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Green policy in Eastern and South-Eastern Europe in the 21st century

Abstract. Green policy has become one of the most pressing issues for Eastern and Southeastern Europe in the 21st century, as modern Europe is experiencing the negative impact of global climate change and the environmental crisis. The purpose of this study was to analyse and summarise approaches to implementing green policies in Eastern and South-Eastern Europe. To fulfil this purpose, the study analysed regulatory documents, statistical data, and reports of international organisations on climate change. The findings of this study on green policies in Eastern and South-Eastern Europe confirmed considerable progress in the implementation of emission reduction and environmental protection measures in the region, specifically, the effectiveness of initiatives aimed at increasing energy productivity, developing renewable energy sources, and reducing the use of environmentally harmful technologies was noted. By 2023, renewable energy sources will account for approximately 19% of total energy consumption worldwide. It was found that conventional bioresources account for 9% of production, while modern renewable energy sources account for more than 10%, which includes heat and electricity production, as well as the transport sector. The use of biomass is responsible for about 14% of final energy consumption. In 2023, renewables accounted for a record 43% of electricity generation in Europe, up from 36% in 2022. This is the second year in a row that energy production from renewable sources has exceeded the use of polluting fossil fuels. The practical significance of this study lies in the development of recommendations and strategies for the implementation of green initiatives in the political, economic, and social practices of the countries of the region under study

Keywords: renewable energy; climate change; nature protection; solar thermal energy; biodiversity; wind turbines

Introduction

In the 21st century, the world is facing a range of serious environmental challenges, including climate change, environmental pollution, and the depletion of natural resources. In the context of growing attention to environmental issues, green policy is becoming a central topic for research. Eastern and South-Eastern Europe, which experienced significant changes in political, economic, and socio-cultural dimensions in the last century, are no exception to this trend. The problematic of this study is that green policy in Eastern and South-Eastern Europe in the 21st century is a complex and multifaceted image, these regions, being at the crossroads of development, face unique challenges in the field of ecology and sustainable development. From implementing energy efficiency strategies to promoting the use of renewable energy sources and biodiversity conservation, green policies in these regions have enormous potential to combat environmental challenges.

Yu.A. Polishchuk (2020) notes that there is a considerable difference in solving environmental problems.

The study results showed that renewable energy can be successfully integrated into the energy systems of Eastern European countries. I.S. Skorokhod & L.M. Gorbach (2019) focus on the analysis of the activities of European institutions in implementing the strategic goals of the EU's common environmental policy. The researchers note that the analysis of the European Union's cooperation with international actors in implementing European environmental policy standards shows the EU's vital role in setting global standards that ensure the effectiveness of environmental policy.

Environmental issues in the 21st century have become global challenges faced by the international community. Environmental pollution, a steady increase in toxic air emissions, melting glaciers and the extinction of plants and animals have become key factors in the global environmental crisis. Therefore, the conclusion of Y.I. Zavada *et al.* (2022), who believe that cooperation between international actors is key to solving environmental problems, is important in this regard. Their study has shown that

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the European Union often acts as a key actor in shaping the world order, offering strong mandates, and promoting institutional development through various measures.

The Green Economy concept has become one of the main programmes implemented by governments around the world to achieve sustainable development. E. Šogorov-Vučković *et al.* (2020) considered the fact that in recent decades, the political establishment has focused on addressing climate change and other environmental problems caused by human activity and natural factors. The conclusions note that the Western Balkan countries have recently begun to implement environmental laws and develop a more energy-efficient environment. Analysing the progress of the Western Balkan countries, this study examines the implementation of environmental initiatives in the economy and plans for future investments in it. D. Blagojević *et al.* (2020), examined the legal regulation and economic prospects of green policy, as well as its investment potential. The study identified key factors that help stimulate investment in this area.

J. Bazić *et al.* (2019) analysed the effectiveness of strategies and policy measures implemented in the Balkans to preserve natural resources and reduce negative environmental impacts. The study concluded with recommendations for further reforms in the environmental sector.

