How Are the Balkan Countries Progressing Toward Green Economy?

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Abstract: Green growth mitigates greenhouse gas emissions and prevents environmental degradation. It creates new growth engines and jobs. A green economy is characterised as a public good. In it, income growth and employment should be driven by public and private investment (UNEP, 2011).

The main purpose of this paper is to present a general picture of green growth for the Balkan countries that are not part of the European Union, as well as to evaluate the indicators where these economies have performed better and where they need to intervene in order to improve. To achieve this goal, the paper uses data obtained from OECD.Stat.

The OECD Green Growth data source contains specific indicators to monitor improvement through green growth. We selected data for five Balkan countries that are not part of the European Union (Albania, Serbia, Montenegro, Bosnia and Herzegovina, North Macedonia) for the years from 1990 to 2020. The variables used in this paper are indicators of green growth, and we will use them to observe which of the countries taken in the study has progressed more towards green growth.

The results of the paper guide governments to design relevant policies in those variables where they have performed the weakest.

Keywords: Economy opportunities, environment, green growth, natural assets, policy responses, quality of life, resource productivity.
JEL Classifications: F64, F43, F69.

INTRODUCTION

During the 2008 financial crisis, the green economy emerged as a policy approach to prevent environmental degradation and create incentives for economic growth. It aimed to create new jobs in the field of green technology and clean energy. Green growth focused on absorbing investments and innovations that supported sustainable development and offered new economic opportunities. At this time, the green economy became the main objective of European economic development strategies.

This new economic model was developed in opposition to the traditional model based on the "*take, make, and dispose*" principle. The green economy, in particular, is defined as "*a system of economic activity related to the production, distribution and consumption of goods and services that results in greater well-being for people in the long term, avoiding the exposure of future generations to risks environmental and ecological insufficiency*" (Cinzia Galimberti, 2016).

The European Environmental Agency gives us the definition of the green economy as "combining increased resource efficiency with environmental sustainability, while increasing well-being and equality in society".

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UNEP states that "*a green economy is one that focused on human and natural factors and can also create high-wage jobs*" (UNEP, 2007). In 2011, UNEP enriched the word "green" to refer to an economy that is not only efficient, but also fair.

National green growth strategies should promote environmentally friendly behavior for businesses and consumers. They should allocate labor, capital and technology towards greener activities and provide incentives for the development of ecological innovations (OECD, 2011b; Kasztelan, 2017).

Acording to Green Economy Coalition[1] there are 5 principles of green economy:

- The wellbeing principle, (A green economy enables all people to create and enjoy prosperity.)
- The Justice Principle, (The green economy promotes equity within and between generations).
- The Planetary Boundaries Principle, (The green economy safeguards, restores and invests in nature).
- The Efficiency and Sufficiency Principle, (The green economy is geared to support sustainable consumption and production).

[1] The 5 Principles of Green Economy | Green Economy Coalition

- The Good Governance Principle, (The green economy is guided by integrated, accountable and resilient institutions).

A green economy enables all people to create and enjoy prosperity means that green economy is people-centred it focuses on economic wealth, prioritizes investment and access to the sustainable natyral systemand also creates green jobs.

The green economy promotes equity within and between generations means that green economy is inclusive and non-discriminatory, promotes the equitable distribution of opportunity and outcome, promotes empowerment of MSMEs, takes a long-term perspective on the economy and seeks a fast and fair transition and covers its costs.

An inclusive green economy ecognizes and nurtures nature's diverse values, nvests in protecting, growing and restoring biodiversity, soil, water, air, and natural systems and is innovative in managing natural systems.

The green economy supports sustainable consumption and production this means that green economy is low-carbon, resource-conserving, diverse and circular.

The economics studies suggest that there is a need to have a stable and predictable macroeconomic environment in order to attract local and foreign investment. According to Candauda Arachchige Saliya Candauda Arachchige Saliya. Driving Forces of Individual Investors in Stock Market Participation. [ref]: vol.19.2021. available at: https://refpress.org/ref-vol19-a8/, investment is one of main factor that affect economics growth.

The main purpose of this paper is to present a general picture of green growth for the Balkan countries that are not part of the European Union, as well as to evaluate the indicators where these economies have performed better and where they need to intervene in order to improve.

