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Chinese Investments in Renewable Energy Projects in Central and Eastern European Countries

SUMMARY

The main aim of this paper is to analyse the most important challenges of Chinese investments in renewable energy projects in Central and East European countries. The focus of research is on challenges within the China-Central and Eastern European countries cooperation framework because theoretical and empirical research is mainly oriented towards traditional energy projects. The analysed period spans from 2014 until 2022. With 26 active or completed projects out of the 29 proposed projects in the renewable energy field, the cooperation has been positive so far, but with modest outcomes. The investors in this field were both Chinese state-owned and private companies, while most of the projects were realised through investments and not loans. The main challenges within China-Central and East European countries renewable energy cooperation were political issues, public policies and strategies of national governments, corruption, finances, and legal issues.

Keywords: China, Central and East European countries, renewable energy, results, challenges.

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Kineske investicije u projekte obnovljivih izvora energije u Centralnoj i Istočnoj Evropi

SAŽETAK

Glavni cilj ovog rada je da analizira glavne izazove kineskih investicija u oblasti obnovljive energije u zemljama srednje i istočne Evrope. Istraživanje je orijentisano na poteškoće u okviru formata Kina–zemlje centralne i istočne Evrope, jer su teorijska i empirijska istraživanja uglavnom orijentisana na projekte vezane za tradicionalne izvore energije. Analizirani period obuhvata period od 2014. do 2022. godine. Sa 26 aktivnih/završenih od 29 predloženih projekata u oblasti obnovljivih izvora energije, saradnja je do sada bila pozitivna, ali sa skromnim rezultatima. Investitori u ovoj oblasti bile su i državne i privatne kineske kompanije, a najveći broj projekata je realizovan kroz investicije, a ne zajmove. Glavni izazovi u saradnji između Kine i zemalja centralne i istočne Evrope bili su politička pitanja, javne politike i strategije nacionalnih vlada, korupcija, finansije i pravna pitanja.

Ključne reči: Kina, zemlje Centralne i Istočne Evrope, obnovljiva energija, rezultati, izazovi.

China-CEEC Cooperation Format: Then and Now

The China-Central and Eastern European countries' (CEEC) cooperation mechanism marked its 10th anniversary in 2022. The format, which was formerly known as the 16+1 or 17+1 cooperation framework, was proposed by China in 2012, and, according to Liu and Kong, it was part of the Chinese pragmatical strategy.² It was founded with the purpose of improving China's relations with a region with which it had not developed cooperation in previous times. China saw an opportunity to collaborate with these countries, especially given the effects of the financial crisis and the CEE countries' lack of EU funds during those difficult times.³ Considering that one of the key effects of the global economic crisis was a reduction in FDI inflow, China saw an opportunity to collaborate with CEE countries that became eager for new investments.⁴

² Zukoi Liu, "History and prospects of cooperation between China and countries in Central and Eastern Europe", *The Review of International Affairs*, Vol. 72, No. 1181, 2021, 43–54, DOI: https://doi.org/10.18485/iipe_ria.2021.72.1181.3; Tianping Kong, "16+1 cooperation framework: Genesis, characteristics and prospect", *Međunarodni problemi*, Vol. 67, Br. 2–3, 2015, 167–183, DOI: <https://doi.org/10.2298/MEDJP1503167T>.

³ Tianping Kong, "16+1 cooperation framework: Genesis, characteristics and prospect".

⁴ Gardó Sándor & Martin Reiner, "The impact of the global economic and financial crisis on Central, Eastern and South-Eastern Europe: A stock-taking exercise", European Central Bank, <https://www.ecb.europa.eu/pub/pdf/scpops/ecbocp114.pdf>, 1–67; Sanja Filipović, „Efekti globalne finansijske krize na finansijski sektor Srbije“, *Industrija*, Vol. 38, No. 3, 2010,

The format was named 16+1 as an indicator of the 16 countries that were part of the original group, namely Albania, Bosnia and Herzegovina, Bulgaria, the Czech Republic, Croatia, Estonia, Hungary, Latvia, Lithuania, Montenegro, North Macedonia, Poland, Romania, Serbia, Slovakia, and Slovenia. After Greece joined the group in 2019, the format was renamed 17+1. However, in 2022, three countries (Estonia, Latvia, and Lithuania) left the format, and the name China-CEEC cooperation mechanism (format) was used further on.

Although the main aim of the cooperation was the improvement of economic relations, China did not stop there. It founded a comprehensive platform that functions on political, cultural, and people-to-people levels. To facilitate cooperation, China and the involved countries established specialised centres in each country dedicated to different types of projects. For instance, a regional transportation centre was established in Serbia and a regional energy centre in Romania. The idea was to formalise and centralise projects according to the type of cooperation or projects, and then to organise and follow their implementation within the platform so that planning and their execution would be efficient. However, this centralisation did not yield significant results, as the centres did not take proactive approaches. As a result, most projects were carried out bilaterally.

During ten years of cooperation within the format, economic relations between China and CEE countries improved significantly, although those improvements were not distributed evenly across the region. While most of the countries saw an increase in trade with China, at the same time, their trade deficit increased. The distribution of loans and investments was also uneven. Some countries received substantial loans and investments, but others received none. There are several reasons why some of the CEE countries were not interested in developing better economic and business relations with China, with political reasons being among the strongest.⁵

According to the Ministry of Commerce of the People's Republic of China (MOFCOM), China has increased trade with the CEEC by 85% during 2012–2020, which is around 8% on an annual level.⁶ At the same time, two-way investments reached only \$20 billion⁷, and those investments did not attain

79–94; Richard Q. Turcsányi, “China and the Frustrated region: Central and Eastern Europe’s repeating troubles with great powers”, *China Report*, Vol. 56, No. 1, 2020, 60–77, DOI: <https://doi.org/10.1177/0009445519895626>.

⁵ Nevena Stojanović Šekarić & Katarina Zakić, “Renewable energy as a connecting spot between China and Central and Eastern European countries: status, directions and perspectives”, *Energy, Sustainability and Society*, Vol. 14, No. 10, 2024, 1–18, DOI: <https://doi.org/10.1186/s13705-024-00439-2>.

⁶ “Economic Watch: China-CEEC trade booming with bright prospects”, *Xinhua Net*, 5 January 2024.

⁷ Ibid.

the expected level from the CEEC point of view.⁸ However, it is difficult to specify the correct number (volume) of Chinese investments in the CEEC since different sources use different methodologies to calculate the volume. For example, Matura stated that the total value of China-related projects in the CEEC is €27.2 billion. However, if we only consider foreign direct investments (FDI), the value is €14.01 billion.⁹ At the same time, he points out that the value of Chinese infrastructural projects in the CEEC is €13.6 billion, and according to the MOFCOM, Chinese investments in the CEEC amount to €2.6 billion.¹⁰ Therefore, depending on methodology, sources, and statistics, the results could be completely different. Regardless, it is crucial to emphasise that there is still vast potential for improving economic relations between China and CEE countries, whether in trade or investments.

The primary research question in this analysis is why the cooperation between China and the Central and Eastern European Countries (CEEC) in the renewable energy sector is not yielding more successful outcomes and what the main challenges are in this cooperation. This paper seeks to analyse the types of investments and projects undertaken, assess the reasons for successful and unsuccessful projects, identify the challenges encountered by countries in implementing them, and provide recommendations on how to improve cooperation in the renewable energy field in the future.

Qualitative descriptive statistical analysis was used as the methodology tool for this research, supported by case study analysis. The aim is to review all projects China applied for and then see what the main challenges in cooperation have been thus far. As a base for this analysis, the database of Chinese renewable energy projects in the CEEC, formed by Stojanović Šekarić and Zakić (2024), was used. The timeframe of this research starts with the year 2014 and ends in 2022.

