

REVIEW

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# Challenges of the green transition for the recovery of the Western Balkans

Jelena Ignjatović<sup>1</sup>, Sanja Filipović<sup>2\*</sup> and Mirjana Radovanović<sup>3</sup>

## Abstract

**Background** The aim of this paper is to reconsider the necessity for the green transition and the key preconditions for the implementation of a circular economy in Western Balkan countries. With the objective of the research in mind, the method of analysis and synthesis was applied to determine (1) regulatory and institutional prerequisites for the green transition; (2) the need for the Western Balkan countries to redefine the model of sustainable economic growth towards the green transition; (3) the development opportunities for recovery defined in the Green Agenda for the Western Balkans; and (4) the possibility of implementing the circular economy in the Western Balkans.

**Main text** The main findings of the research indicate that: (1) the countries of the Western Balkan region, following the example of the EU, should define a national strategic approach to the green transition with an accompanying action plan and regulatory framework; (2) the biggest challenge of the green transition is the reform of the energy sector and the restructuring of the energy-intensive economy; (3) the countries have untapped potential in renewable energy sources and report the improvement of energy efficiency; (4) the circular economy can boost the green transition, because the countries of the region have a five-time lower value of resource productivity than the average of the EU, while the generation of waste (excluding major mineral wastes) per GDP unit is lower compared to the EU; (5) cross-sectoral governance should be more coordinated.

**Conclusions** The green transition might be a development opportunity for the Western Balkans, which should enable sustainable economic growth as well as energy security and environmental protection. However, the implementation of the Green Agenda is not easy, because the region faces the problem of underdeveloped regulatory and institutional capacities that might provide not only the base for long-term planning but also financial resources for the efficient implementation of projects. In addition, it is essential to understand the principles of the Green Agenda and the interaction of all activities that should enable the achievement of defined goals.

**Keywords** Green transition, Green deal challenges, Sustainable development, Circular economy, Western Balkan

## Background

Since 2022, sustainable development has faced many challenges, which build on the transformations that have occurred over time. In the beginning, international initiatives were focused on reducing certain harmful emissions, while the social, economic, and ecological dimensions of sustainable development were recognized over time. Moreover, the interdependence and the need to balance economic growth, social well-being, and environmental protection have been highly prioritized.

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The process of reaching an international agreement on the activities that should contribute to the green transition based on socio-economic and environmental principles is long. First, it should be noted that the green transition is a long-term process that implies a shift towards economically sustainable growth and an economy based on low-carbon solutions rather than on fossil fuels and excessive consumption of natural resources [1].

The first environmental initiative at the global level was the Montreal Protocol, signed on September 16, 1987 [2]. The goal of the Montreal Protocol was to protect the ozone layer; however, it did not meet expectations, because it had several shortcomings, and above all, it was not obligatory for signatories. In addition, this agreement did not promote sustainable development, nor did it develop measures in accordance with national circumstances.

For the first time, the international community set the goal of reducing greenhouse gas (GHG) emissions at the 1992 United Nations Framework Convention on Climate Change (UNFCCC) [3]. Shortly after the entry into force of the UNFCCC [4], negotiations began in 1994 and resulted in the signing of the multilateral Kyoto Protocol in December 1997 [5]. The Kyoto Protocol aimed to reduce GHG emissions in the first implementation period of 2008–2012 for 37 industrialized countries and the European Union (EU). Developed countries have committed to reducing GHG emissions by 5% compared to 1990, while EU member states have committed to reducing GHG emissions by 8% [6]. Unlike the Montreal Protocol, the Kyoto Protocol was binding, and it represented the promotion of sustainable development goals, highly prioritizing energy efficiency, sustainable agriculture, and the development of adequate measures at the national level [7]. Significant progress was the adoption of mechanisms for joint implementation of the Protocol (International Emissions Trading, Joint Implementation, and the Clean Development Mechanism), which set the milestone for further action and cooperation between developed and developing countries [8].

Even though most countries ratified the Kyoto Protocol in 2005, it did not meet expectations and failed to bring environmental stability to the global level. The reason for that was the refusal of the United States, as the largest emitter, to ratify it and Canada's withdrawal from the Protocol in 2011. No concrete measures have been implemented in most countries for years, and developing countries have drastically increased their emissions, worsening the level of total GHG globally. In December 2012, in Doha (Qatar), a second commitment period was signed under the Kyoto Protocol (the Doha Amendment). Signatory parties committed to reducing GHG emissions in the period 2013–2020

by at least 18% (compared to 1990 levels). More than 15 years after the Kyoto Protocol entered into force, the public, faced with the steady growth of GHG emissions, once again poses the question of how to reach a consensus on the need to address global warming [9].

The Paris Agreement was adopted on December 12, 2015, at the 21st Conference of the Parties to the UNFCCC, with the aim of providing global action to address climate change beyond 2020 [10]. The Paris Agreement is the first legally binding climate agreement that applies to all countries to mitigate global warming. This agreement defines the forms for climate neutrality (afforestation, investments into renewable energy sources, carbon tax on imported products produced in countries that are not committed to climate neutrality, etc.). In addition, the Paris agreement defines the terms of financial and technical support for developing countries, technology transfer, and capacity building.

Unlike the Kyoto Protocol, which obligates developed countries to reduce gas emissions, the Paris Agreement requires the contribution of all countries in the world in the form of nationally determined contributions (NDC), as well as taking national measures to achieve goals and reporting on progress. To meet the goals and raise the ambitions to a higher level over time, countries must submit updated NDCs every 5 years, while each new NDC must be more ambitious than the previous one. Compared to other countries, the EU has advanced the most, thanks to political decisions and reforms envisaged by the European Green Deal [11], the strategic document that provides the framework for further economic development.

