed pipeline project used to have the support of the United States, which acknowledged its *"potential to contribute to the energy security and diversification of energy sources and routes in the Eastern Mediterranean"* (Paraskova, 2020), a recent paper to the Greek government expressed a change in the position of the US Administration and their reservations over the project. Notably, the US are shifting their focus to electricity interconnectors in the region. EastMed is facing two main challenges: the Cyprus gas dispute and uncertainty regarding profitability.

6. Conclusion and Policy Implications

The Russian-Ukrainian dispute over the natural gas transit and the subsequent disruption in natural gas supply from Russia to some European countries in 2006 and 2009 has attracted considerable attention to South-East Europe and a label has been put on the region for the weakest and link in the quest for the European Energy security. Fifteen years after the first gas crisis, this paper analyses what has changed in the region for this period in terms of the security of natural gas supply.

Calculation of the SWI and HHI indexes shows that the region considerably improved its energy sources diversity mainly as a result of the substantial decrease in coal and oil consumption, the decreasing trend in natural gas use and the introduction and wider use of renewable energy sources in all countries in the region.

Natural gas markets in the region are still developing, and despite the political commitments, the progress toward the formation of a single market in South-East Europe is still limited. Although there is a negative trend in the natural gas final consumption in almost all SEE countries, most of the governments in the region have been planning nation-wide gasification and increase of the natural gas share in their energy mix.

In terms of imports, natural gas enters South-East Europe either via pipelines or as liquefied natural gas (LNG) via LNG terminals. The total dependence of the region is about 50% and the largest share of gas imports still comes from Russia. However, there are more gas transit projects under development or planned than in any other region in Europe. There are three recent developments, which are expected to have a long-term impact on SEE, in terms of diversification of sources and routes of supply – recently commissioned TurkStream and Southern Gas Corridor, as well as the LNG terminal in Krk.

Although South-East Europe has indeed been characterised by the absence of interconnecting gas infrastructure 15 years ago, a quiet revolution has taken place in since then. There are 14 existing cross-border interconnection points in the region, as well as more than 12 under construction or planned. A lot of diverse projects and ideas for new interconnections are present in the region; however, probably only some of them will be realised in the near future. Upon completion, these interconnectors are expected to bring greater flexibility and integration of the gas markets in the region. Despite the achieved progress, much remains to be done, especially in regard to the interconnection of the inner Wester Balkan countries, some of which still do not have gas markets in place yet, mainly due to the lack of access to gas networks.

The analysis of the prospects of realisation of a few other projects shows that the BRUA and Eastring projects have lost their momentum of development, the IAP project is also not likely to enter the implementation phase anytime soon, mainly due to lack of financing and uncertainty about the sufficiency of additional natural gas quantities from Azerbaijan, and EastMed is facing two major challenges, namely the Cyprus gas tensions and the uncertainty regarding profitability and availability of investors.

There are a few concurrent developments concerning South-East Europe that will affect the security of its natural gas supply:

- It was the individual countries' plans for sustaining or increasing the natural gas usage that brought about the question of how significant the problem of single-source dependence is. Although the Russian natural gas still comprises the greatest share in the region's supply, concerns over possible disruptions have been addressed by continuing development of reverse flow interconnection in the region and commissioning of new infrastructure (e.g. pipelines, LNG terminals and storage facilities) to create alternative options for the routes and sources of supply, though all these infrastructure projects come at a certain price.
- Energy transition in the countries in SEE seems challenging without the use of natural gas in the short and medium-term, considering the prevailing utilisation of coal there. Despite the lower (compared to the EU average) natural gas prices, it is estimated that up to 40% of the regional population may suffer from energy poverty, compared to 10% in the EU. It is questionable whether the energy transition will make the situation better, especially in the absence of natural gas in the energy mix.
- The future of the natural gas sector at the EU level seems quite uncertain and even its role as a transition fuel is still being debated. This brings ambiguity regarding the need for more infrastructure and the economic viability of all investments put into improving the security of gas supply not only in SEE, but in the entire EU.

References

Afgan, N. H. et.al. (2007). Evaluation of natural gas supply options for south east and central Europe. Part 1: Indicator definitions and single indicator analysis. – Energy Conversion and Management, 48(9), pp. 2517-2524.

Baumann, F. (2008). Energy Security as multidimensional concept. CAP Policy Analysis.1.

