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SOLAR ENERGY AS A DRIVER OF SUSTAINABLE DEVELOPMENT AND SOCIO-ECONOMIC CHANGE IN THE WESTERN BALKANS

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Abstract: The Western Balkans region faces serious energy and environmental challenges. As the majority of electricity is still generated from lignite, this results in high pollutant emissions and makes the region one of the most polluted areas in Europe. This dependence on fossil fuels is not aligned with the legal framework of the European Union nor with the international obligations stemming from the Paris Agreement. It also may slow down the process of European integration. In addition, energy shortages and high electricity prices create political and socio-economic tensions. In this context, solar energy emerges as a key driver of sustainable development and the transformation of the energy sector. Through a systematic review of the literature and relevant reports of international organizations (IEA, IRENA, OECD), the paper explores environmental benefits (reduction of CO_2 emissions and contribution to sustainable development goals), economic aspects (job creation, attraction of investments, development of new industries), and social implications (energy security, improved quality of life, education, and public awareness). Special attention is devoted to the specific challenges of the region, including outdated infrastructure, inconsistent regulatory frameworks, insufficient investment, and limited access to financing. The study demonstrates that solar energy, in addition to reducing coal dependency, has the potential to become a catalyst for broader socio-economic development by strengthening local communities, fostering the creation of green jobs, and enhancing regional cooperation. However, to fully realize this potential, a combination of increased public and private investments, reliable regulatory mechanisms, modernization of energy systems, and international support is required, alongside active involvement of the local population and the promotion of energy literacy. The aim of this review paper is to analyze the role of solar energy in the process of sustainable energy transition and its contribution to socio-economic changes in the region.

Keywords: solar energy, sustainable development, energy transition, Western Balkans.

1. INTRODUCTION

The term “Anthropocene” is being used more frequently by researchers to describe an era where human actions are the primary influence on natural processes, leading to ecological imbalances [1]. Consequently, renewable energy sources are becoming essential because they help decrease greenhouse gas emissions, enhance energy security, and promote long-term social and economic stability [2].

The United Nations’ 2030 Agenda for Sustainable Development, a global initiative, includes 17 Sustainable Development Goals (SDGs). SDG 7, which focuses on providing universal access to affordable, reliable, sustainable, and modern energy, is a key objective [3]. Accomplishing this goal requires a shift to renewable energy sources and enhanced energy efficiency. This process is closely linked to the implementation of the Paris Agreement and the European Green Deal, making it particularly signifi-

cant for the countries of Southeast Europe, including the Western Balkans, which face specific challenges in the energy transition, notably in terms of subsidies, coal dependence, and the need for alignment with European climate objectives.

The Western Balkan countries are participating in the global process of energy transition toward a more sustainable and cleaner energy mix, aimed at reducing pollution and ensuring a fairer distribution of transition costs. Analyses indicate that the financing of the energy sector in the region remains one of the key areas requiring reform. A particular emphasis is placed on the need to reduce fossil fuel subsidies and limit price regulation, while simultaneously introducing social support mechanisms for energy-vulnerable households [4].

The transition to a cleaner energy mix represents both an environmental and a socio-economic challenge. The gradual phase-out of coal would lead to a significant reduction in CO_2 emissions and air pollution, especially in urban areas. At the same time, the development of solar and wind power plants, as well as improvements in energy efficiency, could create new economic opportunities and jobs in the energy sector. Solar energy stands out as a resource with considerable potential. However, this process requires substantial investments and may lead to higher energy prices, which would particularly affect socially vulnerable population groups. This further underscores the importance of designing policies that ensure a fair distribution of the costs and benefits of the energy transition [4].

All countries in the region have set more ambitious targets in line with European and international frameworks, including the Energy Community Treaty, the EU Green Deal and the Nationally Determined Contributions (NDCs) under the UNFCCC process. Over the past decade, most Western Balkan states have increased their emission-reduction commitments and initiated the preparation of National Energy and Climate Plans (NECPs) [4]. These plans indicate that solar energy, together with wind and hydropower, will form the backbone of the region's future energy development [4]. An additional strategic framework for implementing these objectives was established by the 2020 Sofia Declaration on the Green Agenda for the Western Balkans, through which the countries of the region committed themselves to accelerated decarbonisation, the development of a circular economy and the protection of biodiversity in line with the European Green Deal [5]. This declaration confirms the political will to systematically integrate climate and environmental policies into economic planning, thereby positioning solar energy and other renewable sources as key instruments of long-term sustainable transition in the region [5].

