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Mitigating economic losses and prospects for the development of the energy sector in the Republic of Kosovo

■ **Abstract.** The purpose of the study was to analyse the current economic problems in the energy sector of Kosovo and to develop effective strategies to overcome them, in particular ways to minimise losses and increase the stability of the energy system, as well as to study opportunities for ensuring the country's long-term development and energy security. The main focus was on the economic impact of implementing international energy standards, particularly European ones, within Kosovo's national policy and development strategy. The analysis emphasised the financial benefits and challenges associated with aligning the country's energy sector with EU directives, especially those related to renewable energy sources and energy efficiency. Key areas of the study included the economic potential of enhancing energy security, promoting renewable energy development, and reducing reliance on fossil fuels. Additionally, the study evaluated the economic implications of these reforms on Kosovo's energy market and overall economic growth trajectory. The study also included an economic analysis that assessed possible economic losses associated with the transition to renewable energy sources. Risks were considered, including job losses in traditional energy sectors such as coal and the significant financial costs required to upgrade infrastructure. However, the study found that the long-term benefits of a green energy transition, including increased energy security, reduced dependence on energy imports and improved environmental conditions, outweigh the short-term economic costs. The results showed that although the economic transition is accompanied by significant financial costs, the long-term

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benefits, such as increased energy security and reduced emissions, are substantial. The study highlights the importance of further reforms and investments to ensure the sustainable development of Kosovo's energy sector, as well as the country's integration into the European energy environment

■ **Keywords:** modernisation; sustainable development of the industry; impact of reforms; attraction of foreign capital; innovative technologies

■ INTRODUCTION

The energy development in Kosovo is characterised by a number of challenges related to limited internal energy resources, low efficiency of energy consumption and the need to adapt to the new conditions of the international energy market. The Republic of Kosovo, being a relatively young state, faces fundamental problems of economic development, which are closely related to energy independence and stability. Unresolved issues of energy security and dependence on energy imports create additional risks for the country's economic stability. Ageing infrastructure is one of the key challenges, leading to significant energy losses during its production and transportation, exacerbating economic difficulties as maintenance costs for such systems rise and overall efficiency remains low. A high level of electricity losses and insufficient capacity to meet domestic demand negatively affect the economic development of the country, restrain the development of industry and increase the burden on the state budget. A significant dependence on imported energy sources increases Kosovo's vulnerability to external shocks, such as fluctuations in global energy prices or political tensions.

The issue of reducing economic losses and prospects for the development of the energy sector has become the subject of numerous studies by various scientists who sought to find ways to stabilise the country's energy system and ensure its sustainable development. Among the scientists who focused their attention on this issue, there are specialists in the fields of energy, economics and international law. Their research covers both the purely technical aspects of energy infrastructure and the economic consequences of energy crises, as well as possible options for the modernisation of Kosovo's energy system. A. Gjukaj *et al.* (2024a; 2024b) paid special attention to the analysis of the historical background that led to the current state of the energy sector in Kosovo. The work considered the impact of political and economic transformations and their impact on the energy infrastructure. The research focused on examining the issues of Kosovo's energy dependence on electricity imports, as well as the need for investment in domestic energy resources such as coal and renewable energy sources. D. Almeida *et al.* (2023) analysed the potential of green energy development in Kosovo. The work was aimed at studying the possibilities of introducing the latest technologies in the fields of wind, solar and hydropower. They also explored the economic benefits of switching to renewable energy sources, stressing that this would not only allow the country to reduce economic losses but also achieve long-term energy independence and sustainability.

C. Iweh *et al.* (2021) and T. Nadeem *et al.* (2023) paid attention to the macroeconomic consequences of energy crises in Kosovo. The studies emphasised that the constant economic losses associated with interruptions in energy supply and inefficient use of energy resources hinder the

development of industry and the attraction of foreign investment. Attention was focused on the need for deep reforms in the energy sector, aimed at increasing production efficiency and reducing losses during energy transportation. The research included a comparative analysis with situations in other post-conflict regions, which made it possible to outline Kosovo's prospects in the context of global trends. Other scholars in this direction are L. Feldhaus & C. Stiewe (2021), the experts on Kosovo's energy policy. The work focused on a detailed analysis of the country's domestic energy policy, including the influence of international organisations and donors on the energy sector. They argued that the successful transformation of Kosovo's energy system is possible only with active cooperation with international institutions such as the European Bank for Reconstruction and Development. The study has highlighted the importance of reforming state-owned energy companies, particularly in terms of improving governance and reducing corruption risks in this industry.