The variables that we have chosen for the analyses are: Production-based CO_2 productivity, Renewable energy supply, Renewable electricity, Forest resource stocks, Annual surface temperature, Development of environment-related technologies, Mean population exposure to PM2.5 and Biomass.

We have chosen Production-based CO_2 productivity because it represents the first (The green economy is people-centred, third (It invests in protecting, growing and restoring biodiversity, soil, water, air, and natural systems) and fourth (low-carbon) principle of green economy.

Renewable energy supply represents the fifth principle (interests of society), forest resource stocks represent first, third and forth principle of green economy (green and decent livelihoods, invests in protecting natyral system, shift to limit consumption of natural resources to physically sustainable levels if we are to remain within planetary boundaries and low carbon. Annual surface temperature represents the fifth principle of green economy (good governance). Development of environment-related technologies represents third and fifth principle of green economy (planetary boundaries, good governance). Mean population exposure to PM2.5 and Biomass represents first, forth and fifth principle of green economy (people-centred, low carbon, good governance).

LITERATURE REVIEW

Green growth is an approach to promote economic growth while conserving the natural resources on which societal well-being relies. Green growth policies can help countries sustainably manage their natural resources for future generations, reduce poverty, generate economic growth and employment opportunities, develop infrastructure, improve water and sanitation quality, diversify energy sources, reduce greenhouse gas emissions and provide more secure livelihoods for populations that depend on natural resources. (Ivana Capozza and Rachel Samson, 2019).

The green economy, according to various international organizations, is based on three main objectives: the efficient use of resources, the protection of the environment and the increase of social equality. The green economy is considered as a tool and prequisite for sustainable development (Europian Commission, 2020). It improves human well-being and social equity and reduces environmental risks and ecological insufficiency (UNEP.February 2018). This economy promotes economic development and preserves the natural resources necessary for social well-being (OECD, May 2011). Society can use resources efficiently, increasing human well-being and simultaneously the natural systems that support us (EEA Report No 2/2014). The green economy seeks to bring long-term societal benefits to short-term activities aimed at mitigating environmental risks. (UNCTAD, 2011)

Karl Burkart (2021) defines that the green economy is based on six main pillars: renewable energies, ecological constructions, clean transport, water management, waste management, rehabilitation of polluted areas.

According to the European Environment Agency (2014) the green economy based on three main pillars: ecosystem, economy and social welfare.

The terms green economy and sustainable development are often used interchangeably to mean the conservation of environmental resources for future generations, but they address different dimensions of social well-being. Sustainable development is a much broader concept than green growth, which mainly considers the economy-ecology nexus. Sustainable development includes all forms of investment and technological innovation that are relevant to the economy. Green growth involves only economic growth through investments and innovations that lead to better environmental quality.

According to OECD (2017), green growth means fostering economic growth and development by ensuring that natural resources continue to provide the environmental goods and services on which our well-being relies. To do this, "*it must absorb the investments and innovations that will support sustainable growth and create new economic opportunities*[2]".

Brundtland Report (1987)[3], defines sustainable development as "*development that meets the needs of the present without compromising the ability of future generations to meet their own needs*", while biologist Liz Allen (2021) Kates et al. (2005) says that sustainable development consists of 3 pil-

[2] Home | OECD iLibrary (oecd-ilibrary.org)
[3] 1987: Brundtland Report (admin.ch)

lars: sustainability economic, environmental sustainability and social sustainability.

Lin-NaHao et.al. in their empirical model they argue that there is an inverse relationship between green growth and CO2 emissions. This study utilizes second generation panel data method(s), i.e., Cross-Sectionally Augmented Autoregressive Distributive lag (CS-ARDL) model.

Zouhaier Hadhek in his research paper has studied the relationship of economics growth and CO2 emissions for developing countries with different samples and different empirical studies. Acording to him the relationship is importand and we showld reduce the emisions of CO2 to progress toward Green Economy

Renewable energy supply represents a very important challenge for green growth. The development of sectors that promote clean energy provides new opportunities in economic development by creating new jobs and reducing poverty (OECD, 2008). Jie Chen et al. confirm the significant impact that renewable energy sources such as hydropower plants, solar panels and wind have on economic growth. They suggest that governments develop these industries to achieve the advantages of ecological sustainability and economic stability.