The EU highly promotes the green transition as a long-term process of transformation and decarbonization of the economy that should promote well-being through a new sustainable model of economic development while ensuring socio-economic and ecological aspects of sustainable development [12]. The green transition is a comprehensive process that, in addition to energy, includes all sectors of the economy that can apply business models contributing to decarbonization and respect for the principles of the circular economy. Hence, in all its public policies, the EU stands for systemic support for green innovations, technologies, and investments [13] and sets such expectations for all candidate countries.

The Western Balkan countries have a great challenge in the process of green transition, similar to other countries that are not part of the EU [14]. On one hand, as countries striving to become EU members, they have an obligation to accept the EU commitments to reduce GHG emissions. On the other hand, the structure of their economy is characterized by high energy and carbon

intensity, which results in high environmental pollution and high dependence on energy imports.

Therefore, a realistic assessment of the specificities of the Western Balkans, which are of particular importance for the sustainable development of the region, is necessary to be able to perceive transition recovery in the Western Balkan countries in accordance with the goals promoted in the Green Agenda for the Western Balkan region.

## Main text

### Green transition in the EU—key prerequisites

The Roadmap to the Green Deal [15] is a long-term development strategy [16] adopted by the European Commission in December 2019 with the aim of making Europe the first climate-neutral continent by 2050 (emission reduction by 55% compared to 1990). While all the EU members individually strive to become climate neutral, five of the EU member states have legally set a goal of climate neutrality—Sweden by 2045 and Denmark, France, Germany, and Hungary by 2050.

The priority of the Green Deal is the transition to clean energy and sustainable use of resources, and this direction of development should create new opportunities for innovation, investment, and job creation. The benefits of the Green Deal should be fresh air, clean water, healthy soil, and biodiversity; renovated, energy-efficient buildings; healthy and affordable food; more public transport; cleaner energy and cutting-edge clean technological innovation; longer-lasting products that can be repaired, recycled, and re-used; future-proof jobs and skills training for the transition; a globally competitive and resilient industry [12, 17].

The EU has integrated climate neutrality into its regulatory framework. Namely, in 2021, the first European Climate Law was adopted [18], including a set of 55 regulations, of which the most important are:

- the revised Renewable Energy Directive that increases the obligation to participate in the production of renewable energy sources by 8% by 2030;
- the revised Energy Efficiency Directive that introduces a public sector obligation to renovate 3% of publicly owned buildings each year;
- the revised Energy Taxation Directive that introduces new forms of taxation of energy products in line with climate goals;
- new regulations to promote higher standards for car and van emissions;
- the revised Alternative Fuels Infrastructure Regulation, which includes the installation of infrastructure for charging electricity and fuel;

- a new set of regulations as a guideline for land, forest, and agricultural use towards achieving EU carbon removal targets.

In addition, all the EU member states agreed that all direct or indirect subsidies for fossil fuels should be abolished by 2025 [19]. The new regulatory framework for the transport sector anticipates that emissions trading will cover road traffic after 2026 while simultaneously promoting subsidies for increased use of renewable energy sources and investments in new clean technologies. In addition, for the aviation sector, the introduction of a tax on pollution and sustainable aviation fuels is proposed, with the obligation to take on sustainable blended fuels for all departures from EU airports. In maritime transport, it is proposed to extend carbon pricing to this sector and reduce the use of polluting fuels that locally pollute the environment.

Leading the fourth industrial revolution [20], the green transition represents an opportunity for European industry to create markets for clean technologies and products, which will affect value chains in energy, transport, and construction. Electrification of the sustainable economy and greater usage of renewable energy might result in higher employment rates in these sectors. Increasing the energy efficiency of buildings should create jobs in construction, with a demand for local labor.

Considering that many EU companies are importers from countries and regions outside the EU, the conditions for unfair competition are created. It is defined that importing companies must pay the carbon price, for which a special Cross Border Adjustment Mechanism (CBAM) is provided [21]. CBAM is an additional tax that the EU imposes on the import of carbon-intensive products (iron and steel, aluminum, cement, fertilizers, electricity, and hydrogen) from non-EU countries to prevent carbon leakage (transfer of production into countries with less strict climate policies and import of these products into the EU) [22]. Introducing this tax directly increases the product price, so it negatively affects the price competitiveness of the selected product and thus redirects consumption from countries that do not tax carbon emissions.

It is widely accepted that the use of renewable fuels will substantially reduce energy consumption, emissions, and energy costs for consumers and industry. It is also important that the energy tax system supports the green transition by giving minimum tax rates to support vulnerable citizens. The EU has created a new Just Transition Fund to assist the regions within the EU that are most exposed to energy transition due to their energy- and carbon-intensive industry structures or fossil fuel-based electricity systems.