Scientific research on reducing economic losses and developing Kosovo's energy sector covers a wide range of aspects, from technical and infrastructural issues to economic and legal challenges. The importance of these studies lies not only in the analysis of the current situation, but also in the development of recommendations on effective strategies to achieve energy security and economic stability in the country. The purpose of the study was to analyse the current economic problems in the energy sector of Kosovo and to develop effective strategies to overcome them, in particular ways to minimise losses and increase the stability of the energy system, as well as to study opportunities for ensuring the country's long-term development and energy security.

■ MATERIALS AND METHODS

Conceptual approaches and theoretical foundations of the development of measures to reduce economic losses and ensure sustainability of energy security were studied. The main attention was paid to the study of modern trends in world energy policy and the impact of economic factors on the energy sector. Such international documents as Decision of the Ministerial Council of the Energy Community No. D/2012/04/MC-EnC (2012), which regulates the interaction of countries within the framework of the Energy Community, and the Declaration on Energy Security and Green Transition in the Western Balkans (2022). The main provisions of these documents were studied, including the definition of strategic directions of energy policy, which contribute to energy security and support the transition to "green" energy sources. Not only concepts, but also practical examples of the implementation of similar strategies are analysed to determine the extent to which these approaches can be adapted to the conditions of Kosovo.

Particular attention was paid to the aspects of diversification of energy sources, improvement of the efficiency of resource use, as well as reduction.

The main focus was on the economic impact of the implementation of international energy standards, particularly European ones, in the national policy and development strategy of Kosovo. The main goal was to determine the extent to which Kosovo's legislation in the field of energy meets European standards, as well as to assess the country's potential for integration into the European energy system (European Standardization..., 2011). Considerable attention was paid to the study of Law of the Republic of Kosovo No. 05/1-084 (2016) which establishes the legal basis for the functioning of the energy market in Kosovo and regulates the activities of public and private participants in this market. This study used a multi-step economic analysis to assess the impact of integrating international energy standards, particularly European ones, into Kosovo's national energy policy and development strategy. A data-driven analysis was conducted using national energy consumption statistics, financial reports and energy market trends. The focus was on assessing the economic benefits and costs associated with the alignment of Kosovo's energy sector with EU directives, particularly in the field of renewable energy and energy efficiency.

An important aspect of the study was the comparison of Law of the Republic of Kosovo No. 05/1-084 (2016) with relevant European regulations, in particular with the Directive of the European Parliament and of the Council No. 2018/2001 (2018). The directive is a key document within the framework of The European Green Deal (2020) and defines targets in the overall structure of energy consumption. A detailed analysis was carried out to understand how far Kosovo has progressed in the implementation of "green" technologies and whether the country's legislation provides adequate incentives for the development of renewable energy sources. The study was devoted to a comprehensive study of international and national energy initiatives, in particular, such as the Kosovo Energy Security of Supply (USAID, 2021) and Kosovo Energy Sustainability Activity (2022). It included an in-depth analysis of strategic documents that determine the direction of development of Kosovo's energy policy in accordance with European standards (European standardization..., 2011).

In the context of the Kosovo Energy Sustainability Activity (2022) initiative, its main goals were considered, such as improving energy efficiency. The measures implemented within the framework of this program, as well as their impact on the local energy market and the environment, were subject to analysis. It was studied which projects and investments were involved, as well as which results were achieved in the field of reducing emissions and improving energy infrastructure. Similarly, the Kosovo Energy Security of Supply was analysed in terms of its impact on the security of energy supply in Kosovo (USAID, 2021). As part of this analysis, the mechanisms ensuring the stability of energy supply, as well as actions aimed at adapting to climate change and improving the resilience of the energy system, were considered.

Attention was paid to strategic documents such as the European Union National energy and climate plans (2020) and the Sofia Declaration on the Green Agenda for the

Western Balkans (2020). In addition to the already described stages of the research, an important aspect was the conduct of an economic analysis, which focused on the existing and potential economic losses of the country due to the transformation of the energy sector. This stage contributed to a deeper understanding of situation in Kosovo, as well as possible ways to reduce the negative consequences of the transition to sustainable energy sources. As part of this analysis, data on economic losses that may occur in the next few years due to the introduction of new technologies and the transition to renewable energy sources were considered. It turned out that the main risks are the reduction of jobs in traditional energy industries, in particular coal, as well as the need for investments in infrastructure modernisation, which may require significant financial costs. At the final stage of the research, the results of the analysis of regulatory legal acts and international documents were integrated, which made it possible to form a complete picture of the prospects for the development of the energy sector in Kosovo. Systematisation of data based on sources such as International Energy Agency's (IEA) World energy outlook 2023 (2023) and Energy Statistics Data Browser (2023). Energy Strategy of the Republic of Kosovo 2022-2031 (2022) outlines a comprehensive framework for the development and modernisation of the energy sector in Kosovo.