2. ENERGY FRAMEWORK AND CHALLENGES OF THE WESTERN BALKANS

The energy system of the Western Balkans is characterized by low, largely regulated energy prices and substantial public subsidies. Such policies discourage investment in renewable energy sources, hinder improvements in energy efficiency, and maintain a high dependency on coal. At the same time, subsidies consume significant public resources that could be more effectively directed toward supporting vulnerable households or modernizing infrastructure. Even Albania, whose electricity system relies almost entirely on hydropower, faces organizational inefficiencies that slow down the green transition [4]. These findings confirm that without subsidy reform, there can be no sustainable shift toward renewable energy.

Between 2018 and 2023, the region allocated approximately EUR 5.8 billion in direct financial support to the energy sector, while low electricity-price policies provided an additional EUR 19.1 billion in indirect (so-called induced) subsidies. If such policies continue, projections indicate that by 2030 the cost of subsidies could exceed EUR 18 billion, which would seriously limit the funds available for decarbonization and modernization of energy systems [4].

The regional energy mix remains heavily based on fossil fuels: the combustion of coal, oil, and wood accounts for over 80% of total primary energy supply. Coal alone provides nearly half of total electricity generation. This structure further highlights the need for greater investment in renewable energy sources — particularly solar systems — which can provide locally available and stable energy, reducing dependence on imports and fossil fuels.

For the Western Balkans, reforming the mechanisms of energy-sector support carries the potential to enable sustainable and inclusive development. The gradual removal of subsidies and the alignment of prices with real costs could create more favorable

conditions for investment in renewables, improve energy efficiency, and free substantial public resources that could be redirected toward infrastructure modernization and social programs aimed at protecting vulnerable households.

The Western Balkan countries are also undertaking the transpose of the EU acquis communautaire and joining the single electricity market in the context of European integration. This includes the unbundling of generation, transmission, and distribution, the dismantling of vertically integrated state monopolies, and setting of a free form wholesale and retail competition for electricity price and volume. While EU rules do make possible provisions protecting households without energy supplies, this needs to be targeted and time-limited, instead of the current trend of a blanket price regime across the region. Thus, the reform of the price and subsidy systems are not only an issue of economic efficiency; they are also a substantial element of prerequisites for the full market-accession of the Western Balkans to the European energy market [4].

3. LEADERS IN DEVELOPMENT AND GLOBAL TRENDS

At the global level, the year 2024 was marked by the dominance of solar photovoltaic (PV) installations within the total capacity of renewable energy. A total of 452 GW of new solar capacity was installed, accounting for roughly three-quarters of all new renewable energy additions. China led the expansion with 277 GW, followed by the United States, India, and Brazil as key markets. Several countries in Southeast Asia and Africa are only beginning to adopt solar technologies more broadly, albeit from a relatively modest starting base [6, 7]. Estimates by IRENA indicate that large-scale systems account for nearly 60% of the world's total installed solar power, confirming the central role of this segment in the ongoing energy transition.

Recent data show that the continued growth of solar capacity is primarily driven by declining costs and climate policies, but increasingly also by new factors such as the electrification of industrial processes, digitalization, and the integration of cleaner technologies. Within the European Union, electricity generation from solar sources reached 251.7 TWh, reaffirming the strategic role of solar power in meeting climate objectives [7].

From a technological standpoint, PV energy remains the leading renewable technology due to its modularity, competitive costs, and potential for rapid scalability. One emerging trend is hybridization — the growing combination of PV plants with battery-energy storage systems (BESS) [8]. These developments confirm that solar power, together with advances in battery technologies and supportive climate policies, represents a cornerstone of the global energy transition.

As highlighted by Farghali et al. [9], these processes have multiple social, economic, and environmental implications and are directly linked, at the global level, to the implementation of the 2030 Agenda for Sustainable Development and SDG 7 – ensuring access to affordable, reliable, sustainable, and modern energy for all [3].

In this context, nanotechnology emerges as driver of the next stage in solar-energy system development. Nanostructured materials and thin films enable significantly more efficient light absorption, reduced energy losses, and improved control of electronic processes within photovoltaic cells. The first generation of solar cells, based on crystalline silicon, continues to dominate the market, while the second generation introduces thin-film semiconductor layers that reduce production costs but typically exhibit lower conversion efficiencies.