Bohi, D., et.al. (1996). The Economics obaumanf Energy Security. Boston: Kluwer Academic Publishers.

BTV Novinite. (2021). Serbia has officially commissioned the Balkan stream gas pipeline, Available at: <https://btvnovinite.bg/svetut/sarbija-vavede-oficialno-v-eksploatacija-gazoprovoda-balkanski-potok-v-sarbija.html>.

Buzan, B., et al. (1998). Security: a new framework for analysis. London: Lynne Rienner

CEENERGY News. (2020). The phase one of the BRUA pipeline is complete. Available at: <https://ceenergynews.com/oil-gas/the-phase-one-of-the-brua-pipeline-is-complete/> .

CEEP (2018). Cross-border energy cooperation in Central Europe. Available at: <https://www.ceep.be/www/wp-content/uploads/2018/11/CEDE-2018-policy-papper.pdf>.

Center for Energy Studies (2014). Natural Gas Reverse Flows in the Danube Strategy Region: Current State and Outlook, Available at: <https://energy.danube-region.eu/wp-content/uploads/sites/6/sites/6/2019/09/Natural_Gas_Reverse_Reverse_in_the_Danube_Region_Current_state_and_Outlook.pdf>.

Chalvatzis, K., Ioannidis, A. (2017). Energy Supply Security in the EU: Benchmarking Diversity and Dependence of Primary Energy. – Applied Energy, 207, pp. 465-476.

Cherp, A., Jewell, J. (2014). The concept of energy security: Beyond the four As. – Energy Policy Journal, 75.

CIA World Factbook. (2021). Available at: <https://www.cia.gov/the-world-factbook/field/energy>.

Cohen, G. (2019). Natural gas import and export routes in South-East Europe and Turkey. – Institute of Energy for South-East Europe Working Paper, 26.

Darik news. (2019). Bulgaria will save about 81 mln leva from the new natural gas entry point. Available at: <https://dariknews.bg/novini/bylgariia/bylgariia-shte-pesti-okolo-81-mln.-leva-ot-novata-tochka-na-dostavka-na-priroden-gaz-2204790>.

Delek Drilling. (2021a). Aphrodite Gas Field, Available at:<https://www.delekdrilling.com/project/aphrodite-gas-field>

Delek Drilling (2021b). Leviathan Gas Field, Available at: <https://www.delekdrilling.com/natural-gas/gas-fields/leviathan>.

Delek Drilling (2021c). Tamar Gas field, Available at: <https://www.delekdrilling.com/natural-gas/gas-fields/tamar>.

Dickel, R. et al. (2014). Reducing European Dependence on Russian Gas: Distinguishing Natural Gas Security from Geopolitics. – OIES Paper, 92.

Dineva, V. (2020). Energy trilemma in South-East Europe – seeking the balance between the Energy security, Economic and Environmental goals in times of Energy transition. Energy and Climate Diplomacy. – Foreign Affairs Research Papers N 13 of the Bulgarian Diplomatic Institute.

Directive (EU) 2018/2002 of the European Parliament and of the Council of December 11th 2018 amending Directive 2012/27/EU on energy efficiency.

Directive (EU) 2018/410 of the European Parliament and of the Council of March 14th 2018 amending Directive 2003/87/EC to enhance cost-effective emission reductions and low-carbon investments, and Decision (EU) 2015/1814.

Elliot, S. (2019). Ukrainian, Romanian gas grid operators sign key interconnection agreement, S&P Global Platts. Available at: <https://www.spglobal.com/platts/en/market-insights/latest-news/natural-gas/121819-ukrainian-romanian-gas-grid-operators-sign-key-interconnection-agreement>.

Elliot, S. (2021). Bulgaria begins first Azeri gas imports, to increase Kulata capacity, S&P Global Platts. Available at: <https://www.spglobal.com/platts/en/market-insights/latest-news/natural-gas/010421-bulgaria-begins-first-azeri-gas-imports-to-increase-kulata-capacity>.

Enerdata. (2021). Hungary extends gas supply contract with Russia's Gazprom. Available at: <https://www.enerdata.net/publications/daily-energy-news/hungary-extends-gas-supply-contract-russias-gazprom.html>.

Energy Community. (2021). Interconnection pipeline Bosnia and Herzegovina – Croatia: project description, Available at: <https://www.energy-community.org/regionalinitiatives/infrastructure/PLIMA/Gas01.html>.