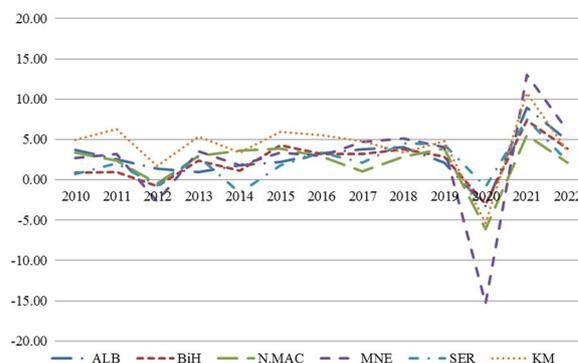
The Effort Sharing Regulation is an initiative that sets national targets for reducing GHG emissions to help the EU meet its obligations under the Paris Agreement. In sectors that account for over 60% of total emissions (transport, agriculture, buildings, and waste management), the plan is to reduce emissions by 30% by 2030 compared to 2005 [23]. As a guarantee for member states to participate in the EU efforts to reduce emissions coming from these sectors, minimum binding annual GHG emission targets for EU countries have been set. The capacity to reduce emissions varies among member states [24, 25], since the targets are defined depending on the gross domestic product (GDP). The safety margin with a total of 105 million tons of CO<sub>2</sub> equivalent will be created and available in 2032, but it is also intended to help less wealthy EU member states achieve their goals for 2030. Although the reserve will be available only if the EU achieves its goal by 2030, under strict conditions, some flexibility will be possible if EU countries borrow and transfer annual allocations of emissions from 1 year to the next.

Despite the EU’s strategic commitment to the decarbonization process, the need for resilience as a new compass for EU policies was open to discussion. Resilience is necessary for the EU (and individual countries) to withstand global challenges and adapt to them, but also to endure transition in a sustainable, fair, and democratic manner [26]. Numerous challenges that arose as a result of COVID-19 and the energy crisis were pointed out not only by the EU economy [27] due to unstable energy supply, high volatility of food and resource prices, and supply chain disruptions [28], but also by the entire society, in which vulnerable groups are the most exposed.

The 2020 Strategic Foresight Report [29] and A Strategic Compass for Security and Defence [30] are examples of Europe’s efforts to enhance its resilience, especially in relation to climate, defense, and energy, shaping responses in the area of green and digital transitions. In light of the fact that resilience requires flexibility and rapid processing and that the green transition is a complex and long-lasting process, it is evident that, especially after 2022, the EU is facing a gap in areas such as energy, food, and resources in the absence of valid data on the scale and consequences of the aforementioned issues.

**Main drivers of the green transition of the Western Balkans**

The Western Balkan region consists of five states (Albania, Bosnia and Herzegovina, Montenegro, North Macedonia, and the Republic of Serbia) and Kosovo and



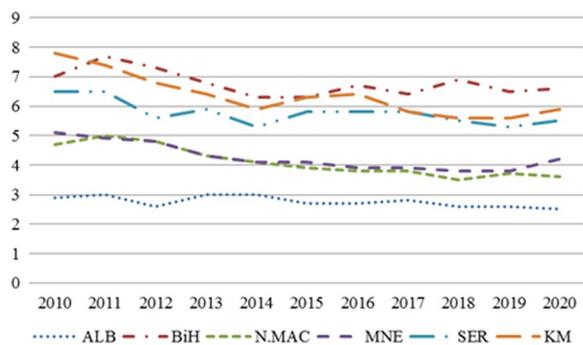
**Fig. 1** Real rates of GDP (%) for the Western Balkans, 2010–2022. [34]

Metohija,<sup>1</sup> which have ambitions to become members of the EU [31]. Although all of these countries, with the exception of Albania, were once part of the Socialist Federal Republic of Yugoslavia (SFRY), their levels of sustainable economic development, industrialization, and performance differ today.

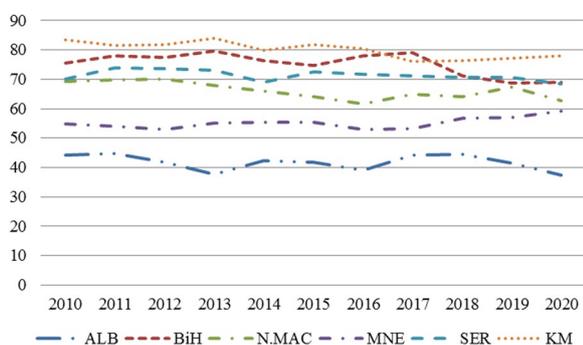
After the disintegration of SFRY, the countries of the region have remained highly oriented towards each other, and since 2000, they have been intensively developing trade and investment relations [32]. After a period of economic crisis in 2008 [33], when the whole region recorded a recession, the average growth rate for the period 2010–2022 was only 2.7%. The second wave of the economic crisis (2012) pushed the region into recession (– 0.26%), as well as the COVID-19 crisis in 2020, when the recession was – 5.66% [34]. In 2021, the region experienced a rapid recovery from the recession, when GDP growth was 5.9% on average and 3.7% in 2022 [34]. Therefore, GDP growth is projected at 2.6% in 2023, 3.1% in 2024, and 3.5% in 2025 [35]. Figure 1 shows real GDP rates for Western Balkan countries and KM.

After the COVID-19 crisis, the economy revived, but energy intensity remained at a high level, which pointed to the need to diversify the energy mix and supply sources. As the energy sector is the largest emitter of carbon dioxide [36], and the economy itself is more energy-intensive than the EU average [37], the countries of the Western Balkan region are looking for a solution in the energy transition [38]. The results of research in this area show that the issue of energy intensity is one of the key problems that will determine the duration, costs, and success of the green transition in the region of the Western Balkans [39], and that the data on the above must be monitored and considered in detail.

<sup>1</sup> All references to Kosovo in this document should be understood in the context of United Security Council Resolution 1244 (1999).