Progress is being achieved through the application of nanocrystalline components, which allow for precise control of the energy bandgap and an extended optical path of incident light, leading to lower carrier-recombination rates and higher overall efficiency. Of particular importance are quantum dots – semiconductor nanocrystals that enable multiple electron release per absorbed photon, thereby increasing the theoretical efficiency limit and optimizing the absorption spectrum of sunlight [10, 11]. In this way, nanostructured systems can theoretically achieve efficiencies of up to 40%, opening the possibility for the commercial production of cheaper and more reliable solar energy.

Research on photocatalytic processes on the surfaces of titanium dioxide (TiO_2) has also demonstrated considerable potential in the field of environmental protection, including photocatalytic degradation of pollutants, water purification, and hydrogen production [13]. In parallel, dye-sensitized solar cells (DSSCs) have been developed, combining organic pigments with porous oxide layers (most commonly

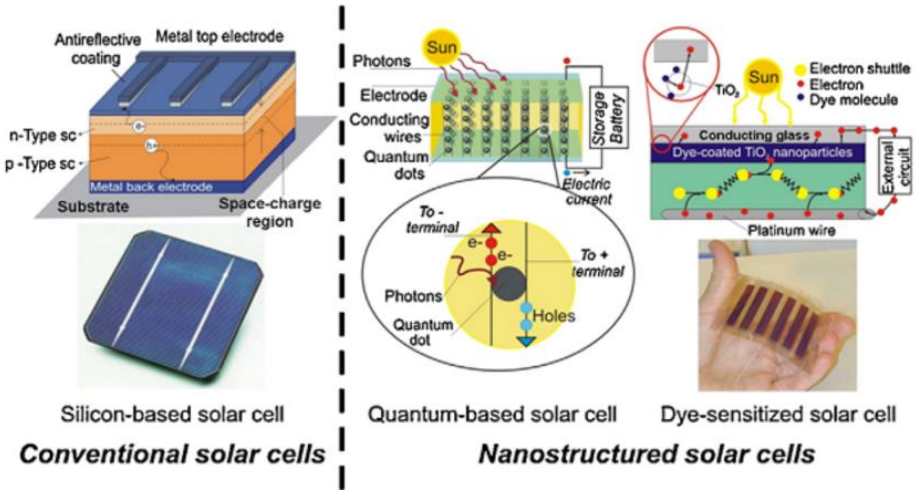

Figure 1. *Comparative overview of conventional and nanostructured solar cells [12]*

TiO_2) to convert light into electrical energy. These cells, known as Grätzel cells, represent a cost-effective alternative to silicon-based systems, as they employ readily available materials such as ruthenium complexes or zinc porphyrins, and provide stable and efficient energy conversion [14].

Further technological progress has led to the development of organic solar cells (OSCs) that use conductive polymers as photoactive materials. Their application enables the fabrication of flexible, lightweight, and low-cost thin-film solar cells that can be integrated into various surfaces and portable devices. These systems, based on the pioneering research of Heeger, Shirakawa, and MacDiarmid, already exhibit laboratory efficiencies of up to 8.6%, although they remain limited by a narrower absorption spectrum and lower charge-carrier mobility [14, 15].

Despite these limitations, ongoing advances in polymer chemistry and nanostructured material design indicate that flexible, efficient, and affordable solar cells will play an increasingly important role in the future global energy transition.

4. ENERGY LANDSCAPE OF THE WESTERN BALKANS

4.1 Structure of energy production

The energy systems of the Western Balkans remain predominantly dependent on fossil energy sources. With the exception of Albania, whose power sector is almost entirely based on hydropower, the other countries rely heavily on coal-fired thermal power plants. The share of coal in electricity generation ranges from 41% in Montenegro to as high as 95% in Kosovo (UN1244). Serbia generates about 67%, Bosnia and Herzegovina 65%, and North Macedonia 51% of their total electricity from coal [16]. Such a structure not only places the region among the largest CO_2 emitters in Europe but also prolongs its misalignment with the European climate-neutrality goals [17].