■ RESULTS

The energy sector in Kosovo has historically faced numerous obstacles, including a reliance on coal-based power generation, ageing infrastructure, and environmental concerns. To address these issues, the government and stakeholders must focus on diversifying energy sources, enhancing energy efficiency, and investing in renewable energy technologies. Additionally, modernising the existing energy infrastructure is essential to minimise transmission losses and improve overall system reliability. This includes upgrading the electricity grid and integrating smart technologies that enhance monitoring and control capabilities. Another key aspect is enhancing energy efficiency across various sectors, including residential, commercial, and industrial. Public awareness campaigns and educational programs can encourage energy-saving practices among consumers, while financial incentives can motivate businesses to adopt energy-efficient technologies. Regional cooperation is vital for Kosovo's energy future. Collaborating with neighbouring countries on energy projects, sharing resources, and participating in regional energy markets can enhance energy security and stabilise prices (Semenenko *et al.*, 2024). The path to mitigating economic losses and fostering development in Kosovo's energy sector involves a comprehensive approach that prioritises renewable energy adoption, infrastructure modernisation, energy efficiency improvements, and regional collaboration. By embracing these strategies, Kosovo can build a more resilient and sustainable energy future that supports economic growth and environmental sustainability.

In Kosovo's energy sector, electricity generation is predominantly based on lignite, a low-grade coal, with reserves exceeding 12.5 billion tonnes (The energy sector in Kosovo, 2020). Lignite-fired power plants, currently accounting for approximately 90% of Kosovo's electricity production, are not only dated but also highly inefficient

(The future..., 2024). This inefficiency manifests in significant operational losses, costing the economy millions of euros annually. For instance, in 2021, the inefficiency of lignite-based power plants, exacerbated by high maintenance costs and frequent outages, resulted in economic losses estimated at EUR 100 million (Energy Statistics Data Browser, 2023). Although lignite prices for domestic generation are as low as EUR 3 per tonne, allowing domestic coal-based electricity prices to remain significantly lower than those in the EU, these benefits are offset by other factors (Di Bella & Thaci, 2023).

Analysis of conceptual approaches and theoretical foundations underlying the development of measures to reduce economic losses and ensure sustainability of energy security in Kosovo is critical for the formation of effective strategies in the face of modern challenges. The main conceptual directions in this area are diversification of energy resources, introduction of renewable energy sources, improvement of energy efficiency and adaptation to global climate changes. Diversification of energy sources involves not only expanding the use of renewable sources, such as solar and wind energy, but also importing energy from different countries, which reduces dependence on one supplier and increases the stability of energy supplies (Qawaqzeh *et al.*, 2020). The theoretical foundations of this concept emphasise the importance of reducing risks associated with fluctuations in energy prices and political instability in the region. Research in the field of energy efficiency indicates a significant potential for cost reduction through the optimisation of energy consumption in industry, the residential sector and utilities. The introduction of innovative technologies and energy efficiency standards can significantly reduce economic losses and improve the overall competitiveness of the country. The issue of adaptation to climate change is important, which requires the integration of environmental aspects into the strategy of energy development. The implementation of “green” technologies and the reduction of greenhouse gas emissions are necessary to ensure environmental sustainability and compliance with international standards.

The Decision of the Ministerial Council of the Energy Community No. D/2012/04/MC-EnC (2012) regulates the interaction of countries within the Energy Community and is a document that contributes to the integration of energy markets and ensuring stability in the region. This document creates a framework for cooperation between participating countries to develop joint energy projects, improve energy efficiency and ensure energy security. The Declaration on Energy Security and Green Transition in the Western Balkans (2022) forms the basis for the transition to sustainable energy systems in the region. For example, Albania is actively developing hydroelectric plants, which provide most of its energy needs, while North Macedonia is investing in solar and wind power, creating the conditions to reduce dependence on traditional fuel sources (Governments’ support..., 2023). Montenegro, in turn, implements projects on energy efficiency in the residential sector, which reduces the energy costs of the population.

Analysis of the national legal framework of the Republic of Kosovo reveals the importance of compliance with international standards and requirements, especially in the context of the energy sector. Law of the Republic of

Kosovo No. 05/1-084 (2016) is the main legal document that establishes the legal basis for the functioning of the energy market in Kosovo, regulating the activities of both public and private participants in this market. The key provisions of this law cover the regulation of tariffs, monitoring of the activities of energy companies, licensing of operators and protection of consumer rights. Kosovo Energy Sustainability Activity (2022) and Kosovo Energy Security of Supply (USAID, 2021) are important initiatives aimed at ensuring the sustainable development of the energy sector of the Republic of Kosovo. The analysis of these programs indicates their contribution to the formation of the national energy policy, which meets the modern challenges in the field of energy security and sustainable development.