**Fig. 2** TES/GDP (GJ/thousand 2015 USD) for the Western Balkans, 2010–2020 [40]

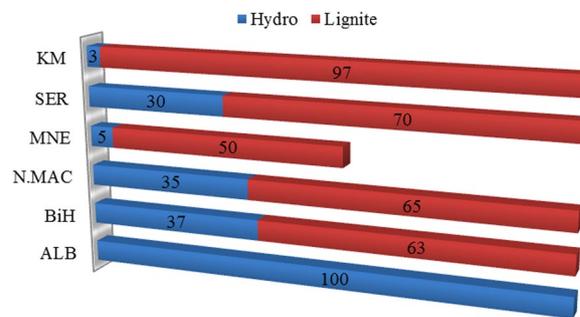


**Fig. 3** CO<sub>2</sub>/TES (t CO<sub>2</sub>/Tj) for the Western Balkans, 2010–2020 [40]

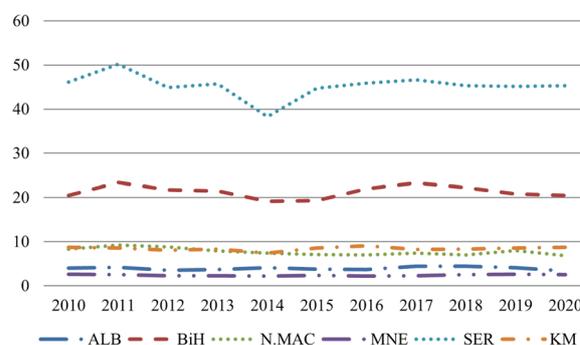
The average values for Total Energy Supply (TES)/GDP for the period 2010–2020 show that the value for the Western Balkan region was 5 GJ/thousand 2015 USD, while the average value for the EU was 3.4 GJ/thousand 2015 USD. Bosnia and Herzegovina had the highest energy consumption per unit of GDP produced (6.7 GJ/thousand 2015 USD), followed by KM (6.3 GJ/thousand 2015 USD), Serbia (6.7 GJ/thousand 2015 USD), Montenegro (4.2 GJ/thousand 2015 USD), and North Macedonia (4.1 GJ/thousand 2015 USD). Albania had the lowest energy intensity (2.7 GJ/thousand 2015 USD) (Fig. 2).

Considering the 2010–2020 period, the average values of CO<sub>2</sub> emissions from fuel combustion (CO<sub>2</sub>/TES) for five Western Balkan countries (61.9 tCO<sub>2</sub>/Tj) were ten times higher than in the EU (6.1 tCO<sub>2</sub>/Tj) (Fig. 3). KM had the highest CO<sub>2</sub> emissions from fuel combustion (80.0 tCO<sub>2</sub>/Tj), followed by Bosnia and Herzegovina (75.2 tCO<sub>2</sub>/Tj), Serbia (71.3 tCO<sub>2</sub>/Tj), North Macedonia (66.1 tCO<sub>2</sub>/Tj), and Montenegro (55.1 tCO<sub>2</sub>/Tj). Albania had the lowest CO<sub>2</sub> emissions from fuel combustion (41.7 tCO<sub>2</sub>/Tj).

The Western Balkan region is a large emitter of CO<sub>2</sub> in the energy sector, because electricity production is based on coal-fired thermal power plants [34, 41], with the exception of Albania, where hydropower plants are



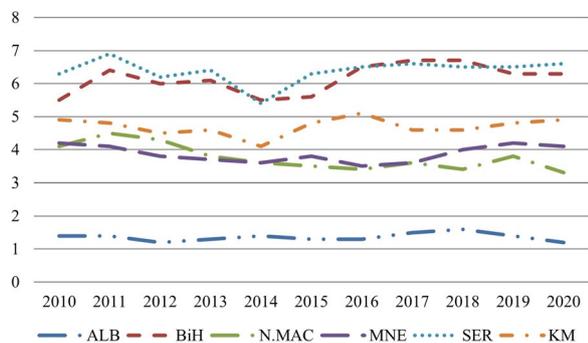
**Fig. 4** Structure of the electricity production (%) for the Western Balkans [41]



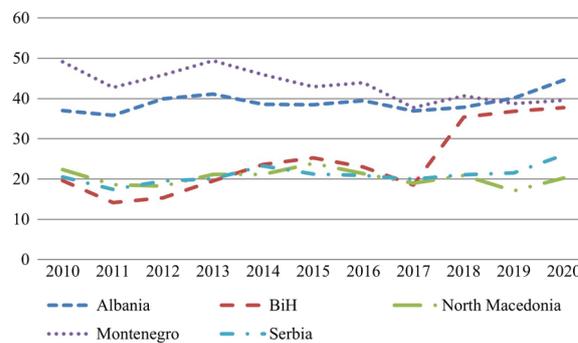
**Fig. 5** CO<sub>2</sub> emissions (Mt of CO<sub>2</sub>) for the Western Balkans, 2010–2020 [40]

the main source of electricity production (Fig. 4). In total, there are 15 coal-fired thermal power plants (of which 5 are in Bosnia and Herzegovina, 2 in North Macedonia, 1 in Montenegro and KM, and 6 in Serbia) with a total capacity of 8706 MW (Bosnia and Herzegovina 2008, KM 1288, North Macedonia 824, Montenegro 210, and the Republic of Serbia 4376). Most existing production capacities were built about four decades ago, and 92% of the hydroelectric capacities were built in the period 1955–1990. Most thermal power plants are outdated, with a high percentage of GHG gas emissions [42], so they require significant investments in modernization, primarily the installation of modern filters [43]. The EU insists on legal obligations to reduce emissions from thermal power plants below the level defined in the National Emission Reduction Plans, which represents a particular challenge for countries that predominantly rely on coal as an energy resource.