Most thermal power plants in the region are technologically outdated and operate with low efficiency, requiring costly refurbishments that further extend dependence on lignite. According to Miljević [18], in 2019 alone, the four Western Balkan countries allocated over € 72 million in direct subsidies for coal-based power generation, artificially maintaining low prices while simultaneously discouraging investment in energy-efficient and renewable projects. These subsidies – identified by the OECD [4] as a barrier to the energy transition – consume substantial public resources that could otherwise be redirected toward infrastructure modernization and support for energy-vulnerable households.

The share of renewable energy sources (RES) in the region's gross final energy consumption is around 22% [19]. Hydropower and biomass remain dominant, while solar and wind energy are in the early stages of rapid growth. By 2023, Serbia had reached 3,715 MW of installed renewable capacity, including a significant increase in wind farms and an initial expansion of solar PV systems through net-metering and net-billing schemes [20]. Bosnia and Herzegovina has 2,262 MW of hydropower, 135 MW of wind, and 212 MW of solar capacity, whereas

North Macedonia exceeds 2,100 MW of total renewable capacity, with solar projects gaining strategic priority. Montenegro has developed over 800 MW of capacity, predominantly hydropower, but with an increasingly important share of wind farms and pilot solar installations. Although Albania remains hydropower-dominated, its system's vulnerability during droughts has prompted the accelerated deployment of solar power plants as a necessary diversification measure [20].

An additional challenge stems from biomass consumption — over 40% of households in the region rely on firewood for heating, often using inefficient stoves, which contributes to air pollution and health risks [21]. Small hydropower plants, despite previous growth, account for only about 5.4% of total generation, while their negative ecological impacts have led to increasing opposition from local communities. In this context, the future direction of the regional energy sector will primarily focus on solar and wind power projects, accompanied by the gradual phase-out of lignite and the reduction of unsustainable biomass use [22].

4.2 Energy market and infrastructure

The energy markets of the Western Balkans are formally liberalized, but in reality, they remain low-competitive and strongly influenced by state-owned companies. Serbia has the most developed market, where SEEPEX operates as a "day-ahead" exchange, with growing trading volume and liquidity. However, the Electricity Integration Package (EIP) has not been fully transposed, which has led to infringement procedures within the framework of the Energy Community [20]. In North Macedonia, MEMO was established in 2023 as a national market operator with daily auctions, but these relate to a relatively small percentage of total consumption. Montenegro has launched the MEPX exchange, while Bosnia and Herzegovina continues to exhibit limited market dynamics, partly as a result of its complex institutional structure and the distribution of regulatory responsibilities within the energy sector. Albania, although hydro-dominant, has regulatory weaknesses that make full liberalization and integration into the regional market more difficult. The gas sector in the region is particularly underdeveloped. Serbia still depends on a long-term contract with Gazprom, while North Macedonia is attempting diversification through new interconnections with Bulgaria and Greece. Montenegro and Albania are only developing the basic regulatory frameworks for the gas market, while Bosnia and Herzegovina remains limited by weak infrastructure [20]. Transmission and distribution infrastructure shows significant losses and obsolescence, which makes the integration of solar and wind capacities more difficult. The lack of smart grids and balancing capacities limits the potential of renewable energy sources. In this context, decentralized production through solar panels is gaining a key role because it allows the reduction of network losses and increases the resilience of local communities.

4.3 Social awareness and political priorities

The energy transition in the Western Balkans cannot be viewed only as a technical and economic process, but as a strongly political and social issue. Although all the countries of the region have formally accepted decarbonization goals in accordance with European and international frameworks, the transition process is often driven by external pressures (EU integration, international donors), while the participation of citizens and civil society is still limited [20]. Bosnia and Herzegovina faces a low level of citizen involvement in decision-making. Electricity subsidies maintain social peace but at the same time discourage modernization and investment in renewable sources. Serbia has developed mechanisms for universal service and protection of vulnerable consumers, but the dominant policy still relies on lignite, which makes political consensus on the green transition more difficult. North Macedonia can be singled out as a positive example – in 2023, a program for vulnerable consumers was introduced, which includes subsidies for energy-efficient appliances, building insulation, and the installation of solar panels, thus moving closer to European standards of a just transition. Montenegro has legally regulated energy communities and net metering, which opens space for active citizen participation in solar energy production. Albania remains institutionally weak and with a low level of public consultations, which limits the democratization of the energy sector. A common denominator for the entire region is strong political resistance to reforms of fossil fuel subsidies. According to the OECD report [4], in the last five-year period, there has been a significant amount of direct and indirect support to the energy sector, predominantly

directed toward the production and consumption of energy from fossil fuels. Such measures maintain the appearance of social protection but at the same time slow down the development of renewable sources and increase the fiscal burden. In this context, solar energy takes on a dual role: as an instrument of energy security and as a means of social inclusion. The installation of photovoltaic panels in households and local communities can provide predictable costs, reduce energy poverty, and create new jobs. Thus, solar energy is confirmed as a key element of a sustainable and socially just transition.