The National energy and climate plans (2020) show that Kosovo defines specific indicators to achieve goals related to energy security and sustainable development. In particular, the country sets ambitious goals for increasing the share of renewable sources in the overall energy balance. As part of the National energy and climate plans (2020), Kosovo plans to achieve 30% renewable energy by 2030, which meets EU requirements. Kosovo is also focusing on reducing greenhouse gas emissions, pledging to reduce them by 40% compared to 1990 levels. These goals are consistent with the pan-European goal of achieving carbon neutrality by 2050. The Sofia Declaration on the Green Agenda for the Western Balkans (2020) also supports these goals, emphasising the importance of environmental sustainability and the integration of environmental standards into national policies. This includes the joint efforts of the countries of the region to improve air quality, reduce emissions and develop a green economy.

Kosovo’s transmission and distribution networks also contribute to economic losses in the energy sector. Transmission losses are at an acceptable level of 1.26%, comparable to regional and European benchmarks, but technical losses in the distribution system remain high, reaching 12.21% in 2022 (Gjukaj *et al.*, 2024a). The financial implications of these losses are significant. In 2020, these network losses resulted in approximately €68 million in lost revenue – funds that could have been reinvested in the energy sector or other critical areas of the economy (Energy Strategy..., 2022). Reducing these losses to a more acceptable level, such as 15%, could lead to annual savings of around €30 million. Additionally, unauthorised consumption, or commercial losses, account for 10.42%. In 2020, the Kosovo A and Kosovo B power plants, located approximately 9 and 14 kilometres from the city centre, exceeded national emission ceilings for sulphur dioxide (SO₂), nitrogen oxides (NO_x), and particulate matter (PM) (Comply or close..., 2021). SO₂ emissions in 2020 amounted to 19,987 tonnes, 1.8 times the national ceiling. NO_x emissions increased to 22,846 tonnes, nearly 3,700 tonnes more compared to 2018. PM emissions in 2020 were 4.25 times above the national ceiling, amounting to 5,867 tonnes, significantly exceeding 5,042 tonnes in 2018 (The health harm..., 2020). These figures underscore the severe environmental challenges facing the country. The World Health Organisation states that there is no safe level of air pollution, and the link between pollution and respiratory and cardiovascular diseases is well established (New WHO..., 2021).

The World Bank supports Kosovo through the KOMPAS project (KOMPAS..., 2024). The project, whose total budget is approximately USD 20.01 million, aims to improve the country's health care system and includes three main components. The first component, with a budget of USD 6.87 million, is aimed at strengthening the structural elements of the health care system, including improving health care preparedness and response, improving the quality of services provided, and providing technical assistance in strategic procurement (Labor management procedures..., 2024). The second component, valued at approximately USD 12.2 million, involves the development and implementation of an Integrated Health System that supports digital health services, improves health data management, and modernises health infrastructure. The third component, with a budget of about USD 0.94 million, provides project management, monitoring and evaluation, including funding for consulting services, procurement of office equipment and covering operational costs (Fig. 1).

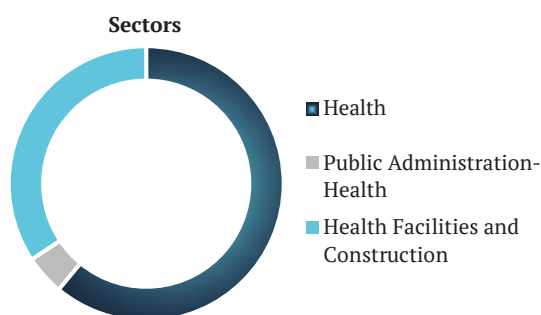


Figure 1. Component statistics "Sectors of KOMPAS project"

Source: created by the authors based on KOMPAS – Kosovo comprehensive approach to health system strengthening project (2024)

2022 saw a slowdown in overall economic growth, which was the result of several factors, among which losses in Kosovo's energy sector played a significant role. Economic growth slowed to 3.5% from 10.7% in 2021, mainly due to the negative impact of trade conditions and rising energy costs, which in turn weakened private demand (International Monetary Fund, 2023). In 2023, the country's trade deficit reached a record level of EUR 5.1 billion, a large part of which is due to rising costs of energy imports, which exceeded exports by EUR 5.9 billion (Bami, 2024). The main goal of the strategy is to increase the share of electricity produced from renewable sources from 6.3% at the beginning of implementation to 35% by 2031. To achieve this goal, the government plans to develop new power generation facilities with a total installed capacity of 1.6 GW. In particular, the strategy calls for the installation of wind and solar farms, each with a capacity of 600 MW, as well as 100 MW of rooftop solar photovoltaic panels for consumption (Nuttall, 2024).