Forests are vitally important natural resources with global reach, thus becoming an effective good without distinction of borders. Forests occupy about 1/3 of the earth's surface, with about 4 billion ha, suffering losses over the years. A significant part of the forest area lies in Europe with about 25.07% of the world total, making it one of the richest regions with forests, with more than 40% of the land covered by them. In the Balkan region, the area is 30 million ha, which constitutes 23% of the total area of the region. Hannah Ritchie and Max Roser (2020).

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We see the direct impacts of forests in:

- Impact on the quality of life (oxygen, drinking water, the habitat of many forms of life is destroyed, etc.).

- Impact on the climate (floods, temperature drop, erosion, etc.).

- Impact on socio-economics, (source of livelihood, reduce poverty, promote tourism, development of the wood industry, etc.)

The study by Söderholm (2020) emphasizes that green economic strategy is to promote the development of sustainable technologies. Abid, N., Ceci, F., & Ikram, M. (2022) emphasizes the two-way connection between green growth and technological innovation in environmental protection. Innovation also affects the reduction of CO2 (Hashmi & Alam), 2019) which, taking into account the positive relationship it has with economic growth, we can say that green growth is not possible without green technologies (Aghion, Hemous, & Veugelers, 2009). Air pollution exposure poses the greatest risk to health. PM2.5 is considered one of the indicators that increases the risk of lung and heart diseases (OECD, 2023). High levels of PM2.5 have been responsible for the death of 8.8 million deaths in 2015 (Lelieveld et al., 2020). Other authors such as (Feng et al., 2016, Balakrishnan et al., 2019) also emphasize a correlation between high levels of PM2.5 and health. The increase of green spaces would positively affect the reduction of PM2.5 and consequently cardiovascular and respiratory diseases (Marselle et al., 2021, Salmond et al., 2016, Mueller et al., 2022.

"Biomass can become an important source of local energy and can replace fossil fuels. In this perspective, many countries are well positioned to benefit from the successful development of biomass in energy" Milagros Riva Saiz.

There are the same technologies and plant capacity that of Proven Biomass-to-Energy (IFC., 2017).

- Combustion plants using a water/steam boiler
- Combustion plants using ORC technology
- Biogas production with gas engine

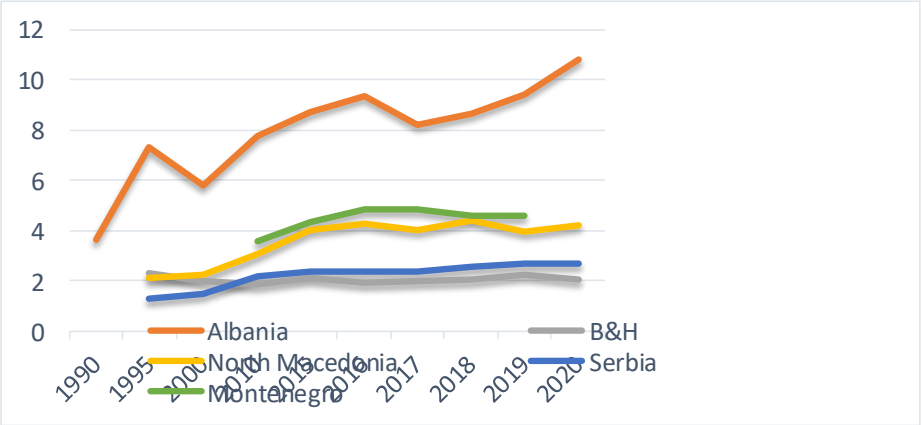
Many authors have emphasized the importance of Biomass, exposure to PM2.5, technologies, forest, renewable energy and CO2 in creating a green economy and therefore green growth.

METHODOLOGY

To achieve the goal, the material uses data generate from OECD.Stat. The OECD Green Growth database contains selected indicators for monitoring progress towards green growth. The database we have selected includes five Balkan country that are not part of EU (Albania, Serbia, Montenegro, Bosnia-Herzegovina, North Macedonia). The indicators have been selected according to well-specified criteria and embedded in a conceptual framework, which is structured around four groups to capture the main features of green growth: environmental and resource productivity, the natural asset base, environmental dimension of quality of life and economic opportunities and policy responses.