When comparing absolute CO<sub>2</sub> emissions in the period 2010–2020, it is evident that EU emissions are higher (7639.1 Mt of CO<sub>2</sub>) than the Western Balkans average (16.1 Mt of CO<sub>2</sub>), as shown in Fig. 5. The largest emitter in the Western Balkans is the Republic of Serbia (average 45.2 Mt of CO<sub>2</sub>), followed by Bosnia and Herzegovina



**Fig. 6** CO<sub>2</sub> emissions per capita (t CO<sub>2</sub>/capita) for the Western Balkans, 2010–2020 [40]



**Fig. 7** Renewable energy consumption (% of total final energy consumption) for the Western Balkans [34]

(21.3 Mt of CO<sub>2</sub>), KM (8.4 Mt of CO<sub>2</sub>), and North Macedonia (7.7 Mt of CO<sub>2</sub>).

Albania (3.9 Mt of CO<sub>2</sub>) and Montenegro (2.4 Mt of CO<sub>2</sub>) have the lowest emissions. The energy sector is the most responsible for high GHG emissions. The power sector is based on obsolete thermal power plants that use lignite as a fuel (except in Albania, which has hydroelectric capacity). Figure 5 shows annual CO<sub>2</sub> and CO<sub>2</sub> emissions for the period 2010–2020.

When analyzing the CO<sub>2</sub> emissions per unit of GDP for the period 2010–2020, it is evident that emissions in the Western Balkans were higher (0.8 CO<sub>2</sub>/2015 USD) than the EU average (0.2 CO<sub>2</sub>/2015 USD). KM (1.36 CO<sub>2</sub>/2015 USD) and Bosnia and Herzegovina (1.29 CO<sub>2</sub>/2015 USD) recorded the highest levels of emissions on average. They are followed by the Republic of Serbia (1.11 CO<sub>2</sub>/2015 USD), North Macedonia (0.77 CO<sub>2</sub>/2015 USD), and Montenegro (0.58 CO<sub>2</sub>/2015 USD), while the lowest level of CO<sub>2</sub> emissions per unit of GDP was recorded in Albania (0.34 CO<sub>2</sub>/2015 USD). Comparing the CO<sub>2</sub> emissions per capita in the same period, the average emission in the EU is higher (6.0 t CO<sub>2</sub>/capita) than in the Western Balkans (4.3 t CO<sub>2</sub>/capita). The highest emissions were recorded in the Republic of Serbia (6.4), Bosnia and Herzegovina (6.1), and KM (4.7), whereas lower emissions were reported by Montenegro (3.9), North Macedonia (3.8), and particularly Albania (1.4). Figure 6 shows annual CO<sub>2</sub> emissions per capita for the Western Balkan region.

Western Balkan countries committed to increasing the participation of renewable energy sources in electricity production by 2020 and reaching specific targets. The goals were achieved by Albania, which has a share of renewable energy sources in electricity production of 44.5% (the target was 38%), and Montenegro, where the share of renewables was 39.5% (the target was 33%). However, three countries did not achieve the targets for 2020, even though they have unused potential [44]—the

share of renewables in electricity production in Bosnia and Herzegovina was 37.7% (target 40%), in North Macedonia 20.2% (target 28%), and in Serbia 27% (target 26%) [34, 45]. The share of RES in the total energy consumption (TFEC) in the EU, according to the 2020 World Bank data, was 21.12% [34], while the target for 2020 was 20% [45]. Data for KM is not available, as shown in Fig. 7.

Targets for 2030 range from 32 for KM to 52% for Albania (Montenegro 50%, Bosnia and Herzegovina 43.6%, the Republic of Serbia 40.7%, and North Macedonia 38%). Among the countries of the Western Balkans, the anticipated increase compared to the 2020 objectives was greatest for Montenegro and smallest for Bosnia and Herzegovina. Accordingly, with the achievement of these targets, Albania and Montenegro will cover half of the final energy consumption in 2030 with renewable energy resources.

### Circular economy in the green transition of the Western Balkans

The circular economy is one of the main pillars of the Green Deal that may contribute to sustainable development, because it advocates the transition from the linear economy based on the intensive exploitation of non-renewable natural resources [46–50]. There are more than 100 definitions of the circular economy. However, it is most frequently depicted as a combination of reduce, reuse, and recycle activities [51, 52]. According to scientific literature relative to circular economy, there are different systematic approaches towards the basic principles of circular economy [53–57]. However, the following five might be seen as the most used in practice:

- Using renewable energy sources and materials;
- Product as a service, in effect rethinking products, so that they become a service;
- Creating sharing platforms;
- Extending the useful life of products; and

**Table 1** Indicators for measuring the circular economy progress in the EU [67]

Production and consumption	Waste management	Secondary raw materials	Competitiveness and innovation	Global sustainability and resilience	
Material footprint	Generation of municipal waste per capita	Recycling rate of municipal waste	Circular material use rate	Private investment and gross added value related to circular economy sectors	Consumption footprint
Resource productivity	Food waste	Recycling rate of all waste, excluding mineral waste	Contribution of recycled materials to raw materials demand	Persons employed in circular economy sectors	GHG emissions from production activities
Waste generation per capita	Generation of packaging waste per capita	Recycling rate of packaging waste by type of packaging	Trade in recyclable raw materials	Patents related to recycling and secondary raw materials	Material import dependency
Generation of waste excluding major mineral wastes per GDP unit	Generation of plastic packaging waste per capita	Recycling rate of waste of electrical and electronic equipment separately collected			EU self-sufficiency for raw materials

Eurostat categories and indicators for measuring progress in the circular economy

- Reusing and regenerating products or components.