The Energy Strategy of the Republic of Kosovo 2022-2031 (2022) was created in accordance with the National Development Strategy – 2030 (2022), which serves as the primary long-term strategic framework for achieving Kosovo's vision by outlining development priorities, objectives, and impact indicators. Within this framework, the National Development Strategy established goals that are specifically linked to the Energy Strategy. Rising per capita incomes also contribute to increased demand for electricity. According to the World Bank, Kosovo's per capita income last year was USD 11,839 (at purchasing power parity), well below neighbouring Albania (USD 14,495) and the EU average (USD 46,468) (KOMPAS..., 2024). According to the IEA, the share of electricity in total energy demand in the EU is expected to rise to 29% by 2040 from the current 21%, leading to a 10-20% increase in per capita electricity consumption (Table 1).

Table 1. Connection between the strategic objectives of the National Development Strategy and the Energy Strategy

Development Goals (National Development Strategy – 2030)	Strategic Objectives (National Development Strategy – 2030)	Strategic Objectives (Energy Strategy of the Republic of Kosovo 2022-2031)
High-quality, reliable, and integrated infrastructure	Improving energy supply security, sustainability and affordability	Enhancing system robustness
	Integration into regional and pan-European energy markets	Safeguarding and empowering consumers
Sustainable environment and improved utilisation of natural resources	Raising the proportion of renewable sources	Strengthening regional cooperation and market functioning
	Improving energy efficiency	Decarbonisation and the advancement of renewable energy
		Increasing energy efficiency

Source: created by the authors based on Energy Strategy of the Republic of Kosovo 2022-2031 (2022), National Development Strategy – 2030 (2022)

Over the past five years, the country's energy intensity has decreased by 10%, but in 2020 this indicator worsened again due to an economic downturn caused by a 4% reduction in gross domestic product. Over the past 10 years, energy intensity has decreased by almost 40%, which is one of the best results in the region. However, despite these achievements, Kosovo's energy intensity is still 25% higher than the Western Balkans average and three times higher than the EU average (Fig. 2). High energy intensity is one of the key issues in the field of energy efficiency in Kosovo. Currently, the Kosovo Energy Efficiency Fund focuses

mainly on investments in public buildings, but further development requires a review of the legal and regulatory framework (Rizvanolli, 2019). Such changes could attract more private investors and promote the development of the Energy service companies (2024) market, which would be a significant step towards improving energy efficiency in the country. In its strategy of integration into regional and European energy markets, Kosovo attaches great importance to strengthening cooperation with Albania. Integration with the Albanian market is seen as an important priority and key goal (Kosovo* 2020 report, 2020).

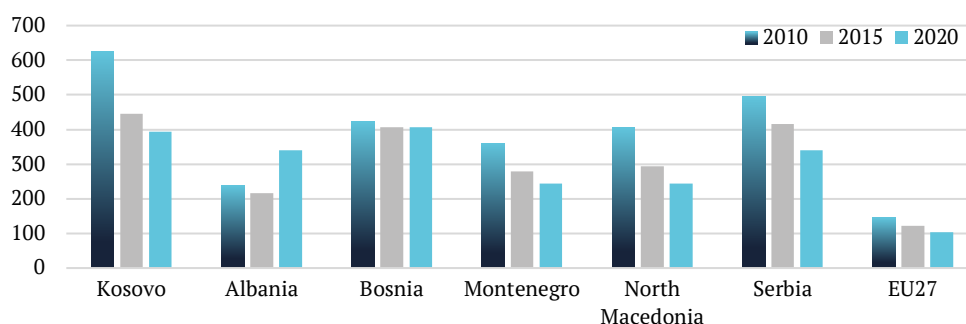


Figure 2. Energy intensity in the Kosovo, Western Balkans and in the EU

Source: compiled by the authors based on OECD (2021)

Despite the short-term economic costs associated with Kosovo's transition to an environmentally sustainable energy system, the long-term potential for development and growth is significant. The initial expenses involved in restructuring the energy sector – such as upgrading infrastructure, implementing new technologies, and adjusting regulatory frameworks – will be offset by various economic and social benefits that emerge over time. One of the key drivers of this transition will be investments in solar and wind energy. These investments will not only create direct employment opportunities during the construction, operation, and maintenance phases of renewable energy projects, but they will also stimulate job creation in related industries. For instance, the renewable energy supply chain – comprising manufacturing, transportation, and distribution of equipment – will see increased demand, which will further bolster employment. Beyond job creation, such investments will make an attractive destination for foreign capital. Foreign direct investment is likely to increase as international investors seek to capitalise on the growing demand for renewable energy in the region. Kosovo's move towards green energy will signal to the global market its commitment to sustainability, which can foster long-term economic partnerships and attract more diverse sources of capital (KSV/024: Energy transition..., 2023).