The variables that we have chosen for the analyses are: (x1)-Production-based CO_2 productivity (GDP per unit of energy-related CO_2 emissions), (x2)-Renewable energy supply (% total energy supply), (x3)- Renewable electricity (% total electricity generation), (x4)-Forest resource stocks, (x5)-Annual surface temperature (changes since 1951-1980), (x6)-Development of environment-related technologies (% of all technologies), (x7)-Mean population exposure to PM2.5 and (x8)-Biomass (% of DMC).

Graphical methods are used to compare Values of variables between countries. We use graphs because they are perfect for comparing one or many value sets, and they can easily show the low and high values in the data sets (Jami Oetting, 2022). To create a comparison chart, we will use a line graph.



Source: Author calculation

Fig. (1). Production-based CO_2 productivity: GDP per unit of energy-related CO_2 emissions.

We use this method because we want to:

- Trach changes of the variables over time
- Compare changes of the variables between countries
- Capture the performance of the variables over time

We want to create an Index in order to make the countries of the region comparable with one another, this to show which has performed better in terms of green growth. Considering that we have seven variables that vary in years, it is necessary to calculate the skewness coefficient of each variable to create an accurate analysis. This coefficient will be used to calculate the coefficient of performance.

How To Calculate the index of performance?

We have used this following step to find the **index of performance.**

First, we ha calculate the average of the variables over years for each country;

$$Average\ (country)_k = \frac{\text{sum of all observations for each variabel}}{Total\ number\ of\ observations\ for\ each\ variabel}$$

Then calculate the percentage of the contribution per variable for each country;

$$\boldsymbol{\rho} = \frac{Average\ (country)_k}{\sum_{k=0}^{n} Average\ (country)_k} * 100$$

To calculate our index, we will consider as a negative effect for large values of '**ρ**' for these variables; Production-based CO2 productivity, GDP per unit of energy-related CO_2 emissions, mean population exposure to PM2.5 and Annual surface temperature, change since 1951-1980.

We will consider as a positive effect for large values of '**ρ**' for these variables; Renewable energy supply, % total energy supply, Renewable electricity, [4] % total electricity generation, Development of environment-related technologies, % all technologies and Biomass, % of DMC

We will use the information below for calculation purpose.

ANALYSIS OF RESULTS AND FINDINGS

According to OECD, production-based CO_2 productivity reflect the economics value generated (in term of real GDP) per unit of CO_2 emitted. Production-based emissions refer to gross direct CO_2 emissions from fossil fuel combustion, emitted within the national territory[5]. In Fig. (**1**) we can distinguish that Albania has the highest level of production-based CO_2 productivity, while Bosnia-Herzegovina has the lowest one. The values that this variable takes for Albania in the longtime are much greater than its values for other countries. The trend of this variable in Albania is increasing, while in other countries it is decreasing or constant.

According to United Nations (1987), renewable energy derives from natural sources that are replenished at a higher rate than they are consumed[6].

index of performance; $\varphi = \sum_{k=1}^{8} k_i$, k_i=points for each variabel

Variable with positive effect	0	1	2	3	4	point to count
ρ	0-10%	11-20%	21-30%	31-40%	41-50%	percentage of the contribution
Variable with negative effect	4	3	2	1	0	point to count

Author methodology

index of performance; $\varphi = \sum_{k=1}^{8} k_i$, k_i=points for each variable.

[4] A line graph reveals trends or progress over time

[5] Green Growth Indicators 2017 | READ online (oecd-ilibrary.org)

[6] What is renewable energy? | United Nations

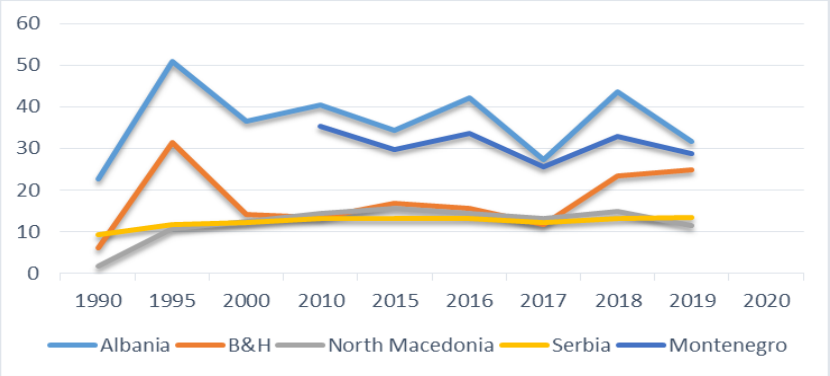


Fig. (2). Renewable energy supply: % total energy supply.