The analysis is structured into five chapters in order to adequately explain the research problem. The first chapter focuses on the literature review, which helped to position previously formulated research problems within the existing literature. The reasons behind Chinese pollution problems, how those problems affected its development domestically, and how they influenced Chinese investments in the renewable energy (RE) field both domestically and internationally are explained in the second chapter. The third part provides insight into the use of traditional and renewable

⁸ Richard Q. Turcsányi, "China and the Frustrated region: Central and Eastern Europe's repeating troubles with great powers"; Marcin Przychodniak, "The rough 'strategic relationship' between Poland and China", *China Observers*, <https://chinaobservers.eu/the-rough-strategic-relationship-between-poland-and-china/>, 01/12/2023.

⁹ Matura Tamas, "Chinese Investment in Central and Eastern Europe A reality check", *CEECAS*, https://bird.tools/wp-content/uploads/2021/04/72d38a_373928ea28c44c7f9c875ead7fc49c44.pdf, 02/02/2023.

¹⁰ *Ibid.*, 14

energy resources, particularly in electricity production in the Central and Eastern European countries, highlighting the challenges they face while trying to achieve a better, more environmentally friendly energy mix. The fourth chapter lists Chinese projects in each CEE country, providing a better understanding of each project in each country individually. The fifth chapter presents challenges and perspectives occurring in RE-China-CEEC cooperation, while the final chapter provides conclusions.

China-CEEC Energy Cooperation

One of the sectors in which China invested regularly and heavily in the CEEC was the energy sector. That was usually a secondary sector, with infrastructure being the primary one.¹¹ China was interested in this sector because it has expertise and economic interest. On the other hand, many countries in the CEEC lacked investments in that sector. According to available data, China wanted to invest in or participate in every possible type of energy-related project, from traditional to renewable energy (RE).¹² Both Chinese state-owned and privately-owned companies participated in projects. So far, the only type of energy investment in which China did not have the opportunity to invest or participate was nuclear energy.¹³ China, from its side, placed financial sources in the form of FDI and in the form of loans. Although FDI, in most cases, positively affects the development of any country, the same cannot be said for loans, which can result in an increase in the foreign debt-to-GDP ratio. This was observed in the CEE countries after the financial crisis and is still relevant today due to the war in Ukraine, which is pressuring the development of the CEEC economies.¹⁴ Due to these circumstances, it was positive that most of the Chinese projects in the CEE countries in the RE field came in the form of FDI, which will be explained later in the analysis.

As with the value of the investments, it is difficult to determine how much China invested in the energy sector in the CEEC. Many projects and

¹¹ Andreja Jaklič & Marjan Svetličič, "China and Central and Eastern European Countries within '16+1': Group or Bilateral Relations?", *Entrepreneurial Business and Economics Review*, Vol. 7, No. 2, 2019, 83–100.

¹² Katarina Zakić & Nevena Šekarić, "China's energy cooperation within the 17+1", *Međunarodni problem*, Vol. 73, No. 1, 2021, 7–38, DOI: 10.2298/MEDJP2101007Z.

¹³ Ibid.

¹⁴ Sanja Filipović, Neda Raspopović & Tošković Jelena, "Correlation between reforms and foreign debt in transition countries", *Industrija*, Vol. 43, No. 1, 2015, 175–191, DOI: <https://doi.org/10.5937/industrija43-7709>; Levon Kameryan, "Managing Public Debt in Central and Eastern Europe: Challenges, Opportunities Shift as Borrowing Costs Rise", Yahoo Finance, <https://finance.yahoo.com/news/managing-public-debt-central-eastern-101244334.html>, 02/02/2023.

signed agreements do not have precise values or are unknown. However, available data can provide significant information and serve as the basis for analysis and conclusions. Due to this, one of the aims of this paper, besides identifying the main challenges in cooperation, is to look at the problems from both Chinese and European angles.

Upon examining the literature on energy cooperation between China and the Central and Eastern European Countries (CEEC), it becomes apparent that most research papers focus on China-EU cooperation, while the CEEC framework is seldom analysed. In order to address this gap, a brief literature review will be conducted to identify the most significant analyses and findings in this area.

Liedtke covered several subjects, such as Chinese energy interests, policy approaches, and types of energy investments in the EU, in his analysis published in 2017.¹⁵ While analysing the motivation behind Chinese investments in the EU energy sector, he noticed that China does not import energy from the EU, meaning that this was not the main reason for its investments in the EU. In his opinion, the main reason for investments were Chinese energy supply capabilities (for example, the export of RE equipment), as well as the interest of Chinese energy companies to gain access to the EU energy companies' know-how, technologies, and operational management skills.¹⁶ Besides this, Liedtke, like Pareja-Alcaraz and Turcsanyi, discussed bilateral energy relations between China and the EU countries, stating that a non-unified approach by the EU countries led to different bilateral results in this field and concluding that a unified approach would be better for the EU, especially in the investment field.¹⁷ While examining green energy projects, Liedtke wrote that: "As part of their EU-China 2020 Agenda for Cooperation adopted in 2013, both parties also put special emphasis on increased energy efficiency and clean energy technologies and agreed to develop a 'roadmap for EU-China energy cooperation' (European Commission, 2013, 10)."¹⁸

Lv and Spigarelli authored an article about the green energy cooperation between the EU and China from 2004 to 2013, before the

¹⁵ Stephan Liedtke, "Chinese energy investments in Europe: an analysis of policy drivers and approaches", *Energy Policy*, Vol. 101, 2017, 659–669, DOI: <https://doi.org/10.1016/j.enpol.2016.09.037>.

¹⁶ *Ibid.*, 663.

¹⁷ Pablo Pareja-Alcaraz, "Chinese investments in Southern Europe's energy sectors: Similarities and divergences in China's strategies in Greece, Italy, Portugal and Spain", *Energy Policy*, Vol. 101, 2017, 700–710, DOI: <https://doi.org/10.1016/j.enpol.2016.09.034>.

Richard Q. Turcsanyi, "Central European attitudes towards Chinese energy investments: The cases of Poland, Slovakia, and the Czech Republic", *Energy Policy*, Vol. 101, 2017, 711–722, DOI: <https://doi.org/10.1016/j.enpol.2016.09.035>.

¹⁸ Stephan Liedtke, "Chinese energy investments in Europe: an analysis of policy drivers and approaches".

establishment of the Belt and Road Initiative (BRI).¹⁹ Their main research aim was to see if there was a pattern of Chinese green investments in the EU. They concluded that companies from China that are well established in the Chinese market (provinces) prefer the same companies within the EU that have a similar institutional environment within the country as China, and vice versa. Similar findings could be found in the analysis by Lv and Spigarelli from 2016.²⁰

An analysis of trade and investments in the field of RE and how they changed over time in China and the EU was conducted by Curran et al.²¹ They stated that China changed its starting position regarding RE, and it became a net exporter of RE instead of a net importer. According to Curran et al., China is today the biggest exporter to the EU of wind and solar energy products. Germany was, and still is, the main target for investments and exports for Chinese companies. They also prefer greenfield investments in the EU. If they did complete projects through acquisitions, the main reason for doing that was access to technologies and knowledge.

A regional approach to Chinese energy investment analysis in South Europe (namely Greece, Portugal, Spain, and Italy) was used in Pareja-Alcaraz's work.²² He concluded that Chinese investors in these countries have mainly focused on assets and the market. Portugal and Italy have seen a significant increase in Chinese investments in this area since 2010. According to the findings, Spain and Italy have received the most investments among the four countries.

Jungmann, on the other hand, wrote about the connection between China-CEEC and sustainable development. Although China has adopted the 2030 Agenda for Sustainable Development, Jungmann noticed that the CEE countries did not recognise the importance of sustainable development in cooperation with China, unlike in some other areas.²³ Although there are

¹⁹ Ping Lv & Francesca Spigarelli, "The integration of Chinese and European renewable energy markets: The role of Chinese foreign direct investments", *Energy Policy*, Vol. 81, June 2015, 14–26, DOI: <https://doi.org/10.1016/j.enpol.2015.01.042>

²⁰ Ping Lv & Francesca Spigarelli, "The determinants of location choice: Chinese foreign direct investments in the European renewable energy sector", *International Journal of Emerging Markets*, Vol. 11, No. 3, 2016, 333–356, DOI: <https://doi.org/10.1108/IJOEM-09-2014-0137>.