5. GLOBAL COST TRENDS AND TECHNOLOGICAL ADVANCEMENTS IN SOLAR ENERGY

The global energy system is undergoing a profound transformation in which renewable sources are becoming the dominant component of new electricity generation. During 2024, the total global renewable energy capacity increased by 582 GW, representing a 19.8% rise compared to the previous year and marking the highest annual growth to date [7]. In the same period, as many as 91% of new renewable energy projects delivered electricity at a lower cost than the cheapest new fossil fuel plants. The average levelized cost of electricity (LCOE) for solar energy amounted to 0.043 USD/kWh, while for onshore wind it was even lower, 0.034 USD/kWh [7]. This confirmed that solar power has become one of the most competitive energy sources worldwide, with cost stabilization indicating a mature market.

The continued decline in costs within the photovoltaic (PV) sector is also reflected in the fall of total installed costs (TIC) for utility-scale projects, which in 2024 averaged 691 USD/kW, representing a reduction of 87% compared to 2010 and 11% less than in 2023. Module prices in Europe reached a historic minimum, ranging from 0.08 to 0.27 USD/W, with an average decline of 97% between 2010 and 2024 [23].

Regional cost differences persist, primarily due to variations in market maturity, local regulations, and labor costs. These differences indicate that the competitiveness of solar energy largely depends on vertical integration of manufacturing, a stable regulatory framework, and efficient project approval procedures. The decrease in the cost of solar modules and systems results from several factors:

– technological innovations such as bifacial, TOPCon, and heterojunction (HJT) cells that increase efficiency;

– reductions in balance-of-system (BoS) costs;

– progress in manufacturing processes, standardization of modules, and optimization of materials;

– strong competition within global supply chains, especially in China, which produces 79% of global polysilicon and 97% of solar wafers [24].

In 2024, the global renewable energy sector prevented fossil fuel consumption worth 467 billion USD, confirming that solar energy is not only economically viable but also strategically important for energy security and the stability of national economies. Although the market is stabilizing, challenges remain — limited access to financing in developing economies, supply chain bottlenecks, and administrative barriers continue to slow implementation. Removing these obstacles and modernizing power grids, including the development of battery storage systems and digitalization of energy processes, represent key conditions for further growth of solar energy and the achievement of sustainable transition goals [6–8].

6. SOLAR TECHNOLOGIES AND TRENDS IN EUROPE AND THE WESTERN BALKANS

Europe recorded a strong expansion of solar energy in 2024, with a total of 251.7 TWh of electricity produced from solar PV systems, marking a historic record [7]. The main drivers of growth were technological progress and European policies supporting the accelerated energy transition.

The price of solar modules in Europe reached its lowest level to date in 2024 — between 0.08 and 0.27 USD/W, on average 22% lower than in 2023 [23]. The countries of the Western Balkans are recording an accelerated increase in small- and medium-scale projects. The decrease in equipment prices, simplified administrative procedures, and growing interest in grid-connected microgeneration systems contribute to the expansion of the regional solar market.

Over the last decade, the Western Balkans have recorded a steady rise in investment in solar technologies, as confirmed by the latest data from the International Renewable Energy Agency (IRENA) [25]. Compared to the period before 2020, the installed capacities and electricity generation from