In addition to financial investments, the transition will drive innovation and technological advancements. As Kosovo develops its renewable energy sector, there will be a growing demand for new technologies, especially in energy storage, grid management, and energy efficiency solutions. The country will have the opportunity to become a hub for green energy innovation, where local and international companies collaborate to develop cutting-edge technologies tailored to the region's specific needs. Over time, these innovations can lead to greater cost reductions in energy production and consumption, making renewable energy more affordable and accessible (KSV/024: Energy transition..., 2023). A critical component of Kosovo's renewable energy policy is the introduction of an auction system for renewable energy projects. This system will ensure transparent and competitive bidding processes, attracting both domestic and international investors to participate in energy projects. The competitive nature of auctions can drive down the cost of renewable energy production by encouraging companies to innovate and offer lower bids, ensuring that Kosovo obtains at more affordable rates. Moreover, the auction system will promote efficiency by rewarding

projects that can deliver energy at the lowest cost, thus optimising the use of available resources.

Reducing losses in energy transmission and distribution networks will help lower costs for consumers and ensure that more of the energy produced is effectively used. This increase in efficiency will make Kosovo's enterprises more competitive, both domestically and internationally, as lower energy costs translate into reduced operational expenses. Businesses that can operate more efficiently will be better positioned to expand, invest in innovation, and enter new markets (The European Green Deal, 2020). The transition to renewable energy will also have far-reaching environmental and social benefits. By reducing greenhouse gas emissions and air pollution, Kosovo will improve public health and contribute to global efforts to combat climate change. A cleaner environment will enhance the quality of life for its citizens and create new opportunities for the development of ecotourism. With its natural landscapes and rich cultural heritage, Kosovo can position itself as a destination for eco-conscious travellers, further diversifying its economy and generating additional income streams.

Energy Statistics Data Browser (2023) and World energy outlook 2023 (2023) will be important tools for Kosovo in mitigating economic losses and developing the energy sector. Energy Statistics Data Browser (2023) provides up-to-date data and analytics on global energy trends that will help Kosovo assess how other countries are reducing energy costs and improving energy efficiency. The data will become the basis for the development of a national strategy for energy development, which will allow optimising energy consumption and reducing dependence on the import of energy resources. In addition to policy development, these tools will support Kosovo's efforts to attract international investment in its energy sector. Investors typically seek markets where there is a clear, data-driven strategy for growth and risk mitigation. By using the IEA's data and aligning its strategy with European trends, Kosovo can demonstrate that it is a forward-thinking, reliable partner for international energy investments. This will be crucial for securing the funding necessary to expand its renewable energy capacity, modernise its grid infrastructure, and invest in innovative technologies that will further drive down costs and emissions.

The Energy Strategy of the Republic of Kosovo 2022-2031 (2022) contains specific strategies and measures aimed at the transition to renewable energy sources, which is relevant for Kosovo. Studying the experience of the EU

in this direction will allow Kosovo not only to integrate renewable energy sources into its energy system but also to attract investments for infrastructure development. In particular, it will contribute to the creation of new jobs in the field of green energy, stimulation of innovation and technological development, which will also positively affect the economic growth of the country. In addition, the European Green Deal provides financial support for countries making the energy transition (Medvedieva *et al.*, 2024). For Kosovo, this opens up the possibility of attracting additional resources for the implementation of projects, which will help not only to reduce dependence on fossil fuels but also to reduce economic losses from fluctuations in energy markets. Implementation of the principles of the European Green Deal will increase the country's energy security and contribute to stable economic development. Therefore, despite the initial costs, the transition to sustainable energy will provide Kosovo with significant long-term benefits. It will contribute not only to the renewal of the economy but also to the creation of new industries that will have a positive impact on the employment of the population, as new jobs will be opened, innovative technologies and ecological construction. The transition to clean energy will also stimulate the development of ecotourism, contribute to the growth of the green economy and increase the country's international competitiveness.