²¹ Louise Curran, Ping Lv & Francesca Spigarelli, "Chinese investment in the EU renewable energy sector: Motives, synergies and policy implications", *Energy Policy*, Vol. 101, February 2017, 670–682, DOI: <https://doi.org/10.1016/j.enpol.2016.09.018>.

²² Pablo Pareja-Alcaraz, "Chinese investments in Southern Europe's energy sectors: Similarities and divergences in China's strategies in Greece, Italy, Portugal and Spain".

²³ Maximilian Jungmann, "The 16+1 Cooperation and China-EU Relations - Window of Opportunity for Sustainable Develop", Working paper, No. 15, 22 June 2018, China-CEE Institute, Budapest.

ideas and statements about cooperation in this field, the author thinks that they are not concrete enough.

While discussing several types of energy projects in the CEE countries, Zakić and Šekarić stated that the number of implemented projects in renewable energy was the highest compared to traditional energy projects. However, according to their value, they were much lower than investments in other fields of energy projects, such as thermal power plants. China and the CEEC have the same agenda regarding renewable energy, and this is why this cooperation has been successful thus far, according to the mentioned authors.²⁴

In their extensive report, Jahns et al. wrote about the energy investment cooperation between China and the Western Balkan countries and compared it with the WB-EU cooperation. Although the authors did state that the majority of Chinese projects in the WB are in thermal power plants (TPP), they think that the specific situation of the WB countries (large reserves of lignite) requires firm support both from the EU and China in the field of renewable energy so that they can transition towards more sustainable development.²⁵ They also proposed forming a WB regional centre for green and sustainable infrastructure, which would serve as a link between the WB countries but also as a link between China and the EU.

Chinese energy projects in the WB were also a part of Csapó's analysis.²⁶ He discussed the pros and cons of Chinese investments in the energy field. He recognises both the need for energy investments that the Balkan countries have and the conflict of interest that the EU has in this field. The main controversy is the construction of thermal power plants that China is financing. On the other hand, the EU is sponsoring the construction of small hydropower plants that also hurt the ecosystem in the Balkan countries.

China's Path Domestically and Internationally to Renewable Energy Development and Cooperation

As China is heading to achieve carbon neutrality by 2060 and since it is actively promoting sustainable development and green energy in the last 14th five-year development plan, it is clear that China is seriously considering

²⁴ Katarina Zakić & Nevena Šekarić, "China's energy cooperation within the 17+1".

²⁵ Henriette Jahns, Malin Emmerich, Marjan Stojiljković, Slaviša Jelisić, Sebastian Rink & Karsten Löffler, "Greening BRI projects: In the Western Balkan countries", Frankfurt School of Finance & Management - UNEP centre, https://www.fs-unep-centre.org/wp-content/uploads/2020/11/2020-11-02_FS-UNEP-Centre_Greening-BRI-projects-in-Western-Balkan-Countries_study.pdf, 2020, 07/01/2024, 1-69.

²⁶ Gábor Dániel Csapó, "Chinese backed energy projects in the Western Balkans: where supply and demand could meet", *Romanian Journal of European affairs*, Vol. 20, No. 2, 2020, 100-119.

today's environmental issues and is making progress in solving them. Additionally, China has consistently supported global climate initiatives such as the Paris COP21 2016 Agreement and the Glasgow COP26 2021 Pact.

In making many changes regarding renewable energy (RE) on domestic territory, China demonstrated what could be done in this field. Its experience could be used to improve RE cooperation within the China-CEEC cooperation framework. Starting with the 11th and 12th five-year development plans, China introduced many measures and policies to solve the problems associated with traditional energy production and pollution.²⁷ The Chinese government worked simultaneously on many levels to reduce it. Firstly, the government adopted new policies to motivate the country's major commercial polluters to work on downsizing their pollution. Secondly, citizens were encouraged to rationalise their pollution. Thirdly, the government is promoting measures directed towards the better and more successful implementation of renewable energy sources. Besides this, China is constantly working on improving the legal framework regarding RE.²⁸ Due to all these interventions, as of 2020, renewable energy accounts for 41% of total electricity capacity in China, with the following structure: 15% is coming from hydropower, 12% from solar, 13% from wind energy, and 1% from bioenergy.²⁹

The main reason behind China's orientation towards the development of renewable energy is the level of domestic pollution, which was severely increased at the beginning of the 21st century. Gippner and Torney stated that starting from 2005 until 2009, China heavily invested in the development of heavy industry, which required excessive use of coal, leading to severe air pollution that reached dangerous levels in major manufacturing cities and provinces.³⁰ The government was aware of these issues and implemented

²⁷ The first official document that documents China's orientation towards sustainable development and RE could be found in China's Agenda 21, which followed the United Nations Conference on Environment and Development Agenda 21 adopted in Rio (1992), according to Lv and Spigarelli. "Ping Lv & Francesca Spigarelli, "The integration of Chinese and European renewable energy markets: The role of Chinese foreign direct investments"; Louise Curran, Ping Lv & Francesca Spigarelli, "Chinese investment in the EU renewable energy sector: Motives, synergies and policy implications"; Ping Lv & Francesca Spigarelli, "The integration of Chinese and European renewable energy markets: The role of Chinese foreign direct investments".

²⁸ Ping Lv & Francesca Spigarelli, "The integration of Chinese and European renewable energy markets: The role of Chinese foreign direct investments".

²⁹ "[IRENA] International Renewable Energy Agency", Energy Profile China, https://www.irena.org/IRENADocuments/Statistical_Profiles/Asia/China_Asia_RE_SP.pdf, 01/02/2023.

³⁰ Olivia Gippner & Diarmuid Torney, "Shifting policy priorities in EU-China energy relations: Implications for Chinese energy investments in Europe", *Energy Policy*, Vol. 101, No. 652, 2017, DOI: <https://doi.org/10.1016/j.enpol.2016.09.043>; ChinaPower; "How Is China's Energy Footprint Changing?", Center for Strategic and International Studies, 2016, (updated January 30, 2021), <https://chinapower.csis.org/energy-footprint/>, 20/02/2023.

new environmental and industrial policies, which later resulted in lower coal imports and consumption.³¹

When analysing the Chinese domestic market, one can notice that among the RE energy investments, those in the hydro sector were the highest, which was expected due to their costs and the number of projects. However, if we account only for green energy projects, China invested the most in solar and wind energy. According to Nahm and Steinfeld (2014), the development of wind energy production was pushed by the demand on the domestic market, while the development of solar energy was driven by the export of solar panels and equipment, most notably to European countries, Germany specifically.³² Today, besides the US and the EU, China is one of the leaders in promoting, investing in, and developing renewable energy sources.³³ It should also be emphasised, that in recent years, China has invested significantly more in developing hydrogen production, specifically green hydrogen, which uses renewable energy for hydrogen production. This type of hydrogen is the most important to preventing and downsizing pollution as it is carbon neutral, unlike other types of hydrogen (grey, blue, pink, etc.).

China's orientation towards sustainable development is also evident through investments in green energy projects within the BRI countries. Alun and Zhou wrote that until 2018, China invested in renewable energy projects in 45 countries through BRI, with an installed electricity capacity of approximately 34 GW.³⁴ They also noted that the United Arab Emirates, Ukraine, Pakistan, Egypt, and Myanmar were the countries that received the most of those investments. While reviewing the type of energy in which it was invested, the authors cited that 74% was invested in solar energy, 25% in wind energy, 1% in geothermal projects, and 0.3% in small hydropower projects.³⁵ More recently, commenting on Chinese projects in the form of investments and loans within the BRI during the first half of 2023, Nedopil noted that this was regrading investments in general in the greenest first six months since the BRI was introduced in 2013.³⁶ Compared to 2022, when

³¹ Olivia Gippner & Diarmuid Torney, "Shifting policy priorities in EU-China energy relations: Implications for Chinese energy investments in Europe".