D. Đukanović & B. Đorđević (2020) analyse the features and principles of the European Union's Common Environmental Policy. Their findings confirm the effectiveness of EU cooperation with international actors in implementing the standards of the Common European Environmental Policy. P. Jovanović & S. Stojković Zlatanović (2020) substantiate the significance and effectiveness of the EU environmental policy. The researchers concluded that the EU's environmental policy is significant and effective, being a key factor in solving global environmental problems.

Thus, there is a sufficient amount of research on green policy, but there are issues that require further study, namely the effectiveness of policy implementation, as well as the study of opportunities and obstacles to cross-border cooperation between countries in the region to implement joint green projects and strategies. Additional research on these aspects will help to improve the understanding of the successes and challenges of green policies in Eastern and Southeastern Europe.

The purpose of this study was to analyse and summarise the different methods and approaches used to implement green policies in Eastern and Southeastern Europe. To this end, it was planned to analyse national green development strategies and programmes, study legislation and regulations, compare key approaches and identify successful practices and challenges in implementing green initiatives, as well as highlight opportunities for experience exchange and cooperation between countries.

Materials and methods

The study of green policies in Eastern and South-Eastern Europe in the 21st century is based on a thorough and consistent analysis of official documents and reports relating to environmental initiatives adopted in these regions. The study analysed the report of The Intergovernmental Panel on Climate Change (2023), which is important for the study as it provided an assessment of the climate

change situation in the region and recommendations for further measures to reduce the impact of climate change and adapt to it.

Next, the results of the Conference of the Parties to the UN Framework Convention on Climate Change (COP26) in Glasgow were collected and systematised, which play a significant role in international cooperation to combat climate change (Masood & Tollefson, 2021). In the context of this study, the outcomes and agreements reached at the COP26 Conference in Glasgow directly affect strategies and policies for green energy, renewable energy, and sustainable development in the Eastern and South-Eastern European regions. The results of the conference will determine the further course of action of the participating countries in these issues, including in the context of green policy research.

The next stage included an analysis of political and environmental programmes and legislation applied in Eastern and Southeastern Europe, including the European Union's Fit for 55 (2021) policy. This policy plays a key role in implementing the EU's commitments under the Paris Agreement (2015). Together, these two documents define strategic goals and concrete measures that countries can take to address the climate challenges that are becoming increasingly urgent in the 21st century. This analysis helped to determine the level of implementation of environmental programmes, identify key issues and identify opportunities for further development of green policy.

The following criteria were used for the problem analysis: the effectiveness of legislation, the availability of mechanisms for monitoring the implementation of environmental standards, the impact of programmes on the environment and the population, and the degree of public involvement in formulating and implementing environmental programmes. In this context, the study of the Carbon Brief report (Gabbatiss, 2024) provided detailed information on greenhouse gas emissions, trends in energy policy, analyses of legislative initiatives, and assessments of the impact of various measures on climate change. The methods used to investigate the above-mentioned source base of the study were the general scientific methods of terminological and problematic analysis, synchronous and asynchronous comparison.

Results

Climate change is a process that occurs on Earth due to a variety of influences, including those caused by human activity. This process is manifesting itself on a large scale, with great speed and intensity, and has already led to numerous weather and climate anomalies in different parts of the world. Transformations are occurring in the atmosphere, in the oceans, on ice sheets and on land, and many of them are unprecedented. Some transformations are already underway, while others, such as sea level rise, may become irreversible in the near future (Kexiang *et al.*, 2024). However, according to the latest report of The Intergovernmental Panel on Climate Change (2023), there is still an opportunity to limit climate change. If greenhouse gas emissions, such as carbon dioxide (CO₂), are suddenly and completely reduced, this can lead to rapid improvements in air quality. In 20-30 years of such a policy, it is possible to achieve global temperature stabilisation.