■ DISCUSSION

The results of the study highlight the importance of a strategic approach to reforming the energy industry in the face of modern challenges. Kosovo faces serious economic losses due to its dependence on fossil fuels, especially in light of rising global energy prices and the need to modernise its energy infrastructure. The development of renewable energy sources, such as solar and wind power, opens up prospects not only for reducing energy imports, but also for creating new jobs and attracting investment. The introduction of mechanisms to support innovations and the development of market relations in the field of energy, such as auctions for the implementation of projects from renewable sources, will be an important stage on the way to energy independence (Shahini *et al.*, 2024). Future opportunities for the development of Kosovo's energy sector include the intensification of cooperation with international partners, especially with neighbouring countries and the EU. In particular, integration into European energy markets will allow Kosovo to participate in regional development processes and strengthen its own energy security. Active use of international financial instruments and attraction of investments can significantly accelerate the transition to clean energy sources, which will contribute to the improvement of economic indicators (Shyle *et al.*, 2021).

The study shows some parallels with the results obtained in the work of S. Patnaik *et al.* (2022). Research highlights the importance of integrating renewable energy sources to improve the efficiency of energy systems. The research focuses on the fact that the modernisation of energy infrastructure in Kosovo is critical for reducing dependence on energy imports. At the same time, the works of scientists confirm that the introduction of modern technologies, in particular energy storage systems, can significantly increase the efficiency of distribution systems. A common

aspect of the research is the need for innovation to improve energy stability. The results indicate the importance of attracting international investment for the development of the energy sector, which is consistent with the conclusions of S. Patnaik *et al.* (2022). They noted that integration into European energy markets opens up new opportunities for countries, in particular for Kosovo, in attracting financial resources and creating new jobs.

M. Abid *et al.* (2023) scholars who studied the concept of economic losses and prospects for the development of the power sector. The research carried out by scientists showed that it has a lot in common with the conclusions presented in the work, which showed the importance of the introduction of renewable energy sources to reduce economic losses and improve the environmental situation. The conducted research emphasised that the use of solar and other renewable energies can significantly reduce Kosovo's dependence on energy imports, as well as reduce the costs of energy resources. In this context, the works of M. Abid *et al.* (2023) emphasised the environmental benefits of solar photovoltaic systems, which confirms the need for a transition to sustainable development in the energy sector. It is important to note that the introduction of new technologies requires not only financial investments but also support from the state to create favourable conditions for the development of the relevant infrastructure (Trusova *et al.*, 2022). Both studies indicate that without political will and strategic planning, it is difficult to achieve significant results in this area.

The study on mitigation of economic losses and prospects for development is consistent with the findings presented in M. Banja *et al.* (2020). The study highlights the critical importance of the transition to renewable energy sources for the reduction of pollution and economic losses arising from the use of traditional energy sources. In particular, the study notes that the active implementation of renewable energy sources in Kosovo can significantly improve the environmental situation, which is also confirmed by the conclusions of M. Banja *et al.* (2020). However, if the research of scientists focuses on environmental aspects, the conducted research also points to the importance of social involvement of the community in the process of reforms. Scientists point to risks associated with insufficient communication and public involvement, which can lead to resistance to change. The conducted research emphasises that without a proper information campaign and active involvement of the population, energy reforms can be perceived as imposed, which increases the likelihood of social instability.

The study, which analyses the mitigation of economic losses and the prospects for the development of the energy sector, supports the key ideas presented in the work of A. Gjukaj *et al.* (2024b). In the study, the authors emphasise the need for a strategic approach to the transition to sustainable energy, emphasising the importance of integrating renewable energy sources to ensure economic stability. The results of the conducted research show that the direct implementation of investments in renewable energy sources will not only help to reduce dependence on imported energy carriers but will also create new jobs, which will positively affect the local economy. Studies highlight that a lack of proper communication between the government and the public can lead to a negative perception of reforms,

which in turn increases the risks of social instability. It is important not only to ensure technical changes but also to develop effective information campaigns to raise public awareness of the benefits of sustainable energy solutions.

The research conducted was based not only on the legal aspects but also on the wider economic consequences of the implementation of this environmental policy in Kosovo. While H. Rastegar *et al.* (2024) were quick to argue the importance of legislative alignment with the EU to drive innovation, authors explore how these legal reforms translate into economic opportunities and challenges. Compared to the findings presented in H. Rastegar *et al.* (2024) study on the impact of environmental policy on renewable energy innovation, this study offers a more economically oriented perspective on Kosovo's energy transition. M. Vyas *et al.* (2022) focused on increasing energy production in urban environments through innovations such as solar photovoltaic trees that maximise electricity production while minimising land use. The study emphasised the importance of optimising the ratio of land to electricity in densely populated areas, a concept that aligns with global trends for sustainable development and reducing the carbon footprint. The study did not delve into specific technological innovations, such as photovoltaic trees, but emphasised the broader economic opportunities offered by the integration of renewable energy sources, such as solar and wind, into Kosovo's national energy mix. Therefore, the results of the study are consistent with the ideas of scientists, emphasising that a strategic approach to the integration of sustainable technologies in the energy sector is critically important for reducing economic losses and ensuring sustainable development. It allows not only to reduce emissions but also to strengthen the country's economy, creating new jobs and improving the quality of life of the population.