³² Louise Curran, Ping Lv & Francesca Spigarelli, "Chinese investment in the EU renewable energy sector: Motives, synergies and policy implications".

³³ Sara Schonhardt, "China Invests \$546 Billion in Clean Energy, Far Surpassing the U.S.", *Scientific American*, <https://www.scientificamerican.com/article/china-invests-546-billion-in-clean-energy-far-surpassing-the-u-s/>, 05/01/2024.

³⁴ Alun Gu & Xiaoyu Zhou, "Emission reduction effects of the green energy investment projects of China in belt and road initiative countries", *Ecosystem Health and Sustainability*, Vol. 6, No. 1, 2020, DOI: 10.1080/20964129.2020.1747947.

³⁵ Ibid.

³⁶ Cristoph Wang Nedopil, "China Belt and Road Initiative (BRI) Investment Report 2023", The Green Finance & Development Center, <https://greenfdc.org/china-belt-and-road-initiative-bri-investment-report-2023-h1/>, 05/01/2024.

renewable energy investments in the BRI countries were 7.11 billion US dollars, in 2023 they amounted to 8.04 billion US dollars.³⁷

Countries within the European Union are among the main Chinese partners in the renewable energy field. China has been cooperating with the EU for almost three decades in different ways so they can better regulate mutual relations in the energy field. The first signed documents date from 1994, and between then and now, several rounds of negotiations, memoranda, and agreements were conducted and signed. This part of the relationship is important because of the fourteen countries that are part of the China-CEEC cooperation framework, eleven are EU members. Therefore, the EU legal framework cannot be omitted in this analysis. Other countries are not in the EU but are aiming to join, so it is important to keep that in mind while discussing energy issues.

It is worth noting that the China-CEEC framework has seen significant energy cooperation. The Centre for Dialogue and Cooperation on Energy Projects was established in Bucharest in 2016, and green energy cooperation was emphasised during the 2019 Dubrovnik Summit. At this event, it was asserted that the projects of the Bucharest Centre for Energy should be used as a base for better energy cooperation. In addition to this, at the 2021 China-CEEC online Summit, Chinese President Xi Jinping stressed the importance and need for cooperation in the fields of green energy and climate change, among many suggestions and proposals dedicated to the improvement of cooperation within this framework.³⁸ However, there was no other institutional push towards more significant RE cooperation within this format since the usual in-person (or online) Summit of Prime Ministers within the China-CEEC format has not been held since 2021.

CEEC and Energy Structure

Without going into the detailed characteristics of each CEE country's energy mix and the reasons behind it, a brief overview of data provided by the International Renewable Energy Agency (IRENA) is presented in Table 1. The purpose of showing this data is to present the potential for cooperation in renewable energy between China and CEE and suggest ways for improving the current situation. Each country has its own energy profile on the IRENA website. Data on total primary energy supply and electricity capacity for non-renewable and renewable sources were specifically selected among other available data for this research, along with the structure of the

³⁷ "The American Enterprise Institute and Heritage Foundation", China Global Investment Tracker, <https://www.aei.org/china-global-investment-tracker/>, 05/01/2024.

³⁸ "Full Text: Keynote Speech by Chinese President Xi Jinping at the China-CEEC Summit", *Xinhua Net*, 09 February 2021.

renewable energy sources (hydro, solar, wind, bioenergy, and geothermal) used in that country.

After summarising the results presented in Table 1 and looking at many other resources, we can draw several conclusions. Due to their geographical position and water and wind resources, Albania, Croatia, Greece, Romania, Slovakia, and Slovenia are achieving better and cleaner energy results than others. Seven countries have nuclear power plants: Bulgaria, Croatia, and Slovenia are sharing one plant; the Czech Republic, Hungary, Romania, and Slovakia each have one; and Poland and Romania are planning to build a new one. Although their nuclear power plants have low CO₂ emissions, they pose high environmental risks. Some countries, such as Bosnia and Herzegovina, Poland, and Serbia, are heavily dependent on coal (mostly lignite) and thermal power plants (TPP). Countries like the Czech Republic, Greece, Montenegro, North Macedonia, and Romania still have significant coal usage in their energy mix, even though they do not have large coal reserves.

Table 1. Total primary energy supply in 2018 and Electricity capacity in 2020 in CEEC

Country	Total primary energy supply ³⁹	TPES in 2018 (TJ)	%	Electricity capacity ⁴⁰	Capacity in 2020 (MW)	%
<i>Albania</i>	Non-renewable	51664	66	Non-renewable	99	4
	Renewable	26627	34	Renewable	2307	96
				Hydro/ marine	2289	95
				Solar	17	1
				Wind	0	0
				Bioenergy	1	0
			Geothermal	0	0	

³⁹ Total primary energy supply is the total amount of energy that a country has at its disposal (TPS = production + imports - exports +/- stock change - international bunkers), while total final energy consumptions is TPS minus losses (TFS = TPS - losses). "[IRENA] International Renewable Energy Agency".

⁴⁰ Energy Statistics Pocketbook 2021 defines electricity capacity as "Electricity capacity is the abbreviated form for the Net Maximum Electrical Capacity, which in turn is defined as the maximum active power that can be supplied continuously, with all plants running at the point of outlet (i.e., after taking the power supplies for the station auxiliaries and allowing for the losses in those transformers considered integral to the station)." United Nations Department of Economic and Social Affairs Statistics Division, "Energy Statistics Pocketbook", United Nations, Statistics Papers Series E, No. 4, 2021, New York, <https://unstats.un.org/unsd/energystats/pubs/documents/2021pb-web.pdf>, 05/01/2024.

Country	Total primary energy supply	TPES in 2018 (TJ)	%	Electricity capacity	Capacity in 2020 (MW)	%
<i>Bosnia and Herzegovina</i>	Non-renewable	244039	78	Non-renewable	2573	57
	Renewable	67102	22	Renewable	1954	43
				Hydro/marine	1829	40
				Solar	35	1
				Wind	87	2
				Bioenergy	3	0
				Geothermal	0	0
<i>Bulgaria</i>	Non-renewable	684720	89	Non-renewable	6910	61
	Renewable	83209	11	Renewable	4347	39
				Hydro/marine	2514	22
				Solar	1073	10
				Wind	703	6
				Bioenergy	57	1
				Geothermal	0	0
<i>Croatia</i>	Non-renewable	249348	71	Non-renewable	1644	34
	Renewable	100799	29	Renewable	3226	66
				Hydro/marine	2200	45
				Solar	85	2
				Wind	788	16
				Bioenergy	143	3
				Geothermal	10	0
<i>Czech Republic</i>	Non-renewable	1635189	90	Non-renewable	17230	80
	Renewable	177989	10	Renewable	4342	20
				Hydro/marine	1090	5
				Solar	2073	10
				Wind	339	2
				Bioenergy	840	4
				Geothermal	0	0

Country	Total primary energy supply	TPES in 2018 (TJ)	%	Electricity capacity	Capacity in 2020 (MW)	%
<i>Greece</i>	Non-renewable	810482	88	Non-renewable	10050	48
	Renewable	112163	12	Renewable	10887	52
				Hydro/marine	3412	16
				Solar	3247	16
				Wind	4113	20
				Bioenergy Geothermal	115 0	1 0
<i>Hungary</i>	Non-renewable	993409	88	Non-renewable	7655	73
	Renewable	125095	11	Renewable	2813	27
				Hydro/marine	58	1
				Solar	1953	19
				Wind	323	3
				Bioenergy Geothermal	476 3	5 0
<i>North Macedonia</i>	Non-renewable	90356	82	Non-renewable	1104	57
	Renewable	19182	18	Renewable	827	43
				Hydro/marine	686	36
				Solar	94	5
				Wind	37	2
				Bioenergy Geothermal	10 0	1 0
<i>Montenegro</i>	Non-renewable	30410	69	Non-renewable	225	22
	Renewable	13583	31	Renewable	782	78
				Hydro/marine	658	65
				Solar	6	1
				Wind	118	12
				Bioenergy Geothermal	0 0	0 0