ENTSO-G. (2020). Gas Regional Investment Plan Southern Corridor, Annex B: Project Information. Available at: <https://www.entsog.eu/sites/default/files/2020-05/l_entsog_SC_GRIP_2019_Annex_B_02.pdf.

European Commission. (2020). Taxonomy: Final report of the Technical Expert Group on Sustainable Finance. Available at: <https://ec.europa.eu/info/sites/default/files/business_economy_euro/banking_and_finance/documents/200309-sustainable-finance-teg-final-report-taxonomy_en.pdf>.

European Commission. (2022). Commission presents Complementary Climate Delegated Act to accelerate decarbonisation. Available at: <https://ec.europa.eu/commission/presscorner/detail/en/ip_22_711>.

European Commission Joint Research Centre. (2021). Technical assessment of nuclear energy with respect to the 'do no significant harm' criteria of Regulation (EU) 2020/852 ('Taxonomy Regulation'). Available at: <https://ec.europa.eu/info/sites/default/files/business_economy_euro/banking_and_finance/documents/210329-jrc-report-nuclear-energy-assessment_en.pdf>.

European Council. (2021). Fit for 55. Available at: <https://www.consilium.europa.eu/en/policies/green-deal/eu-plan-for-a-green-transition/#>.

Eurostat. (2021). Available at: <https://ec.europa.eu/eurostat/web/main/data/database>.

Franki, A., Višković, A. (2015). Energy security, policy and technology in South-East Europe: Presenting and applying an energy security index to Croatia. – Energy, 90 (1), pp. 494-507.

Gazprom Export. (2021a). Available at: <http://www.gazpromexport.ru/en/presscenter/news/2500/>.

Gazprom Export. (2021b). Available at: <http://www.gazpromexport.ru/projects/transportation/>.

Giamouridis, A., Paleoyannis, S. (2011). Security of Gas Supplies in South Eastern Europe. Potential Contribution of Planned Pipelines, LNG, and Storage. Oxford Institute of Energy Studies NG 52. Available at: <https://www.oxfordenergy.org/wpcms/wpcontent/uploads/2011/07/NG_52.pdf>.

HiQSTEP. (2014). Project Romania – Moldova Gas Interconnector, Available at: <https://ieastep.eu/content/romania-moldova-gas-interconnector>.

IEA Energy Statistics data. (2021). Available at: <https://www.iea.org/data-and-statistics?country=WORLD&fuel=Energy%20supply&indicator=TPESbySource>.

IGI Poseidon. (2021). Eastmed – A direct link to new sources for Europe. Available at: <http://www.igi-poseidon.com/en/eastmed>.

Incergo. (2021). Gas system of the Republic of Croatia, Available at: <http://www.incergo.hr/en/gas-system-of-the-republic-of-croatia.php>.

Ionian-Adriatic Pipeline. (2021). Available at: <https://www.wbif.eu/project/PRJ-MULTI-ENE-003>.

ISO 3166. (2020). The International Standard for country codes and codes for their subdivisions.

Khalova, G. O. et al. (2019). Issues of Natural Gas Infrastructure Development in South-Eastern Europe. – International Journal of Energy Economics and Policy, 9(6), pp. 415-420.

Kovács, K. (2017). Reigniting energy cooperation in Central and South-Eastern Europe. – In: Jones, Ch. (ed.). EU Energy Law. 11. The Role of Gas in the EU's Energy Union. Claeys & Casteels Law Publishers. Deventer: Netherlands.

Kruyt, B., et al. (2009). Indicators for energy security. – Energy Policy, 37(6), pp. 2166-2181.

Labandeira, X., Manzano, B. (2012). Some Economic Aspects of Energy Security. – Economics for Energy WP 09.

Le Coq, C., Paltseva, E. (2009). Measuring the Security of External Energy Supply in the European Union. – Energy Policy, 37 (11), pp. 4-10.

Lilliestam, J., Patt, A. (2012). Conceptualising Energy Security in the European Context. – SEFEP working paper 4.

Lopez-Fernandez, O., Molina-Azorin, J. F. (2014). The use of mixed methods research in interdisciplinary educational journals. – International Journal of Multiple Research Approaches. Available at: <https://doi.org/10.5172/mra.2011.5.2.269>.