The idea of transforming waste [58] into a resource to prevent further waste generation is not new—it was already present in previous European strategies [59]. Even though the literature is mostly critical of circularity, highlighting its inability to fulfill the environmental ambitions of the EU [60], the European Commission is expected to intensify the application of circular economy principles in the economy [61].

The EU aims to implement the principles of the circular economy and use available market instruments and mechanisms [62] to promote a circular model of production and consumption [63]. Accordingly, in 2015, the European Commission adopted “An EU Action Plan for the Circular Economy” [64]. In 2020, it adopted “The New Circular Economy Action Plan for a Cleaner and More Competitive Europe”; and in 2022, it published a set of two packages of proposals for encouraging the circular economy [65].

“An EU Action Plan for the Circular Economy” is based on the implementation of the global obligations of the EU states in achieving the goals of sustainable development until 2030, especially the goals of production, consumption, waste management, the cycle from waste to resources, priority areas (plastics, food waste, biowaste, investment materials, investment products, and raw materials) as well as monitoring progress towards a circular economy.

“The New Circular Economy Action Plan” is based on the sustainable products initiative to support circular product design, with a special focus on textiles, construction, electronics, and plastics [65]. The European Commission released its first set of plans to support the circular economy in April 2022. These included the

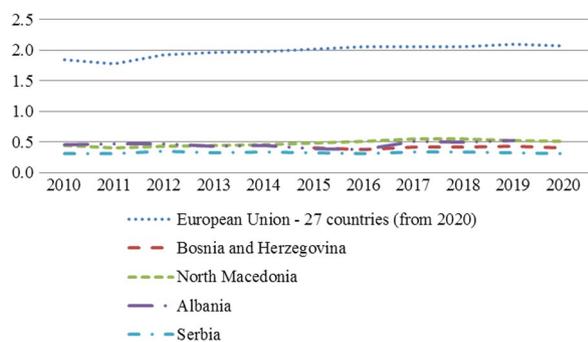
proposal for a regulation on ecodesign for sustainable products, the EU Strategy for Sustainable and Circular Textiles, and the proposal for a directive on empowering consumers in the green transition. The second set of proposals was adopted in November. It included the Proposal for Revision of EU Legislation on Packaging and Packaging Waste, the EU policy framework on biodegradable and compostable plastics, and the Proposal for the EU Carbon Removal Certification Framework [65].

To monitor progress in the implementation of the circular economy in the EU countries [66], Eurostat uses five categories (production and consumption, waste management, secondary raw materials, competitiveness and innovation, and global sustainability and resilience) with relevant indicators, as shown in Table 1.

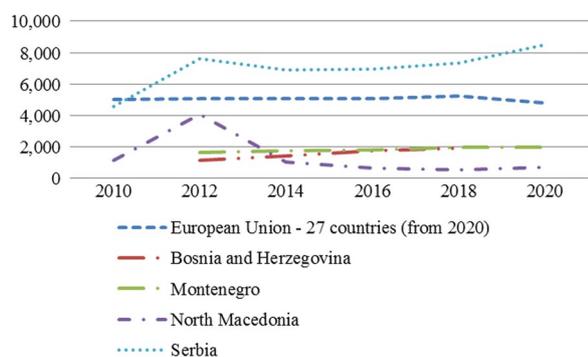
Not all the data for Western Balkan countries are available for all indicators, which implies insufficient monitoring of indicators at the national level. Data are available for the Production and consumption (indicators for Resource productivity, Waste generation per capita, Generation of waste excluding major mineral wastes per GDP unit, and Generation of municipal waste per capita) categories, as well as for the Global sustainability and resilience (indicator Material import dependency) category.

Considering Resource productivity (GDP divided by material consumption in households) [68], the average value for the EU was 1.987, and for the Western Balkan region it was 0.418 Euro per kilogram. The values for North Macedonia were 0.482, for Albania 0.455, and for Bosnia and Herzegovina 0.41, while the Republic of Serbia reported values slightly above the average of 0.325 (Fig. 8). Data for Montenegro are not available.

Waste generation per capita shows the total waste produced in the country, including large mineral waste,