This highlights that decisions made now can have a substantial impact on future climate change.

The report, which was prepared with the involvement of 234 scientists from 66 countries, indicates that the impact of human activity on the increase in climate temperature has been occurring at an extraordinary rate, at least over the past 2,000 years. In 2019, the level of carbon dioxide (CO₂) in the atmosphere reached record highs, with methane and nitrogen oxide concentrations exceeding levels recorded over the past 800,000 years. These data indicate a considerable impact of human activity on atmospheric processes and climate change. It is noted that since 1970, the global average annual surface temperature has risen faster than in any other 50-year period over the past 2,000 years (The Intergovernmental Panel on Climate Change, 2023). For instance, in the last decade (2011–2020), the average temperature exceeded the temperature of the last period of significant warming, which took place almost 6,000 years ago (Depledge *et al.*, 2022). Since the beginning of 1900, the global average sea level has risen faster than at any time in the last three thousand years, indicating the unprecedented and rapid nature of climate change in the 21st century.

At the UN COP26 conference in Glasgow, almost 90 countries, including Ukraine, joined the initiative proposed by the US and the EU to reduce methane emissions by 30% by 2030 compared to 2020 levels. This agreement is aimed at combating one of the main causes of climate change. Methane is the second most important greenhouse gas after carbon dioxide, but it has a higher heat-saving potential than CO₂, but it decays rapidly in the atmosphere (United Nations, 2023). Ukraine emits the most methane in the energy sector, which accounts for 66%. Of this percentage, 49% is accounted for by the oil and gas sector and 17% by the coal sector. As for the share of emissions from the agricultural and waste management sectors, they are 13.7% and 15.4%, respectively (Ukrhydroenergo, 2023). In the energy sector, the largest sources of methane emissions include the production, transportation, storage, distribution, and use of oil and natural gas, as well as coal mining (methane from mines). Over the past five years, Ukraine has seen a predominantly growing methane emissions, especially in the waste sector and agriculture. The increase in methane emissions from landfills is the result of poor waste management and the lack of systemic legislation that would follow European standards in this area.

Another vital outcome of the COP26 summit was the signing of a declaration under which participants, including Ukraine, committed to ending deforestation and improving land conditions by 2030. Under this treaty, countries with more than 85% of the world's forests agreed to stop and even compensate for forest loss by the end of the decade (Matúš & Andrej, 2023). 30 financial institutions have committed to reducing the risk of forest destruction by 2025 (United Nations, 2023).

Ukraine's climate policy priorities need to be adjusted in line with the European Green Deal and the new EU policy "Fit for 55" (2021) to adapt to climate change and integrate climate policy priorities into the country's socio-economic development programmes. One of the key aspects of the Fit for 55 programme is the introduction of a cross-border carbon regulation mechanism. This

mechanism makes provision for the collection of customs duties on imported goods into the European Union depending on their carbon footprint (Fit for 55, 2021). Therefore, the EU wants to protect its producers, as stricter climate regulation in the EU will increase their costs and worsen their competitive position compared to producers in countries with less stringent regulations.

Considering Estonia's experience, it is worth noting that the country has a plan to achieve carbon neutrality by 2022, as well as to revise its economic ties with Germany and Denmark. This strategy is based on the innovative use of wood in construction. The largest construction project in Estonia, called the Environment House, with a value of EUR 54.4 million, is a celebration of the innovative approach to public buildings made of wood in Estonian construction (Hindre, 2023). This project brings together various government agencies and sets a new standard for such buildings and contributes to the creation of comfortable and environmentally friendly public spaces that meet the requirements of sustainable development and environmental safety. An analysis by J. Gabbatiss (2024) shows that, despite its large oil shale reserves, Estonia ranks third in the world in terms of CO₂ emissions per capita. The Estonian government recognises this fact and is steering the country towards renewable energy.