Morningstar, R. L., Simonyi, A., Khakova, O., Markina, I. (2020). European energy diversification: How alternative sources, routes, and clean technologies can bolster energy security and decarbonisation. Atlantic Council. Available at: <https://www.atlanticcouncil.org/in-depth-research-reports/issue-brief/european-energydiversification-how-alternative-sources-and-routes-can-bolster-energy-security-anddecarbonization/>.

New Europe. (2017). EU approves €2.5 million grant for Ionian-Adriatic Pipeline. Available at: <https://www.neweurope.eu/article/eu-approves-e2-5-million-grant-ionian-adriatic-pipeline/>.

Newman, N. (2021). Northern Macedonia and Greece to Sign a treaty to interconnect gas pipelines. – Pipeline Technology Journal. Available at:<https://www.pipeline-journal.net/news/northern-macedonia-and-greece-sign-treaty-interconnect-gas-pipelines>.

Noel, P., Findlater, S. (2010). Gas Supply Security in the Baltic States: A Qualitative Assessment. Working Paper. – International Journal of Energy sector management, 4(2), pp. 236-255.

Paraskova, T. (2020). US backs EastMed Pipeline to supply gas to Europe. Available at: <https://oilprice.com/Latest-Energy-News/World-News/US-Backs-EastMed-Pipeline-To-Supply-Gas-To-Europe.html>.

Park, H., Bae, S. (2021). Quantitative Assessment of Energy Supply Security: Korea Case Study. – Sustainability. 13(4), p. 1854.

Pavlova, I. (2020b). Shell to supply gas to Hungary via Croatia's Krk LNG terminal. Available at: <https://seenews.com/news/shell-to-supply-gas-to-hungary-via-croatias-krk-lng-terminal-712667>.

PCI. (2017). COMMISSION DELEGATED REGULATION (EU) 2018/540 of November 23rd 2017 amending Regulation (EU) No 347/2013 of the European Parliament and of the Council as regards the Union list of projects of common interest.

PCI. (2019). COMMISSION DELEGATED REGULATION (EU) 2020/389 of October 31st 2019 amending Regulation (EU) No 347/2013 of the European Parliament and of the Council as regards the Union list of projects of common interest.

Petrushevska, D., N. (2021). Macedonia, Greece sign deal for construction of 100 mln euro gas link, SeeNews. Available at: <https://seenews.com/news/n-macedonia-greece-sign-deal-for-construction-of-100-mln-euro-gas-link-747266>.

Plinacro. (2019). Presentation for the CESEC Gas Plenary Meeting held in Brussels on October 8th 2019. Available at:<https://ec.europa.eu/energy/sites/ener/files/documents/hr-bih_gas_interconnection_8_10_19_cesec_ south_interconnection_plinaco_and_bh_gas.pdf>.

Plinovodi. (2021). Information leaflet: PCI 6.26 Cluster Croatia – Slovenia – Austria at Rogatec, Available at: <http://www.plinovodi.si/media/4766/pci-information-leaflet-626.pdf>.