Country	Total primary energy supply	TPES in 2018 (TJ)	%	Electricity capacity	Capacity in 2020 (MW)	%
<i>Poland</i>	Non-renewable	4067227	91	Non-renewable	34146	74
	Renewable	391709	9	Renewable	12220	26
				Hydro/marine	976	2
				Solar	3936	8
				Wind	6267	14
				Bioenergy	1041	2
				Geothermal	0	0
<i>Romania</i>	Non-renewable	1160941	83	Non-renewable	8504	43
	Renewable	242906	17	Renewable	11141	57
				Hydro/marine	6593	34
				Solar	1387	7
				Wind	3023	15
				Bioenergy	139	1
				Geothermal	0	0
<i>Serbia</i>	Non-renewable	550671	87	Non-renewable	4685	62
	Renewable	82843	13	Renewable	2909	38
				Hydro/marine	2460	32
				Solar	29	0
				Wind	397	5
				Bioenergy	24	0
				Geothermal	0	0
<i>Slovakia</i>	Non-renewable	647494	90	Non-renewable	5324	69
	Renewable	71192	10	Renewable	2435	31
				Hydro/marine	1612	21
				Solar	593	8
				Wind	4	0
				Bioenergy	226	3
				Geothermal	0	0

Country	Total primary energy supply	TPES in 2018 (TJ)	%	Electricity capacity	Capacity in 2020 (MW)	%
<i>Slovenia</i>	Non-renewable	243989	85	Non-renewable	2416	62
	Renewable	43766	15	Renewable	1509	38
				Hydro/ marine	1171	30
				Solar	267	7
				Wind	5	0
				Bioenergy	66	2
				Geothermal	0	0

Source: International Renewable Energy Agency, Statistical Profiles of Countries, https://www.irena.org/IRENADocuments/Statistical_Profiles/Europe/

The usage of renewable energy sources within the CEEC is quite different. Maybe the best way to describe the situation regarding RE in the CEEC is to say that it is not so green or sustainable. However, we should reiterate that these countries have different energy resources and circumstances regarding the type of renewable energy they can install and use. Most CEE countries have good geographical positions to install and use more solar energy. Additionally, many Central and Eastern European countries could achieve better results by using wind energy. These countries include Albania, Bosnia and Herzegovina, Croatia, Greece, North Macedonia, Montenegro, Poland, Romania, Serbia, and Slovakia. Nowadays, small hydropower plants are considered more harmful than beneficial due to many environmental issues, so they are not an option for most CEE countries. However, biofuel and biowaste are becoming more and more popular. Hungary, Poland, and Slovakia are achieving excellent results in this field.

Additional problems in transitioning towards a more ecologically friendly environment and the implementation of RE projects in the CEEC have been evident in their political and legal backgrounds. Reports from some EU countries, such as Romania and Bulgaria, have highlighted that the EU common goals related to climate change and transition towards more green energy were obstructed on several fronts, from governments' positions towards RE and the costs associated with it to energy lobbies, pressure from citizens, etc.⁴¹ There were also reports of corruption in the allocation of the

⁴¹ Simona Davidescu, Ralitsa Hiteva & Tomas Maltby, "Two steps forward, one step back: Renewable energy transitions in Bulgaria and Romania", *Public Administration*, Vol. 96, 2018, 611-625, DOI: <https://doi.org/10.1111/padm.12522>.

EU RE funds.⁴² Bosnia and Herzegovina, although not an EU member state, has experienced problems within the legal framework related to the implementation of RE projects, and there were some troublesome transactions connected to concession rights.⁴³

Furthermore, in some countries, there were abrupt changes in green energy policies, meaning they would start with the feed-in tariffs (FIT) and then relatively quickly change to the feed-in premiums (FIP). Those kinds of changes resulted in numerous problems, and many companies that wanted to invest or have already invested in the CEE countries withdrew from projects or faced losses.⁴⁴ Those issues and many others are indicating what needs to be changed in many CEE countries in the RE field, both on a political and legal level, to achieve better results.

China-CEEC RE Projects: What Has Been Done Thus Far?

This research is based on the two databases formulated by Stojanović Šekarić and Zakić (2024)⁴⁵ and Zakić and Šekarić (2021).⁴⁶ The first database provides data only about Chinese RE projects. The second provides data on traditional and renewable energy projects together. Both have different sets of data but are complementary to this analysis. In this part of the paper, all RE projects in which we observed China-CEEC cooperation will be presented.

In **Bosnia and Herzegovina**, the first project is the construction of the wind farm Ivovik, which will be realised by giving concession rights for 30 years to two Chinese companies. The deal is worth €133 million.⁴⁷ The second wind project involves CMEC as a potential partner. This company has partnered with two local firms, Tomix Kneževa and TLG Travnik, to build two wind farms (Vlašić and Galica) in the Central Bosnia Canton with a total capacity of 100 MW under a joint venture, where 90 per cent of the project would be financed by the Chinese Exim Bank and the

⁴² Aron Buzogány & Simona Davidescu, "Energy Governance in Romania", in: Michèle Knodt, Jörg Kemmerzell (eds), *Handbook of Energy Governance in Europe*, Springer, Cham, 2022, DOI: https://doi.org/10.1007/978-3-030-43250-8_24.

⁴³ Dragan Maksimović, "Karbonizacija zelene energije u BiH", *Deutsche Welle*, 13. avgust 2023.

⁴⁴ Olivia Gippner & Diarmuid Torney, "Shifting policy priorities in EU-China energy relations: Implications for Chinese energy investments in Europe".

⁴⁵ Nevena Stojanović Šekarić & Katarina Zakić, "Renewable energy as a connecting spot between China and Central and Eastern European countries: status, directions and perspectives".

⁴⁶ Katarina Zakić & Nevena Šekarić, 2021. "China's energy cooperation within the 17+1".

⁴⁷ Vladimir Spasić, "CMEC considering construction of wind farms at Galica, Vlašić location", *Balkan Green Energy News*, 22 June 2023.

remainder from local sources. The project is worth €140 million, and negotiations are ongoing.⁴⁸

Chinese companies applied for several hydropower projects in Bosnia and Herzegovina: the Dabar hydropower plant (HPP), HPPs on the Drina River (Buk Bijela, Foča, and Paunci), and four smaller HPPs (three on the Bistrica River and one on Janjina). The Dabar HPP will be built by the Chinese company China Energy Gezhouba Group, and the project is worth €222.8 million.⁴⁹ The second project is the construction of three HPPs in Buk Bijela, Foča, and Paunci on the Drina River, with China National Aero-technology International Engineering Corporation (AVIC-ENG) negotiating with the government over this investment valued at €460 million.⁵⁰ The same company is also interested in building three small-scale HPPs on the Bistrica River, worth €103 million.⁵¹ Chinese company Dongfang Electric will be involved in the construction of the solar power plant Bileća, worth \$49 million.⁵²

In the **Czech Republic**, one of the first Chinese investments in energy was made by the China-CEE Fund, which acquired Energy 21, a firm that operates a 61 MW solar power plant.⁵³ The value of this transaction remains unknown, but experts assume it was worth several hundred million dollars. In June 2021, the CEE Fund sold an undisclosed-value investment portfolio to a Vienna-based energy development company.⁵⁴

Only one energy venture involving China was realised in **Croatia**. China North Industries Cooperation (Norinco) acquired a 76 per cent stake in the Croatian company Energija Projekt for €32 million. In addition, Norinco also bought the rights to build 39 wind turbines in the city of Senj with an electricity-generating capacity of 156 MW. According to the agreement, the rights were worth €230 million.⁵⁵ The construction of wind turbines in the city of Senj and nearby Brinje municipality is finished, and the wind park is operational.

⁴⁸ Igor Todorović, „Elektroprivreda BiH dobila koncesiju za vetroelektranu Vlašić“, *Balkan Green Energy News*, 2020, 22. jun 2023; Vladimir Spasić, „CMEC considering construction of wind farms at Galica, Vlašić location“.