By signing the new climate law, which will come into force in 2025, the country joins the European Union in its commitment to achieve carbon neutrality by 2050. This means a transition to a green economy, the abandonment of oil shale, and investments in housing and transport. Notably, the relevant legal act was also signed by the Western Balkan countries. Estonia, by taking a step towards carbon neutrality and the use of wood in construction, is establishing itself as a leader in environmental initiatives in the region (Rodrigues *et al.*, 2022, Kovačević *et al.*, 2023). Its development strategy not only promotes environmental well-being, but also creates new opportunities for the country's economy and industry.

Another key area of green policy is to promote the development and use of renewable energy sources. Green energy aims to generate electricity with minimal or no use of coal, oil, or natural gas. It is based on the use of alternative energy sources such as solar, wind, hydroelectric, bioenergy, etc. The energy sector in the 21st century is undergoing a fundamental transformation. The move towards clean energy sources with minimal CO₂ emissions has considerable energy security benefits, but it also carries certain risks. The growing interdependence, complexity, and diversity of energy systems raise new energy security issues (Đuričin *et al.*, 2022). Alongside conventional aspects of energy security, such as diversity of energy sources, supply, and transportation, new challenges and issues are emerging. Particular attention should be paid to the impact of energy on climate change and the development of green technologies.

In the European Union, energy production and use account for 75% of carbon and other greenhouse gas emissions. A clean energy system is therefore of paramount significance. To accelerate the process in this area, Directive No. (EU) 2018/2001 (2018) on renewable energy sources was adopted. The Directive increases the target of producing 40% of the EU's energy from renewable sources

by 2030. All member states shall be obliged to contribute to this goal and set concrete targets for the use of renewable energy in various sectors, such as transport, heating, cooling, building, and industry. To achieve climate and environmental goals, sustainability criteria related to the use of bioenergy are being tightened, and Member States must establish effective bioenergy support schemes that follow the cascade principle, which minimises the negative impact of the industry on the market and biodiversity.

By 2023, the share of renewable energy sources in the world's total final energy consumption will reach 19%. This is split between a 9% share of bio-based energy and a 10% share of modern renewables, including heat and electricity generation and transport (Seidl *et al.*, 2020). As of 2022, renewable energy sources accounted for almost 23% of global electricity production, with hydropower accounting for the largest share of 16.6%. Of the other renewable energy sources, wind energy accounts for the largest share of 3.1%, followed by bioenergy with

1.8%. Monitoring of atmospheric wind, solar radiation, and hydrological changes is key to the successful implementation of climate policy in Europe, as it provides important data to optimise renewable energy production and reduce greenhouse gas emissions (Ramirez & Vezzoni, 2022). Knowledge of the regional characteristics of these energy sources allows policy makers to develop targeted strategies for a rapid transition to sustainable energy sources, which contributes to both environmental protection and economic development. In 2023, Europe reached a record 43% of electricity generation from renewable sources, up from 36% in 2022. This is the second year in a row that energy production from renewable sources has exceeded that from fossil fuels (Fig. 1). The countries with the largest volumes of "green" electricity are 7 countries, which together account for 71% of the total global renewable energy production (480 GW, including hydropower): China, the USA, Germany, Italy, Spain, Japan, and India.