Politico. (2022). EastMed: A pipeline project that ran afoul of geopolitics and green policies, Available at: <https://www.politico.eu/article/eastmed-a-pipeline-project-that-ran-afoul-of-geopolitics-and-green-policies/>.
Ralev, R. (2019). Four SEE countries to complete IAP gas project design by Sept 2020. Available at: <https://seenews.com/news/four-see-countries-to-complete-iap-gas-project-design-by-sept-2020-report-667566 (accessed March 23rd 2021)>.
Regulation (EC) No 715/2009 of the European Parliament and of the Council of July 13th 2009 on conditions for access to the natural gas transmission networks and repealing Regulation (EC) No 1775/2005.
Regulation (EU) 2020/852 of the European Parliament and of the Council of June 18th 2020 on the establishment of a framework to facilitate sustainable investment, and amending Regulation (EU) 2019/2088.
Regulation (EU) 2021/1119 of the European Parliament and of the Council of June 30th 2021 establishing the framework for achieving climate neutrality and amending Regulations (EC) No 401/2009 and (EU) 2018/1999.
Reuters. (2019). Turkey's gas exploration off Cyprus raises tensions. Available at: <https://www.reuters.com/article/us-cyprus-turkey-ship-timeline-idUSKBN1WT20L>.
Reuters. (2020). Israel approves pipeline deal to sell gas to Europe. Available at: <https://www.reuters.com/article/us-israel-europe-natgas/israel-approves-pipeline-deal-to-sell-gas-to-europe-idUSKCN24K0FN>.
Rodríguez-Fernández, L., Carvajal, Fernández A., Ruiz-Gómeza, L. (2020). Evolution of European Union's energy security in gas supply during Russia-Ukraine gas crises (2006-2009). – Energy Strategy Reviews, 30.
Romania Insider. (2021a). Romania expects natural gas from Azerbaijan in 2022. Available at: <https://www.romania-insider.com/romania-natural-gas-azerbaijan-2022>.
Romania Insider. (2021b). Romania's Transgaz triples capacity of gas interconnector to Moldova. Available at: <https://www.romania-insider.com/transgaz-triples-capacity-gas-moldova>.
S&P Global Platts. (2020). Trans Adriatic Pipeline begins gas deliveries from Azerbaijan to Italy, Available at: <https://www.spglobal.com/platts/es/market-insights/latest-news/natural-gas/123120-trans-adriatic-pipeline-begins-gas-deliveries-from-azerbaijan-to-italy>.
Seliverstov, S. (2007). Energeticheskaya bezopasnost Evropeiskogo soyuza (mezhdunarodno-pravovie aspekti)./ Energy security of the European Union (international legal aspects). Publishing house "Finansowyi control" (in Russian).
Serbia Energy. (2020). Montenegro: Pandemic slowed down IAP project. Available at: <https://serbia-energy.eu/montenegro-pandemic-slowed-down-iap-project/>.
Simonija, N. A., Torkunov, A. V. (2014). Jenergobezopasnost' ES i Rossija / Energy Security of the EU and Russia. – Polis. Politicheskie issledovanija / Polis. Political studies, N 5, pp. 9-19 (in Russian).
Skalamera, M. (2015). Energy Security in the Wake of the Ukraine Crisis: Getting the Real Threats Right. Global Policy Essay.
Southern Gas Corridor. (2021). Available at:<https://www.sgc.az/en>.
Sovacool, B. K., Mukherjee, I. (2011). Conceptualising and measuring energy security: A synthesised approach. – Energy, 36, pp. 5343-5355. Available at: <https://doi.org/10.1016/j.energy.2011.06.043>.
Stein, D. (2019). Trans Adriatic Pipeline expansion. Available at: <https://www.atlanticcouncil.org/blogs/energysource/trans-adriatic-pipeline-expansion/>.
TAP. (2021). TAP to Deliver the First Gas Exit Point in Fier, Albania. Available at: <https://www.tap-ag.com/news/news-stories/tap-to-deliver-the-first-gas-exit-point-in-fier-albania>.
Vicini, G., et al. (2005). Security of Energy Supply: Comparing Scenarios from a European Perspective, 12-14.
WEC. (2020). Change of natural gas delivery point from January 1st. Available at: <http://www.wec-bulgaria.org/en/news-and-events/bulgarian-energy/change-of-natural-gas-delivery-point-from-january-1st/>.
Western Balkans Investment Framework. (2021). Bosnia and Herzegovina – Croatia South Gas Interconnection, Available at: <https://wbif.eu/project/PRJ-MULTI-ENE-005>.
Winzer, C. (2011). Conceptualising Energy Security. – EPRG Working Paper 1123. – Cambridge Working Paper in Economics 1151, pp. 4-8. Available at: <https://doi.org/10.1016/j.enpol.2012.02.067>.
Zhiznin, S. Z. (2010). Russian energy diplomacy and international energy security (geopolitics and economics). – Baltic Region 1(3), pp. 7-17.
Zhiznin, S. Z., Cherechukin, A. V. (2019). Economic and ecological facet of introduction the clean coal technologies in China. – Ugol, 12, pp. 56-58.
Zhiznin, S. Z., Timohov, V. M., Dineva, V. (2020). Energy security: Theoretical interpretations and quantitative evaluation. – International Journal of Energy Economics and Policy, 10(2), pp. 390-400. https://doi.org/10.32479/ijeep.8950.
Zhiznin, S. Z., Timokhov, V. M. (2019). Economic and geopolitical aspects of the Nord Stream 2 Gas pipeline. – Baltic Region, 11(3), pp. 25-42.