⁴⁹ Vladimir Spasić, „ERS dokapitalizacijom planira da pribavi 218 miliona evra za HE Dabar“, *Balkan Green Energy News*, 13. januar 2022.

⁵⁰ Vladimir Spasić, „Kineska kompanija AVIC nudi finansiranje i gradnju HE Buk Bijela i 4 MHE“, *Balkan Green Energy News*, 24. jul 2019.

⁵¹ Ibid.

⁵² Igor Todorović, „EFT hires China’s Dongfang to build its 60 MW solar power plant in BiH“, *Balkan Green Energy News*, 7 December 2021.

⁵³ CEE Equity Partners, „CHINA CEE Investment Co-operation Fund invests in Energy 21“, 2016, <http://cee-equity.com/china-cee-investment-co-operation-fund-invests-in-energy-21/>, 07/01/2024.

⁵⁴ CEE Equity Partners, „China-CEE Fund I exits Energy 21“, 2021, <http://cee-equity.com/china-cee-fund-i-exits-energy-21/>, 07/01/2024.

⁵⁵ Hina NS, „Plenković otvorio radove na vjetroparku kod Senja, Kinezi na projektu od 160 milijuna eura“, *tportal.hr*, 20. novembar 2018.

Greece and China have several very interesting projects in the energy and electricity fields, but in the RE fields, there are two that stand out. The first is the acquisition of 75% of wind farms within the Copelouzos company by China Energy Europe Renewable Energy S.A. (CEERE) (Shenhua Group), which was finalised in 2017 and was worth €1454 million.⁵⁶ This is by far the highest value achieved for any RE project in CEE countries. Due to this acquisition, the construction Chinese company is in charge of four wind farms in Greece: Organis, Grammatikaki, Megavouni, and Korfovouni. The second project for which the finances are still not fully submitted is the MINOS Concentrated Solar Power Project in Crete, for which China Energy Engineering Corporation and Zhejiang Supcon Solar Technology Co., Ltd. will be in charge. The project is worth \$320 million.⁵⁷ Because of these two projects, Greece is the number one country regarding the achieved value of RE energy projects with China.

Until now, **Hungary** and China have cooperated only in the green energy field, and all projects have been successful. The first project was the design and construction of a 40-megawatt geothermal power station in Tura, a town in Pest County, and it has been completed. The key investor, KSORKA, contracted the Chinese company Zhejiang Kaishan Compressor Co. to build the €141 million project. However, the amount of the Chinese company's investment is unknown.⁵⁸ The second project, finalised in 2021, was the construction of the Kaposvar solar power plant. This greenfield investment was made by China National Machinery Import & Export Corporation (CMC), a subsidiary of China General Technology (Group) Holding Co., Ltd. (Genertec). This facility is Hungary's largest solar power plant, worth €100 million.⁵⁹ The third energy project is interesting as it demonstrates Chinese companies' interest in acquiring investment rights in solar energy. The Chinese company ReneSola is highly active in this field; it bought the rights to build two solar power stations of 13.9 MW and 2.15 MW, respectively, but sold them later for an undisclosed price. This move was made following the company's policy to "achieve its goal of \$100 million in cash flow generation from the monetisation of projects".⁶⁰ Unisun

⁵⁶ [CGIT] China Global Investment Tracker, "The American Enterprise Institute and Heritage Foundation", 2024, <https://www.aei.org/china-global-investment-tracker/>, 05/01/2024.

⁵⁷ "The American Heritage and Enterprise Institute".

⁵⁸ "Kaishan's geothermal power plant in Turawell Hungary attracts visitors from countries in Europe", Kaishan, 2018, <http://www.ouyangailian.com/en/shownews/id/4708.html>, 05/06/2023.

⁵⁹ Xin Chen & Marton Ugródsy, "China and Hungary: 70 Years of Bilateral Relations in a Changing World".

⁶⁰ "ReneSola Divests 13MW Polish Solar Projects to SUNfarming", Yahoo Finance, 2019, <https://finance.yahoo.com/news/renesola-divests-13mw-polish-solar-150903403.html>, 06/05/2023.

Energy Group started the construction of an 11.6 MW solar power plant in village Tiszaszollos in 2018.⁶¹ The plan was to install a power plant with a 50 MW capacity. However, there has been no news in relation to the new capacities since 2018. The level of investment is also unknown. Shanghai Electric Power Solar Power Plant is in charge of construction and has a commission right for the new solar power plant in north Hungary, for which the rights to build the power plant belonged to Chint Solar Hungary.⁶² The project is active, but its value is unknown.

In **Montenegro**, one project was completed successfully, i.e., the construction of a wind turbine on Mt. Možuri. The Maltese firm Enemalta plc was the main investor, but China's Shanghai Power Electronics actually did the construction work in Montenegro, which was worth €87 million.⁶³ In March 2019, Norinco submitted documentation to the Montenegrin government for the construction of a 293.6 MW HPP on the Morača River. This project consists of building eight HPPs in a cascade arrangement on the Morača, which will be financed by a concession. The negotiations have been going on for several years, and the estimated value of this project is approximately €500 million.⁶⁴

Poland has seen successful involvement by Chinese energy companies, especially in the alternative energy field. The first such transaction was the China-CEE Fund's purchase of a 16 per cent stake in Polenergia (which produces power from conventional and renewable sources) for PLN 240 million, or around \$60 million.⁶⁵ In 2021, the CEE Fund sold its stake in Polenergia to Brookfield Renewable Partners for an undisclosed value.⁶⁶ Besides this, the CEE Fund partnered with Israel-based Enlight Renewable Energy in a joint venture to buy two wind projects developed by Poland's GEO Renewables. The Polish company retained a minority stake (10 per cent) in the two ventures, while the Chinese and Israeli firms acquired the remaining 90 per cent.⁶⁷ The main target for this investment was the

⁶¹ Ivan Shumkov, "China's Unisun starts building 11.6-MW solar farm in Hungary", *Renewables Now*, 2018, <https://renewablesnow.com/news/chinas-unisun-starts-building-116-mw-solar-farm-in-hungary-632144/>, 07/01/2024.

⁶² Ivan Shumkov, "Chint sells 200-MWp PV bundle in Hungary to Shanghai Electric Power", *Renewables Now*, 2023, <https://renewablesnow.com/news/chint-sells-200-mwp-pv-bundle-in-hungary-to-shanghai-electric-power-820209/>, 12/12/2023.

⁶³ "Winds of BRI blow into green energy ambitions of Montenegro, Malta", *Xinhua Net*, 20 November 2019.

⁶⁴ „Kinezi ponudili gradnju osam hidroelektrana na Morači", *Investitor*, 12. mart 2019.

⁶⁵ "Fund invests \$77m to help create Poland's largest independent vertically-integrated energy group", *CEE Equity Partners*, 2014, <http://cee-equity.com/fund-invests-77m-to-help-create-polands-largest-independent-vertically-integrated-energy-group/>, 05/06/2023.

⁶⁶ "China-CEE Fund I exits Energy 21".