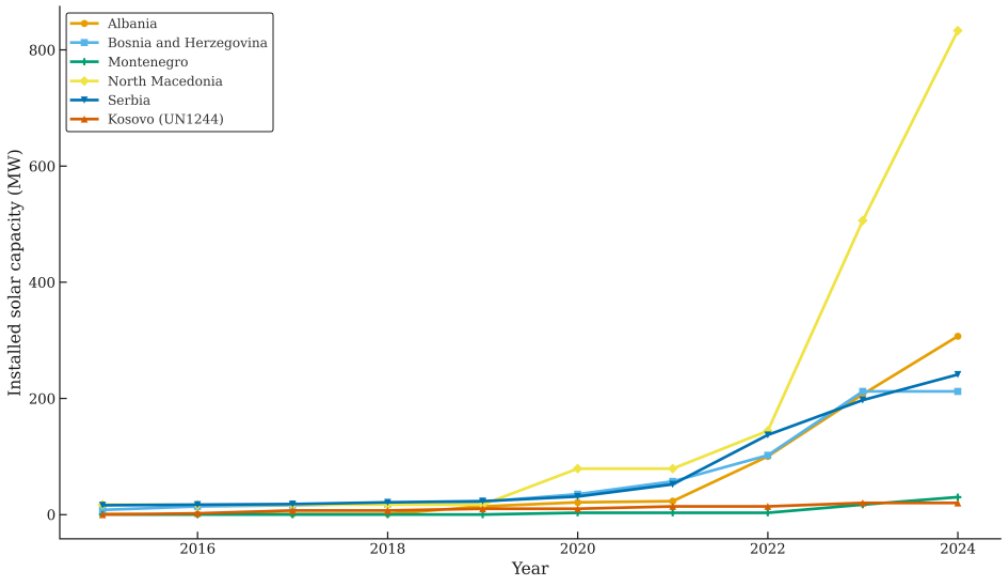

Figure 2. *Growth of installed solar energy capacity in the Western Balkan countries (2015–2024) [25]*

solar sources have multiplied, as shown in Figure 2. This trend clearly indicates the beginning of a more intensive energy transition in the region, aligned with European decarbonization goals.

In Table 1, the data on annual solar energy production in the Western Balkan countries for the period 2015–2023 are presented, providing insight into the development dynamics and inter-country differences within the region.

Such data confirm that the Western Balkan countries are entering a phase of accelerated development of solar energy, characterized by a pronounced increase in installed capacities and production after 2020. Although the total amount of electricity generated remains significantly lower compared to the European Union member states, the growth trend indicates an increasingly strong integration of renewable energy sources into the region's power mix. Further progress depends on the continuous development of the regulatory framework, investment incentives, and modernization of grid infrastructure, which will enable a sustainable and long-term increase in the share of solar energy in total consumption.

7. SOCIO-ECONOMIC AND ENVIRONMENTAL IMPACTS OF SOLAR ENERGY

Solar energy in the Western Balkan region plays an increasingly significant role in supporting sustainable development and the ongoing energy transition. Its application contributes to poverty alleviation, employment growth, improved public

Table 1. *Solar energy production in the Western Balkan countries [25]*

Year	Albania (GWh)	Bosnia and Herzegovina (GWh)	Montenegro (GWh)	North Macedonia (GWh)	Serbia (GWh)	Kosovo (UN1244) (GWh)
2015	1	9	0	23	19	0
2016	1	24	0	24	19	0
2017	1	21	0	24	23	1
2018	1	21	0	23	24	2
2019	22	30	0	23	28	11
2020	32	45	2	24	35	10
2021	41	72	3	51	59	16
2022	161	114	3	101	148	14
2023	297	253	17	355	178	9

health, and the reduction of negative environmental impacts. In rural areas, solar projects create new jobs during the stages of manufacturing, installation, and system maintenance, thereby stimulating local development and reducing depopulation. According to Arvanitopoulos and Agnolucci [26], each additional 1 GWh of electricity generated from renewable sources can create approximately 3.5 new jobs, while global analyses indicate that renewable energy sources employed around 9.8 million people in 2016 [27]. In the Western Balkan countries, which face high unemployment rates and pronounced regional economic disparities, the development of solar energy can have long-term positive effects through the creation of so-called "green jobs" and the strengthening of local entrepreneurial activity.

The social impacts of solar energy are also reflected in improvements to public health and gender equality. By reducing the use of biomass and firewood in households—particularly in rural areas—exposure of women and children to smoke and indoor air pollution decreases, thereby contributing to the achievement of Sustainable Development Goals related to health and equality (SDG 3 and SDG 5). Additionally, the development of solar projects promotes energy democracy by encouraging the participation of citizens and local communities in energy cooperatives and shared ownership models (prosumer models).