**Fig. 8** Resource productivity (Euro per kilogram), 2010–2020 [68]

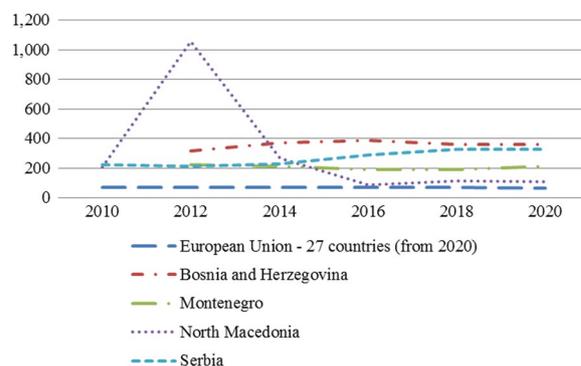


**Fig. 9** Waste generation per capita (kilograms per capita), 2010–2020 [69]

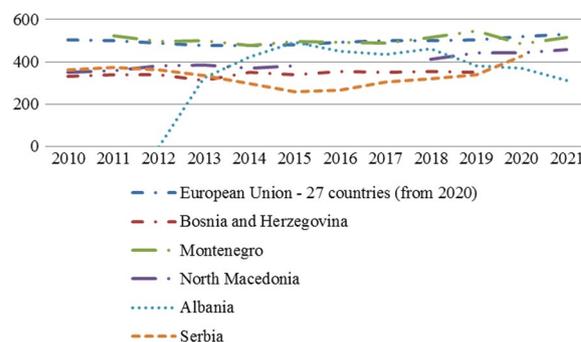
divided by the average population of the country [69]. The average value for the EU was 5048 kg per capita, and the value for the Western Balkan region was 3125. The value for the Republic of Serbia was 6683, for Montenegro 1837, for Bosnia and Herzegovina 1571, and for North Macedonia 1376 kg per capita (Fig. 9). Data for the observed period are not available for Albania.

Generation of waste excluding major mineral wastes per GDP unit shows all waste generated in a country (in mass units), excluding major mineral wastes, per GDP unit [70]. The average value for the EU was 67 kg per thousand euro, and the average value for the Western Balkans was 284 kg per thousand euro. The value for Bosnia and Herzegovina was 359, for North Macedonia 306, for the Republic of Serbia 266, and for Montenegro 204 kg per thousand euro (Fig. 10). Data for the observed period are not available for Albania.

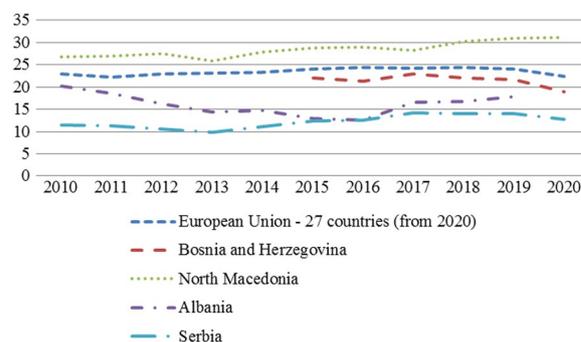
Generation of municipal waste per capita measures the waste (from households, commerce, offices, and public institutions) collected by or on behalf of municipal authorities and disposed of through the waste management system [71]. The average value for the EU was 498 kg per capita, and for the Western Balkans 397 kg per capita. The value for Montenegro was 504 kg per



**Fig. 10** Generation of waste excluding major mineral wastes per GDP unit (kg per thousand euro) [70]



**Fig. 11** Generation of municipal waste per capita (kg per capita), 2010–2021 [71]



**Fig. 12** Material import dependency (%), 2010–2020 [72]

capita, for Albania 406 kg per capita, for North Macedonia 398 kg per capita, for Bosnia and Herzegovina 343, and for the Republic of Serbia 332 kg per capita (Fig. 11).

Material import dependency (the ratio of imports over direct material inputs) shows the extent to which an economy relies upon imports to meet its material needs [72]). The average value of this indicator for the EU was 23% and 20% for the Western Balkans. The value for North Macedonia was 28%, for Bosnia and Herzegovina

22%, for Albania 16%, and for the Republic of Serbia 12% (Fig. 12). Data for the observed period are not available for Montenegro.

### **The challenges of the green transition for the Western Balkan region**

The Western Balkan countries, striving to become EU members, signed the Green Agenda for the Western Balkans in December 2020, within the initiative for the future enlargement of the EU. The Green Agenda aims to help the Western Balkan countries prepare for EU accession by adopting harmonized standards and defining development priorities. The document is completely in line with the European Green Deal.

There are five priority areas of the Green Agenda for the Western Balkans: decarbonization, the circular economy, pollution reduction, sustainable agriculture, and biodiversity [73].

Decarbonization or reduction of GHG gases by 2050 is considered a priority, which implies a rapid transition from coal and oil to renewable energy sources while respecting the specificities of the region and the need to preserve the economic sector and the social position of citizens. In light of the above (although there are no studies on this topic), the circular economy may be one of the adequate ways to reduce GHG emissions in the Western Balkans [74]. This is because it is based on sustainable production by encouraging the use of secondary raw materials and developing an efficient waste management system with a focus on planning and implementation at the local level, rural development, and employment of hard-to-employ categories of the population, all of which represent the real needs of the Western Balkan region.

Pollution reduction is one of the biggest issues in the region of the Western Balkans, so in addition to strict control and sanctioning, the Green Agenda proposes the development of publicly available systems for monitoring the level of pollution and its origin, which is undoubtedly a particular need of the region. The circular economy supports sustainable agricultural production and development of rural areas as essential priorities based on organic production and strict legal frameworks and standards for land conservation through reduced use of synthetic chemical pesticides and fertilizers. The above is particularly important for the Western Balkan countries, which have significant agricultural resources but are characterized by predominantly intensive agricultural production [54].

The countries of the Western Balkans, as contracting parties of the Energy Community, pledged to work with the EU to create a climate-neutral Europe, which includes defining national energy and climate goals by 2030 as well as developing and implementing its

national energy and climate plans with clear measures that will reduce GHG emissions [75]. It was agreed that the first steps would be to encourage the introduction of a tax on carbon dioxide emissions, develop market models for the use of renewable energy sources, and phase out subsidies for coal. It is expected that alignment with the EU Emissions Trading Scheme (EU ETS) will continue, as will the introduction of other emission taxation models that promote decarbonization in the region. Steps towards implementing the Green Agenda include cooperation in preparing an assessment of the socio-economic impact of decarbonization on each country and at the regional level.