■ CONCLUSIONS

The study reveals in detail the challenges faced by the country in the process of transition to sustainable energy development, as well as the prospects that open up to the energy sector in the context of integration into the European energy system. Special attention was paid to the issues of energy security, diversification of energy sources and introduction of "green" technologies. The study highlighted the importance of improving the efficiency of energy use and reducing greenhouse gas emissions to achieve sustainable development goals. Key laws were reviewed, such as Law No. 05/1-084 on the energy regulator, which regulates the operation of the country's energy market. It

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is important that the country implement more effective incentives for the development of renewable energy sources and ensure market stability through transparent regulatory mechanisms. A review of Kosovo's legal framework for compliance with European standards has shown progress in reforming the energy sector, but significant gaps remain, particularly in tariff regulation, licensing and market transparency. Analysis of national initiatives, such as the Kosovo Energy Sustainability Activity and Kosovo Energy Security of Supply programs, indicated successes in increasing energy efficiency and the development of renewable sources but also revealed the need for infrastructure modernisation. Economic analysis has shown the potential losses associated with the energy transition, including the risks of job losses in traditional industries such as the coal industry and the significant investment required to modernise the energy system. Despite these challenges, the long-term benefits, including increased energy security and environmental sustainability, far outweigh the short-term economic costs.

In general, the study emphasises the need for further reforms in the legislative framework, ensuring market transparency and attracting investments in energy infrastructure. Only through an integrated approach will Kosovo be able to ensure the sustainable development of the energy sector, compliance with European standards and the achievement of energy security. The main challenges are dependence on coal, an imperfect legal framework and insufficient investment in infrastructure. However, prospects include energy efficiency initiatives, the development of renewable energy sources and integration into European energy programs. Despite the need for significant investment, the transition to "green" energy promises economic and environmental benefits for the country. In the future, it is advisable to investigate several key areas related to the mitigation of economic losses and prospects for the development of the energy sector in the Republic of Kosovo. It is important to analyse the socio-economic factors influencing the implementation of renewable energy sources in order to identify barriers and opportunities for investment. Researching the effectiveness of policies supporting the development of renewable energy will allow improving approaches to attracting financing.

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■ CONFLICT OF INTEREST

None.

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Пом'якшення економічних втрат та перспективи розвитку енергетичного сектору в Республіці Косово

■ **Анотація.** Метою дослідження було провести аналіз поточних економічних проблем в енергетичному секторі Косова та розробка ефективних стратегій їх подолання, зокрема шляхів мінімізації втрат і підвищення стабільності енергетичної системи, а також вивчення можливостей забезпечення довгострокового розвитку та енергетичної безпеки країни. Основна увага була зосереджена на економічному впливі впровадження міжнародних енергетичних стандартів, зокрема європейських, у національну політику та стратегію розвитку Косова. Аналіз підкреслив фінансові вигоди та виклики, пов'язані з приведенням енергетичного сектору країни у відповідність до директив ЄС, зокрема тих, що стосуються відновлюваних джерел енергії та енергоефективності. Ключові сфери дослідження включали економічний потенціал посилення енергетичної безпеки, сприяння розвитку відновлюваної енергетики та зменшення залежності від викопних видів палива. Проведено оцінку економічних наслідків реформ для енергетичного ринку Косова й загальної траєкторії економічного зростання. Дослідження також включало економічний аналіз, яким оцінено можливі економічні втрати, пов'язані з переходом на відновлювані джерела енергії. Розглянуто такі ризики, як втрата робочих місць у традиційних енергетичних секторах, таких як вугільна промисловість, і значні фінансові витрати, необхідні для модернізації інфраструктури. Однак дослідження показало, що довгострокові переваги переходу до «зеленої» енергетики, включаючи підвищення енергетичної безпеки, зменшення залежності від імпорту енергоресурсів і поліпшення стану навколишнього середовища, переважають короткострокові економічні витрати. Результати показали, що хоча економічний перехід супроводжується значними фінансовими витратами, довгострокові вигоди, такі як підвищення енергетичної безпеки та скорочення викидів, є суттєвими. Дослідження підкреслює важливість подальших реформ та інвестицій для забезпечення сталого розвитку енергетичного сектору Косова, а також інтеграції країни в європейське енергетичне середовище

■ **Ключові слова:** модернізація; сталий розвиток галузі; вплив реформ; залучення іноземного капіталу; інноваційні технології