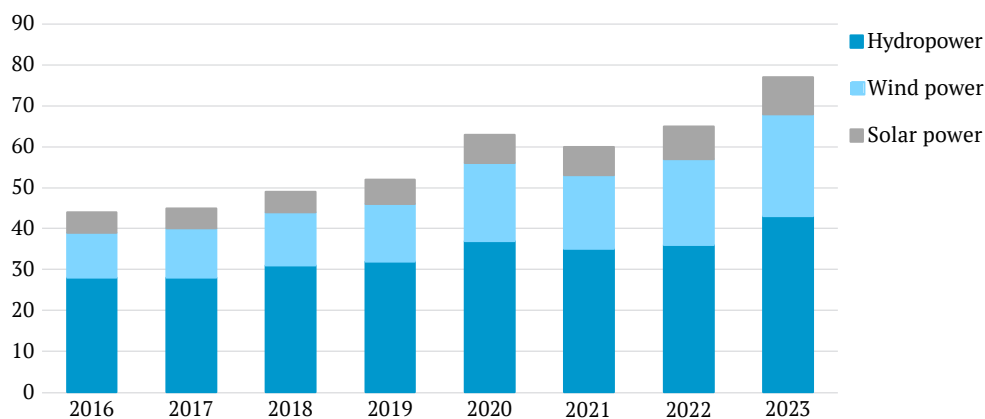


Figure 1. Percentage of electricity generated annually in Europe is distributed among different sources from 2016-2023

Source: structured by the author of this study based on ENTSO-E data (2023)

According to the International Renewable Energy Agency (IRENA, 2023), by the end of 2021, 3,064 GW of clean generation were installed worldwide. Of the total, 40% were employed at hydroelectric power plants (1,230 GW), 28% at solar power plants, and 27% at wind power plants. These data indicate that the development of solar and wind power is much greater than that of hydropower. The market is split roughly equally between solar and wind power, with an installed capacity of 849 GW (of which 843 GW is photovoltaic and just over 6 GW is solar thermal). Wind and solar power plants have a capacity of 825 GW, respectively. Other renewable energy sources, such as bioenergy (143 GW), geothermal (16 GW) and ocean energy (524 MW), together account for approximately 5% of the market share (Fig. 2).

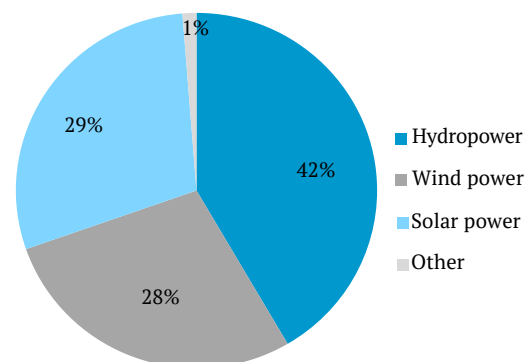


Figure 2. Global renewable energy market in 2023
Source: (IRENA, 2023)

In the EU, the level of renewable energy development is generally analogous to global indicators. The contribution of renewable energy sources (RES) to final energy consumption is 15%. The share of renewable energy in electricity production is 25.4%, of which about 5% is generated from biomass. Over 19% of total heat energy in the EU is produced using renewable energy sources.

To ensure that renewable energy accounts for 20% of total final energy consumption by 2030, EU countries must not only expand renewable energy production capacity but also reduce primary energy consumption. This involves reducing primary energy consumption by around 5% by 2030 compared to 2015 levels. To meet the 2DS climate change scenario, the EU reaffirmed its official goal in 2011 to reduce greenhouse gas emissions (decarbonisation) by 80-95% by 2050 compared to 1990 levels. As the energy sector is one of the main sources of human-related greenhouse gas emissions, the main opportunities for reducing these emissions should be realised in the energy sector (Hickel *et al.*, 2021). To achieve these goals of reducing greenhouse gas emissions and ensuring the reliability and competitiveness of energy supply systems, the European Commission has developed an Energy Roadmap 2050. This map analyses how these goals can be achieved (Low-carbon development strategy..., 2018).

The energy sector is the main sector on which the success of the decarbonisation process depends, as it produces 68% of greenhouse gas emissions. Ukraine has been actively developing renewable energy sources (RES), which is a key element of the energy transition, although there is a considerable difference in the share of renewables between Ukraine and the EU. For instance, in 2019, the share of RES in electricity production was 3.6% and 23.8% in Ukraine and the EU, respectively (excluding hydropower), and 8.7% and 34.6% (including hydropower) (Ukrhydro-energo, 2023). According to the current energy strategy of Ukraine until 2035, it is planned to increase the share of renewable energy sources in total electricity supply to 25%.