For the implementation of the Green Agenda for the Western Balkans, an investment plan for the period 2021–2027 was adopted [76]. The investment plan envisages EUR 9 billion of investments through the Instrument for Pre-Accession Assistance (IPA), of which 30% is earmarked for energy transition. The IPA package is designed to support the long-term green socio-economic recovery of the region by introducing European standards and defining development priorities.

However, for successful implementation of the Green Agenda and the green transition in general, it is necessary to overcome certain problems that exist in the Western Balkan region. The economic and energy development of the region, as well as the high investments required for the green transition, pose the greatest challenge for the economically disadvantaged countries of the observed region. Namely, as the whole region (except Albania) is highly dependent on coal-fired power plants, the region finds the elimination of coal subsidies to be a significant blow to the existing power industry and mines, which can cause socio-economic problems, because these industries employ a large number of workers. In addition, since the price of electricity has been primarily a social category subject to state regulation in the Western Balkans for decades, the switch to ecological (and, therefore, more expensive) sources of energy may result in price increases and put a lot of pressure on all citizens [77]. Furthermore, coal is the backbone of the nation's energy security, which has become a priority issue after 2022; accordingly, this aspect should not be overlooked in future green transition plans [78].

Introduction of the CBAM mechanism will result in higher prices for selected products, so products from the Western Balkan region will not be competitive on the European market. Therefore, the transformation of the energy sector [79] and industry is necessary. At the same time, the green transition is a development opportunity for the integration of Western Balkan companies into the EU supply chain, promotion of sustainable agriculture and food production, and complete reduction of

pollution, thereby improving the quality of life and health of its citizens.

Another major problem is the lack of capacity for long-term planning and writing projects for international funding. By and large, all countries in the region do not have enough staff with specific knowledge to initiate the writing of internationally funded projects at the level of their governments.

In addition, the lack of intersectoral cooperation in the region at the governmental level and the incompleteness of the public reform process may impede the consistent implementation of the Green Agenda [80]. Not only does better coordination of public administration slow down the efficient withdrawal of investment funds, but it also hinders the efficient use of own budget resources. It can be assumed that this is frequently due to the absence of a hierarchy of priorities and a clear vision of investments that contribute to meeting the goals defined in the Green Agenda.

The biggest problem with the green transition in the Western Balkan region is the high proportion of old coal power plants and energy-intensive industries. In addition, it seems that there is a lack of political will and strategic planning. The big challenge for the region is also related to the creation of climate plans at the national level, which have been postponed for an indefinite period of time. Moreover, the challenges relate to corruption in state energy companies through irregularities and the risk of corruption in public procurement [81], as well as a lack of rule of law and accountability [82].

The countries of the Western Balkan region have great potential for the production of energy from renewable sources, but also for energy savings in the heating sector (insulation of buildings and houses) and electricity generation. The Western Balkan countries have made progress in implementing European regulations, which is crucial, because full compliance with European regulations is one of the conditions for EU membership. In addition, harmonization may attract green investments in the housing and public sectors for the transition to the green economy [83].

## Conclusions

By adopting the Green Deal in December 2019, the EU defined the long-term goal of becoming a climate-neutral continent by 2050. After that, it adopted the first Climate Law, which introduced the defined goal of climate neutralization into law. The whole process was completed with the adoption of a long-term financial plan and a set of 55 regulations that define all the

necessary steps to enable the implementation of the Green Deal. The aim of this paper is to consider the potential for the green transition in the Western Balkan region, where the research results confirm the following:

- 1) The need for the green transition in the Western Balkan region arose due to the need to move to a model of sustainable economic development that will, at the same time, enable sustainable economic growth, efficiency improvements, and reduction in energy and carbon intensity. Accordingly, the countries of the region should define their national strategies for the green transition based on the development of an action plan and regulatory framework following the EU model.
- 2) The biggest challenges for the green transition in the Western Balkan region are the reform of the energy-intensive economy and the reform of the power sector, where the old coal-fired thermal power plants dominate. On the other hand, the countries of the region have renewable energy resources that are not used enough. Although all countries had committed to increasing the share of renewable energy sources in electricity production, only Albania and Montenegro had met the targets by 2020.
- 3) Circular economy might be an appropriate approach towards green transition, since the Western Balkan region has five times lower resource productivity than the EU, while the generation of waste (excluding major mineral wastes) per GDP is almost the same. At the same time, both regions have a high material import dependency.
- 4) The Green Agenda represents a development opportunity for the countries of the region, because it enables the integration of the Western Balkans into the EU supply chain, sustainable agriculture and food production, and a complete reduction of pollution, all of which will improve the quality of life and health of citizens. However, there are numerous obstacles to the consistent implementation of the Green Agenda. Disrupted cross-sectoral governance and an incomplete public administration reform process pose significant obstacles that make it difficult not only to attract EU funding sources but also to make efficient use of existing budget resources. Without further efforts in the implementation of the Green Agenda, the Western Balkan region will continue to lag behind the developed world, so further alignment with EU standards and laws is necessary for the green transformation of these economies.

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### Author contributions

Jl prepared literature review and data processing. SF made paper structure and analysis. MR takes part in preparation of the manuscript draft. All authors participated in manuscript editing and approved the final manuscript.

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### Availability of data and materials

The data sets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

### Declarations

#### Ethics approval and consent to participate

Not applicable.

#### Consent for publication

Not applicable.

#### Competing interests

The authors declare that they have no competing interests.

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