Source: Author calculation.

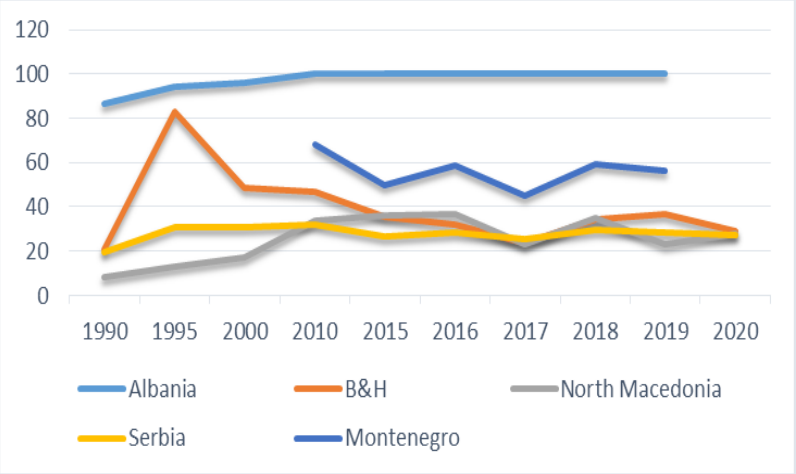


Fig. (3). Renewable electricity, % total electricity generation.

Source: Author calculation.

Electricity produced from renewable energy sources comprises the electricity generation from hydro plants (excluding that produced as a result of pumping storage systems), wind, solar, geothermal and electricity from biomass/wastes. That sort of energy generally has a lower environmental impact over its life-cycle than electricity generated from fossil fuels. Greater use of renewable electricity reduces environmental pressures resulting from electricity production[7].

Figs. (**2**) and (**3**) show that Albania is more advantageous in terms of the supply of renewable energy and renewable electricity, followed by Montenegro. In 2018, Bosnia-Herzegovina made efforts to increase the capacity for the supply of renewable energy, while Serbia and North Macedonia present a constant trend without visible progress in renewable energy.

According to OECD (2009), forest resource stock is measured as the growing stock of standing trees.[8] The exploitation of the forest resources contributes significantly to the economy. In Fig. (**4**), we see that Bosnia-Herzegovina and Serbia have the largest stock of forests amongst the countries studied, while Albania and Montenegro the lowest one. The forest stock trend for the first two countries and for the second two is almost the same.

The annual surface temperature data reflect how much warmer or cooler each country was compared to a base period of 1951-1980. The global mean surface air temperature for that period was 14 C, with an uncertainty of several tenths of a degree.[9] Regarding this variable (Fig. **5**), all countries have an increasing trend. The same trend of this variable for all countries can be explained by the fact that temperature fluctuation and its increase is a global phenomenon and cannot be controlled by a single country. The lowest temperatures were shown in 1995 and the highest in 2018.

The data for the development of environment-related technologies presented in Fig. (**6**), start from approximately 2010, since the countries under consideration are countries that have recently begun to pay attention to this technology, compared to other more developed countries. We noticed that environment-related technologies have grown slightly in Albania, Montenegro and North Macedonia, have decreased

[7] Renewable electricity — European Environment Agency (europa.eu)
[8] Green Growth Indicators 2017 | READ online (oecd-ilibrary.org)
[9] World of Change: Global Temperatures (nasa.gov)