⁶⁷ "China-CEE, Israeli Enlight to invest \$406 mln in Polish wind farms", *Reuters*, 1 September 2014.

acquisition of 250 MW in wind power capacity at two wind farms, the 36 MW Wroblew and the 214 MW Project 2. In 2015, when the purchase took place, the Wroblew wind farm had already been constructed, whereas the second one was incomplete. Some sources put the value of this acquisition at \$406 million, although China Global Investment Tracker reports the transaction was worth \$200 million.⁶⁸ Moreover, very soon after the transaction was finalised, the Wroblew wind farm was sold to Ikea for PLN 200 million, equivalent to \$50 million.⁶⁹ The third project for the China-CEE Fund was a joint venture with GEO Renewables, where the Fund took on a 90 per cent stake and the Polish company retained 10 per cent.⁷⁰ Together, they bought the Zopowy wind farm, with 15 turbines rated at a total of 30 MW.⁷¹ The value of this transaction remains unknown. Additionally, the Fund acquired the Korytnica 1 wind farm in 2015, with a capacity of 3.3 MW, and continued to construct the Korytnica 2 wind farm until 2021, with a capacity of 50.4 MW.⁷² The CEE Fund sold its stakes in Zapowy and Korytnica wind farms to Spanish Iberdrola in 2021. The last Chinese energy venture in Poland was launched by the solar panel manufacturer ReneSola. In November 2018, ReneSola successfully bid for the construction rights to 26 utility projects of 1 MW each. The firm sold the rights for those projects to two companies in 2019 and 2020: 13 power plants with a total output of 13 MW were sold to SUNfarming Polska Asset, and the remaining 13 (also 13 MW) were bought by Polish Mosty Group.⁷³

Before the 16+1 framework was established, **Romania** and China cooperated mainly in the wind energy field, but due to changes in law procedures and many changes in the national government ruling parties, they stopped with those investments. Recently, there have been three solar projects in this country with the involvement of Chinese companies. First is Ratesti Solar Park, and two Chinese companies (CHINT Solar and INTEC Energy Solutions and Design) are in charge of the engineering, procurement, construction, and high-voltage grid connection. The project is worth €100 million, and the park owners are the companies Econergy Renewable Energy and Nofar Energy. Chinese company Jiangsu Zhongli, together with its partner ReneSola Energy, acquired the ownership of a small solar plant in

⁶⁸ This is the reason why the 'Value' column for this project has been left blank in the Appendix.

⁶⁹ "CEE Equity Partners", 2015, <http://cee-equity.com/category/press-releases/page/2/,07/01/2024>.

⁷⁰ Ibid.

⁷¹ Richard Q. Turcsanyi, "Central European attitudes towards Chinese energy investments: The cases of Poland, Slovakia, and the Czech Republic".

⁷² "China-CEE Fund I exits Energy 21", CEE Equity Partners, 2021, <http://cee-equity.com/china-cee-fund-i-exits-energy-21/,07/01/2024>.

⁷³ "ReneSola Divests 13MW Polish Solar Projects to SUNfarming".

Timiș for €1.86 million.⁷⁴ The last solar project is the Ucea De Sus solar farm, which Jianguo Sunshine Group bought for around €100 million.⁷⁵

In **Serbia**, oil and gas company NIS, in which Russia's Gazprom holds a controlling stake, contracted Shanghai Electric Group Company for the turnkey construction of the Pančevo combined cycle power plant, with a generating capacity of 200 MW. The project was finished in 2022, and it involved installing "two Ansaldo Energia gas turbines and one steam turbine".⁷⁶ The investment is valued at €180 million and is financed by Gazprom. The Belgrade City Council and the Power Construction Corporation of China signed a deal in January 2020 for the construction of a hot water pipeline to connect the Obrenovac TPP and the New Belgrade heating plant.⁷⁷ This €164.7 million project will probably be financed using a loan from Exim Bank.⁷⁸ The construction of the new solar park Agrosolar in Kula, which is owned by MK Group and Fintel Energija, is given to Power China Construction Solar. The value of the project is €340 million.⁷⁹

Overall, the achieved results are modest. The number of projects and participating companies is increasing, as is the type of renewable energy sources installed. Most of the investments were in solar (12), wind (9), and hydro energy (4), while other forms of RE projects appear rarely. Bosnia and Herzegovina, Hungary, and Poland had the most successful cooperation rates with China compared to other CEE countries. These countries also had the most diversified cooperation. Greece, on the other hand, had the highest value of realised projects. Both Chinese state-owned and private companies participated in RE projects, with more FDIs and acquisitions than loan arrangements. Most of the projects in renewable energy were not so expansive, and that was probably one of the reasons for their success. Another reason for success lies in having Europe's climate and energy-related interests coincide with Chinese investments. However, projects related to hydropower are still in limbo because the procedures and effects

⁷⁴ Tudor Popescu, "INTEC, China's CHINT to develop 154 MWp solar park in Romania", *Renewables Now*, 2022, <https://renewablesnow.com/news/intec-chinas-chint-to-develop-154-mwp-solar-park-in-romania-783160/07/01/2024>; Vladimir Spasić, "Chinese companies sell three solar power plants in Romania", *Balkan Green Energy News*, 8 January 2021.

⁷⁵ "AidData, A Research Lab of William&Marry, "China Development Bank provides EUR 50 million loan to Green Vision Seven SRL for 82MW Solar Power Park Project", <https://china.aiddata.org/projects/66498/05/01/2024>.

⁷⁶ "Gazprom starts building thermal power plant in Serbia", Gazprom, 2019, <https://www.gazprom.com/press/news/2019/march/article476546/>, 07/01/2024.

⁷⁷ Jelica Dojčinović, "Definitivno: Kinezi potpisali za toplovod Obrenovac – Novi Beograd", *Mondo*, 9. Jaunar 2020.

⁷⁸ "Kinezi će graditi toplodalekovod Obrenovac-Novu Beograd", *RTS*, 27. Novembar 2017.

⁷⁹ Hana Stevović, "Najveća solarna elektrana biće u Srbiji i gradiće je Kinezi", *Bloomberg Adria*, 04. Jul 2022.

of those projects are more complicated and the costs are higher, so their realisation takes more time.

Challenges and Perspectives of Future Cooperation in the RE Field

The latest climate summit in Glasgow in 2021 showed that China and the CEE countries are dedicated to a sustainable development agenda. The COVID-19 pandemic highlighted many problems in the international community, and it became more evident that climate change, pollution, and unsustainable development are among the pressing issues that the global community needs to address and solve as soon as possible.

Although sustainable development goals should be universal, the means and ways of achieving them are universal for all countries. They have different economic means, natural resources, and visions of transitioning to a healthier environment. These are all legitimate reasons that should be considered while analysing the results of the transition of each CEE country towards green development and renewable energy. Moreover, those same considerations should be used for China as well.

When speaking of renewable energy cooperation in practice, there should be no conflicts of interest between the EU and China, but in reality, they exist. For example, the conflict between China and the EU regarding antidumping prices of solar power equipment started in 2012. The EU company, Prosun, went to the EU Commission to indicate that Chinese solar companies used unfair competition in formulating the prices of solar panels in the EU, which were enabled by state subsidies.⁸⁰ The EU Commission did find that Prosun's claims were founded and suggested certain measures. This issue was eventually resolved by having Chinese solar companies use the minimum prices defined by the EU when formulating their own. Chinese solar companies that invested in the EU were also more oriented towards sales than production, and that was the additional cause for friction in addition to antidumping prices.⁸¹

One of the points of dispute was also wind energy projects, this time in China. When the first European companies wanted to establish the production of wind turbines in China, they first had to undertake to have high local added value within those wind projects. That value sometimes went up to 70%⁸², so the EU companies saw that as additional pressure and unfair requirements for pursuing their production in China.

⁸⁰ Louise Curran, Ping Lv, Francesca Spigarelli, "Chinese investment in the EU renewable energy sector: Motives, synergies and policy implications".

⁸¹ Ibid., 677

⁸² Ibid., 673

On the other hand, Chinese companies faced many uncertainties while operating in the CEE countries. They had many difficulties establishing renewable energy cooperation even before the beginning of the 16+1 cooperation framework. As stated previously, they faced political pressure, corruption, and constant changes in legal regulations regarding tariffs, so many of them withdrew from the CEEC market.

Even in cases where we witnessed good RE cooperation between China and some CEE countries, political and other pressures played a significant role in the overall results. It is worth noting that Poland had excellent results in collaboration with China in green energy up until 2021, and the China-CEE Fund was especially active by investing the most. However, since the beginning of 2021, the Fund has sold its entire wind energy investment portfolio in Poland. There were no reports on the reasons for the sudden disinvestment in this field, but this cannot be an indicator of better future cooperation between China and Poland in the green energy field.