From an economic perspective, the implementation costs of solar technologies have significantly declined over the past decade, making these technologies competitive—and even cheaper—than conventional energy sources. Although initial investments still represent a challenge, especially for small producers, the long-term reduction in operating costs and the stability of energy generation make solar power plants a financially sustainable solution [28].

The environmental dimension further strengthens the case for expanding solar energy. Since solar power plants do not release CO_2 during operation, they help reduce greenhouse gas emissions and contribute to better local air quality. In this way, solar energy is not only a cleaner alternative to conventional electricity production but also an important factor that can support broader socio-economic changes and advance sustainable development across the Western Balkan region.

8. CONCLUSION

Solar energy occupies a central position in the process of sustainable energy transition in the Western Balkan region, whose development has for decades relied on coal and fossil fuels. The analysis shows that solar energy has the potential to simultaneously address three regional challenges—environmental, economic, and social. As the most widespread and accessible renewable source, solar energy enables the reduction of greenhouse gas emissions, diversification of the energy mix, and strengthening of energy security, thereby contributing to the fulfillment of international climate commitments and sustainable development goals.

In the economic sphere, the solar sector is becoming a generator of new investments and employment, stimulating local development and contributing to the reduction of regional inequalities. Its continued growth, however, will depend on creating stable and transparent regulatory conditions, upgrading grid infrastructure, and ensuring that the costs of the energy transition are distributed fairly. Phasing out subsidies that favor fossil fuels and redirecting public support toward innovation and small-scale producers are essential steps in building a more sustainable and resilient energy system.

From a social perspective, solar energy transcends its technical dimension and becomes a means of community empowerment and energy democracy. By enabling citizens and local communities to actively participate in energy production, it creates the foundation for social inclusion and reduction of energy poverty.

Viewed within the broader context of the Western Balkans, solar energy should not be understood merely as a technical solution, but as an indicator of a new development approach. Its expansion points to a deeper transformation of regional energy policies and long-term planning, while simultaneously strengthening alignment with contemporary European climate and energy standards. In this sense, the development of solar energy becomes a clear indicator of the region's readiness to actively engage in the global energy transition.

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СОЛАРНА ЕНЕРГИЈА КАО ПОКРЕТАЧ ОДРЖИВОГ РАЗВОЈА И ДРУШТВЕНО-ЕКОНОМСКИХ ПРОМЕНА ЗАПАДНОГ БАЛКАНА

Сажетак: Регион Западног Балкана суочава се са озбиљним енергетским и еколошким изазовима, јер већину своје енергије и даље производи из лигнита, што резултира високим емисијама загађујућих материја и чини га једним од најзагађенијих подручја у Европи. Оваква зависност од фосилних горива није усклађена са правном тековином Европске уније нити са међународним обавезама из Paris Agreement-a, што може успорити процес европских интеграција. Поред тога, енергетски недостаци и високи трошкови електричне енергије стварају политичке и друштвено-економске тензије. У таквом контексту, соларна енергија се намеће као кључни покретач одрживог развоја и трансформације енергетског сектора.

Кроз систематичан преглед литературе и релевантних извештаја међународних организација (IEA, IRENA, OECD), рад истражује еколошке бенефите (смањење емисија CO_2 и допринос циљевима одрживог развоја), економске аспекте (отварање нових радних места, привлачење инвестиција, развој нових индустрија) и социјалне импликације (енергетска сигурност, побољшање квалитета живота, образовање и подизање свести). Посебна пажња посвећена је специфичним изазовима региона, укључујући застарелу инфраструктуру, неуједначене регулаторне оквире, недовољно улагање и ограничен приступ финансирању.

Рад показује да соларна енергија, поред своје улоге у смањењу зависности од угља, има потенцијал да постане катализатор ширег друштвено-економског развоја кроз јачање локалних заједница, развој „зелених“ послова и унапређење регионалне сарадње. Међутим, да би се овај потенцијал остварио, неопходна је комбинација повећаних јавних и приватних улагања, поузданих регулаторних механизама, модернизације енергетских система и међународне подршке, уз активно укључивање локалног становништва и подизање нивоа енергетске писмености. Циљ овог прегледног рада је да анализира улогу соларне енергије у процесу одрживе енергетске транзиције и њен допринос друштвено-економским променама у региону.

Кључне ријечи: соларна енергија, одрживи развој, енергетска транзиција, Западни Балкан.

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