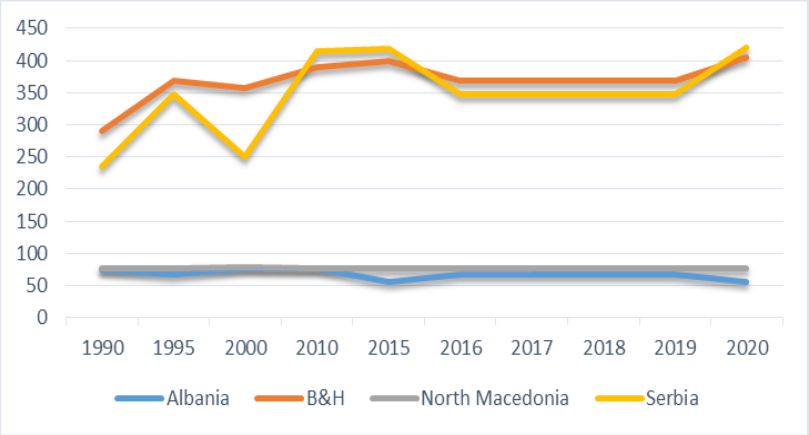


Fig. (4). Forest resource stocks.

Source: Author calculation.

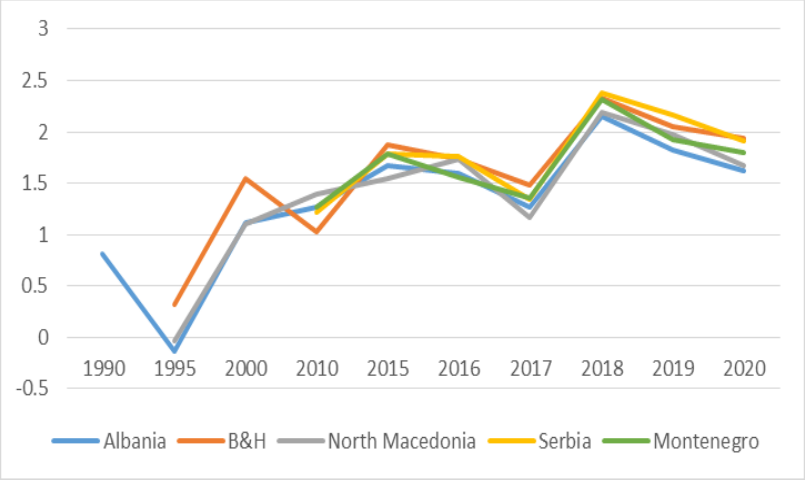


Fig. (5). Annual surface temperature, change since 1951-1980.

Source: Author calculation.

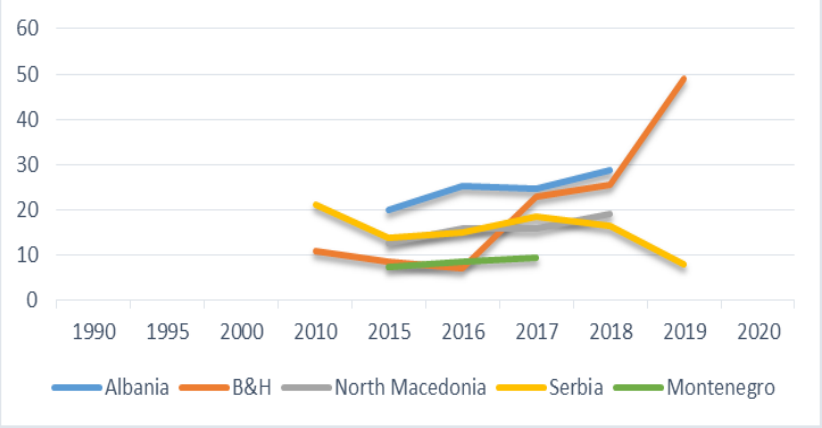


Fig. (6). Development of environment-related technologies, % all technologies.

Source: Author calculation.

in Serbia and have a visible increase in Bosnia-Herzegovina, reaching a doubling in 2018.