This trend is also reflected in climate ambitions. According to the Low-Carbon Development Strategy of Ukraine until 2050, it is expected that if decarbonisation policies and measures are implemented, greenhouse gas emissions will reach 31% of 1990 levels by 2050 (Low-carbon development strategy..., 2018). The mission is to transform the energy system to use low-carbon energy sources, develop clean electricity and heat, and increase energy efficiency and energy saving in all sectors of the economy, housing, and public spaces. Improving energy efficiency is a crucial task for Ukraine and the EU, as about 40% of all energy is used in residential and commercial construction. This problem is made even more serious by the fact that the amount of energy consumed per 1 m² is considerably higher than in EU countries with analogous climatic conditions.

Ukraine lacks the proper means to make significant progress in energy efficiency, and key energy and climate policy documents need to be updated (Banerjee *et al.*, 2020). Still, there has been some progress in liberalising energy markets, integrating into the European energy system, and improving consumer protection through the monetisation of subsidies and privileges. The European Green Deal

is a dynamic and comprehensive strategy that does not overturn previous policy decisions but complements and implements them. Therefore, it is important for Ukraine to continue reforming the energy sector within the framework of its existing commitments, specifically, by implementing the provisions of the Association Agreement (Decision of the Association Council Between Ukraine and the EU No. 984_001-19, 2019), which makes provision for the harmonisation of Ukrainian energy legislation with EU standards.

The Ukrainian government has yet to approve official documents related to the phase-out of coal by 2035 within the framework of the Powering Past Coal Alliance (PPCA) initiative. However, the Ministry of Energy plans to start negotiations with PPCA to clarify the timing of the coal phase-out according to the definitions of the current Energy Strategy. In 2020, about 35% of all electricity generated in Ukraine was generated by thermal power plants, which are mainly fuelled by coal or gas. Therewith, approximately two-thirds of electricity is generated from sources that do not emit greenhouse gases, such as nuclear and hydroelectric power plants, as well as energy from renewable sources. However, due to the use of outdated thermal power plants, Ukraine faces large emissions of ash dust, sulphur dioxide, and nitrogen oxides. To improve the situation in this area, the National Plan for Reducing Emissions from Large Combustion Plants was developed (Decree of the Cabinet of Ministers of Ukraine No. 796, 2017). However, environmental upgrades are very costly, although crucial.

Kosovo's parliament has adopted the Law on the Promotion of Renewable Energy (Ministry of Economy, 2023), receiving praise from the Energy Community Secretariat for aligning the legal framework with the Renewable Energy Directive. The purpose of this law is to improve security of supply and protect the environment (Erjavec *et al.*, 2021). It also includes provisions for combined heat and power (cogeneration). The legislation covers the electricity, heating, cooling, and transport sectors, paving the way for incentives for consumers to generate, store, and sell surplus renewable electricity. Furthermore, a system of guarantees of electricity origin is to be introduced, and the Energy Regulatory Office (ERO) plans to create a register in June 2024. The law also makes provision for the establishment of a renewable energy operator that will manage the renewable energy support fund (Krasniqi & Ymeri, 2022). Furthermore, the legislation defines energy communities, energy storage activities, and the installation of meters for self-consumers of renewable energy sources that will not be able to send electricity to the grid.

The adoption of this law was postponed until the establishment of the Albanian Energy Exchange (ALPEX), which launched a day-ahead liquid market along with Kosovo and Albania. Market price determination at auction is required for obligations entered into under contracts for difference (CfDs). Subsidies are provided through renewable energy auctions (Martinovska Stojcheska *et al.*, 2024). On the other hand, the first tenders of this type were already completed at the end of 2023, even before the adoption of the Law on the Promotion of Renewable Energy Sources. In 2022, the government of North Macedonia submitted a comparable draft law to the national parliament.