Law procedures and implementation of renewable energy projects in the Balkans are not the same or progressive as in the CEE EU countries. However, those same CEE EU countries lag behind more developed EU countries concerning green energy.⁸³ Therefore, each country has its own problems and issues to be addressed and solved according to domestic circumstances. To ensure that funds are spent and allocated properly, it is crucial to have a consistent rule of law. Additionally, it is essential to establish a precise institutional framework and adhere to it. Unfortunately, in most Balkan countries, the institutional framework dedicated to green energy is not as advanced as in EU countries, which makes it difficult to achieve comparable results.

Moreover, the Western Balkan countries have a lower level of economic development when compared to the EU. The pandemic has caused significant economic problems for these countries in particular, making it difficult for them to recover. Unlike other EU countries, they do not have access to EU recovery funds, which means that their economic recovery will take longer. Given their current circumstances, it is challenging for them to consider implementing green development initiatives.

Furthermore, the WB countries oriented their cooperation with China more towards thermal power plants than renewable energy. The reason is that they have large lignite reserves, and thanks to TPP, their energy security mix is stable. Also, they have enough energy to export due to TPP. In order to transition towards sustainable development and carbon neutrality, the WB countries must invest heavily in renewable energy, and even if they invest in

⁸³ Teresa Pakulska, "Green Energy in Central and Eastern European (CEE) Countries: New Challenges on the Path to Sustainable Development", *Energies*, Vol. 14, No. 884, 2021, 1-19, DOI: <https://doi.org/10.3390/en14040884>.

it, they cannot reach the electricity production level they have with TPP. Additionally, they will not have a stable and on-demand energy supply as they do now.

However, at the same time, since the WB countries are the EU candidate countries, their policies and actions must be aligned to the EU standards, particularly in the RE field. The EU is devoted to achieving carbon neutrality by 2050. Therefore, it urges its members and candidate countries to speed up the process. Because of this, the EU imposed measures that will motivate countries to adhere to this process. For example, companies that operate in non-EU countries will start to pay special taxes regulated by the Cross-Border Adjustment Mechanism (CBAM) in 2026, with full effect in 2030. The purpose of those taxes is to downsize the export of products that have highly intensive carbon usage in their production⁸⁴ and to prevent spill-off effects of carbon leakage from non-EU countries to the EU market.⁸⁵ As a result, the affected countries or companies will lose their competitive advantage since their products will become more expensive in the EU market. Given this situation, cooperation between the WB countries and China in the RE field becomes even more crucial for their economic development.

The Bucharest Energy Centre, established for purposes of 16+1 cooperation, has not been fully utilised thus far. The Centre should start with more ambitious work and organise more meetings, fairs, and educational workshops regarding renewable energy. It should be a starting point for all companies and governments from China and the CEEC that want to cooperate in the RE field. In addition, the CEEC should also work together to develop joint projects in renewable energy.

The CEEC should make more effort on the local level to explore possibilities for green energy projects, especially in a rural environment where there is still excessive usage of crude ore and wood for heating. They should also create concrete programmes to help local communities transition towards more sustainable development. Local provinces should be financially prepared and educated to execute green energy projects.

The cooperation in solar and wind energy has been successful, but biowaste, biofuel, and geothermal energy have not, and it is a pity this potential was not utilised. So far, China and the CEEC have not had joint projects in hydrogen energy.⁸⁶ However, recently, there was an announcement by the Serbian government that China would open a green

⁸⁴ Such as the automotive industry, production of iron and steel, chemical industry, etc.

⁸⁵ Jelena Ignjatović, Sanja Filipović & Mirjana Radovanović. "Challenges of the green transition for the recovery of the Western Balkans", *Energy, Sustainability and Society*, Vol. 14, No. 2, 2024. <https://doi.org/10.1186/s13705-023-00421-4>.

⁸⁶ China has successful projects in green and blue hydrogen domestically and is intensively working on using this type of energy even more. Blue hydrogen is made by splitting natural

hydrogen production facility near the Bor copper mine.⁸⁷ Even though the production of hydrogen energy is still very expensive compared to other green energy sources, China and the CEEC can work together on those projects. Most countries in the world do not have enough resources to invest in the research and development of this type of energy, and they will need the help of more developed countries. China can certainly be one of them.

Renewable energy should be a top priority for cooperation between China and the CEEC due to the increasing number of uncertainties in the world. Sustainable development, climate change, and energy production are crucial topics that will gain even more attention in the future. The focus is no longer on whether we should transition to sustainable development and renewable energy but on how we can achieve it.

Conclusion

China's rapid economic development over the past 70 years is unprecedented. Whether someone admires Chinese economic success or not, its results cannot be denied. During the reform years, generations of Chinese people lived in poverty and difficult situations. Nevertheless, the perseverance and hard work of many generations resulted in unique achievements. Today, Chinese people live in better conditions than their ancestors, but the reforms are still ongoing. Yet such rapid development has its setbacks as well. The speed of growth of the Chinese manufacturing industry had its price: TPP overcapacity, air pollution, and the health of citizens. The price for achieving economic goals was high. However, it was a collective decision that it was worth paying. However, the circumstances have changed. Chinese citizens and the government have been working on sustainable development and the development of green energy for decades. China achieved tremendous domestic results in those regards. Furthermore, China invests in renewable energy worldwide through initiatives such as the BRI.

Over time, there were notable shifts in the economic cooperation between China and the CEE nations. While some countries have had successful collaborations with China, others have not. Nevertheless, China has shown a willingness to cooperate with each CEE country, which has resulted in the successful completion of numerous projects. Each country had the opportunity to propose projects they believed would be beneficial, and it was

gas into hydrogen and CO₂, and green hydrogen by splitting water into hydrogen and oxygen by electrolysis. There is no problem with storing CO₂ with green hydrogen, but with blue, there is. However, the production of blue hydrogen is less expensive.

⁸⁷ Marijana Avakumović, „Kinezi najavili ulaganje dve milijarde evra u OIE u Srbiji“, *Bloomberg Adria*, 06. Novembar 2023.

up to them to decide which sectors and projects would be priorities. Initially, numerous projects were proposed, but as time passed, it became apparent that many of them could not be realised due to various reasons. In some cases, the negotiation process was too slow, while in others, the requirements imposed by China for funding did not align with the needs of the particular country. Additionally, some projects were too expensive to be realised.

In the case of trade, results are even more evident, and the volume is significantly higher. The main concern of many CEE countries is that, although trade volume went up, they still have a large trade deficit with China. However, it was optimistic to expect that the CEE countries would have a considerably lower trade deficit with China due to the cooperation framework. What happened was that exports to and imports from China went up, meaning that this cooperation opened opportunities for many companies to make connections and work in countries with which they could not work until then.

The analysis done in this paper focused on China-CEEC cooperation on renewable energy. The research showed that out of the proposed 29 projects, 26 are finished or active, and state- and private-owned Chinese companies worked on them. Most of the projects were realised through FDIs or acquisitions, and in some cases, Chinese companies were in charge of the construction or design of the project. Bosnia and Herzegovina, Hungary, Poland, and Greece had thus far the most successful cooperation, bearing in mind the number and volume of realised projects. Wind and solar energy projects are in the lead, while biofuel and geothermal projects have only one project. Among the CEE countries, Bosnia and Herzegovina and Montenegro have been the only ones in negotiations with China regarding hydropower plants. However, many countries within the China-CEE cooperation framework did not cooperate in the renewable energy field, namely Albania, Bulgaria, the Czech Republic, North Macedonia, Slovakia, and Slovenia.

The current geopolitical and geoeconomic situation is a constant reminder that circumstances can change rapidly. As a result, programmes aimed at transitioning towards renewable energy and sustainable development might be jeopardised, so time and resources dedicated to those issues should be used wisely. The main challenges within China-Central and East European countries' renewable energy cooperation were political and legal issues, public policies and strategies of national governments, corruption, and finances. The wind and solar energy investment projects by Chinese investors in the CEEC have yielded satisfying results. However, there is still untapped potential for cooperation in hydrogen, biowaste, geothermal, and hydropower energy. There are many ways and possibilities to improve renewable energy cooperation within the China-CEEC framework, and both sides should strive to explore and improve those relations.

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