Population-weighted exposure to ambient PM2.5 pollution is defined as the average level of exposure of a nation's population to concentrations of suspended particles measuring less than 2.5 microns in aerodynamic diameter, which are capable of penetrating deep into the respiratory tract and causing severe health damage. Exposure is calculated by weighting mean annual concentrations of PM2.5 by population in both urban and rural areas. The guideline set by the World Health

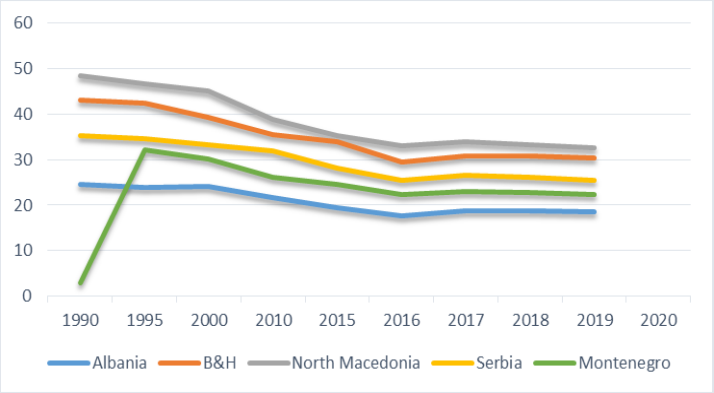


Fig. (7). Mean population exposure to PM2.5.

Source: Author calculation.

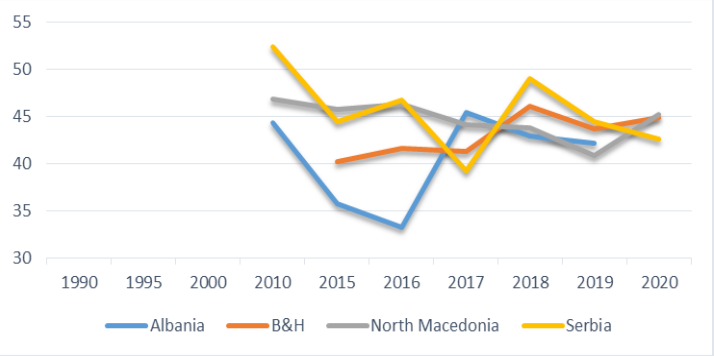


Fig. (8). Biomass, % of DMC.

Source: Author calculation.

Organization (WHO) for PM2.5 is that annual mean concentrations should not exceed 10 micrograms per cubic meter, representing the lower range over which adverse health effects have been observed. [10] The results in Fig. (**7**) indicated that the mean PM2.5 concentration order was shown as North Macedonia > Bosnia-Herzegovina > Serbia > Montenegro > Albania. The average percentages of PM2.5 concentrations for these countries are from 3 to 5 times greater than the appropriate rate in order not to create harm to people's health. The progress of this variable over the years is in decline for all the selected countries, but its values are still far from the correct ones.

Domestic material consumption (DMC) refers to the number of materials (in terms of weight) used in an economy, i.e., materials extracted or harvested in the country, plus materials and products imported, minus material and products exported.[11] The data we collect are for the biomass calculated as a percentage of domestic material consumption (Fig. **8**), for about a decade. Biomass is organic, meaning it is made of material that comes from living organisms, such as plants and animals. The most common biomass materials used for energy are plants, wood, and waste.[12] If we analyze our figure, the selected countries, during the last 20 years, converge almost at the same point in the use of biomass to create energy. They use from 40 to 50% of DMC for biomass.

In order to realize which of the examined countries has beter performance, we collect all the data observed above in a single table. To make these countries comparable we will use coefficient of performance as explained in the methodology of this paper.

Calculation the index of performance for all countries;

index of performance for Albania $-\ \varphi = \sum_{k=1}^{8} k_i = 17$

index of performance for B&H $-\ \varphi = \sum_{k=1}^{8} k_i = 18$

index of performance for North macedonia $-\ \varphi = \sum_{k=1}^{8} k_i = 12$

index of performance for Serbia $-\ \varphi = \sum_{k=1}^{8} k_i = 16$

index of performance for Montenegro $-\ \varphi = \sum_{k=1}^{8} k_i = 15$

From the results of Table **2**, it can be observed that Albania, compared to the other countries examined, performs "worst" in production-based on CO_2 production and forest resources stocks. It performs "best" in renewable electricity. In the forest resources stocks, Bosnia-Herzegovina and Serbia have the "best" value and North Macedonia the "worst". Bosnia-Herzegovina and North Macedonia performed "bad" for renewable energy supply, renewable electricity and mean pop-

[10] Brauer, M. et al. 2017, for the Global Burden of Disease Study 2017
[11] https://data.oecd.org/materials/material-consumption.htm
[12] https://education.nationalgeographic.org/resource/biomass-energy

Table 2. Percentage of the Contribution for Each Country.