Discussion

The study suggested a considerable increase in investment in renewable energy in all quantiles, which is consistent with the strengthening of environmental policy. This growth is observed in both the short and long term. The analysis shows that the upward trend in investment is uniform across the entire scale, which underscores the significance of this phenomenon for different market segments and levels of economic development. Specifically, even in less developed economies, investments in renewable energy have increased significantly, reflecting the growing environmental awareness and the need to move towards cleaner energy sources. Notably, this trend is sustainable and manifests itself in both the short and long term, indicating that the development of renewable energy is a productive and sustainable process that contributes to the achievement of global goals of environmental sustainability and energy security in both domestic and industrial use.

N. Alsagr (2023) found that production and industrial operations are highly dependent on energy. This dependence is important not only for increasing national income and improving the quality of life, but also for the overall development of society. However, much of the energy comes from carbon-based fuels, which are the main source of greenhouse gas emissions and environmental pollution. This requires finding cheaper, more efficient and environmentally friendly energy sources. Fossil fuel reserves are rapidly depleting, threatening energy security and societal stability, and therefore the transition to renewable energy sources is becoming a necessity.

The results of the study clearly confirm that carbon dioxide emissions caused by human activity have become a serious problem for the natural environment. Particularly noteworthy is the high consumption of conventional carbon fuels in heavy industry, which leads to considerable carbon emissions. This underscores the need to develop and implement effective strategies to reduce greenhouse gas emissions, such as switching to renewable energy sources and other energy efficiency measures. This approach will not only help preserve the natural environment, but also reduce dependence on carbon fuels, supporting sustainable development of society.

W. Cai *et al.* (2019) investigated China's green policy, confirming the need for a transition to renewable energy sources. Since the industrial revolution of the mid-20th century, China's carbon dioxide emissions caused by human activity have become a serious threat to the ecological balance. Furthermore, the government's lack of attention to environmental protection creates problems with environmental governance and leads to environmental degradation, as also noted in the previous section.

China's experience in researching and implementing green policies is of immense importance for Eastern and Southeastern Europe for several reasons. China, which is the world's largest producer of carbon dioxide due to its industrial intensity and large coal use, is also demonstrating its determination to implement green policies. For instance, C. Li *et al.* (2023) and S. Li *et al.* (2023) state that China plans to reach peak greenhouse gas emissions by 2030 and become carbon neutral by 2060. This demonstrates the country's serious efforts to reduce emissions and move towards a more sustainable way of producing

and consuming energy. Such steps reflect China's awareness of the need to combat climate change and its desire to join global efforts in this area. Furthermore, China is actively introducing innovative technologies and promoting the development of renewable energy sources, which can be a valuable source of information and inspiration for other countries in the region. Thus, China's experience can serve as a valuable source of information and best practices for Eastern and Southeastern European countries in their efforts to reduce greenhouse gas emissions and implement green policies.

The findings suggest that environmental policy plays a key role in stimulating green growth and facilitating the transition to a sustainable energy mix. Decisions taken at the national and international levels to reduce greenhouse gas emissions, develop renewable energy sources, and strengthen environmental controls can contribute to economic development, job creation, and a better quality of life. The introduction of green technologies and practices can reduce the adverse environmental impact, reduce energy and water consumption, and contribute to more efficient use of resources. This will help prevent climate change, reduce air and water pollution, and contribute to biodiversity conservation.

Furthermore, environmental policy can stimulate innovation in clean technologies and sustainable development, which contributes to economic growth and competitiveness in the global market. It is therefore important that governments and society at large actively support and promote environmental initiatives and policies to achieve green growth and sustainable development. However, according to A. Razzaq *et al.* (2021), the implementation of this policy can have both positive and negative consequences for economic growth, social justice, and individual behaviour. On the positive side, new economic opportunities in the clean energy sector can be created through effective environmental policies, which can help create jobs and support local entrepreneurship. For instance, the introduction of feed-in tariffs and tax preferences for renewable energy installations can stimulate investment in sustainable technologies and promote innovation in clean energy.

Furthermore, according to S. Bashir *et al.* (2021), an environmental strategy may not always ensure social justice, as transition costs may be unevenly distributed and disproportionately burden poor or marginalised communities. This finding reflects an important aspect of environmental strategies that needs to be considered within the framework of the study. This highlights the significance of understanding and addressing the social aspects of environmental strategies to ensure that they are effective and supportive of all segments of society. This approach will help balance environmental protection measures with the need to ensure social justice, which is a key aspect of sustainable development.

The electricity sector in the world, including Eastern and South-Eastern Europe, is a key element of the economy and society, and is one of the leading sources of environmental pollution. The main contributor to this pollution is electricity generation, which is mainly based on the use of fossil fuels, mainly coal, natural gas, and oil. In support of this, M. Jovanović *et al.* (2023) developed business as usual (BAU) scenarios for 2030 and 2050 for the electricity

sector in the Republic of Serbia. These scenarios assume no substantial changes in electricity generation technology. After adjustments based on available reports of the Energy Agency of the Republic of Serbia, the forecasts for the periods indicated were obtained. The researchers' conclusions are valuable for the study, as such scenarios provide a basis for comparison with alternative scenarios that involve the introduction of innovative technologies, policy decisions, or measures to reduce greenhouse gas emissions. The analysis of different scenarios allows assessing the effectiveness and potential consequences of different energy sector development strategies and helps to make informed decisions to achieve sustainable development.

Conclusions

In modern Europe, as nowhere else in the world, there is a considerable interest in green technologies. As a country that aspires to join the EU, Ukraine is actively working to develop alternative energy sources. Lithuania, Latvia, and Estonia are already following the example of Western European countries and implementing plans to reduce emissions and improve energy efficiency. The growing interest in green technologies and sustainable development in this region shows that countries are aware of the significance of preserving the environment and are striving to grow in a greener space.

Countries in the Western Balkans, such as Albania, Serbia, Montenegro, Bosnia and Herzegovina, as well as North Macedonia and Kosovo, are also showing a growing interest in green technologies and sustainable development. These countries have considerable potential for the development of renewable energy sources, specifically solar and wind energy, due to their natural resources and geographical conditions. For instance, Albania is developing solar and hydropower projects aimed at reducing dependence on conventional energy sources and developing environmentally friendly sources. Serbia is also actively developing its renewable energy sector, particularly solar and wind power, which could help reduce its dependence on coal-fired power. Measures aimed at preserving the environment and developing green

technologies are becoming increasingly important for these countries in the context of their energy and economic development.

The development of green technologies and innovations plays a key role in the implementation of green policies. Investments in research and development help to reduce the cost of renewable energy sources, increase their efficiency and competitiveness. Green policy is not limited to energy aspects, but also concerns biodiversity conservation, sustainable use of natural resources, and waste reduction. Solving these problems requires a comprehensive approach and cooperation between government, business, and the public. Despite the positive trends, there are challenges and obstacles to the implementation of green policy. These include legislative instability, financial constraints, technological difficulties, and resistance from conventional energy industries. The findings suggest that countries in the region are developing and implementing green policies, but there are considerable differences in their nature, scope, and effectiveness between countries. Such differences affect the pace and vectors of renewable energy development, greenhouse gas emissions reduction, and overall climate change resilience.

Limitations of the study include the lack of in-depth analysis of the role of the public and political parties in the development and implementation of green policies in the countries under consideration, as well as insufficient coverage of socio-economic responsibility in the context of implementing green strategies. Prospects for further research include a more in-depth investigation of the impact of green policies on the economic, social, and environmental development of the countries of the region, as well as an analysis of the effectiveness and efficiency of measures aimed at reducing emissions and increasing the use of renewable energy sources.

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Conflict of Interest

None.

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