Variable	Effect	Albania		B&H		North Macedonia		Serbia		Montenegro	
		ρ	k	ρ	k	ρ	k	ρ	k	ρ	k
x1	negative	36%	1	11%	3	19%	3	12%	3	23%	2
x2	positive	33%	3	16%	1	11%	1	11%	1	28%	2
x3	positive	40%	3	16%	1	10%	0	11%	1	23%	2
x4	positive	8%	0	43%	4	9%	0	40%	3	25%	2
x5	negative	17%	3	20%	3	18%	3	23%	2	22%	2
x6	positive	29%	2	24%	2	19%	1	18%	1	10%	0
x7	negative	14%	3	24%	2	26%	2	20%	3	16%	3
x8	positive	23%	2	25%	2	26%	2	26%	2	25%	2

Source: Author calculation.

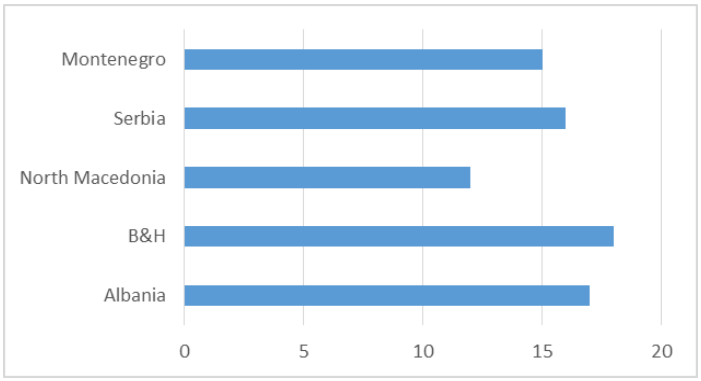


Fig. (9). Coefficient of performance.

Source: Author calculation.

ulation exposure to PM2.5. Montenegro has a "bad" for the development of technologies related to the environment.

From Fig. (**9**) we notice that B&H has the best performance with the available data. Albania performs the best of the remaining four countries and North Macedonia the worst.

CONCLUSIONS AND RECOMMENDATIONS

The human economy is based on the environment. It extracts from environment the productive (natural) resources it needs to produce and throws into it the production wastes, which can take different forms. Studies have shown that if the human economy continues in this way, then the earth will have serious problems in terms of climate change, insufficiency of natural resources and the destruction of the ecosystem. There is a need for countries to make more sustainable use of the environment and natural resources, while maintaining and improving living standards and reducing poverty.

In our paper we have relied on data for a small group of countries and on some indicators of green growth. The suggested indicators are some of those used and analyzed in studies to help countries improve their policies and practices in economic-environmental issues.

From this study occurs that the countries considered must improve in all these indicators analyzed in the paper. Two of the main indicators examined are the emission of carbon dioxide from human productive activity and the use of renewable energies.

The emission of carbon dioxide is a phenomenon that not only concerns the country that releases it, but also those affected by its distribution in the atmosphere. To reduce carbon dioxide emissions, one of the political instruments that should be used is taxation. The increase in taxes would drive the economy to low carbon technological innovations. This would help countries to have a cleaner environment and air, reducing global greenhouse effects.

The same instrument would also take improvements in the reduction of fossil fuel extraction. This type of fuel is a non-renewable resource and its continued use greatly increases production costs. For all non-renewable resources, policy instruments should include taxes, tradable permits, laws and international agreements. Governments should move towards renewable energy sources.

The regulation of these policies and the increase of investments and innovations in the direction of sustainable growth and new economic opportunities will have a significant impact on the regulation of other indicators used in this paper, such as biomass or the reduction of particles in the atmosphere, and also in preserving and increasing natural capital (such as forests), reducing the scarcity of natural resources,

reducing major environmental pollution, climate change and biodiversity loss. Innovations must include not only technological ones, but also innovations in business models, economic and social systems and changes in the lifestyle.

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